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THE FACTORS AFFECTING EFFICIENCY OF CRUDE PALM OIL IN INDONESIA PALM OIL INDUSTRY

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Abstract

This research aim is to determine the factors affecting efficiency of crude palm oil (CPO) in Indonesia by using simple regression (T-partial) and multiple regression (F-simultaneous) analysis through EViews software. The results of this study indicate that partially is the independent variables that affecting Crude Palm Oil (Y) with a T-Statistic value greater than T table (1.65) are the total concession (7.214855), issued capital (2.087724), total investment (6.538604) and total employees (5.167861) with an alpha value of 0.05. While simultaneously, the independent variables that affecting the dependent variable are total concession, authorized capital, issued capital, paid up capital, total investment, total employees with F-statistic value of 16,65554, F table value of 1.94 with alpha value of 0.05 . Therefore, the palm oil industry in Indonesia can improve efficiency and production through maximum use of total concession inputs, issued capital, total investment and total employees.

Keywords: Affecting, Efficiency, Crude Palm Oil, Simple Regression, Multiple Regression

INTRODUCTION

The agricultural sector is one sector that is quite important in Indonesia. This is because the agricultural sector is the second most influential sector on economic growth, after the processing industry (Detik Finance, 2017). This is also supported by data (Kementerian Perindustrian Republik Indonesia, 2017) which explains that the agricultural industry contributes the second highest Gross Domestic Product (GDP) after the non-oil and gas processing industry, which is 13.59% in the first quarter of 2017. Based on occasional paper (Sheil, et al., 2009), expansion of palm oil as an major driver of economic growth and alternative fuel. In the agricultural sector, the plantation subsector has the potential level where during the 2010-2017 plantation sub-sector contributed the highest compared to other sub-sectors, amounting to 34.7% (Kementerian Koordinator Bidang Perekonomian, 2019). According to Maygirtasari, Yulianto, & Mawardi (2015) plantations are one of the agricultural sub-sectors that have an important role in development and one of Indonesia's mainstays is palm oil.

Palm oil is a leading commodity in Indonesia and has an important role in economic activities in Indonesia, namely as the largest foreign exchange earner of $ 24 billion (Rp 298 trillion) in 2017 (Belajartani.com, 2018) and palm oil is also one Indonesia's main export commodity, where palm fruit is an important part of palm oil plants which can be processed

into crude palm oil and palm kernel oil. Most of the regions in Indonesia can be utilized as oil palm plantations that produce crude palm oil, but currently production is only available on a few islands, namely Sumatra, Kalimantan and Sulawesi. The growth of Indonesia's crude palm oil production in recent years has increased and is directly proportional to the area of oil palm plantations, even crude palm oil is a product of the plantation subsector which is Indonesia's leading export commodity as the highest crude palm oil producer in the world. The production of crude palm oil is mostly used by food industry, especially in the cooking oil industry, then for non-food such as cosmetics and pharmaceuticals. But those that have a greater market potential are the cooking oil industry.

In Indonesia, people really need cooking oil in the process of food making. Therefore, great potential producers continue to increase their crude palm oil production. Factors affecting crude palm oil production include raw materials, capital and processing machinery. One of the factors of production in operational activities in the palm oil industry is capital which functions to finance every production activity, namely costs incurred or expenses directly related to palm oil production activities, one of which is crude palm oil (CPO) production activities. Costs incurred in this activity are the purchase of boiler chemicals, spare parts, employee wages and so on. Then the raw material is also a determining factor for the production of crude palm oil, namely the supply of fresh fruit bunches, if it does not provide fresh fruit bunches smoothly, then it can hamper the smooth production of CPO (Hermawan, Edison, & Damayanti, 2015) while according to (Septian, 2015) one of the most important factors in the production process is labor, because it acts as a driving force in the production process and in research by (Norhidayu, Nur-Syazwani, Radzil, Amin, & Balu, 2017), labour, capital and the utilization rate have a significant relationship with production of CPO. Therefore the organization / company must be able to use inputs effectively and efficiently. Can be said to be

effective if the company / organization can use resources as well as possible and produce more output than input.

One of the problems in the palm oil industry is technical inefficiency, in (Defrizal, Tan, & Tasman, 2016) research explained that technical efficiency has an important role in increasing the productivity of oil palm and shows that the age of plantations, land ratios, land status, sources seeds and workforce training are significantly related to technical efficiency and according to (Yunikartika, 2016) in 2014 the crude palm oil productivity was only 3.73 tons / ha from the oil palm plantation area of 10.96 million hectares, when compared to other countries namely Malaysia's crude palm oil productivity of 4.82 tons / ha from the oil palm area of 4.5 million hectares. So it can be seen that even though Indonesia is the number one producer of palm oil in the world, Indonesia has not yet used land efficiently, due to its low productivity but the area of plants used is twice as large. This is also support by data indexMundi, palm oil production by country, Indonesia with first rank the highest palm oil production but the annual growth rate with sixth rank, which can be seen in Table 1.

Table 1. *Palm Oil Production by Country (1000 MT)*

Rank	Country	Production (1000 MT)
1	Indonesia	42,500
2	Malaysia	19,800
3	Thailand	3,000
4	Colombia	1,680
5	Nigeria	1,015
6	Guatemala	852
7	Ecuador	630
8	Honduras	580
9	Brazil	540
10	Cote D'ivoire	515

Source: (United States Department of Agriculture, 2019)

Table 2. *Palm Oil Production Annual Growth Rate by Country*

Rank	Country	Production - Annual Growth Rate

1	Ecuador	8.62%
2	Peru	7.22%
3	Thailand	3.45%
4	Colombia	3.38%
5	Brazil	2.86%
6	Indonesia	2.41%
7	Cote D'ivoire	0.19%
8	Liberia	0.00%
9	Mexico	0.00%
10	Benin	0.00%

Source: (United States Department of Agriculture, 2019)

This was also expressed by Joko Suproyono as the Chairperson of GAPKI, although Indonesia is the largest palm oil producing country in the world, but for productivity problems, Indonesia is still less competitive with other producing countries such as Malaysia, Colombia, and Thailand (Okefinance, 2018). Irrespectively from the raw material price, another important factor in production process is the efficiency because this factors have a strongly affect the cost of crude palm oil produced (Sommart & Pipatmanomai, 2011). Issues and challenges of productivity, labour shortage, technology adoption and sustainability need to be addressed fully and in an effective manner in order to ensure that the industry will remain resilient in the future (Nambiappan et al., 2018) .Based on these problems, it is necessary to conduct research in order to find out what factors affect efficiency the production of crude palm oil (CPO) in Indonesia by the regression method.

MATERIALS AND METHODS

The research used in this study consisted of descriptive research types, namely research that focuses on how to solve current problems or actual problems to describe the situation precisely and accurately.

General Procedure

This research aims to find out what factors affect the production of crude palm oil (CPO) in Indonesia by using a regression analysis method. The method consisting of simple regression and multiple regression analysis. Simple regression is used to determine the effect of each independent variable on the crude palm oil (CPO) variable which will produce a T-statistic value and a Prob (T-Statistic) value, while multiple regression to find out simultaneously the effect of the independent variable on the crude palm oil variable (CPO) which will produce an F-statistic value and a Prob (F-Statistic) value through EViews software.

Physical and Spectral Data

This study uses quantitative data in the form of numbers (scores, values) or statements that are valued and statistical analysis that is usually used to prove and reject a theory. The data source used is secondary data that is data that has been collected by other parties and data collected is not only for the purpose of a particular research .The data used for this study came from the Ministry of Agriculture of the Republic of Indonesia or Kementrian Pertanian Republik Indonesia in 2018 as many as 265 company data consisting of 6 independent variables namely total concession, authorized capital, issued capital, paid up capital, total investment, and total employees with 1 dependent variable, namely crude palm oil.

RESULTS AND DISCUSSIONS

Following are the results and discussion of the partial and simultaneous regression tests in this study through EViews software:

Simple Regression Analysis (T-Partial)

Effect of total concession (X_1) on CPO

Based on the results of the EViews output, the coefficient of determination or R^2 is 0.165223, so it can be concluded that 16.52% of the Total Concession (X_1) variable can explain the CPO variable and the remaining 83.48% is explained by other variables.

Hypothesis:
H0: There is no significant effect between Total Concession (X_1) on Crude Palm Oil (CPO).

Ha: There is a significant effect between Total Concession (X_1) on Crude Palm Oil (CPO).

For the decision of this regression test that is based on the EViews output display shows that the T-Statistic of 7.214855 is greater or equal to 1.65. This is supported by the sigma value (Prob-Tstat) of 0,0000 which is smaller or equal to the value of alpha (α) 0.05, from these results then H0 is rejected.

It can be concluded that there is a significant effect between Total Concession (X_1) on Crude Palm Oil (CPO). This was also reported from (Kontan.co.id, 2019), PT Provident Agro Tbk (PALM) which suffered a substantial loss in 2018, Finance Director of PT Provident Agro Tbk, Devin Antonio said the loss was inseparable from the land divestment carried out by PALM also reduced the production of Crude Palm Oil (CPO) produced by PALM.

Simple regression equation:

$$Y_2 = a + bX_1$$

Y = -1.348726 + 0.342245 X_1.

That is, if the Total Concession (X_1) rises by 1 point, the Crude Palm Oil has an increase of 0.344245. If the Total Concession (X_1) drops by 1 point, Crude Palm Oil decreases by 0.344245. Moreover, if the Total Concession (X_1) is worth 0, then Crude Palm Oil will be worth -1,348726.

Effect of Authorized Capital (X_2) on CPO

Based on the results of the EViews output, the coefficient of determination or R^2 is 0.009979, so it can be concluded that 0.99% of the Authorized Capital (X_2) variable can explain the Crude Palm Oil (CPO) variable and the remaining 99.01% is explained by other variables.

Hypothesis:

H0: There is no significant effect between Authorized Capital (X_2) on Crude Palm Oil (CPO)

Ha: There is a significant effect between Authorized Capital (X_2) on Crude Palm Oil (CPO)

For the decision of this regression test that is based on EViews output display shows that the T-Statistic of 1.628197 is smaller or equal to 1.65 (T table). This is supported by the sigma value (Prob-Tstat) of 0.1047 which is greater or equal to the alpha value (α) of 0.05, from the results, H0 is accepted. So it can be concluded that there is no significant effect between Authorized Capital (X_2) on Crude Palm Oil (CPO).

Simple regression equation:

$$Y_2 = a + bX_1$$

Y = -3.231100 + 0.032336 X_2.

That is if the Authorized Capital (X_2) rises by 1 point, the Crude Palm Oil has an increase of 0.032336. If Authorized Capital (X_2) drops by 1 point, Crude Palm Oil decreases by 0.032336. If Authorized Capital (X_2) is worth 0, Crude Palm Oil will be worth -3,231100.

Effect of Issued Capital (X_3) on CPO

Based on the results of the EViews output, the results show that the coefficient of determination or R^2 is equal to 0.016302 so it can be concluded that 1.63% of the Issued Capital variable (X_3) can explain the Crude Palm Oil (CPO) variable and the remaining 98.37% is explained by other variables.

Hypothesis:
H0: There is no significant effect between Issued Capital (X_3) on Crude Palm Oil (CPO).

Ha: There is a significant effect between Issued Capital (X_3) on Crude Palm Oil (CPO).

For the decision of this regression test that is based on the output view EViews shows that the T-Statistic of 2.087724 is greater or equal to 1.65 (T-table). This is supported by the sigma (Prob-Tstat) value of 0.0378 which is smaller or equal to the alpha value (α) of 0.05, from this result the H0 is rejected. It can be concluded that there is a significant effect between Issued Capital (X_3) on Crude Palm Oil (CPO).

Simple regression equation:

$$Y_2 = a + bX_1$$

Y = -3.256787 + 0.036473 X_3.

If Issued Capital (X_3) rises by 1 point then Crude Palm Oil has an increase of 0.036473. If Issued Capital (X_3) drops by 1 point, Crude Palm Oil decreases by 0.036473. And if Issued Capital (X_3) is worth 0, Crude Palm Oil will be worth -3,256787.

Effect of Paid Up Capital (X_4) on CPO

Based on the results of the EViews output, the results show that the coefficient of determination or R^2 is 0.009895 so it can be concluded that 0.98% of the Paid Up Capital variable (X_4) can explain the Crude Palm Oil (CPO) variable and the remaining 99.02% is explained by other variables.

Hypothesis:
H0: There is no significant effect between Paid Up Capital (X_4) on Crude Palm Oil (CPO).

Ha: There is a significant effect between Paid Up Capital (X_4) on Crude Palm Oil (CPO).

For the decision of this regression test that is based on the EViews output display shows that the T-Statistic of 1.621204 is smaller or equal to 1.65 (T table). This is supported by the sigma value (Prob -Tstat) of 0.1062 which is greater or equal to the alpha value (α) of 0.05, from this result, H0 is accepted. So it can be concluded that there is no significant effect between Paid Up Capital (X_4) on Crude Palm Oil (CPO).

Simple regression equation:

$$Y_2 = a + bX_1$$

Y = -3.201650 + 0.031176 X_4.

If Paid Up Capital (X_4) rises by 1 point, CPO has an increase of 0.031176. If Paid Up Capital (X_4) drops by 1 point, Crude Palm Oil (Y) decreases by 0.031176. If Paid Up Capital (X_4) is 0, then Crude Palm Oil (Y) will be worth -3,201650.

Effect of Total Investment (X_5) on CPO

Based on the results of the EViews output, the results show that the coefficient of determination or R^2 is 0.139830 so it can be concluded that 12.98% of the Total Investment (X_5) variable can explain the Crude Palm Oil (CPO) variable and the remaining 86.02% is explained by other variables.

Hypothesis:
H0: There is no significant effect between Total Investment (X_5) on Crude Palm Oil (CPO).

Ha: There is a significant effect between Total Investment (X_5) on Crude Palm Oil (CPO).

For the decision of this regression test that is based on the output display EViews shows that the T-Statistic of 6.538640 is greater or equal to 1.65 (T-table). This is supported by the sigma value (Prob-Tstat) of 0.0000 which is smaller or equal to the alpha value (α) of 0.05, from these results then H0 is rejected.

It can be concluded that there is a significant effect between Total Investment (X_5) on Crude Palm Oil (CPO). This is because the Director General of the Ministry of Industry Agro Industry, Panggah Susanto, said the downstream investment is driving the export of downstream CPO products

from 30% of the total national palm production to 70%. This shows the benefits of industrial downstream instruments increasing the volume and value added of exported goods as the Secretary General of the Indonesian Palm Oil Association (GAPKI), Joko Supriyanto, said investment in the downstream CPO sector continues to grow. At least 10 palm oil plantation companies in Indonesia expanded to the downstream sector by building downstream factories worth a total of 5 trillion rupiahs (Kemenprin RI, 2014).

Simple regression equation:

$$Y_2 = a + bX_1$$

Y = -2.450073 + 0.2322713.

If the Total Investment (X_5) increases by 1 point, the Crude Palm Oil has an increase of 0.2322713. If the Total Investment (X_5) drops by 1 point, Crude Palm Oil decreases by 0.2322713. And if the Total Investment (X_5) is 0, then Crude Palm Oil will be worth -2,450073.

Effect of Total Employees (X_6) on CPO

Based on the results of the EViews output, the results show that the coefficient of determination or R^2 is 0.092186 so it can be concluded that 9.21% of the Total Employees (X_6) variable can explain the Crude Palm Oil (CPO) variable and the remaining 90.79% is explained by other variables.

Hypothesis:
H0: There is no significant effect between Total Employees (X_6) on Crude Palm Oil (CPO).

Ha: There is a significant effect between Total Employees (X_6) on Crude Palm Oil (CPO).

For the decision of this regression test that is based on the EViews output display shows that the T-Statistic of 5.167861 is greater or equal to 1.65 (T table). This is supported by the sigma value (Prob T-stat) of 0.0000 which is smaller or equal to the alpha value (α) of 0.05, from this result, H0 is rejected. It can be concluded that there is a significant effect between Total Employees (X_6) on Crude Palm Oil (CPO). This is because according to (Gabungan Pengusaha Kelapa Sawit Indonesia, 2017) the number of workers in the palm oil industry has increased from year to year and based on data (Sawit Indonesia, 2018) that the number of workers in the palm oil plantation sector for CPO has also increased.

Simple regression equation:

$$Y_2 = a + bX_1$$

Y = -1.598990 + 0.202309 X_6.

If the Total Employees (X_6) increase by 1 point, the Crude Palm Oil has increased by 0.202309. If the Total Employees (X_6) decrease by 1 point, the Crude Palm Oil will decrease by 0.202309. And if the Total Employees (X_6) are worth 0, then Crude Palm Oil will be worth -1,598990.

Multiple Regression Analysis (F-Simultaneous)

Based on the results of the EViews output, the results show that the coefficient of determination or R^2 is 0.279316 so it can be concluded that 27.93% of the variable Total Concession (X_1), Authorized Capital (X_2), Issued Capital (X_3), Paid Up Capital (X_4), Total Investment (X_5), and Total Employees (X_6) can explain the Crude Palm Oil (CPO) variable and the remaining 72.07% is explained by other variables.

Hypothesis:
H0: There is no significant effect between Total Concession (X_1), Authorized Capital (X_2), Issued Capital (X_3), Paid Up Capital (X_4), Total Investment (X_5), and Total Employees (X_6) on CPO.

Ha: There is a significant effect between Total Concession (X_1), Authorized Capital (X_2), Issued Capital (X_3), Paid Up Capital (X_4), Total Investment (X_5), and Total Employees (X_6) on CPO.

For the decision of this regression test that is based on the output view EViews shows that the F-stat is 16.66554 which is greater or equal to 1.94 (F-table). This is supported by the sigma value of 0.0000 which is smaller or equal to 0.05 (α), from this result, H0 is rejected. It can be concluded that there is a significant effect between Total Concession (X_1), Authorized Capital (X_2), Issued Capital (X_3), Paid Up Capital (X_4), Total Investment (X_5), and Total Employees (X_6) on CPO.

Multiple regression equation:

$$Y_3 = a + bX_1 + cX_2 + dX_3 + eX_4 + fX_5 + gX_6$$

Y = -1.501984 + 0.250171 X_1 - 0.058403 X_2 + 0.162526 X_3 - 0.051264 X_4 + 0.80254 X_5 + 0.065394.

If the Total Concession (X_1), Authorized Capital (X_2), Issued Capital (X_3), Paid Up Capital (X_4), Total Investment (X_5), and Total Employees (X_6) increases by 1 point, then Crude Palm Oil (CPO) an increase of 0.548678. If the Total Concession (X_1), Authorized Capital (X_2), Issued Capital (X_3), Paid Up Capital (X_4), Total Investment (X_5), and Total Employees (X_6) drops by 1 point, then Crude Palm Oil (CPO) experiences a decrease of -0.548678. If Total Concession (X_1), Authorized Capital (X_2), Issued Capital (X_3), Paid Up Capital (X_4), Total Investment (X_5), and Total Employees (X_6) is 0. then Crude Palm Oil (CPO) will be worth amounting to -1.501984.

CONCLUSIONS AND RECOMMENDATIONS

From the research results and analysis results of crude palm oil data processing consisting of 265 companies, the factors affecting crude palm oil in Indonesia with a partial regression test are total concession, issued capital, total investment and total employees. While for the simultaneous regression test, all independent variables have an influence on crude palm oil (CPO).

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