**KLASSEN** | *Vol. 04 No. 2: Juli-Desember 2024* e-ISSN 2775-7722
*Program Studi Ekonomi Pembangunan Universitas Baturaja* p-ISSN 2776-4311
https://journal.unbara.ac.id/index.php/klassen

# ECONOMIC OF SCALE PALM OIL INDUSTRY (ISIC : 10431) INDONESIA

**Sisilia Aura Putri Permia[1], Imam Asngari[2], Deassy Apriani[3]**
[1,2,3] **Department of Economics, Faculty of Economics, Universitas Sriwijaya, Indonesia**
*** deassyapriani@fe.unsri.ac.id**

***Abstract*:**
*Indonesia is the global langers palm oil producer. Palm oil has the hightest production compared to other commodities, one of the reasons is the area that is owned by Indonesia. This research analyzed the economic of scale of the palm oil industry and the effect of capital and labor on the production of the palm oil industry. This research used secondary data from Indonesian Statistic in the period of 2000-2019. This research used the Cobb-Douglas production function to calculate the economic of scale by using multiple regression. The results showed the variables of capital and labor have a positive and significant effect on the production of the palm oil industry. The economic of scale of the palm oil industry showed a decreasing scale category with the coefficient results is 0.526836.*

**Keywords :** ***Economic of Scale, Cobb-Douglas, Palm Oil Industry***

**JEL :** D21, D24, F13

---

## 1. INTRODUCTION

The agricultural sector has an important role in the Indonesian economy. There are many plants that can live in Indonesia such as palm oil, rubber, sugar cane, tea, coffee, and others. According to the Indonesian Statistics (2021) the agricultural. sector contributed to the Gross Domestic Product with a fairly high value of 13.7 percent in 2020. The plantation subsector also plays an important role in the Indonesian economy. According to the Indonesian Statistics, (2021) the provision of plantations in 2020 to Gross Domestic Product was 26.50 percent and 26.50 percent to the agriculture, forestry and fisheries sector.

Palm oil is a leading plantation commodity in Indonesia that has a rapidly increasing production. According to the Indonesian Statistics (2020) oil palm has the highest production compared to other plantation commodities, one of the reasons is the large area owned by Indonesia. In 2020, Indonesia's oil palm plantation area reached more than 14 thousand hectares with production reaching 48 thousand tons with plantation areas spread across 26 provinces in Indonesia.

Palm oil is resistant to high pressure and has the ability to neutralize chemicals that cannot be neutralized by other chemicals (Rengga, 2020). In addition, palm oil has a low price, is easy to process, and is stable when produced for various types of food, cosmetics, and others. Palm oil also has a high coating power, causing palm oil to be used as raw material in the industrial sector in producing cooking oil.

The demand for palm oil is not only domestic but also very much foreign. According to the publication of Indonesian palm oil statistics Indonesian of Statistics (2020), Indonesia exports palm oil to all continents of the world. However, the main market share is the Asian continent. Indonesia supplies its palm oil (CPO) production to meet the demand in the global market.

The increasing absorption and consumption of vegetable oils abroad has also increased, this has caused palm oil to be able to beat the market share of other vegetable oil sources such as soybean oil, sunflower, castor bean, corn, and coconut oil (Kementrian Perindustrian RI 2021).

Directory of Indonesian Oil Palm Plantation Companies (2020) The survey of oil palm plantation companies in 2020 found 2,511 companies spread across 26 provinces. Riau has 363 oil palm plantation companies, which is the province that has the largest number of oil palm plantation companies in Indonesia. Then, followed by East Kalimantan

Province with 332 companies, West Kalimantan with 331 companies, North Sumatra with 324 companies, and there are 232 companies in Central Kalimantan Province.

Basically the company will try to maximize production to maximize profits, the maximum profit also depends on the scale of the company's business. The scale of an industry can increase, remain constant, and decrease by comparing changes in production levels with changes in input levels (Azwardi, 2008).

Business scale can be measured using the production function. The production function itself is the relationship between input and output. If there are many raw materials (inputs) available, the higher the production output will be (Andriani, 2017). Capital and labor also have a positive relationship to output, the higher the capital and the more labor employed in a company, the higher the production output will be (Febrianto,. et.al 2020)

## 2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### 2.1. Theoretical Basis

#### 2.1.1. Cobb-Douglas Production Function

This production function represents the real relationship between input and output. To ascertain the relationship between the two variables using regression tests. Cobb-Douglas can analyze three things, first, efficiency analysis is the use of the smallest input to get the largest number of products without forgetting the quality of the products produced. (Perloff, 2012). Second is scale, based on the Cobb-Douglas production function equation, there are three possible situations of scale: constant scale, increasing scale, and decreasing scale. Thirdly, the elasticity with respect to a particular input is a measure of the proportional change in its input when the other inputs are constant. Before partial production can be calculated, the values of total physical product, average physical product, and marginal physical product are first sought.

#### 2.1.2. Industrial Organization Theory

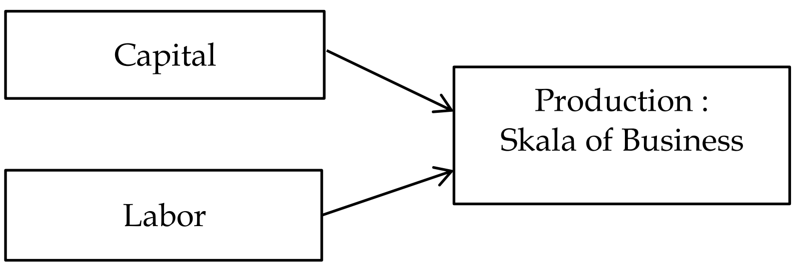
Paradigm *Stucture-Conduct-Performance* is a paradigm used to link elements of market structure to the behavior and performance of an industry. *Stucture* is usually explained by the market concentration ratio. The market concentration ratio is a calculation of the distribution of market shares in the industry. There is a perfect one-way relationship between market structure, behavior and performance. Market structure strongly influences firm behavior which can determine various components of the firm's performance.

#### 2.1.3. Business Scale

According to Dewi (2018), Business scale is an assessment of the ability carried out by the company in business management, this is assessed based on the total workforce and total income obtained by the company in a certain period of time. Business scale is divided into 3 (Perloff, 2012) :

1. Constant Scale is a condition where when the input increases by a certain amount, the output also increases by the same number.
2. Increasing scale is a where the increase in output is much greater than the increase in input
3. Decreasing scale is a where the change in output is less than the addition of input.

**Framework**



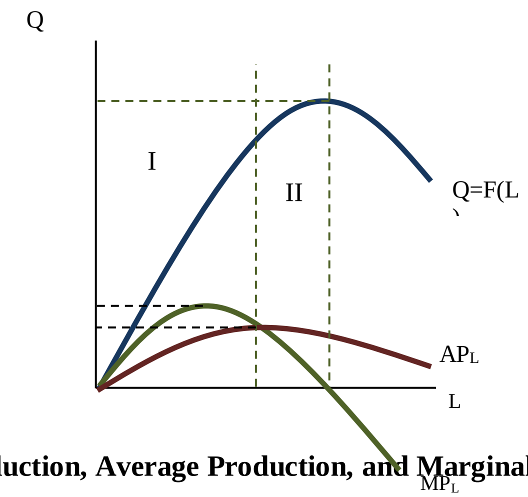

**Picture 2. Research Framework**

## 2.2. Literature Review

Research conducted by Sholahudin et al. (2019) and Dewi et al. (2017) , stated that the capital variable has a positive influence on production and so does labor also have an influence on production. In addition, capital and labor together have a positive relationship to production. Research conducted by Rianto (2016) and Putri et al. (2020) which states that capital and labor have a significant influence on production. Contrary to the results of research conducted by Tamjidillah (2018) dan Sutra et al. (2021) which states that capital and labor have no influence on production.

Research conducted by Badriah et al., (2022) dan Hermawan et al., (2015) In his research, he got the sum of the variable coefficients with a number <1, more precisely 0.79 and 0.82, this situation states that the CPO production process is still unable to provide added value, this is because the proportion of input use is too excessive disproportionate to the production results achieved. So it can be concluded that the scale of business in both studies is categorized as Decreasing Return To Scale.

Production is intended to provide an understanding of the behavior of companies in buying and using inputs for production and selling products (Karim, 2014). Production theory explains the behavior of producers in maximizing profits and optimizing production efficiency. Maximizing profits or production efficiency will not be separated from the structure of costs and revenue obtained.




**Picture 1. Total Production, Average Production, and Marginal Production Curves**
Sumber : Konsake (2019)

## 2.3. Hypothesis

1. It is suspected that labor and capital have an influence on production.
2. It is suspected that the scale of the palm oil industry is increasing.

## 3. METHODS

This research focuses on the scale of business using production factors, namely capital and labor, using the cobb-douglass production function analysis technique, the analysis was carried out using secondary data obtained from the Central Bureau of Statistics from 2000-2019. This study will measure the scale of business and the influence of production factors on the production of the palm oil industry in 2000-2019.

The function of cobb douglas measures the scale of business with a measuring tool, namely Eviews12. Cobb-Douglas production function, this production function is often referred to as an exponential production function or power function. The specific form of the production function is :

$$\mathbf{Q = a}K^{\alpha}L^{b}$$

It is then transformed into a linear logarithm model into :

$$\textbf{Ln } Q_t = \ln \beta_0 + \beta_1 \ \ln K_t + \beta_2 \ \ln L_t + u_t$$

Information :

$Q_t$ = Production
$K_t$ = Labor
$L_t$ = Capital
$\beta$ = Parameters

Normality test is a test used with the aim of knowing that the data used is normal or not. The way to observe residual normality is through graph analysis and statistical analyzes. (Billy 2022). The basis for making data normality decisions by looking at the probability number, namely if the probability> 0.05 then the data is normally distributed and if the probability ≤0.05 then the data is not normally distributed.

According to Nugraha (2022), The multicollinearity test is carried out to find out whether there are variables that correlate with each other in the independent variables. This symptom is indicated by a significant correlation between the independent variables.

According to Janie (2012), Autocorrelation aims to test whether the model in linear regression has a correlation between confounding errors in period t and confounding errors in period t-1 (previous). A good regression model is one that is free from autocorrelation.

The heteroscedasticity test aims to test whether in a regression there is an inequality of variance from the residuals of one observation to another observation, it is called homoscedasticity and if the variance is different it is called heteroscedasticity. A good regression model is that heteroscedasticity does not occur.

The F test aims to determine whether the independent variables significantly affect the independent variables together (Yuliara, 2016). The t test aims to determine whether the regression model equation formed partially the independent variables have a significant effect on the independent variables (Yuliara 2016). The coefficient of determination is a summary measure that informs how well a regression line fits the data (Gujarati, 2015).

## 4. RESULTS

Based on Cobb-Douglas which can be described through the existing model, the following are the estimation results of the regression equation model :

**Table 1. Model estimation results**

| Variables | Coefficient | Std. Error | t-Statistik | Prob. |
|---|---|---|---|---|
| Constant | 0.319329 | 0.054318 | 5.878925 | 0.0000 |
| Ln Labor | 0.031537 | 0.009270 | 3.402013 | 0.0007 |
| Ln Capital | 0.646735 | 0.056864 | 11.37345 | 0.0000 |
| **Summary** | | | | |
| $R^2$ | 0.948244 | | | |
| Adj. $R^2$ | 0.948244 | | | |
| F. Statistic | 0.000000 | | | |

Source: Author Computation, 2022

**LNQ1 = 0.319328770327 + 0.031536779747* Labor + 0.646735235195* Capital**

It can be seen from the coefficient of the capital variable in the palm oil industry, which is equal to 0.031536 with a positive sign, this indicates that when there is an increase in the capital variable by 1 percent, this has an impact on production which also increases by 3 percent. The labor variable coefficient is 0.64673, this indicates that production will decrease by 64 percent if there is an increase in labor by 1 percent and it is not significant because the coefficient on labor is > 0.05.

The normality test is carried out to determine whether the data used is normally distributed or not. By looking at the probability number, if the probability number is> 0.05 then the data is normally distributed. In this study, the probability number is 0.121903 or> 0.05, so the data used is normally distributed and can do the next test.

Multicollinearity test is conducted to see if there are independent variables that are correlated with each other. By looking at the VIF value if <10 then the data does not have a correlation between the independent variables. In this study, the VIF value is 3.766802, it can be concluded that the data in this study does not have a correlation between the independent variables.

The Autocorrelation test is carried out with the aim of seeing if there is a relationship between periods. By looking for the value of DW = 1.863683, DU = 1.5367, DL = 1.1004, 4-DU = 2, 4633, and 4-DL 2.8996. If the DW value is between the DU and 4-DU values, the data is free from autocorrelation. In this study, DW is between DL and 4-DU where DW is 1.863683. So it can be concluded that the data in this study are free from autocorrelation.

The Heteroscedasticity test is carried out to see if in the model there is an inequality of variance from the residuals. With the provisions of the value on the probability> 0.05. In this study, the probability value is 0.2653> 0.05, so in this study there is no heteroscedasticity problem.

In this study, the probability obtained from the F test is 0.000000> 0.05, so it can be concluded that capital and labor simultaneously have a significant effect on the production of the palm oil industry. In the T test in this study on the capital variable of 0.0007, capital has a positive and significant effect on the production of the palm oil industry. In the capital variable, the probability is 0.0000, so capital has a significant effect on the production of the palm oil industry.

The result of the Coefficient of Determination is 0.948344. It can be concluded that the production of the palm oil industry can be explained using capital and labor by 94 percent and as much as 6 percent of the production of the palm oil industry is explained by variables other than capital and labor. In this study, the variable coefficient numbers were obtained as follows :

$$\alpha = 0{,}031537$$
$$\beta = 0{,}06467$$

With the sum result 0,6782 atau <1, then the scale of the palm oil industry in 2000-2019 is categorized as follows diminishing scale. The regression results which show that the probability value of the capital variable is 0.0001 or this figure is smaller than 0.05, then there is a significant influence between capital on the production of the palm oil industry. The positive sign on the probability value indicates that if there is an increase in capital, production will also increase, and vice versa if there is a decrease in capital, production will also decrease.

The same thing was also stated by Handayani (2015) the results of his research the capital variable has a significant effect on the production of the CPO industry at PT. Sawit Riau Makmur with a large coefficient of 2.060 in this case it means that every additional capital of one unit, production will increase by 2.060. In addition Hermawan et al., (2015) stated the same thing in his research that there was a significant influence between capital and CPO production at PT Satya Kisma Usaha Sungai Bengkal Mill, Tebo.

Other capital, another production factor in the production process of the palm oil industry is labor. Labor is a factor of production that plays a significant role in producing palm oil. The regression results state that the probability value on the labor variable is 0.0007 the number shown is greater than 0.05. This shows that there is a significant influence on the labor variable on production, so if there is a change in labor, it will result in changes in the production of the palm oil industry.

The same thing was also stated by Rianto, (2015) stated that the labor variable has a significant effect on oil palm production at PT Gruti Lestari Pratama. The regression results that have been carried out show that the probability is small than 0.05, which is 0.000000. This states that capital and labor together have a positive and significant influence on the production of the palm oil industry.

If there is an increase in capital and labor, the addition also has an impact on production. When there is an increase in capital and labor, the production of the palm oil industry will also increase. Likewise, on the contrary, if there is a reduction in capital and labor, the production of the palm oil industry will decrease.

The coefficient of determination of 0.948244 shows that capital and labor in the palm oil industry can explain 94 percent of the production of the palm oil industry and the remaining 6 percent is explained by other production factors besides capital and labor.

The same result was also stated by Rianto, (2015) that capital and labor simultaneously have a significant effect on oil palm production with variations in capital and labor variables able to explain oil palm production by 82.80 percent. Lisa & Syahnur (2019) also states that simultaneously the capital and labor variables have a positive influence on oil palm production in Aceh Tamiang District. In this study, the number obtained from the sum of the coefficients of the independent variables is 0.526836. In the result of the sum of the coefficients less than 1, the palm oil industry is categorized as diminishing returns to scale.

Diminishing scale is a situation where there are many additions to capital and labor, but the increase in production output is less than the change in the addition of capital and labor to the company.

Similar research was also conducted by Badriah et al., (2022) in his research obtained a variable coefficient summation number of 0.79 or equal to <1, it was concluded that the coconut sugar industry in Banyumas was categorized as declining or Decreasing Return to Scale (DRS). Other research was conducted by Hermawan et al., (2015) With the calculation of the coefficient of 0.820 or equal to <1, this situation states that the CPO production process in the period 200-2014 is still not able to provide added value, this is because the proportion of input use is too excessive disproportionate to the production results achieved.

## 5. CONCLUSION AND SUGGESTION

### 5.1. Conclusion

1. Together, capital and labor have a significant influence on the production of the palm oil industry. Personally, the elasticity of capital is 0.03 or inelastic in the palm oil industry, and labor also has a significant influence on the production of the palm oil industry with an elasticity of 0.65.
2. The palm oil industry is categorized as a diminishing return, this is not in accordance with the hypothesis in this study because the number of independent variable coefficients amounts to 0.6782 or <1, so it is categorized as a diminishing return. *diminishing return.*

### 5.2. Suggestion

1. It is possible to add the latest year's data and some variables such as adding raw material variables, or others.
2. Get information to relevant parties about the palm oil industry.

**REFERENCE**

Andriani, Dwi Nila. 2017. "Pengaruh Modal, Tenaga Kerja, Dan Bahan Baku Terhadap Hasil Produksi (Studi Kasus Pabrik Sepatu PT. Kharisma Baru Indonesia)." *EQUILIBRIUM : Jurnal Ilmiah Ekonomi Dan Pembelajarannya* 5(2):151. Doi: 10.25273/Equilibrium.V5i2.1543.

Azwardi, Abukosim D. A. N. 2008. "Ekonomi Pembangunan Analisis Skala Usaha Dan Tingkat Keuntungan Industri Kerajinan Songket Di Kota Palembang." 6(1):54–57.

Badriah, Lilis Siti, Arintoko Arintoko, And Dijan Rahajuni. 2022. "Decreasing Return To Scale In Cottage Industries : Empirical Evidence From The Coconut Sugar Industry In Banyumas , Indonesia *." *Journal Of Asian Finance, Economics, And Business* 9(7):219–29. Doi: 10.13106/Jafeb.2022.Vol9.No7.0219.

Billy, Nugraha. 2022. *Implementasi Metode Regresi Linier Berganda Dengan Pertimbangan Uji Asumsi Klasik*. 1st Ed. Edited By M. A. Susanto. Jakarta: Pradina Pustaka.

BPS RI. 2021. "Pendapatan Nasional Indonesia Bps-Statistics Indonesia." *06 Agustus 2021* X–111.

Dewi, Ida Ayu Nyoman Utami, And Ni Nyoman Yuliarmi. 2017. "Pengaruh Modal , Tenaga Kerja , Dan Luas Lahan Terhadap Jumlah Produksi Kopi Arabika Kecamatan Kintamani Kabupaten Bangli." *E-Jurnal EP UNUD. Universitas Udayana* 6(6):29.

Dewi, Mike Kusuma. 2018. "Skala Usaha Dan Umur Usaha Yang Mempengaruhi Penggunaan Sistem Informasi Akuntansi (Studi Empris Pada Toko Kue Dan Roti Di Kota Padang)." *Jurnal Pundi* 2(3):241–52. Doi: 10.31575/Jp.V2i3.89.

Febrianto, Achmadi Akhimullah, Wahyu Hidayat Riyanto, And Muhammad Sri Wahyudi Suliswanto. 2020. "Pengaruh Modal Dan Tenaga Kerja Terhadap Produksi Indutri Meubel Bukir Kota Pasuruan." *Jurnal Ilmu Ekonomi JIE* 4(4):665–80. Doi: 10.22219/Jie.V4i4.13528.

Gujarati, Damodar N., And Dawn C. Porter. 2015. *Dasar-Dasar Ekonometrika*. 5th Ed. Edited By D. A. Halim. Jakarta: Salemba Empat.

Handayani, Meri. 2011. "Analisis Faktor-Faktor Produksi Yang Mempengaruhi Industri Crude Palm Oil (Cpo) Di Kabupaten Rokan Hilir (Studi Kasus Pt. Sawit Riau Makmur) Oleh." *Jomfekom* 4(1):1–13.

Hermawan, Budi, . Edison, And Yusma Damayanti. 2015. "Analisis Faktor - Faktor Yang Mempengaruhi Produksi Crude Palm Oil (Cpo) Pada Pt. Satya Kisma Usaha Sungai Bengkal Mill Kabupaten Tebo." *Jurnal Ilmiah Sosio-Ekonomika Bisnis* 18(2):124–32. Doi: 10.22437/Jiseb.V18i2.2823.

Janie, D. N. A. 2012. *Statistik Deskriptif & Regresi Linier Berganda Dengan SPSS*.

Karim, A. A. 2014. *Ekonomi Mikro Islami. Jakarta:Rajawali Pers*. 5th Ed. Jakarta: PT Raja Grafindo Persada.

Kementrian Perindustrian RI. 2021. "Tantangan Dan Prospek Hilirisasi Sawit Nasional Analisis: Pembangunan Industri." P. 57 In *Kementerian Perindustrian Republik Indonesia*.

Kosanke, Robert M. 2019. 3rd Ed. Edited By K. Utama. Jakarta: PT Raja Grafindo Persada.

Perloff, Jeffrey M. 2012. *Microecnomic*. 7th Ed. Edited By S. Yagan. United States: Addison Wesley.

Pindyck, Robert. .., And Daniel. .. Rubinfeld. 1997. *MICROECONOMICS*. 3rd Ed. Beijing: Tsinghua University.

Putri, B., S. D. W. Prajanti, And Amin. Pujiati. 2020. "The Effect Of Capital, Labor And Raw Materials Toward Production Value (Study On Tapioca Flour Industry In Margoyoso District, Pati Regency)." *Journal Of Economic Education* 9(1):48–54.

Rengga, W. R. .. 2020. *Goreng, Perpanjangan Masa Pakai Minyak*. 1st Ed. Edited By Y. A. Nabila And R. Gunadi. Yogjakarta: CV. Budi Utama.

Rianto, Rianto. 2015. "Analisis Pengaruh Modal Dan Tenaga Kerja Kerja Terhadap Produksi Kelapa Sawit Pada Pt. Gruti Lestari Pratama Medan." *Studia Economica :*

*Jurnal Ekonomi Islam* 1(1):124. Doi: 10.30821/Se.V1i1.236.

Sholahudin, Muhammad Dedy, Arfida Boerochminari, And Zainal Arifin. 2019. "Pengaruh Modal Dan Tenaga Kerja Terhadap Produksi Kopi Proses Jenis Robusta Dampit." *Jurnal Ilmu Ekonomi* 3(4):1–13.

Sutra, Riani, And Febryandhie Ananda. 2021. "Influence Of Capital, Labor And Wage Levels On Production Of Super Tofu Padang." *Basic And Applied Accounting Research Journal* 1(1):27–37. Doi: 10.11594/Baarj.01.01.04.

Tamjidillah, Muhammad. 2019. "Pengaruh Lahan, Modal Dan Tenaga Kerja Terhadap Produksi Kelapa Sawit Di Kabupaten Barito Kuala (Studi Kasus Di Kecamatan Barambai)." *JIEP: Jurnal Ilmu Ekonomi Dan Pembangunan* 1(2):1–23. Doi: 10.20527/Jiep.V1i2.1148.

Vinet, Luc, And Alexei Zhedanov. 2011a. "A 'Missing' Family Of Classical Orthogonal Polynomials." *Journal Of Physics A: Mathematical And Theoretical* 44(8):1–9. Doi: 10.1088/1751-8113/44/8/085201.

Vinet, Luc, And Alexei Zhedanov. 2011b. "A 'Missing' Family Of Classical Orthogonal Polynomials." *Journal Of Physics A: Mathematical And Theoretical* 44(8):330 Pages.

Yuliara, I. Made. 2016. "Modul Regresi Linier Berganda." *Universitas Udayana* 18.