# THE INFLUENCE OF LAND AREA, PALM OIL PRODUCTION AND LABOR ON GROSS REGIONAL DOMESTIC PRODUCT IN ACEH PROVINCE

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***Abstract***

*The purpose of this study is to investigate how palm oil production, labor, and land area affect Aceh province. This study relies on secondary data for the years 2016 to 2020 that can be accessed at www.bps.go.id. Using Eviews 9 Software, panel data regression analysis was used to analyze the data. According to the findings of this study, production has a significant impact on Gross Regional Domestic Product bruto (PDRB) while land area has no effect on PDRB in Aceh Province. In Aceh Province, labor has no significant negative impact on PDRB. In the meantime, in Aceh Province, land area, production, and labor all have a positive and significant impact on PDRB simultaneously. This study suggests that district and city governments in Aceh Province should pay more attention to the area of oil palm land and oil palm small holders for the community in order to increase district and city PDRB.*

**Keywords:** ***Gross Regional Domestic Product, Land Area, Palm Oil Production and Labor.***

## INTRODUCTION

Gross Regional Domestic Product (PDRB) is a tool to measure how well or poorly the government uses available resources to model for planning and decision-making. Aceh province has oil and natural gas wealth, plantations, agriculture, marine resources, other natural resources (Juniarsih, 2021). The agricultural sector of Aceh Province's Gross Regional Domestic Product is currently a sector that has the potential to become a superior because of its high potential to have a tendency or impact to develop compared to other sectors. According to BPS data, the agricultural sector contributes the largest to the Gross Regional Domestic Product of Aceh Province (Faiziah et al., 2014). The government strives for the welfare and prosperity of the community in various fields now and in the future. One of the areas optimized by the government is the palm oil industry. These industries are very strategic in the macroeconomy and become new growth centers and can increase economic growth in rural and urban areas (Juanda et al., 2021).

**Table 1**

**Gross Regional Domestic Product 2016-2020**

| District/City | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| North Aceh | 17,867,553.66 | 18,151766.38 | 16,286,459.23 | 16,852,696.94 | 17,015,452.78 |
| Lhokseumawe | 8,873,694.67 | 8,980,377.13 | 6,840,710.70 | 7,112,684.80 | 7,009,713.29 |
| East Aceh | 7,479,287.21 | 7,677,933.91 | 7,802,174.64 | 8,146,902.30 | 8,292,591.42 |
| Bireun | 7,397,629.76 | 7,689,706.30 | 9,586,141.56 | 10,065,327.74 | 9,970,576.95 |

| District/City | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| Great Aceh Regency | 7,265,105.64 | 7,549,095.89 | 9,561,638.20 | 9,977,735.25 | 10,008,806.57 |

Source: (Direktorat Jendral Perkebunan 2020)

Based on table 1.1, PDRB always increases from 2016 to 2020. Spatially, the structure of PDB from 2016 to 2020 in Aceh Province is still dominated by five districts or cities, namely North Aceh Regency amounting to 86,173,928.99. Cause North Aceh Regency is a regency / city that has the largest economy in Aceh Province and the agricultural sector as a support. This value contributes more than 36% of the total GDP in North Aceh Regency. Furthermore, Lhokseumawe City amounted to 38,817,180.5. The GRDP in Lhokseumawe City is quite high because it is dominated by business activities including car and motorcycle maintenance, processing industry, construction, agriculture, fisheries, transportation, as well as wholesale trade and retail warehousing. East Aceh Regency amounted to 39,398,889.48, categorized high because there are leading commodities, namely the agricultural sector, including oil palm, cocoa, rubber, and coconut plantation crops. In the next order, Bireun Regency amounted to 44,709,382.31. The GRDP in Bireun City is high because it is dominated by forestry, and agricultural services include plantations, food crops and horticulture, as well as dominance in the livestock and fisheries sectors.

In general there are two types of benefits associated with agricultural land, first the benefits for existing use (use value) incurred by agriculture or exploitation of agricultural land. There are two types of use value: direct benefits and indirect benefits. Products that can be measured in real terms and sold at marketable prices or outputs. Furthermore, benefits that cannot be measured by money but can be felt directly by the community are providing food security (Izzaty et al., 2016).

**Table 2**

**Oil Palm Land Area 2016-2020**

| District/City | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| East Aceh | 25,842 | 25,997 | 26,177 | 26,307 | 26,357 |
| Great Aceh Regency | 1,664 | 1,664 | 1,664 | 1,677 | 1,677 |
| Bireuen | 3,751 | 4,142 | 4,144 | 4,139 | 4,13 |
| North Aceh | 17,911 | 18,185 | 18,185 | 18,185 | 18,185 |
| Lhokseumawe | 210 | 208 | 208 | 208 | 209 |

Source: (Direktorat Jendral Perkebunan 2020)

Based on table 1.2, oil palm land area data increases every year. This also happens in districts or cities. One of those affected is Lhokseumawe City. In 2017 it decreased by 208 to 2019. Furthermore, it experienced an increase in 2020. The growth of the plantation industry, including Aceh Province, shows that the plantation development industry is the main component of the national economy. This is shown by this sector not only generating

foreign exchange through exports but also making a significant contribution to poverty reduction, job creation, and providing sources of income for the community.

**Table 3**
**Palm Oil Production 2016-2020**

| District/City | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| East Aceh | 28,909 | 29,094 | 31,3 | 31,534 | 31,415 |
| Great Aceh Regency | 680 | 424 | 424 | 474 | 484 |
| Bireuen | 2,249 | 2,538 | 4,022 | 4,022 | 3,946 |
| North Aceh | 39,643 | 48,361 | 48,812 | 48,813 | 48,688 |
| Lhokseumawe | 244 | 246 | 255 | 266 | 286 |

Source: (Direktorat Jendral Perkebunan 2020)

Based on table 3, oil palm production data in four districts/cities generally increased. However, Great Aceh Regency experienced a significant decrease in 2017-2020 compared to 2016. The high absorption of the agricultural sector is not in line with adequate government efforts to develop policies as it triggers improvement. The agricultural industry still puts farmers in a marginal position. The wishes of farmers often clash with government policies. The wishes of farmers and the wishes of the government are at odds in the policy of importing palm oil and other goods. The situation of farmers did not improve as a result of the conditions that occurred (Setiawan, 2006). Farmers use labor as a source of production and distribution of goods and services. Farmers target labor as a means of revitalization and market expansion (Simanjuntak & Bhakti, 2018).

**Table 4**
**Labor 2016-2020**

| District/City | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| East Aceh | 12.253 | 15.619 | 16.525 | 16.594 | 16.619 |
| Great Aceh Regency | 760 | 983 | 760 | 778 | 778 |
| Bireuen | 2.741 | 3.650 | 3.037 | 3.030 | 3.019 |
| North Aceh | 10.520 | 12.686 | 10.794 | 10.794 | 10.794 |
| Lhokseumawe | 128 | 162 | 128 | 128 | 130 |

Source: (Direktorat Jendral Perkebunan 2020)

Based on table 4, labor data in five districts/cities experienced fluctuating numbers. East Aceh Regency has experienced an increase in the number of workers every year, especially in 2017-2018. The workforce owned by Great Aceh Regency Regency increased in 2017 and stagnated in 2018-2020. The number of workers in Bireun Regency increased in 2017 and decreased in 2018-2020. Furthermore, the number of workers in North Aceh

Regency in 2017 experienced an increase, then decreased in 2018 and stagnated at 10,794 until 2020. The number of workers in Lhokseumawe City increased in 2017 compared to the previous year and then decreased in 2018-2020.

## LITERATURE REVIEWS

### Gross Regional Domestic Product

The total added value of goods or services produced by all economic activities in Indonesia is the gross regional domestic product of all regions in one year (Sanusi, 2018). Gross domestic product (GDP) is calculated at constant prices and prevailing prices. GDP at prevailing prices is used to measure how much the economic structure and development shift. Meanwhile, real economic expansion and changes in production volume are measured using constant price GDP (Izzaty, et.al 2016). Per capita economic growth, also known as gross domestic product (GDP), results in a shift in consumption in terms of people's purchasing power. That is, changes in consumption patterns will increase people's purchasing power, and economic growth will have an impact on increasing per capita output (Diba et al., 2018).

### Land

Land Area is an important component in agriculture. Because soil serves as an important factor, the soil contains all its natural resources and is used as a location for living pregnant women who are used as a place to grow crops and shelter creatures in it including all its natural wealth. The Big Dictionary states in Indonesian land refers to arable land and open and available land. About open space used with arable land is land used for agriculture. Land has two special characteristics, namely as an object and as a natural resource. When man cultivates the land, turning it into agricultural land or urban land, then he becomes an object. Through the provision of infrastructure, the government is obliged to carry out the objectives of agricultural land development. This infrastructure development will increase land values. Land is also fixed, limited in number, and does not change in supply. One of the fundamental components in the development of oil palm plantations is land. To ensure the sustainability of land productivity, it must be understood the characteristics of oil palm plantation soil. Sandy soils, which are considered suboptimal soils, are usually nutrient-rich materials that are rarely used for agricultural purposes. But chemically sandy soil contains enough potassium and phosphorus that plants are not ready to absorb, it needs fertilizing help. Physically, sand-dominated soil will have many macro pores allowing the roots to penetrate it easily. However, water will also disappear faster from the ground. Therefore, sandy soils are poor in nutrients, infertile, and unproductive for plant growth. The state of the land and the level of management applied both have a significant impact on the growth and productivity of oil palm plants on sandy soils.

### Production

Production is a value creation activity in its broadest definition whereas production activity is the act of producing a particular good using the means of production. The inputs used in the production process are referred to as factors of production. In production

activities, productivity is defined as the ratio of output to input. Productivity is a metric that shows how effectively resources are managed and used to get the best results. Productivity can be used to measure the success of an industry in making goods or services. Therefore, the amount of product produced increases by units of ratio. The most important commodity that has the potential to make a significant contribution to the economy is oil palm plantations (Bintariningtyas & Juwita, 2021). Palm oil is one of the commodities in the plantation subsector that can increase the income of farmers and communities. In addition, it is also a source of industrial processing raw materials that provide added value. Oil palm plants are the main source of food and nutrition for the population, so their scarcity in the domestic market has a direct impact on economic growth and welfare (Heriyanto et al., 2019).

**Labor**

According to Mulyadi (2006) the labor force is the population of people aged between 15 to 64 years, or the number of people who live in a country and can produce goods and services when there is demand. Conversely, according to Arfida (2003), the labor force is a population that is in working age and is able to produce goods and services to meet the needs of the community (Masru'ah, 2013).

**Conceptual Framework**

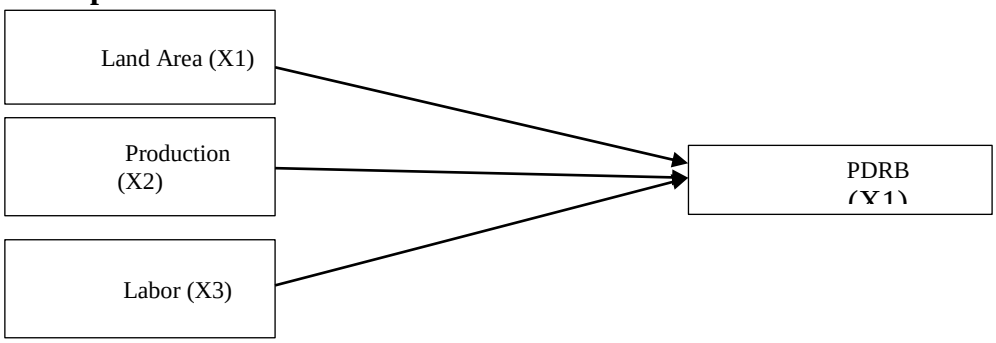


Figure 1. Conceptual Framework

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## METHODS

The panel data regression model was used in this study to determine how much influence the independent variable had on the dependent variable. The following equation will be used to express the relationship between variables in a mathematical model:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon \quad (1)$$

Information:

$Y =$ Produk Domestik Regional Bruto (PDRB)
$X_1 =$ Luas Lahan Kelapa Sawit
$X_2 =$ Produksi Kelapa Sawit
$X_3 =$ Tenaga kerja
$\alpha =$ Konstanta
$\varepsilon =$ *error term*

$\beta_1\beta_2\beta_3$=Koefisien regresi
$i = i$ sampai dengan $n$ (Cross Section)
$t = t$ sampai dengan n (time series)

**Panel Data Regression Method Estimation**

There are three ways to estimate panel data regression models, namely:

**Commond Effect Model (CEM)**

Estimation models known as effect models (CEM) utilize the OLS (ordinary least square) method to estimate parameters and combine (collect) all cross-sectional data as well as time series. One of the most common approaches to estimating the parameter value of regression equations is the OLS method.

**Fixed Effect Model (FEM)**

Fixed Effect Model (FEM) is a method of estimating panel data with dummy variables that serves to explain intercept differences between cross-sections over time. The slope between the cross section and the time series is also assumed to be constant in this model. The Least Squared Dummy Variable (LSDV) method is used in this model. Regression equation in fixed effect model. Fixed effect model assumes that slope coefficients are constant but intercepts are not constant (Diba, et.al 2018).

**Random Effect Model (REM)**

The Random Effect Model (REM) regression model is a variation of the generalized least square (GLS) estimate. Using the least squares method, REM takes into account errors in panel data. By taking into account cross-sectional and time series errors, this model approach increases the effectiveness of the least squares method.

**Estimation Method**

To choose an estimation determination model, there are several tests that can be done, namely:

**Uji Chow**

The purpose of the Chow test is to determine which common effect model (CEM) or fixed effect model (FEM) is superior. The equation of the finite sum of residual squares and the sum of infinite residual squares is assumed to remain unchanged by the chow test. The decision making methods of the chow test are as follows:

a. If the significance value is <0.05, then the best model is panel data regression with FEM.
b. If the significance value is >0.05 then the best model is panel data regression with CEM.

**Hausman Test**

The Husman test is used to select the best model between FEM and REM. Fixed effect models assume independent variables correlate with errors, while for random effect

models. The decision-making techniques in the Husman test are as follows:

a. If the value is significant<0.05, then the best model is panel data regression with FEM.
b. Apabila nilai signifikan>0,05 maka model yang terbaik adalah regresi data panel dengan REM.

**Multikolinieritas Test**

The multicollinearity test serves to determine the relationship between independent variables in research. Ghozali (2011) claims that the purpose of this test is to determine whether the model finds any correlation between independent variables. Independent variables should not correlate with each other in the model to achieve representative results. Regression models with squared residual logs as the dependent variable reveal whether the regression model has multicollinearity or not. Multicollinearity does not occur if the probability of each independent variable is greater than 0.05. Multicollinearity occurs when the probability of each independent variable is less than 0.05.

**Heteroscedasticity Test**

The heteroscedaticity test aims to test the variance inequality between one residual and another observation, a model that is not heteroscedasticity is a good model. The Harvey test is one method to determine the presence or absence of heteroscedasticity. The Harvey Test serves as a basis for decision making based on heteroscedasticity tests. If the probability is >5%, then the variables do not have heteroscedasticity. If the probability is <5% then the variables have heteroscedasticity.

**t Statistic Test**

The statistical test t (partial test) shows the size of the contribution of each independent variable to the dependent variable. This study examines independent variables, namely Local Original Income (PAD), Government Expenditure, Economic Growth against the dependent variable, namely Poverty. This study used t-test analysis to see the relationship between each independent variable to the dependent variable. If the results of research and data processing found a tcal>ttable value for each variable and the significance value can be seen from a significant value of <5%, then the independent variable has a significant effect on the dependent variable. It is concluded that the independent variable has no effect on the dependent variable.

**Coefficient of Determination Test (R2 Test)**

The coefficient of determination test is used to see the extent to which the model is able to explain the variation of the dependent variable. The value of the coefficient of determination (Adjusted R2) ranges from 0 to 1. A low adjusted value of R2 indicates that the independent variable is unable to adequately explain the variation of the dependent variable. If the independent variable has a value close to one, that means there is enough information needed to predict the variation of the dependent variable.

## RESULTS AND DISCUSSION

### A. Descriptive Statistics

This study used a type of panel data which is a mixture of time series data and cros section data. Time series data in 2016-2020 while the cross section data is 5 Regencies / Cities in Aceh Province.

**Table 5**
**Classical Assumption Test**

| Variable | PDRB | Land Area | Palm Oil | Labor |
|---|---|---|---|---|
| PDRB | 1.000000 | 0.310091 | 0.711275 | 0.328292 |
| LL | 0.310091 | 1.000000 | 0.859852 | 0.990420 |
| PS | 0.711275 | 0.859852 | 1.000000 | 0.861684 |
| TK | 0.328292 | 0.990420 | 0.861684 | 1.000000 |

Source: data processed (2022)

Table 5 shows that the independent variables are land area, oil palm production, labor variables. There is a relationship between independent variables because each variable value is at or more than 0.80. This means that this study is not free from multicollinearity.

**Table 6**
**Heteroscedasticity Test**

| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Probability** |
|---|---|---|---|---|
| Coefficient | 3154708. | 4125436. | 0.764697 | 0.4549 |
| Land Area | -3.360.425 | 4.548.261 | -0.738838 | 0.4701 |
| Palm Oil | 3.849.807 | 2.489.224 | 1.546.589 | 0.1404 |
| Labor | -2.377.851 | 5.231.487 | -0.454527 | 0.6552 |

Source: data processed (2022)

Table 6 shows that the probability of the Land Area variable is 0.4701, the probability of the Production variable is 0.1404, and the probability of the Labor variable is 0.6552 or more (>0.05). There is no heteroscedasticity in the research variables.

**Table 7**
**Chow Test**

| Effects Test | Statistic | d.f. | Prob. |
|---|---|---|---|
| Cross-section F | 66.815.394 | -4,17 | 0.0000 |
| Cross-section Chi-square | 70.417.038 | 4 | 0.0000 |

The results of the chow test show a probability value of <5%, which is 0.0000 < 0.05. Based on the test results, the Fixed Effect Model is accepted. This shows that the Fixed Effect Model is superior to the Common Effect Model.

**Table 8**
**Hausman Test**

| *Test Summary* | *Chi-Sq. Statistic* | *Chi-Sq. d.f.* | *Prob.* |
|---|---|---|---|
| Cross-section random | 9.343.070 | 3 | 0.0251 |

Source: data processed (2022)

The results of the Hausmant Test are presented in table 4.4, and the probability value is 0.025<0.05 which is less than 5%. As a result, the Random Effects Model is not as useful as the Fixed Effects Model. The Lagrange Multiplier test is not required because the Fixed Effect Model selected.

**B. Panel Data Analysis**

**Uji Fixed Effect**

Data processing in the Regression data panel, which combines cross-sectional and time series data, was used in this study. The General Effects Model, Fixed Effects Model, and Random Effects Model are the three stages of using panel data regression. The results of the Fixed Effect model estimation for this study are as follows:

**Fixed Effect Model Test Results**

$$PDRB_{it} = \beta_0 + \beta_1 LA_{it} + \beta_2 PO_{it} + \beta_3 L_{it} + \varepsilon \quad (2)$$

From the regression equation, it shows a negative constant value of -18913488 which means that if the variables of land area, production, and labor are constant, the GRDP has decreased by Rp 18,913,488. The value of the coefficient of the variable land area is 2885,814 meaning that if the land area increases by 1Ha, the GRDP increases by Rp2.885.814. The value of the coefficient of variation in oil palm production is 78,40777, meaning that if the oil palm trees increase by 1 unit, the GRDP increases by Rp7,840,777. The value of the labor variable -224.0462 shows that if the labor variable increases by 1 person, eating GRDP decreases by 2,204.62.

**Table 9**
**Partial Test Results (Test t)**

| **Independen Var** | **t-statistic** | **t-table** | **Prob** | **Information** |
|---|---|---|---|---|
| Land area | 2.705.664 | 172.074 | 0.0672 | Insignificant |
| Produc Palm Oil | 1.343.216 | 172.074 | 0.0150 | significant |
| Labor | -1.826.263 | 172.074 | 0.0854 | Insignificant |

Source: data processed (2022)

Based on table 9 shows the land area has $t_{hitung} < t_{tabel}$ (2.705664 > 1.72074). Probability 0.0672>0.05 that the variable land area does not have a positive and significant effect on GRDP in Aceh Province. On the value of the variable coefficient of Production $t_{hitung} > t_{tabel}$ (1.343216>1.72074) or probability value 0.0150<0.05 thus showing the results

of variable production affecting GDP in Aceh Province. Next value $t_{hitung} < t_{tabel}$ (-1.826263<1.72074) or probability value 0.0854>0.05 which means negative and insignificant shows that labor variables have no effect on the GDP of Aceh province.

**Table 10**
**Simultaneous Test Results (Test F)**

| F statistic | F table | Alpha | Probabilitas | Ket |
|---|---|---|---|---|
| 2.786.277 | 2.76 | 0.05 | 0.0000 | Significant |

Source: data processed (2022)

With a probability of (0.0000 < 0.05) obtained from the results of simultaneous tests using Test F shows that the variables Land Area, Production, and Labor have a positive and significant effect on the level of GDP in Aceh Province

**Table 11**
**Test Results of Coefficient of Determination (R2)**

| | | | |
|---|---|---|---|
| R-squared | 0.991359 | Mean dependent var | 9965136. |
| Adjusted R-squared | 0.987801 | S.D. dependent var | 3386297. |
| S.E. of regression | 374011.6 | Durbin-Watson stat | 1.151609 |
| Log likelihood | -351.4537 | | |
| F-statistic | 278.6277 | | |
| Prob(F-statistic) | 0.000000 | | |

Source: data processed (2022)

Adjusted r-squared of 0.987801, showing a relationship of 0.98 (98 percent) between significant independent variables. The R-squared value shows the relationship between the independent and dependent variables has an influence of 0.99 (99%), while other variables have an influence of 0.1 (1%).

**Conclusion**

Based on research and discussion on the impact of land area, palm oil production, and labor on GRDP in five districts and cities of Aceh province:

1. Land area has a positive and significant impact on the GRDP of districts and cities of Aceh Province. Of the five districts and cities of Aceh Province, the land area will increase palm oil production conversely, GDP also decreases when land area decreases.
2. Palm oil production has a negative and significant impact on GDP. Based on these findings, increasing palm oil production will have an impact on reducing GDP in five districts and cities in Aceh Province. Vice versa if the decline in palm oil production causes an increase in GDP in five districts and cities of Aceh Province.
3. Five districts and cities of Aceh Province, labor has no significant influence on gross domestic product (GDP). Based on these results, GRDP in five districts and cities in Aceh Province was not affected by the increase in labor force.

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