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The Effect Land Area, Productivity, and Labor on Palm Oil Production in Sumatera Island 2011-2023

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Abstract

The purpose of this study was to determine how much influence land area, productivity, and labor have on oil palm production on the island of Sumatra in 2011-2023. The type of research used is quantitative research using descriptive methods. The focus location in this research is 10 provinces on the island of Sumatra. Data collection in this study was carried out with secondary data using statistical data taken from Plantation Statistics of Various Years during the period 2011-2023. The results in this study show that simultaneously the independent variables of land area, productivity, and labor on the dependent variable of production at the 95% confidence level show a simultaneous and significant influence. Partially, it is known that land area has a positive and significant effect on oil palm production on the island of Sumatra in 2011-2023. Furthermore, productivity shows a positive and significant influence on palm oil production on the island of Sumatra in 2011-2023. While labor shows a negative and significant influence on palm oil production on the island of Sumatra in 2011-2023.

Keywords: Land Area; Productivity; Labor; Production

1. Introduction

Economic development is one of the main parts of national development that aims to improve people's welfare. In developing countries the agricultural sector has a very important role in economic growth and development compared to developed economies which have more verified economies [1]. The agricultural sector is one of the sectors that can generate foreign exchange [2]. The utilization of agricultural resources is key in increasing agricultural productivity, so limited resources must be allocated as efficiently as possible. The agricultural sector plays an important role in Indonesia's economic development. The development of the agricultural sector will trigger an increase in the amount of production of agricultural products that will be useful to meet national food and industrial needs, increase exports, increase community income, expand employment opportunities and encourage equitable distribution of company income. [3] Therefore, the utilization and development of all agricultural potential that has high potential must be a top priority to be explored and developed in carrying out regional economic growth as a whole [4].

The agricultural sector has various subsectors, one of which is the plantation subsector. The plantation subsector is a mainstay of Indonesia's foreign trade balance because of its contribution to the formation of foreign exchange. Some plantation commodities can only grow in the tropics so that market demand can only be met by a few countries. Indonesia's plantation commodities that have comparative advantages are coffee, cocoa, rubber, and palm oil. In the agricultural sector, the plantation sub-sector is expected to continue to play an important role through its contribution to GDP, export revenue, employment, poverty reduction and development.

With comparative advantages, plantation commodities have great potential to contribute to the country's foreign exchange so they need to be developed. Agriculture has sub-sectors that have a role and potential in building the Indonesian economy, one of these sub-sectors is plantations. One of the commodities of the plantation sub-sector is oil palm and this is a prima donna plant for now. Where many large companies cultivate these plants, coupled with government intervention through state-owned plantations, namely PT. Perkebunan Nusantara (Persero), better known as PTPN, and this makes a program for the government to become the largest palm oil producing country in the world. So this opens up opportunities for the palm oil business both from nurseries, planting, to harvest processing techniques. To see the development of oil palm production on the island of Sumatra consisting of 10 provinces from 2018 to 2023 can be seen in the table below:

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Table 1. Sumatra Island Oil Palm Production (Tons)

Tahun	2018	2019	2020	2021	2022	2023
Aceh	1.037.402	1.081.822	1.027.298	966.044	994.418	1.099.018
Sumatera Utara	5.737.271	6.163.771	5.200.864	5.264.734	5.988.099	5.453.030
Sumatera Barat	1.248.269	1.298.038	1.298.653	1.396.812	1.359.299	1.393.896
Riau	8.496.029	9.127.612	8.863.931	8.961.940	8.969.588	9.059.611
Kepulauan Riau	28.853	31.067	19.753	15.823	16.123	18.515
Jambi	2.691.270	2.891.336	2.639.894	2.431.643	2.629.476	2.720.529
Sumatera Selatan	3.793.622	4.075.634	3.279.094	3.691.701	4.101.776	3.281.115
Kep. Bangka Belitung	900.318	985.013	803.321	866.051	862.300	823.176
Bengkulu	1.047.729	1.073.531	1.066.171	994.583	1.017.133	1.190.068
Lampung	487.203	508.772	356.719	449.999	450.169	433.637
Total	**25.467.966**	**27.236.596**	**24.555.698**	**25.039.330**	**26.388.381**	25.472.595

Source: Plantation Statistics Publication Book

Sumatra contributes a considerable amount of palm oil production in Indonesia. In the table above, it can be seen that overall palm oil production on the island of Sumatra has increased and decreased production in each province. In the Riau Islands province, palm oil production experienced a decline in production starting in 2018 with a total production of 28,853 tons until 2023 with a total production of 18,515 tons. Riau Province with the largest producer of oil palm production on the island of Sumatra in 2018 total production was at 8,496,029 tons and in 2023 total production was at 9,059,611 tons. Factors that can increase agricultural yields are the use of inputs, such as land area or land, increasing the number of workers, the amount of fertilizer, the use of pesticides, and so on. Or another way is by improving agricultural technology.

Figure 1. Graph of Oil Palm Land Area in Sumatera Island

Source: Plantation Statistics Publication Book

Based on figure above, it can be seen that the graph of the development of oil palm land area on the island of Sumatra from 2018 to 2023 has fluctuated. In 2020 to 2021 there was a significant development in land area but from 2020 to 2023 it decreased every year. From the picture above we can see that the area of oil palm plantations on the island of Sumatra reaches 8,000,000 to 10,000,000 hectares. The increase in oil palm planted area often pays little attention to the suitability of land for oil palm. Land unsuitability can lead to a decrease in oil palm productivity. Analysing the factors affecting oil palm productivity cannot be done easily considering that there are many factors that affect the productivity of oil palm [5]. To see the productivity of oil palm on the island of Sumatra can be seen from the picture below:

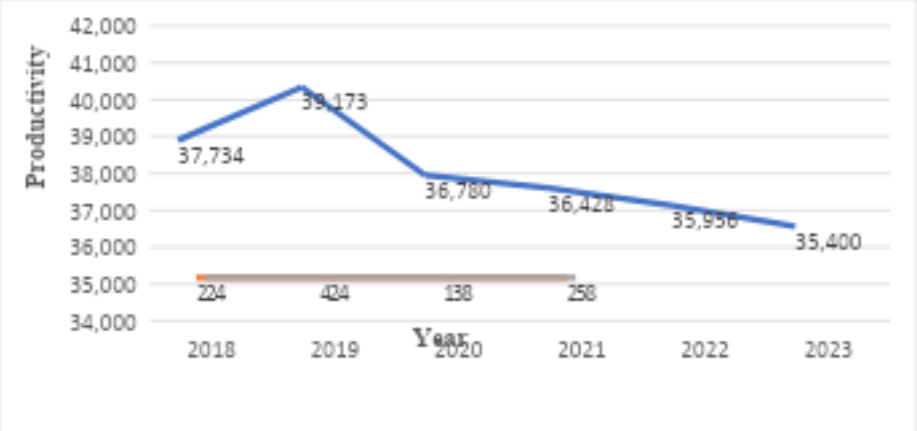

Figure 2. Palm Oil Productivity Chart of Sumatra Island

Source: Plantation Statistics Publication Book

Based on the picture above, the graph of oil palm productivity on the island of Sumatra has decreased from 2019 to 2023. From the graph above, it can be seen that the utilization and management of oil palm is less than optimal, resulting in productivity tending to decline. The development of the oil palm subsector is a considerable absorption of labor, and as a source of income for farmers, oil palm is one of the commodities that has a large share in generating local revenue, namely Gross, National Income Products, and community welfare [6]. The development of oil palm labor in Sumatra Island can be seen from the figure below:

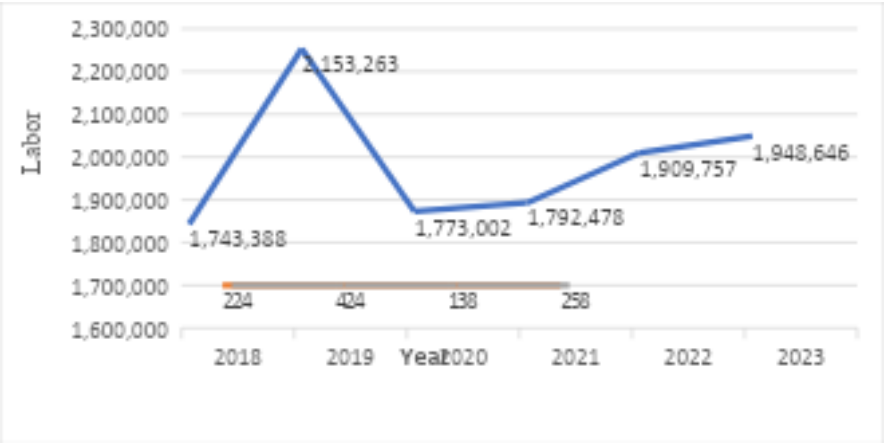

Figure 3. Graph of Sumatra Island Oil Palm Labour Force

Source: Plantation Statistics Publication Book

Based on the figure above, it can be seen that the development of the number of oil palm workers on the island of Sumatra, where from 2018 to 2023 tends to increase. However, from 2019 to 2020 the number of oil palm workers has decreased. Based on statistical data on Indonesian plantations on Sumatra Island in 2018-2023, the development of oil palm production on the island of Sumatra has experienced fluctuations or ups and downs. In 2018 the amount of oil palm production on the island of Sumatra was 25,467,966 tons. In 2019 there was an increase in the amount of production of 27,236,596 tons and in the following year between 2020-2023 there was a tendency for the amount of production to fluctuate.

Likewise, land area, productivity and labor also fluctuate where in a certain year there is an increase and in the following year there is a decrease. In general, it can be seen that the increase in production is influenced by the increasing land area and the increasing number of workers in oil palm production. However, the amount of labor fluctuates so that it affects the amount of production produced and so does the land area that experiences fuluktuatif.

2. Literature Review

2.1. Production

Production is an activity to increase benefits by combining factors of production. Production is an attempt to increase benefits by means of form utility, move place utility, and store utility. The production system is the linkage of one component (input) with another component (output) and also involves the process of interacting with one another to achieve one goal.

2.2. Land Area

The size of the land is the entire area where the farmer is planting or working on the planting process, the size of the land guarantees the amount or yield that the farmer will get. The size of agricultural land affects the scale of farming which in turn affects the level of efficiency of the farm being run. The area of land is the entire area that is the place of planting or working on the planting process, the land area guarantees the amount or results that will be obtained by farmers. If the land area increases, the production of farmers will also increase and vice versa if the land area used is small, the production obtained by farmers is also small [7]. Land area includes the part of the earth's surface that is not covered by water or the part of the earth's surface that can be used for farming and living including the natural resources contained therein [8].

2.3. Productivity

Productivity is the efficient use of resources (inputs in producing a level of comparison between outputs and inputs). Productivity measurement for one input at a time is called partial productivity measurement. The measurement is measured in terms of output to input. If the outputs and inputs used in the formula are expressed in physical quantities, the resulting productivity ratio is an operational productivity measure. If outputs and inputs are expressed in rupiah, the resulting productivity ratio is a measure of financial productivity [9].

2.4. Labor

Labor is everyone who is able to do work in order to produce goods and/or services both to meet their own needs and for the community. Labor includes people who have or are working, who are looking for work and who carry out other activities such as attending school and taking care of the household [10].

3. Research Method

This type of research is quantitative research, which is research that uses systematic scientific studies of parts, phenomena, and their relationships. This quantitative research uses descriptive methods, namely research used to analyze data by describing or describing the data that has been collected as it is without making general conclusions or generalizations. This study describes the land area, productivity, labor and production of oil palm in North Sumatra Island in 2011-2023. The focus of this research location is all provinces on the island of North Sumatra, namely Aceh Province, North Sumatra, West Sumatra, Riau, Riau Islands, Jambi, South Sumatra, Bangka Belitung Islands, Bengkulu and Lampung.

The data used in this research is panel data. Panel data is a combination of time series and cross section data. The data source used in this research is secondary data, which is data that has been processed by certain organizations or parties. The data in this research uses statistical data taken from Plantation Statistics for Various Years during the period 2011-2023. In the study, the dependent variable is palm oil production as (Y), and the independent variables are land area as (X1), productivity (X2) and labor as (X3). For the model that will be used to determine the effect of land area, productivity, and labor in Sumatra Island in 2011-2023:

$$Yit = \alpha + \beta_1 X_1 it + \beta_2 X_2 it + \beta_3 X_3 it + €it$$

4. Results and Discussion

The chow test is conducted to see which model is more appropriate, the common effect model or the fixed effect model for data estimation. The following are the results of the chow test, namely:

Table 2. Result of Chow Test

Effect Test	Statistic	d.f	Prob.
Cross Section F	11.528020	(9.117)	0.0000
Cross Section Chi Square	82.532681	9	0.0000

Source: Researcher Processed Data

From the chow test results, the prob. cross section F value is 0.0000 and the chi square value is 0.0000. And these results indicate that the prob value. <0.05, which means H0 is rejected, then H1 is accepted, which means that the fixed effect model is better than the common effect model.The Hausman test is carried out with the aim of seeing which method is more appropriate between the fixed effect model or the random effect model. The following are the results of the Hausman test, namely:

Table 3. Result of Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Cross Section Random	35.339933	3	0.0000

Source: Researcher Processed Data

From the results of the Hausman test, the estimation results show a probability value of 0.0000 (probability <0.05), so H0 is rejected and H1 is accepted with the fixed effect model, so there is no need to take the next step with the Lagrange Multiplier test.

Based on the tests carried out previously to find out what model can be used to test the hypothesis, the results show that the fixed effect model is suitable for testing the hypothesis in this study. The following are the results of the fixed effect model test:

Table 4. Result of Estimation Fixed Effect Model

Variable	C	Land Area	Productivity	Labor
Coefficient	300712.8	2.147423	153.5630	- 1.156249
Prob.	0.2265	0.0000	0.0037	0.0215

Dependent variable: Palm Oil Production

Prob (F-statistic): 0.000000

R^2: 0.987591

Source: Researcher Processed Data

5. Conclusions

The land area variable partially has a positive and significant effect on oil palm production on the island of Sumatra. Furthermore, the productivity variable partially also has a positive and significant effect on oil palm production on the island of Sumatra. However, the labour variable partially has a negative and significant effect on oil palm production on the island of Sumatra. Then simultaneously or simultaneously the variables of land area, productivity, and labour have a significant effect on oil palm production on the island of Sumatra 2011-2023.

References

[1] Meyer, D. F, (2019) " An Assessment Of The Importance Of The Agricultural Sektor On Economic Growth And Development In South Africa". *International Institute Of Social And Economic Sciences*, 8 (1): 240–255.
[2] Hartoyo, Ujang, dan Wahyudian, et al, (2004). "Analisis Faktor – faktor Yang Mempengaruhi Konsumsi Kopi Dan Analisis Pemerataan Beberapa Merek Kopi dan Implikasinya". *Jurnal Manajemen dan Agribisnis*, 1 (1) : 55 -68.
[3] Soekartawi, (2003). "Prinsip Ekonomi Pertanian", Raja Grafindo Persada, Jakarta.
[4] Osly, P. J., Araswati, F., Ririhena, R. E., et al, (2020). "Analysis Of Agricultural Growth Using LQ And Shiftshare Methods (Case Study: Manokwari Regency, Indonesia)". *Jurnal Infrastruktur*, 6(1) : 53–58.
[5] Yohansyah, W.M dan Lubis, I, (2014). "Analisis Produktivitas Kelapa Sawit (Elaeis guineensis Jacq.) di PT. Perdana Inti Sawit Perkasa I", *Jurnal Ekonomi*, 2(1): 125 – 131.
[6] Afifuddin, S., Kusuma, SI, (2007). "Analisis Struktur Pasar CPO: Pengaruhnya terhadap pengembangan ekonomi wilayah Sumatera Utara", *Jurnal Perencanaan dan Pengembangan Wilayah*, 2 (3): 124-136.
[7] Mubyarto, (1989). "Pengantar Ekonomi Pertanian", LP3ES, Jakarta.
[8] Sukirno, (2021). "Makroe Ekonomi", Kencana, Jakarta.
[9] Mulyadi S, (2014). "Ekonomi Sumber Daya Manusia Dalam Perspektif Pembangunan", PT. Raja Grafindo Persada, Jakarta.
[10] Simanjuntak, Payaman J, (1985). "Pengantar Ekonomi Sumber Daya Manusia", LPFE, Jakarta.