

# Analysis of Factors Influencing Palm Oil Farmers' Income of Production in the Labuhanbatu Regency

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## Abstract

The research was conducted to determine the factors that affect the income of oil palm farmers in North Labuhanbatu Regency with production as the intervening variable. The income of oil palm farmers is the dependent variable, while land area, fertilizer costs, labor, and selling prices become independent variables and production as an intervening variable. The population in this study involved the people of North Labuhanbatu Regency consisting of eight sub-districts, with a total population of 20.861 oil palm farmers. The sample in this study amounted to 100 farmers. This type of research used primary and secondary data. The method used in this research was path analysis. It is the development of multiple regression analysis by describing the magnitude of the influence of independent variables on the dependent variable indirectly using IBM SPSS AMOS 22. The results of path analysis show that land area, fertilizer costs, and selling prices have an indirect and significant relationship to farmers' income through production, while indirect labor has no influence on farmers in production.

*Keywords:* primary data, production, farmer income, path analysis, IBM SPSS AMOS.

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## 1. Introduction

The agricultural sector has a fairly important role in economic activities in Indonesia. This can be seen from its contribution to Gross Domestic Product (GDP), which is quite large, around 13,28% or second rank to the Manufacturing Industry sector at 19,25% in 2021. One subsector that has quite large potential is the plantation subsector. In 2021, the contribution of the plantation subsector is 3,94% of total GDP and 29.67% of the Agriculture, Forestry, and Fisheries sectors or the first place in this sector (Statistics, 2021).

Palm oil is one of the plantation commodities, which has quite an important role in economic activities in Indonesia because of its ability to produce vegetable oil that is much needed by the industrial sector. Its properties are resistant to oxidation under high pressure and its ability to dissolve chemicals that are insoluble in other solvents, as well as its high coating capacity. It means that palm oil can be used for various purposes, including cooking oil, industrial oil, and fuel (biodiesel).

As a palm oil producing country with the largest plantation area and also palm oil producers in the world, Indonesia has great potential to market palm oil and palm kernel oil both at this country and abroad. Potential markets that will absorb the marketing of palm oil (CPO) and palm kernel oil (PKO) are industries, especially the cooking oil industry, special fats (*Cocoa Butter Substitute*), margarine/shortening, *oleochemicals*, and bath soap (Ditjenbun, 2022).

The development of plantation land area in Indonesia continues to experience a very significant increase since the start of the development of oil palm plantations. In the past 10 years starting in 2013, the total land area of oil palm plantations in Indonesia reached 10.462 million Ha and in 2022, the total area of oil palm plantations in Indonesia experienced an increase in area of 15,381 million Ha. This means an increase in land area of 4,919 million Ha in the past 10 years. This land area is the result of the accumulation of Community Plantations/*Perkebunan Rakyat* (PR), Large State Plantations (PBN), and Large Private Plantations (PBS). Of the three types of business, PBS controls 8.402

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million hectares of Indonesian oil palm area, 6.379 million hectares community plantations, while PBN only controls 598 hundred hectares of land.

Significant development of plantation land area occurred in People's Plantations (PR), and Large Private Plantations (PBS), which respectively experienced an expansion of 46% and 56%. Meanwhile, Large State Plantations (PBN) experienced a decrease in land area of 18% and an increase in the number of the total area of plantation land in Indonesia over a 10 year period was 47%. As the area of oil palm plantations increases and the development of the palm oil industry, this will also have a positive impact by increasing the production value of both Fresh Fruit Marks (FFB) and palm oil (CPO) existence. The Director General of Plantation's data contained in the national superior plantation statistics shows an increase in palm oil production within the last periods, where in 2013, FFB production was 27,782 million tons and in 2022 FFB production was 48,235 million tons, meaning that over the past decade, FFB production in Indonesia has experienced a very significant increase. The increase is 73.6% of the amount of FFB production, including People's Plantations (PR), Large State Plantations (PBN), Large Private Plantations (PBS). The increase in palm oil production in Indonesia has a good trend. PBS and PR still dominate the largest production of palm oil in Indonesia, while PBN increases palm oil production relatively in small quantities.

Based on data from the leading national plantation statistics book 2020-2022, palm oil production in 2022 was 48,235 million tonnes. This production was achieved with a land area of 15,380 million hectares of which 63,4% was cultivated by PBS, then 33.7% was cultivated by PR, and the rest managed by PBN. Based on average data from 20-13-2022, palm oil production centers in Indonesia were the provinces of Riau, North Sumatra, Central Kalimantan, South Sumatra, Jambi and West Kalimantan, East Kalimantan, Aceh, West Sumatra, and South Kalimantan. In 2022, the wide plant plantation coconut palm people in North Sumatra covers an area of 490.16 thousand Ha with production output of 7.451.890.91 million tons of Fresh Fruit Tag (FFB) (BPS, 2022b).

Labuhanbatu Regency is one of the regencies producing the largest palm oil production in North Sumatra, ranking second after Asahan Regency. However, a significant increase occurred in North Labuhanbatu Regency where land expansion occurred by 4.84 thousand hectares in a period of 1 year. North Labuhanbatu Regency has great potential to become a FFB producing district and owner of the largest area of oil palm plantations in North Sumatra Province, with its community dependent on oil palm farming businesses, as well as many plantation transitions from both rubber plantations and rice farming to oil palm plantations. This is because the results obtained from oil palm plantations are better, easy-maintenance, and has a long productive period.

Furthermore, North Labuhanbatu Regency is a relatively new regency compared to Asahan Regency, which has been around for a long time and is well established in running the government, and with a larger area than North Labuhanbatu Regency. However, North Labuhanbatu Regency has greater potential in the agricultural sector than Asahan Regency in terms of increasing agricultural land area every year.

Labuhanbatu Regency has a community plantation area of 77.02 thousand hectares with a production output of 1.163.002 tons (BPS, 2022a). The following table details the land area and amount of palm oil production per North Labuhanbatu sub-district. The sub-district with the largest area and production output is in the Aek sub-district Natas, Kualuh Hulu, and Aek Kuo followed by other sub-districts. On average, one hectare of land is capable of producing and producing approx. FFB 1.000 -1.200 kg and people who work as oil palm farmers in North Labuhanbatu Regency generally have an average of 2-4 hectares of oil palm farming land. However, there are also those who have more than that.

This significant increase in land area is not accompanied by improvements in agricultural infrastructure, one of which is obtained in the field is that the road infrastructure for transporting oil palm plantation products that is still very worrying. This has a negative impact on the selling price of FFB per kilogram, so it has a big impact on income for farmers in North Labuhanbatu Regency, for example the Sono Martani area, Poldung, and many other areas as the main support for the economy is oil palm farming.

The selling price of FFB itself tends to fluctuate. The government has also decided to determine the price of FFB through *Permetan* No. 14 of 2013, but in determining it for lower-level farmers, it is still far from providing prices that are in line with expectations. Referring to the Palm Oil Farmers Union, there are several things that the government must evaluate and pay attention to in regulating and determining FFB prices, including 1) ensuring the stability of FFB prices because stable prices will have an impact on efforts to increase productivity and processing of palm oil plantations at the small farmers' level, 2) the lower price limit in situations of price volatility as protection for the state, and 3) protection for farmers over prices determined by middlemen.

The common problem of low productivity and quality of oil palm production is due to the relatively simple production technology, from the seeding stage to the harvesting stage. Based on observations, the cause of this problem is the lack of information related to agriculture in society in everyday life. Other problems with agriculture itself include: the dry season, which hampers agricultural productivity and pests that are difficult to eradicate, thereby accelerating the death and damaging the growth process of oil palm trees. The second factor is the shrinking area of agricultural land, which is caused by industrialization and urbanization and the increasing encroachment of clearing and new community residential land. Limited use of technology and low quality of human resources also determine agricultural productivity (Irnawati, 2021).

According to Suratiah (2015), there is a number of suspected factors that influence farmer's income, namely internal factors and external factors. Internal factors include the number of workers, wide land, and capital, while external factors are input (availability, price) and output (request, price). Second, factor management that is farmer as manager must be able to make decisions with various consideration economy so that obtained results can provide maximum income. In implementation, it is required various information about combination factor production and information price, both in price production or price product.

Levels of well-being farmer often correlate with business farmer reflected by income farmer. This always influenced by several factors, such as social factors, economic, and agronomic factors. One of these factors is the use of production factors and the selling price of the production produced (Kurmini, 2018). According to Suparyanto in Arifin (2015), income is the amount received by members of society for certain period of time as a compensation for the factors of production in participating in forming the national product. In general, farmers' income contains as remainder or object from subtraction mark reception farming with costs incurred and from income can be stated as a return on the use of labour, equity, and agro-processing skills.

Basically, the aim of farmers is to optimize income. This is also what is expected by farmers in North Labuhanbatu Regency, optimal income only occurs if it is driven by optimal production results supported by production factors (land area, fertilizer costs, labour), as well as stable selling prices. Through data from the Central Statistics Agency, palm oil production in North Labuhanbatu Regency continues to experience a good increase. However, this is not accompanied by stable FFB prices so the income received by farmers is not appropriate and not optimal with farming costs realized, especially for people who only have 2-4 ha of land.

## **2. Methods**

The method used in this research is the path analysis method. Path analysis is a development of a regression model for the fit of the correlation matrix of two or more models compared by the researcher and the tools used in this study using IBM SPSS AMOS 22.

This research was conducted in North Labuhanbatu Regency, North Sumatra Province, which consisted of eight sub-districts, namely: Marbau District, NA XI-X, Aek Natas, Aek Kuo, Kualuh Hulu, Kualuh Selatan, Kualuh Ledong, and Kualuh Hilir. The time of this research was started in October 2023. The population in this research employed oil palm farmers in North Labuhanbatu Regency, totaling 20.861 oil palm farmers, and the number of samples in this research is 100 samples of oil palm farmers.

The type of data in this research was primary data, obtained directly from the original source in the form of interviews and opinion polls from individual palm oil farmers in North Labuhanbatu Regency.

## **3. Result and Discussions**

### *3.1. Result*

This calculation was carried out using IBM SPSS AMOS 22 and obtained the results shown in Table 1. Based on Table 1, it can be seen that the correlation between independent variables in this research has a strong and significant correlation where the estimated value is  $> 0.75$ . According to Haryono (2016), if the correlation between variables is  $> 0.75$ , its correlation is very strong. The probability value of each correlation variables is  $< 0.05$  can be concluded to have a very strong and significant influence between the correlations between independent variables.

**Table 1.** Correlation Results of Land Area, Fertilizer Costs, Labor, and Selling Prices

Correlation between variables	Estimate	Probability
LL ↔ HJ	0.830	0.001
TK ↔ HJ	0.797	0.001
BP ↔ HJ	0.821	0.001
BP ↔ TK	0.905	0.005
LL ↔ TK	0.900	0.003
LL ↔ BP	0.944	0.001

### 3.1.1. First Substructure Path Analysis

From Table 2, it can be seen that only labor (X3) does not have a significant influence on production, where the probability value is  $0.304 > 0.05$  but it has a positive influence on production. For land area (X1), fertilizer costs (X2), and selling price (X4), they have a significant influence with a probability value of  $< 0.05$ , and also have a positive influence on production. The *R Square* value is 0.975. This figure means that the influence of land area, fertilizer costs, labor and selling prices on palm oil production in North Labuhanbatu Regency is 97.5%, while the remaining of 2.5% is influenced by other factors outside the variables of this research.

**Table 2.** Influence of Land Area, Fertilizer Costs, Labor, and Selling Prices on Palm Oil Production

Influence between variables	Estimate	Probability	R Square
PR ↔ LL	0.660	0.001	0.975
PR ↔ BP	0.236	0.001	
PR ↔ TK	0.041	0.304	
PR ↔ HJ	0.075	0.011	

**Table 3.** Influence of Land Area, Fertilizer Costs, Labor, Selling Prices, and Production on Palm Oil Farmers' Income

Influence between variables	Estimate	Probability	R Square
PDT ↔ HJ	0.122	0.001	0.975
PDT ↔ PR	0.944	0.001	
PDT ↔ BP	0.008	0.707	
PDT ↔ TK	-0.079	0.001	
PDT ↔ LL	0.012	0.662	

**Table 4.** Goodness of FIT Test Results

Statistical Report	Recommended Value Imam Ghozali		
	Cut of value	Results	Information
<b>Absolute Fit</b>			
X <sup>2</sup> (prob)	Not significant ( $p > 0.05$ )	(0.663 > 0.05)	Suitable Model
CMIN/ df	< 2	0.190	Good Fit
RMSEA	$0.05 < x < 0.08$	0.000	Good Fit
GFI	> 0.9	0.999	Good Fit
<b>Incremental Fit</b>			
AGFI	> 0.9	0.987	Good Fit
TLI	> 0.9	1.008	Good Fit
NFI	> 0.9	1.00	Good Fit
<b>Parsimonious Fit</b>			
PNFI	0-1.0	0.067	Bigger is better
PGFI	0-1.0	0.048	Bigger is better

From Table 3, it can be seen that land area (X1) and fertilizer costs (X2) do not have a significant relationship where land area (X1) has a probability value of  $0.662 > 0.05$  and fertilizer costs (X2) has a probability value of  $0.707 > 0.05$ . However, both variables have a positive relationship with farmer income. Meanwhile, labor (X3), selling price (X4), and production (Y1) have a significant influence with a probability value  $< 0.05$ , where selling price (X4) and production (Y1) have a positive relationship with farmer income, whereas Labor force (X3) has a negative influence

on farmer income. The *R Square* value is 0.997. This figure means that the influence of land area, fertilizer costs, labor, selling prices, and production on the income of oil palm farmers in North Labuhanbatu Regency is 99.7% while the remaining of 0.3% is influenced by other factors outside of the variables in this research.

Based on Table 4, it can be seen that from the probability value of 0.663, which is greater than 0.05, it can be concluded that the empirical data matches the model. If observing at other fit criteria, such as CMIN/DF of 0.190. it can be concluded that the model is very good because it is below 2. Likewise, if considering at the GFI, TLI, NFI, AGFI, which are above 0.90. it can be concluded that model is very good. The PNFI and PGFI values are still relatively small, indicating that there are no significant model differences.

**Table 5.** Standardized Direct and Indirect Effects and the Total Effects

<b>Standardized Direct Effects</b>						
	HJ	TK	BP	LL	PR	
PR	0.075	0.041	0.236	0.660	0.000	
PDT	0.122	-0.079	0.008	0.013	0.944	
<b>Standardized Indirect Effects</b>						
	HJ	TK	BP	LL		
Z Sobel	2.532600	1.02626	25.97188	11.32827		
PDT	0.071	0.039	0.222	0.623		
<b>Standardized Total Effect</b>						
	HJ	TK	BP	LL		
PDT	0.192	-0.040	0.230	0.637	0.944	

### 3.1.2. Standardized Direct Effects of Factors Affecting Palm Oil Farmers' Income

Based on Table 5, land area (X1) can directly determine a change in production (Y1) of 0.660. fertilizer costs (X2) can directly determine a change of 0.236 in production (Y1), labor directly determine a change of 0.041 in production (Y1), and selling price (X4) can directly determine changes in production (Y1) of 0.075.

Meanwhile, regarding income (Y2) and land area (X1) can directly determine changes in income (Y2) of 0.013, fertilizer costs (X2) can directly determine changes in income (Y2) of 0.008, Labor (X3) can directly determine changes to income (Y2) of -0.079, selling price (X4) can directly determine changes to income (X4) of 0.122, and production (Y1) can directly determine changes to income (Y2) of 0.944.

## 3.2. Discussion

### 3.2.1. The Influence of Land Size on Palm Oil Production in North Labuhanbatu Regency

The influence of land area on production has a probability value of  $0.001 < 0.05$ , meaning that land area has a significant influence on oil palm production. The magnitude of the influence of land area on production is 0.660. If the land area increases by 1 Ha, the amount of oil palm production will increase by 66%, and vice versa.

Land area has a positive and significant influence on oil palm production in North Labuhanbatu district . The results are in line with research conducted by Andini (2016), where the land area in this research has a significance value of 0.018, with a regression coefficient value of 0.527, meaning that land area has a positive and significant influence where when an increase of 1 Ha in land area will result in an increase in production amounting to 527 kg. This is also similar to the production theory used because land area is one of the factors that influences production activities themselves so that the presence of natural factors (land area) will create a new economic activity, namely production activities. The area of agricultural land that will affect the scale of the business, which will ultimately affect the efficiency of an agricultural business. This is proven by the large amounts of returns received from the land area compared to other factors. Large land areas will influence the increasing number of oil palms that will be planted, which will ultimately affect the size of the production of fresh fruit bunches produced with a good maintenance process as well. If the land area becomes larger, the economic opportunity to increase production will be greater. In general, it is stated that the larger the area of oil palm farming land a farmer has in North Labuhanbatu Regency, the greater the amount of FFB production produced.

### 3.2.2. *The Influence of Fertilizer Costs on Palm Oil Production in North Labuhanbatu Regency*

The influence of fertilizer costs on palm oil production has a probability value of  $0.001 < 0.05$  and with an estimated value of fertilizer costs of 0.236, this means that fertilizer costs have a positive and significant influence on palm oil production in North Labuhanbatu district, which is if fertilizer costs increase by 1%, it will increase palm oil production yields by 23,6%, and vice versa. Running an oil palm farming business fertilizer is one of the important factors in increasing production yields. The use of good fertilizer in good doses will also result in the production of Fresh Fruit Bunches increasingly abundant. This is in line with research conducted by Andini (2016), where the probability value is  $0.000 < 0.05$  with a regression coefficient value of 0.247. It indicates that fertilizer costs have a positive and significant influence, where if there is a 1% increase in fertilizer costs, production will increase 24,7%. Fertilizer costs are part of the farming capital itself, where capital is a form of wealth that can be used directly or indirectly in the production process to increase output (Kurmini, 2018). In understanding, economic capital is goods or money, which together with the factors of production, labor and land, produce new goods and services. Capital (fertilizer costs) is an important element in increasing production results from agriculture itself. With the right dose of fertilizer and good maintenance, the production results from oil palm in North Labuhanbatu Regency will provide good productivity regarding the quality and quantity of FFB because one of an important factor to increase productivity from palm oil FFB production is the use of good fertilizer and based on the predetermined dosage.

### 3.2.3. *The Influence of Labor on Palm Oil Production in North Labuhanbatu Regency*

The influence of labor on palm oil production has a probability value of  $0.345 > 0.05$  and with an estimated labor value of 0.041. This means that labor has a positive but not significant influence on palm oil production in North Labuhanbatu district. If labor increases by 1%, it will increase palm oil production by 0.41%, but does not have a significant influence on production. Labor is an important factor for increasing production in agricultural businesses if it can be utilized properly and optimally. However, if the utilization of labor is poor and less than optimal, it will not have a significant influence on the production results of agricultural businesses. According to the reality that occurs in the field, the use of labor in agricultural activities itself is not maximized properly. Among the factors are: the limited supply of workers who are honest in their work has a fatal impact on the production results obtained by farmers. This lack of honesty includes stealing from FFB harvests by farmers' workers, resulting in reduced agricultural production results owned by farmers. Moreover, in this research location, farmers sometimes have difficulty finding workers to carry out harvesting, fertilizing, and so on. Besides working on the farmer's land (*pengupah*), most of the workforce also works on their own land with the harvest schedule which often coincides between the worker and the party who hires them and sometimes also during fertilization, pulverization, and other agricultural work activities. Labor settlement is quite low, hampered, and takes longer than it should because many of the workers take jobs in other wage plantations. Thus, the most efficient and optimal use of labor is if the family or family members' labor can still be done by the family's own labor (Suratiyah Apriyana Eristanti & I Nyoman Nugraha Ardana Putra, 2019).

### 3.2.4. *The Influence of Selling Prices on Palm Oil Production in North Labuhanbatu Regency*

The influence of selling prices on palm oil production has a probability value of  $0.011 < 0.05$  and with an estimated value of fertilizer costs of 0.071. This means that selling prices have a positive and significant influence on palm oil production in North Labuhanbatu district. If the selling price increases by 1%, it will increase palm oil production yields by 0.71%, and vice versa.

This is in line with research by Adie & Arianti (2022) that the price of FFB has a positive and significant influence on farmer production. Expectations regarding the selling price of FFB and the large amount of production indicate that farming households always have the desire to increase the area of agricultural land because North Labuhanbatu Regency has suitable biophysical conditions for oil palm farming so that profits are expected to be obtained after production. Efforts that can be made to deal with production risks in oil palm crops caused by prices are crucial to promote crop diversification programs on community agricultural land. Agricultural diversification itself is an effort to diversify the types of business itself to avoid dependence on one farming business.

The results of this research are that HP and IK are simultaneously able to explain 51.4% of the diversity of the soybean production population. The partial test results show that the independent variable has a probability value of  $< 0.10$ . This also shows that each independent variable coefficient can be used to explain the influence of farmer price variables and soybean imports with a confidence level of 90%. From the results in the field, the farmers hope that the FFB price itself has a basic price where the basic limit for setting the FFB price does not fall from the price of 1,800/kg because at this price limit, the farmers are still able to carry out good maintenance of oil palm. Thus, it will produce productivity, which is good for palm oil production.

### 3.2.5. *The Influence of Land Size on the Income of Oil Palm Farmers in North Labuhanbatu Regency*

The influence of land area on the income of oil palm farmers has a probability value of  $0.662 > 0.05$  and with an estimated value of land area of 0.013, meaning that land area has a positive but not significant influence on the income of oil palm farmers in North Labuhanbatu district. If the land area increases by 1%, it will increase the income of oil palm farmers by 0.13%. However, the influence of this land area does not have much influence on the income of oil palm farmers in North Labuhanbatu Regency because it does not have a significant relationship.

Control of large areas of agricultural land is very important in production or farming and agricultural businesses. According to Arifalfarisi (2015), land has a big influence on crop yields. In the sense that the amount of harvest will change if the size of the farmer's land changes, the larger the farmer's land, the greater the amount of harvest that will be cultivated, and this will further increase the farmer's income.

The thing that causes the land area factor to be less significant on farmers' income and does not have a big impact on farmers' income in North Labuhanbatu Regency from the results of field research is that many farmers still do not realize about quality oil palm seeds to produce good and consistent FFB production. Even in the era of track fruit, this is because there is rarely any socialization about good oil palm farming, namely how to properly select types of seeds, fertilizers, medicines, ripening/shooting, harvesting, and so on. Therefore, it will impact on the inefficiency of the production results obtained. Another thing that happens in the field is that many new pests are acquired by oil palm farmers' plants in the form of fungal pests, which undermine the fertility of the oil palm trees themselves, which also results in the insignificance of the results production. It has an impact on farmers' income in North Labuhanbatu Regency. This is also reinforced by Sicat and Arndt's theory, which states that in the agricultural sector, the supply of arable land is not fixed and they do not know how to maintain land productivity so that the land they cultivate to be infertile, resulting in poor quality and quantity of yields, thereby reducing the selling prices of oil palm, even though farmers cultivate large areas of land (Adie & Arianti, 2022).

### 3.2.6. *The Influence of Fertilizer Costs on the Income of Palm Oil Farmers in North Labuhanbatu Regency*

The influence of fertilizer costs on the income of oil palm farmers has a probability value of  $0.662 > 0.05$  and with an estimated value of fertilizer costs of 0.008, this means that fertilizer costs have a positive but not significant influence on the income of oil palm farmers in North Labuhanbatu district. If the cost of fertilizer increases by 1%, it will increase the income of oil palm farmers by 0.08%, but the cost of fertilizer does not have a significant influence on the income of oil palm farmers.

In line with research conducted by Listiani et al. (2019), where the fertilizer coefficient value is 0.777 with a significance value greater than 0.05. It means that fertilizer costs have a positive influence but have no significance on farmer income. The insignificant influence of fertilizer costs on income in the field is because farmers tend to use fertilizer in doses that are not in accordance with the recommendations or suggestions. In the field itself, most farmers use very small doses of fertilizer. This happens because the price of fertilizer is relatively expensive and high, not accompanied by a good selling price for palm oil, resulting in palm oil productivity being far from adequate when viewed from the number of trees and land area because the use of low fertilizer doses. Besides the lack of socialization and training or lack of information was received by farmers in the field, resulting in the use of fertilizer less than the recommended dose. The farmers themselves have the assumption that fertilizer is useful for increasing the productivity of oil palm plants, so that the use of fertilizer can increase farmer income.

The urea fertilizer dose recommended by the government is 250 kg/ha or 35 kg/1,400 m<sup>2</sup> (Siallagan Irawan et al., 2014). Farmers in North Labuhanbatu mostly use 150 kg/ha of urea fertilizer, which is lower than the recommended dose. Fertilizer use must be in accordance with the recommended dosage because using fertilizer correctly will affect plant productivity. This is in accordance with the opinion of Linggah and Marsono in Listiani et al. (2019), which states that the correct use of fertilizer must pay attention to several things, for example the dosage, how to use it, the use of fertilizer, and its properties for plants that must be known first before using the fertilizer.

### 3.2.7. *The Influence of Labor on the Income of Palm Oil Farmers in North Labuhanbatu Regency*

The influence of labor on the income of oil palm farmers has a probability value of  $0.001 < 0.05$  and with an estimated value of labor of -0.079. This means that labor has a negative but significant influence on the income of oil palm farmers in North Labuhanbatu district where if labor increases by 1%, it will reduce the income of oil palm farmers by -0.79%, and vice versa.

The process of cultivating oil palm from cultivating the land to producing FFB production requires assistance from workers. Labor itself is an important factor in the success of production. Labor consists of labor within the family and labor outside the family, the number of which varies from one farmer to another.

Expensive labor costs result in much higher production costs, which can affect farmers' income. This is in accordance with Suratiah's opinion in Apriana Eristanti & I Nyoman Nugraha Ardana Putra (2019) that the use of labor is an important factor, whether the available family labor can meet various needs. The workforce needed is greater than the potential, so it needs budget preparation for the required workforce outside the family. This will affect farming costs because workers outside the family must be paid wages.

According to the results in the field, the use of labor owned by many farmers is not functioning properly so that in reality, it will have a negative impact on the income of the farmers themselves because the labor is not functioning properly but the wages paid by farmers for this labor continues to be given. Moreover, many workers also have a dishonest attitude in carrying out their work, which means that this will have an effect that can reduce farmers' income.

This is in line with the theory of the law of production, *the Law of Diminishing Return*, which states that if the number of production factors (labor) is continuously increased by one unit, total production will initially increase more and more, but after it reaches a certain level, additional production will decrease and eventually reach a negative value (Purba et al., 2021).

### 3.2.8. *The Influence of Selling Prices on the Income of Palm Oil Farmers in North Labuhanbatu Regency*

The influence of selling prices on palm oil production has a probability value of  $0.011 < 0.05$  and with an estimated value of fertilizer costs of 0.071. This means that selling prices have a positive and significant influence on palm oil production in North Labuhanbatu regency. If the selling price increases by 1%, it will increase palm oil production yields by 0.71%, and vice versa.

This research is in line with Adib Susilo & Susilo (2019) that selling prices have a positive and significant influence on farmers' income. Then, research conducted by Wahab & Pamungkas (1987), which explains that prices influence the income of KUD Cinta Damai oil palm farmers.

Consistent and stable selling prices will also provide good income for oil palm farmers in North Labuhanbatu Regency. Through interviews with farmers in the field, the farmers' wishes are that the price of palm oil FFB itself has a limit price of 1.800/kg, so that the farmers are no longer worried about fluctuating prices and have no limit price for palm oil per kilogram. By setting a limit price for FFB, it will provide a better attitude for farmers in improving their agricultural maintenance to provide production results with good quality and quantity.

### 3.2.9. *The Influence of Production on the Income of Palm Oil Farmers in North Labuhanbatu Regency*

The influence of production on the income of oil palm farmers has a probability value of  $0.001 < 0.05$  and with an estimated labor value of 0.944. This means that production has a positive and significant influence on the income of oil palm farmers in North Labuhanbatu district, which if production increases by 1%, it will increase the income of oil palm farmers by 94.4% and vice versa.

These results are in accordance with the research of Adie & Arianti (2022), where production has a positive and significant influence on farmers' income with a probability value of 0.000 and a regression coefficient value of 149.83. Then, the research of Pradnyawati & Cipta (2021) mentioned that the influence of production has a positive and significant influence on farmer income.

If the demand for FFB production is high, prices at the farmer level will also be high, so that the same costs farmers will get higher income, conversely, if farmers have succeeded in increasing production, but prices fall then farmer income will also fall (Suratiah in Pradnyawati & Cipta 2021). With the good production results, it will also have a big impact on the opinions of the farmers themselves, where income is a calculation between the product yield multiplied by the selling price (Soekartawi in Wayan Widiantara, 2018), so that the demand for production results becomes higher and palm oil will have an impact on selling prices. It will also have a positive impact on the income of oil palm farmers in North Labuhanbatu Regency.

### 3.2.10. *Indirect Influence of Land Size on Farmers' Income through Production in North Labuhanbatu Regency*

Sobel calculation of the indirect influence of the land area variable on the farmer income variable with an estimated value of 0.623 with a Sobel z value  $11.32827 > 1.96$ . It means that land area has a positive and significant influence on income through production with a large indirect effect of 62.3%. The larger the land owned by farmers in North

Labuhanbatu Regency and the better its maintenance, the higher the productivity will be. This, indirectly, will have a positive impact on the income of farmers in North Labuhanbatu Regency.

Control of large areas of agricultural land is very important in production or farming and agricultural businesses. According to Arifalfarisi (2015), land has a big influence on crop yields. In the sense that the amount of harvest will change if the size of the farmer's land changes, the larger the farmer's land, the greater the amount of harvest that will be cultivated and this will further increase the farmer's income. This is similar to research conducted by Kariimah & Septiowati (2019), land area indirectly has a significant influence through production on the income of rice farmers in Mengwi District. This has the similar results as research conducted by Ramadhanti & Sapari (2023), where land area indirectly has a significant influence on onion farmers' income through production in Selo District.

### *3.2.11. Indirect Influence of Fertilizer Costs on Farmers' Income through Production in North Labuhanbatu Regency*

Sobel calculation of the indirect influence of the fertilizer cost variable on farmer income are 0.222 with a Z Sobel value of  $25.97188 > 1.96$ , which means that fertilizer costs have a positive and significant influence on farmer income through production with a large indirect effect of 22.2%. By using good fertilizer and in accordance with the recommended dosage, this will have an indirect influence on farmers' income. This is allegedly because fertilizer is one of the important factors in increasing productivity results from oil palm production, which with good production results will also has a positive impact on farmers' income.

In the field itself, most farmers use very small doses of fertilizer. This happens because the price of fertilizer is relatively expensive and high, which is not accompanied by a good selling price for palm oil, resulting in palm oil productivity being far from adequate when viewed from the number of trees and land area because the use of low fertilizer doses. Besides the lack of socialization and training or lack of information received by farmers in the field which results in the use of fertilizer less than the recommended dose. The farmers themselves have the assumption that fertilizer is useful for increasing the productivity of oil palm plants, so that the use of fertilizer can increase farmer income. The urea fertilizer dose recommended by the government is 250 kg/ha or 35 kg/1,400 m<sup>2</sup> (Siallagan Irawan et al., 2014). Farmers in North Labuhanbatu regency usually uses 150 kg/ha of urea fertilizer, which is lower than the recommended dose. Fertilizer use must be in accordance with the recommended dosage because it will affect plant productivity.

This is in accordance with the opinion of Linggah and Marsono in Listiani et al. (2019), which states that the correct use of fertilizer must pay attention to several things, for example the dosage, how to use it, the use of fertilizer, and its properties for plants that must be known first before using the fertilizer. Thus, using good fertilizer and mature financing will provide additional income through productive palm oil production both in terms of quality and quantity of the Fresh Fruit Bunches themselves.

### *3.2.12. Indirect Influence of Labor on Farmers' Income through Production in North Labuhanbatu Regency*

Sobel calculation of the indirect influence of the labor variable on farmer income is 0.039 with a Z Sobel value of  $1.02626 < 1.96$ , which means that labor has a positive but not significant influence on farmer income through production, with an indirect effect only 0.39 %. Labor that is not functioning properly and does not have an honest nature and good skills will have a very negative impact on the productivity of agricultural products. This will have an indirect impact on the income of the farmers themselves, where by expenditure of wages that have been paid but the workforce is not functioning properly. It will have an impact on productivity and provide reduced income for farmers in North Labuhanbatu Regency.

The process of cultivating oil palm from cultivating the land to producing FFB production requires assistance from workers. Labor itself is an important factor in the success of production. Labor consists of labor within the family and labor outside the family. Expensive labor costs result in much higher production costs, which can affect farmers' income. This is in accordance with Suratiah's opinion in Apriyana Eristanti & I Nyoman Nugraha Ardana Putra (2019), which states that the use of labor is an important factor, whether the available family labor can meet various needs. The workforce needed is greater than the potential, so the it needs budget preparation for the required workforce outside the family. This will affect farming costs because workers outside the family must be paid wages. According to the results in the field, the use of labor owned by many farmers is not functioning properly so that in reality, it will have a negative impact on the income of the farmers themselves because the labor is not functioning properly but the wages paid by farmers for this labor continues to be given, which means that this will have an effect that can reduce farmers' income. This is in line with research conducted by Arsana (2020), where indirect labor does not have a significant influence on salt farmers' income through production in Buleleng Regency.

### 3.2.13. Indirect Influence of Selling Prices on Farmers' Income through Production in North Labuhanbatu Regency

Sobel calculation of the indirect influence of the selling price variable on farmer income are 0.071 with a Z Sobel value of  $2.532600 > 1.96$ . It means that the selling price has a positive and significant influence on farmer income through production with an effect size of 0.71%. A good selling price will influence good production and will indirectly impact the income of oil palm farmers themselves.

Consistent and stable selling prices will also provide good income for oil palm farmers in North Labuhanbatu Regency, where through interviews with farmers in the field, the farmers' wishes are that the price of palm oil FFB itself that has a limit price of 1,800/kg, so that farmers are no longer worried about fluctuating prices and have no limit price for palm oil per kilogram.

By determining a limit price for FFB, it will provide a better behavior for farmers in improving their agricultural maintenance to provide production results with the good quality and quantity. Referring to oil palm farmers, there are three things that farmers expect for an improvement in the selling price of palm oil FFB. First, ensuring the stability of FFB prices because stable prices will have an impact on efforts to increase productivity and processing of oil palm plantations at the small farmer level. Second, limit prices under a situation of price volatility as state protection. Third, protection for farmers over prices determined by middlemen.

## 4. Conclusions

According to the research results, these can be concluded that there are positive and significant influences of palm oil production, fertilizer costs, and selling prices on palm oil production, as well as production on farmer's income in North Labuhanbatu Regency. Then, there are positive but not significant influence of labor and selling prices on palm oil production, as well as land area and fertilizer on farmer income. Moreover, there are negative but significant influence of labor on farmer's income. Indirectly, there is a positive and significant relationship between fertilizer costs and income through production. There is a positive but not significant relationship between labor and income through production. Last, there is a positive and significant relationship between selling price and income through production in North Labuhanbatu Regency.

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