# RICE PRODUCTION INPUT ANALYSIS IN ASAHAN DISTRICT

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This study aims to determine the effect of land area, labor, fertilizer and pesticides on the production of lowland rice in Asahan Regency. This study uses secondary data obtained from the Central Statistics Agency (CSA) of the Ministry of Agriculture, the Department of Trade, the Department of Agriculture of Food Crops District and North Sumatra Province and other institutions related to the object of research. The tool used to process the data is the Eviews 8.0 program. Data analysis techniques in this study used the OLS (Ordinary Least Square) method, classical assumption test and statistical test. The results showed that: 1) land area had a significant effect and had a positive coefficient on rice production; 2) labor does not have a significant effect and has a negative coefficient on rice production; 3) fertilizer is not significant and has a positive coefficient on rice production; 4) pesticides have a significant effect and have a positive coefficient on rice production.

Keywords : Land Area, Labor, Fertilizer Prices, Pesticide Prices and Rice Production

## INTRODUCTION

Every factor of production in the economy is owned by someone. The owner sells the factors of production to entrepreneurs and as a reward for their services, namely obtaining income, and the amount of income obtained by various factors of production used to produce something is the same as the price of the goods (Sadono, 2003).

The agricultural sector is a sector that has a very important role in the economy of most developing countries. We can see this clearly from the role of the agricultural sector in accommodating the population and providing job opportunities to the population. Indonesian agriculture is tropical agriculture because most of its area is in the tropics which is directly affected by the equator, which cuts Indonesia almost in half. Indonesia is still a country that plays an important role in the overall national economy. One of the food crop commodities in Indonesia is rice, the production of which is still a staple food. Rice is an agricultural crop and is the world's main crop (Danim, 2004).

A production function can give us an idea of technically efficient production, meaning that all inputs used in production are minimal or completely efficient. To increase production, it can be done by (Soekartawi, 2003), increasing the number of one of the inputs used and adding several inputs (more than the input used).

Land area is a factor of rice production, land area greatly affects the level of rice production, if the area of rice land is wider then rice production will increase. On the other hand, if the area of rice land is narrow, the production will be less. Labor is one of the factors of production in agriculture, especially for rice production. In order to clearly describe the production function and analyze the role of each production factor, one factor is considered a variable and the other is considered a fixed factor. For example,

to analyze the relationship between rice production and soil, other factors such as labor, seeds, capital is considered constant. The functional relationship as described above also applies to all factors of production. From the above description it is clear that the production (output), is the result of a combination of various factors of production together. Therefore, to obtain optimal results, it is necessary to combine these production factors appropriately so that the highest efficiency is achieved, both physically and economically (Mubyarto, 1991).

Apart from production factors, namely land area, labor, another factor that affects rice production is the use of fertilizers. The level of productivity of rice farming is basically strongly influenced by the level of application of the technology, and one of them is fertilization. Guidelines for the level of fertilizer use per unit area have technically been issued by the Department of Agriculture. With the use of fertilizers that do not match the dose, productivity per unit of land can be reduced, so that rice production will decrease.

If the price of fertilizer changes, it means that the production cost factor also changes. This means that if the price of fertilizer is more expensive, the production cost will increase and if the output price (rice) is relatively constant, the producer's income will be smaller. Or it could also happen that because of the high price of fertilizer, the use of fertilizer is reduced which further reduces production. To overcome this and in an effort to encourage increased food production, the government has implemented a policy of subsidizing fertilizer prices.

Another problem is that nuisance organisms can also cause low rice productivity per hectare, and can even cause crop failure or puso. Disturbing bodies can be insects, caterpillars, birds, rats and so on. Eradication of intruder bodies has its own ways, according to its type. One type of nuisance body that causes a lot of harm to farmers is the type of insect. Eradication that is often done by farmers is by using pesticides. There are various types of pesticides, their use, size, and time of use. Improper use of pesticides will not give optimal results. The disproportionate use of pesticides, apart from causing insects to become resistant to these types of pesticides, can also cause environmental pollution. As a result, the average rice production per hectare will decrease.

One area that has the potential to develop lowland rice farming is in North Sumatra Province, precisely in Asahan Regency which also has the potential for lowland rice cultivation. This can be proven from the increase in planting area and the production of lowland rice from year to year has increased, in 2012 it was 18,281 Ha and the production of lowland rice was 93,913 tons, while in 2013 there was an increase of 18,781 and production of 103, 881. And in 2013 in 2014 19,874 and production 111,887. This proves that in Asahan Regency there is an increase in the expansion of lowland rice planting areas, which has a great opportunity both through increasing productivity and in lowland rice production (BPS Kabupaten Asahan 2014).

Asahan Regency is one of the centers of rice production in North Sumatra and has an area of 9,445 ha, of which 3,275 ha is paddy field area. Most of the population make a living as farmers. The results produced are usually consumed as food and some are sold with the aim of increasing family income. The size of the income of lowland rice farming received by residents in the village is influenced by the receipt of production costs.

Realizing that the need for rice will continue to increase in line with the rate of population growth every year, while on the one hand farmers experience obstacles such as relatively high production costs for farming, although on the other hand it appears that the basic price for rice itself has not provided a maximum profit. for farmers so that it can be seen in one of the indicators of farmer welfare through the farmer's exchange rate which is still below 100 (BPS 2018).
With the background that has been stated above, it raises the author's desire to look further to find out Production Inputs that are able to have an influence on farm income in Asahan Regency and are expected to be able to provide maximum profit through the efficiency of these production inputs.

**Research purposes**
1. To determine the effect of land area on lowland rice production.
2. To determine the effect of labor on the production of lowland rice.
3. To determine the effect of fertilizer on the production of lowland rice.
4. To determine the effect of pesticides on lowland rice production.

**RESEARCH METHOD**
The scope of this research was carried out in the Asahan Regency, North Sumatra Province using observational data from 1993 to 2018.

**Data types and sources**
The type of data used is secondary data, obtained from the Central Statistics Agency of North Sumatra Province. Secondary data is data collected from indirect sources (second source) generally obtained through agencies/services/agencies engaged in the data collection process, both government and private agencies. The secondary data in this study were sourced from BPS (Central Bureau of Statistics), the Ministry of Agriculture, the Ministry of Trade, the Food Crops Agriculture Office of the Regency and Province of North Sumatra and other institutions related to the object of research.

**Research method and design**
The data analysis method used in this study will use a descriptive method, equipped with econometric analysis with multiple regression models based on the production function Y = f(K,L). Regression analysis was performed using the ordinary least squares (OLS) method, using the natural logarithm function (double log). To facilitate data processing, the analytical tool used in processing the data is the Eviews version 8.0 program.
The multiple regression model is basically a study of the dependence of the dependent variable (bound) with one or more independent variables (explanatory/independent variables), with the aim of estimating and/or predicting the population mean or the mean value of the dependent variable based on the value of the independent variable. known (Gujarati, 2007: 180).

## RESULT AND DISCUSSION

### Rice Production

In general, rice production in Asahan Regency fluctuated but tended to decline, from 1993 to 2018 it can be seen in the image below

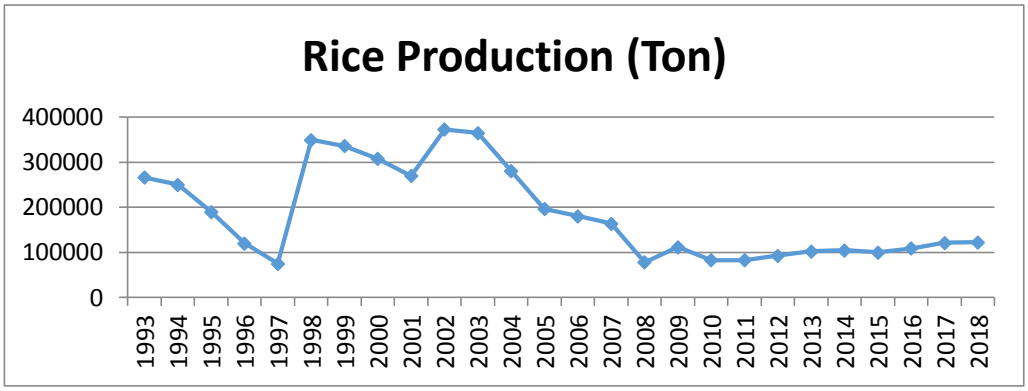


**Figure 1. Development of Asahan Rice Production 1993-2018 (Tons)**

*Source: BPS, 2018*

As shown in the figure above, the largest increase in 2002 was 373,014 tons. This achievement is inseparable from the efforts of the regional government of Asahan Regency in increasing production capacity through pest control, eradication of plant diseases, irrigation management and is supported by the increasing number of workers working in the agricultural sector of Asahan Regency. In 2011 production decreased by 83, 198 tons, this decrease was due to the lack of application of agricultural technology for farmers. Although the local government has implemented an applicable technology-based policy pattern, the willingness of farmers to apply agricultural technology is still minimal, but in 2018 it rose to 122,362 tons.

### Land area

Land area is a factor of production, land area greatly affects the level of rice production, if the area of rice land is wider then rice production will increase. On the other hand, if the area of rice land is narrow, the production will be less.

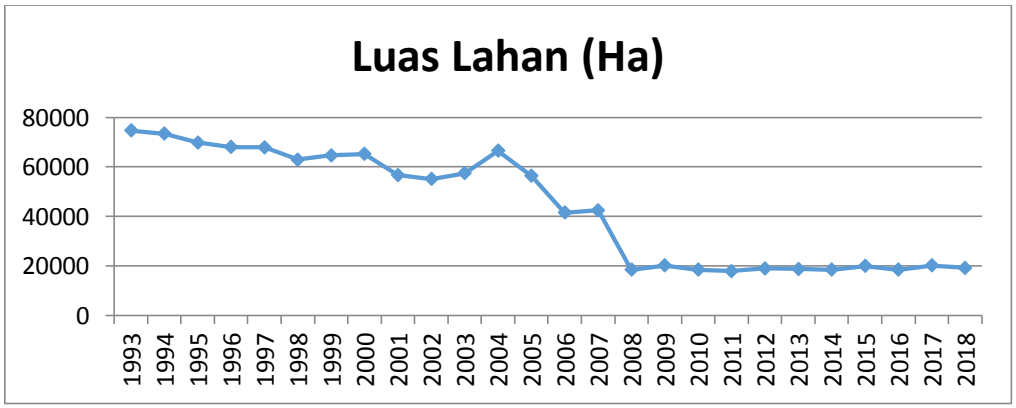


**Figure 2. Development of Paddy Land Area in Asahan District 1993-2018 (Ha)**

*Source: BPS, 2018*

As shown in the table above during 1999-2018 the area of lowland rice fluctuated but tended to increase as shown in 1999-2004 it increased from 74,676 ha to 66,521 ha, this could not be separated from the efforts made by the Asahan Regency Agriculture Service. in developing rice production through the project implementing unit which is carried out in the form of processing which involves several things such as increasing the area of rice plants, land processing and eradicating grass. It decreased in 2005-2018 from 56,325 ha to 19,191 ha. This decrease is inseparable from the relatively large conversion rate of paddy fields, in other words, the conversion of land from agricultural land to residential or industrial land.

**Labor**

In general, the workforce working in the agricultural sector (paddy rice) in Asahan Regency tends to increase from 1999 to 2018 as can be seen in the image below

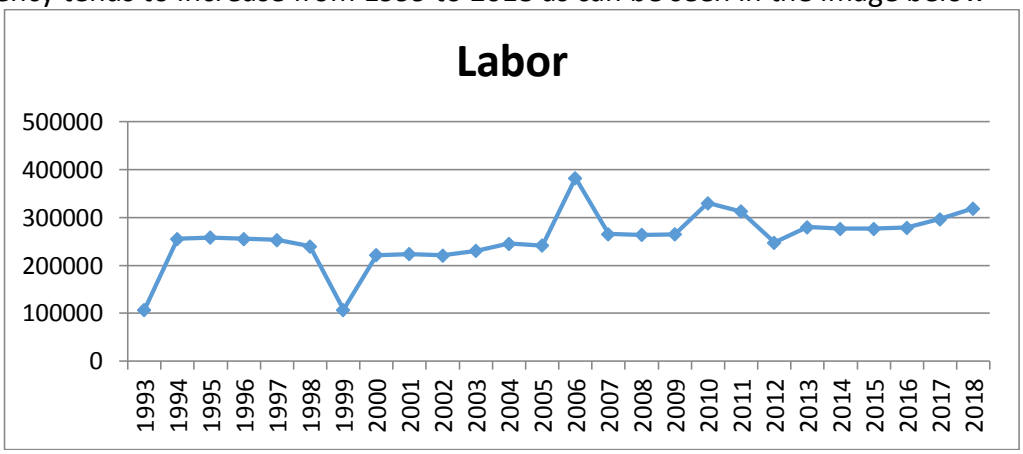


**Figure 3. Figure 3 Development of Manpower in Asahan District 1993-2018 (People)**

*Source: BPS, 2018*

As shown in the figure above, over the last twenty-five years, the labor force in the rice farming sector in Asahan Regency has tended to increase. It can be seen that in 1999-2010 the number of workers in the rice farming sector in Asahan Regency tended to increase from 3,098 people to 107,437 people, reaching 330,321 people. This is inseparable from the role of the local government or related agencies in carrying out mechanization programs in order to stimulate the younger generation to work in the agricultural sector. This increase in the workforce is also largely due to the difficulty of finding work and ultimately returning to work in agriculture. However, it decreased in 2011 to 313,021 people. This is due to the declining interest of young workers to enter the agricultural sector, so there is often a shortage of lowland rice workers during land processing or at harvest time.

**Fertilizer**

It is the amount of fertilizer used by all farmers in Asahan district, to fertilize their rice plants for a period of one year. The fertilizer in question is an index of the use of Urea, SP-36, KCl and Za fertilizers. Fertilizer production is highly dependent on government policies, because fertilizer producers, all of which are state-owned enterprises, whose main goal is to support agricultural and plantation activities in Indonesia. In addition to

production that refers to domestic needs, the development of fertilizer production is also constrained by the limited supply of gas to meet the needs of the fertilizer industry in Indonesia.

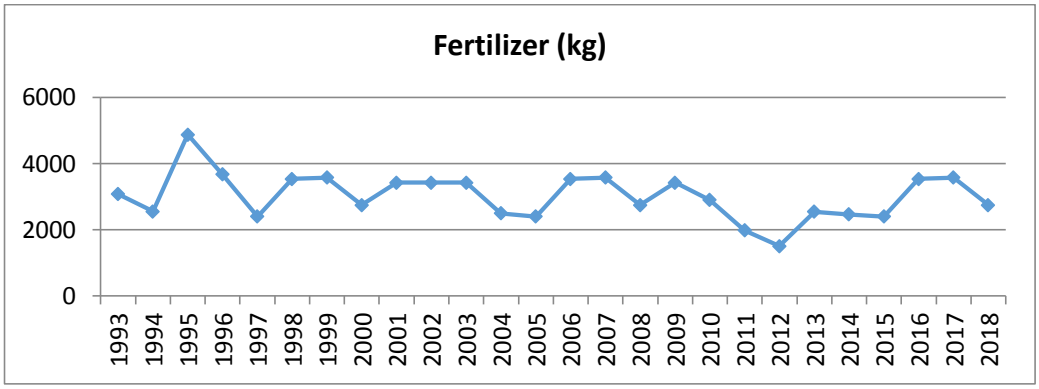


**Figure 4. Development of Fertilizer Use in Asahan District 1993-2018 (Kg)**

*Source: BPS, 2018*

As shown in the picture above, during the last twenty-five years the use of fertilizer for paddy rice in Asahan Regency tends to fluctuate, the highest use of fertilizer in 1995 was 4,876 kg and the lowest in 2012 was 1,500 kg. Fertilizer plays an important role in the success of lowland rice farming. Unbalanced fertilization as done by farmers greatly affects the growth and production of plants. Fertilizer is needed to increase root development, tiller formation, and accelerate flowering plants, strengthen plant cell walls, expand leaf canopy for photosynthesis, and increase the number of grains per panicle and the percentage of pithy grain.

**Pesticide**

Rice farmers in Asahan District use pesticides consisting of insecticides, herbicides, fungicides and molluscides during the rice cropping cycle. The use of pesticides is adjusted to the needs and intensity of pest and disease attacks on rice crops, which can be seen in the image below**.**

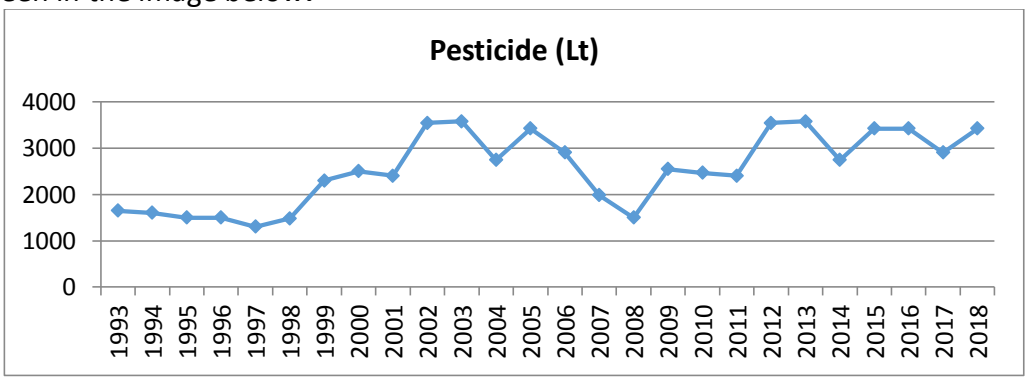


**Figure 5. Development of Pesticide Use in Asahan District 1993-2018 (Lt)**

*Source: BPS, 2018*

As shown in the picture above, during the last twenty-five years the use of pesticides for lowland rice in Asahan Regency tends to fluctuate, the highest use of pesticides in 2013 was 3,576 Lt and the lowest in 1997 was 1,300 Lt. Pesticides are widely used to eradicate

weeds and control many types of insect pests in rice fields such as grasshoppers, caterpillars, leafhoppers and bedbugs. and relatively few molluscides are used as needed.

**Estimated Results**

To test the hypothesis formulated in this study, an estimate was made using the Ordinary Learst Square (OLS) model for 25 year time series data using eviews 8.0. The results of the regression analysis on the estimation model used in this study are shown in Table 4.3.

Statistical analysis was used to see the validation of the model used in this study. Statistical testing was carried out on the results of the regression model. The statistical tests include testing the magnitude of the value of R2, t-Statistics and F-Statistics.

**Table 1. Estimation Results of Rice Production Model**

Dependent Variable: PP
Method: Least Squares
Date: 03/26/20 Time: 12:14
Sample: 1993 2018
Included observations: 26

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -74180.03 | 117547.1 | -0.631066 | 0.5348 |
| LL | 3.180554 | 0.752761 | 4.225184 | 0.0004 |
| TK | -0.452051 | 0.260018 | -1.738536 | 0.0968 |
| PU | 29.22535 | 18.56087 | 1.574567 | 0.1303 |
| PS | 58.50731 | 17.63829 | 3.317062 | 0.0033 |

| | | | |
|---|---|---|---|
| R-squared | 0.709109 | Mean dependent var | 186014.8 |
| Adjusted R-squared | 0.653701 | S.D. dependent var | 101448.9 |
| S.E. of regression | 59699.78 | Akaike info criterion | 25.00309 |
| Sum squared resid | 7.48E+10 | Schwarz criterion | 25.24503 |
| Log likelihood | -320.0401 | Hannan-Quinn criter. | 25.07276 |
| F-statistic | 12.79799 | Durbin-Watson stat | 1.775683 |
| Prob(F-statistic) | 0.000020 | | |

*Source: Eviews*

The results of the regression analysis of rice production (PP) can be written in a linear equation as follows:

PP = -74180.03 + 3.180554* LL - 0.452051* TK + 29.22535* PU + 58.50731*PS

The results of the estimation of rice production (PP), the independent variables of land area (LL), and pesticides (PS) significantly affect rice production in Asahan Regency at = 5%, while labor (TK) is not related or has a negative effect on rice production (PP). ) and

Fertilizer (PU) are not related and have a positive effect on rice production (PP) in Asahan Regency at = 0.05.

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

The determinant coefficient test (R2) is used to see how much variation in the independent variables (LL, TK, PU, and PS) can explain the dependent variable (Y). From the estimation results for rice production obtained R2 of 0.709. This means that 29.1% of rice production variables can be explained by the variables of land area (LL), labor (TK), fertilizers (PU) and pesticides (PS) while the remaining 39.03% is explained by other variables outside the model.

**Partial Test Results (t-test)**

The t test or Partial test is carried out to see the effect of the independent variables on the dependent variable partially or one by one. From the results of the estimation of rice production (PP) obtained the tcount value for each variable is as follows:

Based on the results of the partial test or the so-called test of significance, the t-count value of LL is equal to 4.225184 with a probability of 0.0004, the t-count value is greater than the probability value with dfa = 0.05, which means that H0 is rejected and Hi is accepted. and partially the variable area of land has a significant and positive effect on rice production in Asahan Regency at an error rate of 5 percent.

For the variable Labor (TK) with a t-statistic value of -1.738536 and with a probability of 0.0968, the t-statistic value is smaller than the probability with dfa = 0.05, which means that H0 is accepted and Hi is rejected and partially the Labor variable has no effect. significant and negative coefficient on rice production in Asahan Regency at an error rate of 5 percent.

For the fertilizer variable (PU) with a t-statistic value of 1.574567 and with a probability of 0.1303, the t-count value is greater than the probability value with dfa = 0.05, which means that H0 is accepted and Hi is rejected and partially the fertilizer variable (PU) has an effect not significant and has a positive coefficient on rice production in Asahan Regency at an error rate of 5 percent.

For the pesticide variable (PS) the t-count value is 3.317062 with a probability of 0.0033, the t-count value is greater than the probability value with dfa = 0.05 which means that H0 is rejected and Hi is accepted and partially the pesticide variable has a significant and positive coefficient on production rice in Asahan Regency at an error rate of 5 percent.

**Simultaneous Test Results (F Test)**

The F test or simultaneous test is now carried out to see the effect of the independent variables simultaneously or jointly on the dependent variable. From the estimation results for rice production (PP), the F-count value is 12.79799. This shows that the independent variables for land area, labor, fertilizers and pesticides simultaneously and together affect rice production in Asahan Regency. The estimation results have met the model suitability test for the simultaneous test, so the estimation results can be used for analysis.

**Economic Interpretation**

Several previous tests have shown that the regression model is free from the classic assumption disease. From the estimation results using the ordinary least square (OLS) model, the regression coefficient of land area is 3.180554, which means that if there is an increase in land area of 1 percent, it will increase rice production by 18.05% and vice versa. From the test results on the t-statistical value obtained 4.225184 which is greater than the t-table (α 5% = 18.05%), this means that every increase in land area has a significant effect on rice production in Asahan Regency. The regression results obtained strengthen the results of research conducted by Rusdiah Nasution (2008) with the research title "Effect of Working Capital, Land Area and Labor on Rice Farming Income in Dairi Regency" from the results of his research showing that land area has a positive and significant effect on rice farming income. Agricultural land is a determinant of the influence of agricultural commodities. Farmers in Asahan Regency generally have a fairly extensive land tenure with an average control of over one hectare, so that agricultural development is easier to do compared to plots of land with narrow land tenure, because farmers usually do not control their own land and choose work according to the will together. This means that farmers have a great motivation to work together to manage paddy fields which causes farmers not to act individually. So that with a large enough land tenure can increase production through farming efficiency.

The results of the estimated labor (TK) have no effect on rice production in Asahan Regency. The value of the labor regression coefficient is -0.452051. means that every 1% increase in labor, it has no effect or has a negative effect on rice production in Asahan Regency. From the test results on the value of t-statistics obtained -1.738536 smaller than the t-table (α 5% = 45.20). This means that every increase in labor has a negative effect on rice production in Asahan Regency. The results of the study indicate that an increase or decrease in the number of workers during the study period has a positive and insignificant effect on rice production, the higher the number of workers, the higher the rice production will be.

The results of the regression calculations above have shown consistency with the theory which states that labor can encourage increased production and these results have been able to strengthen the previous research conducted by Desky Syahroel (2007) with the research title "Analysis of Factors Affecting Rice Production in Southeast Aceh Regency ” with regression results which show that labor has a positive and significant effect on rice production. Labor has a very important role in encouraging increased production. Asahan Regency has quite good potential, especially in the agricultural sector in supporting sustainable regional economic development. The influence of labor on rice production in Asahan Regency is very large because most farmers in Asahan Regency use additional labor in almost every stage of agriculture from tillage to harvesting. Because if you use additional labor outside of the land owner's labor, then each stage of agriculture will get more optimal results which ultimately affect the increase in agricultural production.

The estimation results of Fertilizer (PU) have no effect on rice production in Asahan Regency. The value of the fertilizer regression coefficient is 29.22535. means that every 1% increase in labor, it has no effect or positive effect on rice production in Asahan Regency. From the test results on the value of t-statistics obtained 1.574567 smaller

than the t-table (α 5% = 22.53). This means that every increase in fertilizer has a positive effect on rice production in Asahan Regency.
The results of the regression calculations above have shown consistency with the theory which states that fertilizer in this study is one part of the capital, and this is in line with previous research conducted in different districts with different sub-districts by Saeful (2013), which showed that the volume of fertilizer had a positive and insignificant effect on rice production.
From the estimation results using the ordinary least square (OLS) model, the pesticide regression coefficient is 58,50731, which means that if there is an increase in pesticides by 1 percent, it will increase rice production by 50.73% and vice versa. From the test results on the value of t-statistics obtained 3.317062 which is greater than the t-table (α 5% = 50.73%), this means that every increase in pesticides has a significant effect on rice production in Asahan Regency.
This is in line with Riyadi's research (2007), Wirosari District, Grobogan Regency which explains that the output produced in a certain period is the same as a function of capital and labor where the pesticides used in this study are one part of the capital, that pesticides have an effect on significant to rice production.

## CONCLUSION AND SUGGESTION

### Conclusion

Based on the results of data analysis and discussion that has been stated in the previous chapter, the following conclusions can be drawn:

1. The variable area of land has a significant and positive effect on rice production in Asahan Regency at an error rate of 5 percent.
2. The labor variable has no significant effect and has a negative coefficient on rice production in Asahan Regency at an error rate of 5 percent.
3. The Fertilizer (PU) variable has no significant effect and has a positive coefficient on rice production in Asahan Regency at an error rate of 5 percent.
4. The pesticide variable (PS) has a significant and positive effect on rice production in Asahan Regency at an error rate of 5 percent.

### Suggestion

The suggestions that can be given related to the research results are as follows:

1. Efforts to increase rice production, by implementing mechanization programs that can stimulate the enthusiasm of the younger generation to work in the agricultural sector.
2. The Asahan Regency Government in developing rice production in the form of processing involves several things such as increasing the area of rice plants, land processing in the form of land revitalization or utilization of unused land.
3. The Government of Asahan Regency in increasing rice production should provide training and education to farmers to improve technical skills and knowledge through the use of agricultural technology.

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