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ANALYSIS OF FACTORS INFLUENCING RICE PRODUCTION IN LABUHAN BATU DISTRICT

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ABSTRACT

This research aims to analyze the factors that influence rice production in Labuhan Batu Regency. The research was conducted in Labuhanbatu Regency, North Sumatra Province. The determination of the research area was carried out purposively with the consideration that the Labuhanbatu Regency area according to BPS data in 2021 experienced a deficit in milled dry unhulled rice production and corn production in Labuhanbatu which was not commensurate with the population growth. The population in this study was all existing sub-districts. in Labuhanbatu Regency there are 9 sub-districts and the method used in sampling is a census and sample selection is taken from 9 sub-districts in Labuhan Batu District. Data analysis in this research uses Multiple Linear Regression Analysis (multiple regression) through the Cobb-Douglas function. The results of this research are that in the research the variable Land Area influences rice production because t count > t table (6,184 > 2,010) and the level is significant 0.000 < 0.05. In the research, the Labor variable influences rice production because t count > t table (3.001> 2.010) and the significance level is 0.002 < 0.05. In research, the fertilizer variable influences rice production because t count > t table (5.075 < 2.010) and the significance level is 0.000 < 0.05. In the research, the Seed variable influences rice production because t count > t table (4.341 < 2.010) and the significance level is 0.000 < 0.05. Form a linear regression model from the Cobb-Douglas production function to study the factors that influence rice production. Showing the results of (bx1+bx2+bx3+bx4) = 4,761, meaning that in this study the land area, labor contribution, fertilizer use, and seed use can be projected to see the amount of rice production in Labuhan Batu of 47.61%.

Keywords: *paddy, land area, labor, fertilizer, seed and production*

INTRODUCTION

Indonesia is one of the largest rice-producing countries in the world. World-grain launches from the November 2022 edition of the World Agriculture Supply and Demand Estimates (WASDE) report by the US Department of Agriculture (USDA), Indonesia is included in the top 10 world rice producers. In succession, referring to the projection of rice production in 2022/2023, the world's main producers are (www.cnbcindonesia.com):

Table 1. Rice Production

Country	productivity
China	147 juta ton
India	124 juta ton
Indonesia	34,6 juta ton
Vietnam	27,4 juta ton
Thailand	20,1 juta ton
Myanmar	12.5 juta ton
Philipina	12,41 juta ton
Japan	7,45 juta ton
Brasil	7,3 juta ton
Pakistan	6,6 juta ton

Meanwhile, Badan Pusat Statistik (BPS) noted that national rice production in 2021 was 31.36 million tons. And it is predicted to increase by 2.29% or 720 thousand tons to 32.07 million tons. Where actual production for the January-September 2022 period was 26.17 million tons. This figure decreased by 0.22% or around 60 thousand tons from the same period in 2021 which reached 26.23 million tons. this happened because Bulog's stock was only 295,337 tons (59.76%) of government reserve rice (CBP/medium) and as much as 198,865 (40.24%) of commercial rice (Irawan, 2015). It is far from the government's target of 1.2 million tons by the end of 2022. The stock position is considered too small and there are fears it will trigger new problems. This is because Bulog has to intervene in the market amid price spikes due to the famine season, while the government is focusing on controlling inflation (Hapsari & Rudiarto, 2017). Bulog must also have stock to meet needs during emergencies such as natural disasters (www.cnbcindonesia.com).

North Sumatra Province is one of the areas where the food security index is considered quite stable, this is because, in the North Sumatra region, many areas are agricultural centers, namely Karo, Deli Serdang, Bahorok, North Tapanuli, and so on, these areas make North Sumatra having sufficient food security can even export their crops to areas such as Batam, Riau and other areas on the island of Sumatra where their yields are insufficient (Peku Jawang, 2021).

The focus of this research is rice production in Labuhan Batu district because rice production will have direct implications for food security in Labuhanbatu, this is because the price position of rice as the main food determines a large amount of demand for this product, but rice as a food product the main ones have an inelastic demand elasticity because if the price of rice rises, buyers are reluctant to look for substitutes (because rice is the main food product) and therefore have to keep buying the rice so that the demand will not change much (Damayanti & Khoirudin, 2016).

Table 2. Harvested Area, Production Rice by District in Labuhanbatu Regency (2016-2020)

Year	Production Yield/Ton	Harvested Area/Ha
2016	160215.70	31883.30
2017	193564.00	38720.00
2018	57317.78	12366.68
2019	75623.32	15194.29
2020	58193.58	11594.12

Source: BPS North Sumatra

Table 2. shows that it can be seen that from 2018 to 2020 there has been a significant decrease in rice production as shown in the table. This can be caused by a reduction in the area of rice fields in Labuhan Batu Regency. The factors that affect rice production are land area, number of workers, fertilizer, and rice seeds. Ishaq et al. (2017) argues that if there are fluctuations in rice related to supply availability and price increases, it will have an impact on political stability. This shows the availability and price stability of rice is one of the keys to achieving national stability, especially economic stability.

METHOD

The research was conducted in Labuhanbatu Regency, North Sumatra Province. The determination of the research area was carried out purposively (deliberately) with the consideration that the area of Labuhanbatu Regency was because according to BPS data for 2021, there was a deficit in dry milled rice production and corn production in Labuhanbatu which was not proportional to the population growth. The population in this study were all sub-districts that existed in Labuhanbatu Regency, which totaled 9 sub-districts the method used in sampling was a census, and the selection of samples was taken from 9 sub-districts in Labuhan Batu District. Data analysis in this study used multiple regression analysis through the Cobb-Douglas function (Rizky Satria, 2013).

The purpose of Multiple Linear Regression Analysis is to study how close the influence of one or more independent variables is with one dependent variable. The data analysis technique used in this study was carried out through the Cobb-Douglas production function. Mathematically, the Cobb-Douglas function can be written as follows:

$$Yat = \alpha X1\beta 1X2\ \beta 2X3\beta 3X4\ \beta 1\varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (1)$$

The description of the formula is:

Yat is the rice production number (tons) of Labuhan Batu for the last 10 years
X1t is the area of Agricultural Land Area (Ha) Labuhan Batu in the last 10 years
X2t is Labuhan Batu Labor (Soul) for the last 10 years
X3t is the use of fertilizer (Rupiah) in Labuhan Batu in the last 10 years
X4t is the use of seeds (Tons) of Labuhan Batu in the last 10 years

By using the Cobb-Douglas model, the parameters/elasticity will be obtained directly from each variable X to Y. Estimate the elasticity coefficient, can be done by making the Cobb-Douglas model a multiple regression equation with natural logarithms (ln) (Philip & Amstrong, 2013; Sinaga et al., 2018).

$$\ln Ybt = \ln\alpha + \beta 1\ln X1t + \beta 2\ln X2t + \beta 3\ \ln X3t + \beta 3\ln X3t + \varepsilon.$$

RESULTS AND DISCUSSION

Classic Assumption Test

Before carrying out regression testing, classical assumption testing must be carried out first. Imam Ghozali (2016) stated that multiple linear regression analysis needs to avoid deviations from classical assumptions so that problems do not arise in the use of the analysis and to find out whether the regression model used in the study is the best. In this study, several assumption tests were carried out including the Normality test

Tabel 3. One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		33
Normal Parametersa	Mean	0.0000000
	Std. Deviation	2.60863773
Most Extreme Differences	Absolute	0.065
	Positive	0.049
	Negative	-0.065
Kolmogorov-Smirnov Z		0.459
Asymp. Sig. (2-tailed)		0.984

a. Test distribution is Normal.

Table 3. shows that the Asymp. Sig. (2-tailed) 0.984 > 0.05 means that in this study the data distribution is normal.

Multicollinearity Test

This test is used to test whether, in the regression model, a strong correlation is found between the independent variables. The test provisions are to see whether there are symptoms of correlation between the independent variables of multicollinearity, which can be seen from the magnitude of the tolerance value and VIF (Variance Inflation Factor) (Sugiono, 2005). The general value that is usually used is the tolerance value > 0.1 or a VIF value < 10, so multicollinearity does not occur.

Tabel 4 Coefficients[a]

Model		Unstandardized Coefficients		Collinearity Statistics	
		B	***Std. Error***	***Tolerance***	***VIF***
1	(Constant)	20.033	4.671		
	Land area	1.521	0.204	0.799	1.252
	Labor	1.011	0.355	0.807	1.239
	Fertilizer	1.077	0.212	0.941	1.063
	Seed	0.955	0.220	0.961	1.040

a. Dependent Variable: Rice Production

Table 4 shows that the Tolerance value for Land Area is 0.799 > 0.10 and the VIF value is 1.252 < 10, the Tolerance value for Labor is 0.807 > 0.10 and the VIF value is 1.239 < 10, the Tolerance value for Fertilizer is .941 > 0.10 and the VIF value is 1.063 < 10, Seed Tolerance value is 0.961 > 0.10 and VIF value is 1.040 < 10.

Heterodexacity Test

How to detect whether there is heteroscedasticity in a model can be seen in the Scatterplot Model image. Analysis of the Scatterplot image states that the multiple linear regression model does not contain heteroscedasticity if, the data points spread above and below or around the number 0.

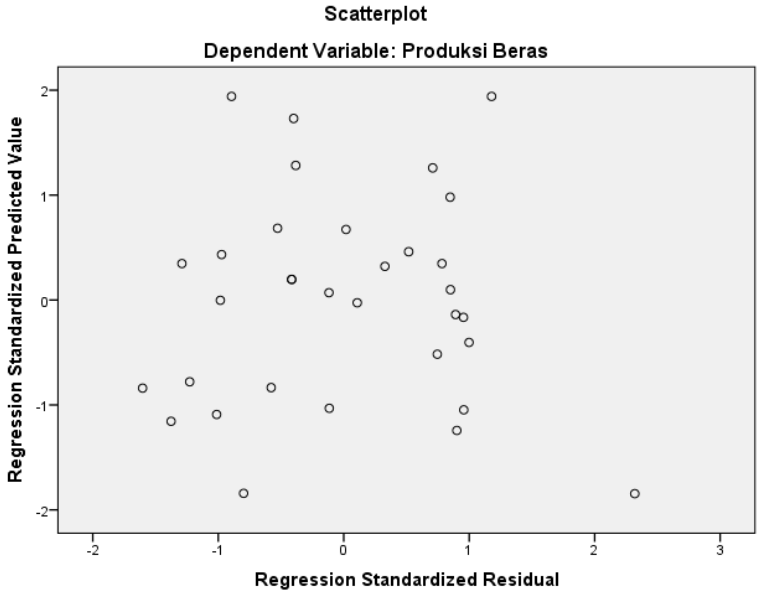

Figure 1. Heterodecacity Test

Through graphic analysis, a regression model is considered to have no heteroscedasticity if the points that are spread randomly do not form a clear pattern, and are spread above or below zero on the Y axis. So Figure 1. shows that the points are spread randomly then heteroscedasticity does not occur.

Multiple Linear Regression Analysis

To test the influence of the management accounting information system on rice production in Labuhan Batu was carried out using a multiple regression analysis model. Multiple linear regression analysis functions to determine the influence of the independent variable on the dependent variable. The test criteria can be seen below

$$Y = a + b1X1 + b2X2 + b3X3 + b4X4 + e$$

Tabel 5. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	20.033	4.671		4.288	0.000
	Land area	1.521	0.204	0.582	7.449	0.000
	Labor	1.011	0.355	0.264	3.001	0.002
	Fertilizer	1.077	0.212	0.365	5.075	0.000
	Seed	0.955	0.220	0.309	4.341	0.000

a. Dependent Variable: Rice Production

The explanation from the table above is:
$Y = 20.033 + 1.521\ X_1 + 1.011X_2 + 1.077X_3 + 0.955X_4 + e$

The explanation of the table above is:

1. The (Constant) value of 24,797 shows a positive constant value, meaning that if the Land Area, Labor, Fertilizer, and Seeds do not change or are the same = 0 then it will increase rice production by 24,797
2. The Land Area Regression Coefficient is 1.521, indicating that if the Land Area variable increases by 1% it will increase rice production by 1.521%
3. The Labor Regression Coefficient is 1.011, indicating that if the Labor variable increases by 1% it will increase rice production by 1.011%.
4. The Fertilizer Regression Coefficient is 1.077, indicating that if the Fertilizer variable increases by 1% it will increase rice production by 1.077%.
5. The Regression Coefficient for the Seed variable is 0.955, indicating that if the Seed variable increases by 1% it will increase rice production by 0.955%

Based on the results of data processing, all independent variables have a positive influence on rice production in the Labuhan Batu district. then all these variables can be included in the model. Form a linear regression model from the Cobb-Douglas production function to study factors that influence rice production. The similarities are:

$$Y = 1.521\ X1 + 1.011X2 + 1.077X3 + 0.955X4 + e$$

(bx1+bx2+bx3+bx4) = 4,761 meaning that in this study the land area, labor contribution, fertilizer use, and seed use can be projected to see the amount of rice production in Labuhan Batu of 47.61%

Hypothesis Testing

t-test

A partial test or t-test is a test carried out to determine the effect of the independent variable on the dependent variable, partially (individually) the criteria for partial testing can be the hypothesis testing model as follows:

Table 6. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	*Std. Error*	*Beta*		
1	(Constant)	20.033	4.671		4.288	0.000
	Land area	1.521	0.204	0.582	7.449	0.000
	Labor	1.011	0.355	0.264	3.001	0.002
	Fertilizer	1.077	0.212	0.365	5.075	0.000
	Seed	0.955	0.220	0.309	4.341	0.000

a. Dependent Variable: Rice Production

1. The Influence of Land Area on Rice Production: It can be seen in Table 4.5 that the t value of Land Area is 7.449 and the significance level is 0.000, in the research the variable Land Area has an influence on rice production because t count > t table (6.184 > 2.010) and the significance level is 0.000 < 0.05
2. The Influence of Labor on Rice Production: It can be seen in Table 4.5 that the t-calculated value of Labor is 3.001 and the significant level is 0.002, in the research the variable Labor influences rice production because t-calculated> t table (3.001 > 2.010) and the significant level is 0.002 < 0.05
3. Effect of Fertilizer on Rice Production: It can be seen in Table 4.5 that the t-calculated value of Fertilizer is 5.075 and the significant level is 0.000, in the research the Fertilizer variable influences rice production because the t-calculated> t table (5.075 < 2.010) and the significant level is 0.000 < 0.05
4. Effect of Seeds on Rice Production: It can be seen in Table 4.15 that the t-calculated value of Seed is 4.341 and the significant level is 0.000, in the research the Seed variable influences rice production because the t-calculated> t table (4.341 < 2.010) and the significant level is 0.000 < 0.05

F-test

To test whether the proposed hypothesis is accepted or rejected, the F statistic (F test) is used. The F test aims to determine the influence simultaneously or together of the independent variables on the dependent variable

Table 7 ANOVA[a]

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	660.419	4	165.105	44.320	0.000[b]
	Residual	104.308	28	3.725		
	Total	764.727	32			

a. Dependent Variable: Rice Production

b. Predictors: (Constant), Land area, Labor, Fertilizer, Seed

Table 7 shows that the f count is 41,510 and the significance level is 0.000, meaning that in the research, Seeds, Land Area, Fertilizer, and Labor simultaneously influence rice production because f count > f table because (41,510 > 3.19) and the significance level is 0.000 < 0.05.

Coefficient of Determination

The coefficient of determination shows the size of the contribution of the variable influence on the dependent variable where $0 \leq R^2 \leq 1$. If the value of R2 is getting closer to the value of 1 then it shows a stronger relationship of the independent variable to the dependent variable. Conversely, if the determinant (R2) is smaller or closer to zero, then the influence of the independent variable on the dependent variable is getting weaker. The processing results of multiple linear regression analysis can be seen in Table 8 below

Table 8. Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.929a	0.864	.844	1.93010	2.442

Table 7 shows an r square value of 0.864, meaning that in this study the variables Seed, Land Area, Fertilizer, and Labor influence 0.864 or 86.4% of Labuhan Batu Regency's rice production while the remaining 13.7% are other variables not examined in this study.

Discussion

Rice is an agricultural product that has an important role in meeting consumption needs in Indonesia. This is because rice is the staple food consumed by the majority of the Indonesian population. The high tendency to consume rice causes various kinds of problems, such as a lack of availability of rice which results in price increases and an increase in the poor population due to increased spending on buying rice. So the availability of rice must remain stable, to minimize the negative impact of lack of availability. Government intervention and implementation of policies in the domestic agricultural sector, especially in agricultural products such as rice, are carried out with the hope of achieving rice self-sufficiency and achieving prosperity for farmers as producers and society as consumers. However, in reality, the results show movements that are contrary to the hopes that the government wants to create. Various phenomena have occurred which have resulted in a decline in rice production levels in Indonesia. The results of this research answer the problem formulation and hypotheses that have been proposed previously. The results of this research are:

Effect of Land Area on Rice Production

Production is an activity of making an item or keeping it to meet a need. Some of the things that influence production are labor, capital, and materials. In agriculture, a farmer must be able to use output as efficiently as possible to produce the maximum possible results. In agriculture, superior seeds, and the quality of an intelligent workforce greatly influence agricultural output. However, land area and soil fertility also affect the amount of agricultural production and the quality of production produced.

In this study, the variable land area affects rice production because of t count > t table (6,184 > 2,010) and a significant level of 0.000 <0.05. The cause of the decline in rice production is most related to current conditions, namely the widespread conversion of agricultural land. As a result, crop yields have decreased because the area of agricultural land has decreased. This condition prompted the government to import rice to meet domestic rice needs and to stabilize domestic rice prices.

The results of this study are in line with research conducted by Denny Afrianto (2017) with the title "Analysis of the effect of rice stocks, harvested area, average or production, rice prices and total rice consumption on food security in Central Java" The results of this study indicate that harvested area is significant and positively related to food security.

Effect of Labor on Rice Production

The workforce consists of the labor force and non-labor force. The labor force is the entire population aged ten years and over who has the most activities working and looking for work. The important thing is that the workforce from farming families themselves plays an important role, not only in Indonesia. Also in countries with advanced agriculture, the wives and children of farmers actively contribute to production activities. The productivity of agricultural labor can be increased in various ways, including through education and training to improve the quality and results of work. Most of the farmers' knowledge and skills in working are obtained from parents who have guided them since they were children. But it has already been mentioned that new technologies in agriculture sometimes come from places far away from farmers.

In this study the labor variable affects rice production because of t count > t table (3.001 > 2.010) and a significant level of 0.002 <0.05, Rice as a food-producing crop is very important for the people in Indonesia, This statement is the theory (Anwar & Fatmawati, 2018) that the production function essentially lies between scarcity and economic action and he says that scarcity causes economic problems and measures that need to be resolved. This causes economic problems that arise because human needs are unlimited while the means of satisfying human needs are relatively very limited

The results of research conducted by Catur Indra Gunawan (2017) with the title "The influence of harvested area, productivity, rice consumption, and farmer exchange rates on food security in Brebes Regency" show that one that can provide food security from an area is the contribution of agricultural land in an area.

Effect of Fertilizer on Rice Production

To obtain high grain yields while maintaining soil fertility, it is necessary to apply a combination of inorganic and organic fertilizers. The advantage resulting from the combined application of the two types of fertilizers is that the deficiencies in the properties of organic fertilizers are met by inorganic fertilizers, on the other hand, the deficiencies of inorganic fertilizers are fulfilled by organic fertilizers. So the combination of these two fertilizers is considered perfect because it complements each other between the advantages and disadvantages of organic and inorganic fertilizers. Rice plants require a lot of N nutrients compared to P or K nutrients. N nutrients serve as a source of material for plant growth, tiller formation, and chlorophyll formation which is important for the assimilation process, which in turn produces starch for growth and grain formation. Nutrient P functions as a source of energy to meet the quality of plant life such as the simultaneity of growth and maturation. Meanwhile, nutrient K functions as a supporting component of enzyme reactions in plants. It also functions to improve grain yield, drought resistance, plant disease resistance, and grain quality. Thus to get grain with high quantity and good quality, the plant needs to be given complete nutrients.

In this study, the variable Fertilizer affects rice production because of t count > t table (5.075 < 2.010) and a significant level of 0.000 < 0.05. To obtain high grain yields while maintaining soil fertility, it is necessary to combine inorganic fertilizers with organic fertilizers. The advantage resulting from the combined application of the two types of fertilizers is that the deficiencies in the properties of organic fertilizers are met by inorganic fertilizers, on the other hand, the deficiencies of inorganic fertilizers are fulfilled by organic fertilizers. So the

combination of these two fertilizers is considered perfect because it complements each other between the advantages and disadvantages of organic and inorganic fertilizers.

The results of this study are in line with research conducted by Klivensi Ilona Mafor, (2015) with the title "Factor Analysis of Rice Production in Tompasobaru Dua Village". The results showed that fertilizer could increase rice production at the study site.

Effect of Seeds on Rice Production

Seeds are a supporting commodity in labor which can later affect rice production. What must be available when carrying out rice planting activities, if the seeds are planted by the portion of the availability of paddy fields and also the quality of the seeds meets the standards, the more likely the success of the resulting rice production is, in other words, the seed variable is a variable that affects the level of rice productivity. Seeds are the most important factor that must be considered by farmers if they want to have superior-quality rice production. Therefore farmers must be careful in selecting seeds. According to (Sutopo, 2004) seeds are plant seeds that are used for the breeding process in plants. Especially for rice plants, farmers must use the best quality seeds, because the rice that will be planted goes through the process of becoming rice and is processed again into rice which is a staple food for the people of Indonesia.

In the study of the seed variable, it affected rice production because of t count > t table (4,341 <2,010) and a significant level of 0.000 <0.05. Seedlings are a supporting commodity in labor which can later affect rice production. What must be available when carrying out rice planting activities, if the seeds are planted by the portion of the availability of paddy fields and also the quality of the seeds meets the standards, the more likely the success of the resulting rice production is, in other words, the seed variable is a variable that affects the level of rice productivity. Seeds are the most important factor that must be considered by farmers if they want to have superior-quality rice production. Therefore farmers must be careful in selecting seeds. According to (Sutopo, 2004) seeds are plant seeds that are used for the breeding process in plants. The results of this study are in line with research conducted by Klivensi Ilona Mafor, (2015) with the title "Factor Analysis of Rice Production in Tompasobaru Dua Village". The results showed that seeds could increase rice production at the study site.

Contribution of Land Area, Labor, Use of Fertilizers and Seeds to Rice Production

The form of the linear regression model of the Cobb-Douglas production function shows the results of (bx1+bx2+bx3+bx4) = 4,761 meaning that in this study land area, labor contribution, use of fertilizers, and use of seeds can be projected to see the amount of rice production in harbor stone of 47.61%. The r square value of 0.864 means that in this study the variables of Seed, Land Area, Fertilizer, and Labor affect 0.864 or 86.4% of rice production in Labuhan Batu Regency while the remaining 13.7% are other variables not examined in this study.

The results of this study are in line with research conducted by Catur Indra Gunawan (2017) with the title "The effect of harvested area, productivity, rice consumption, and farmer exchange rates on food security in Brebes Regency. The results showed that the harvested area is significant and has a positive relationship. Productivity is significant and positively related. This has similarities with the results of research conducted by the author, meaning that if the area of paddy fields is increased and productivity is increased, it will increase rice production

The results of research conducted by (Ishaq et al., 2017) with the title "Analysis of Factors Influencing Rice Production in East Java Province" The results of spline semiparametric regression show the factors that have a significant effect on rice production, namely rice harvest area and bulk rain, while the factors that do not have a significant effect are the area of paddy puso, the realization of subsidized fertilizers, and the average height, the results of this study have differences with the author's research, in terms of the use of fertilizers, this can happen due to nutrient factors, fertility and contours that differ from one location to another.

CONCLUSION

In the research, the variable land area affects rice production because t count > t table (6.184 > 2.010) and the significance level is 0.000 < 0.05. In the research, the Labor variable affects rice production because t count > t table (3.001 > 2.010) and the significant level is 0.002 < 0.05, in the research the Fertilizer variable affects rice production because t count > t table (5.075 < 2.010) and the level significant at 0.000 < 0.05, in this study the seed variable influences rice production because t count > t table (4.341 < 2.010) and the significant level is 0.000 < 0.05. The form of the Cobb-Douglas production function linear regression model is to study the factors that influence rice production. Showing results (bx1+bx2+bx3+bx4) = 4.761, meaning that in this study land area, labor, fertilizer use and seed use can be projected to see the amount of rice production in Batu Harbor of 47.61%.

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