The Analysis of Determinants of Production and Optimization of Garlic Farming in Sembalun District East Lombok Regency

ABSTRACT

Each farming aims to maximize farming income but is constrained by the quantity of inputs. The limited quantity of input is faced by farmers who cultivate garlic plants. One solution is to utilize production inputs available at the location where farmers live, such as organic fertilizers, to reduce the use of inorganic fertilizers. The purpose of the study is to analyze the influence of the use of production inputs on production quantity and to determine the level of efficiency of the use of each production input. The purpose of the research was achieved through the collection of primary data from the results of the garlic farming survey in Sembalon District, East Lombok Regency. As a respondent, 71 farmers cultivate garlic. The research location is in SembalonBumbung village and SembalunLawang village. The number of sampling units in each village was selected using a proportional random sampling technique of 44 farmers in SembalunBumbung village and 27 farmers in SembalonLawang village. Production quantity and input quantity data were analyzed by multiple regression followed by an analysis of the ratio of marginal production value to the price per input unit to determine the status of efficiency in the use of production inputs. The results of the study showed that the use of organic fertilizer inputs, ZA fertilizers, and phonska fertilizers had a real effect on the production quantity. The use of organic fertilizers is not optimal, while the use of ZA fertilizers and phonskafertilizers needs to be reduced to increase efficiency.

Keywords: farming; organic fertilizers; seeds; optimization; garlic

1. INTRODUCTION

Garlic is one of the agricultural commodities that is widely cultivated in Indonesia. This vegetable is already very well known to the Indonesian people and is popular as a cooking spice, and also a medicinal ingredient. Almost all dishes in the archipelago use this white bulb as a flavoring ingredient. Traditionally, garlic is also known and is often used by Indonesian people. Garlic is often used to treat worms, toothache, diarrhea, and poisoning. In addition, garlic is also commonly used to ward off disease and provide strong immunity(BPTP, 2018)

The national garlic consumption needs have increased every year. However, this increase has not been able to be balanced by an increase in domestic production. According to data from BPS, in 2021, the need for garlic consumption in Indonesia reached 532,000 tons, while national production was recorded at 98,387 tons. Because the amount of production cannot meet the garlic consumption needs, the government is forced to continue to import every year from several countries such as China, Taiwan, India and the United States (BPS Kabupaten Lombok Timur, 2020). Several areas where garlic was produced in Indonesia in 2020 were in the provinces of Central Java, West Nusa Tenggara, East Java and West Sumatra. Based on BPS data in 2020, garlic production in the province of Central Java contributed 41% to Indonesia's total garlic production, West Nusa Tenggara 30%, East Java 7% and West Sumatra 6% and West Java 4%. The total national production of garlic in 2020 was 81,805 tons (BPS, 2021).

Sembalun District is one of the centers for garlic commodity development in West Nusa Tenggara. This is due to the climate and soil conditions that are very supportive for the growth of garlic. It is recorded that garlic production in Sembalun District in 2020 was 10,976.2 tons from 1,151 ha of managed land, or it can be said that its productivity is around 9.53 tons/Ha (BPS Kabupaten Lombok Timur, 2020).

In garlic farming, the production inputs used include land, seeds, fertilizers, pesticides, and labor. However, it is often found that farmers do not understand the principle of input-output relationships so that farmers use production inputs that are not in accordance with the recommended dosage. This causes the use of production inputs to be suboptimal and when harvesting the output produced is not as expected. In fact, in farming activities, the use of optimal production inputs has a very important role. By knowing the level of optimization of the use of production inputs, it can be known which production inputs should be added or reduced in order to get the greatest output.

2. RESEARCH METHODS

The research method used is a descriptive method(CR Kothari, 2004), where the descriptive method is a method that provides a systematic, factual, and actual description or painting of the facts, characteristics, and relationships between the phenomena being investigated. The unit of analysis in this study is garlic farming in Sembalun District, East Lombok Regency. The determination of the research location used the *purposive sampling method,* considering that in the two villages, there were more farmers who cultivated garlic. The number of respondents was 71 garlic farmers determined using the Slovin formula, with the selection of respondents using *proportional random sampling,* with details of SembalunBumbung Village with 27 respondents and SembalunLawang Village with 44 respondents. The types of data used in this study include qualitative data and quantitative data, with research data sources being primary and secondary data.

The data analysis that is in accordance with the research objectives is as follows:

1. Classical Assumption Test

   a) Normality Test

   In research, the normality test is a requirement that must be met in a regression model, because this test is to test whether in the regression model, the independent variables and dependent variables have a normal distribution. The normality test aims to determine whether the regression model meets the normality assumption or not. The normality test can be done with the Kolmogorov-Smirnov test. If the significance of the Kolmogorov-Smirnov value is more than 5%, then it can be concluded that the data is normally distributed. The possible treatment so that the data becomes normal is to transform the data into a natural logarithm form(Gujarati, 2006).

   b) Multicollinearity Test

   The multicollinearity test aims to test whether the regression model finds a correlation between independent variables. To detect the presence or absence of multicollinearity, it can be done by using the Tolerance and Variance Inflation Factor (VIF) values using SPSS. The cut-off values commonly used to indicate the presence of multicollinearity are tolerance and VIF (variance-inflation factor) values. If the tolerance value is > 0.1 or equal to the VIF value <10, it means that there is no multicollinearity (Gujarati, 2006).

   c) Heteroscedasticity Test

   The Heteroscedasticity Test aims to test whether in the regression model the variance inequality of the residuals of one observation to another observation. If *the variance* of the residuals of one observation to another observation remains, then it is called Homoscedasticity and if it is different, it is called Heteroscedasticity. Heteroscedasticity testing can be done by the Glejser test, namely by regressing the absolute value of the residual against the independent variable. If the independent variable has a significant effect on the absolute residual value (as a dependent variable), then it can be concluded that heteroscedasticity occurs. The *Glejser test* is carried out using the SPSS program application. The way to overcome heteroscedasticity is to transform it into a regression model, namely by dividing the regression model by one of the independent variables used in the study, and by logarithm(Gujarati, 2006).

2. Cobb-Douglas Production Function

   a) Simultaneous regression coefficient test (F and R2 test)

   Statistically, the F test formulation is (Gujarati, 2006)

$$F = \frac{R^2/(k-1)}{(1-R^2)/(n-k)}$$

Description: F = Value sought (F count)
R^2 = Coefficient of determination
k = Number of independent variables
n = Number of samples
I = constant

Hypothesis formulation:

1. H_o : $b_1 = b_2 = b_3 = b_4 ... = b_{12} = 0$, meaning that simultaneously the independent variable (X) does not have a real effect on the dependent variable (Y).
2. H_i : $b_1 = b_2 = b_3 = b_4 ... = b_{12} \neq 0$, that is, simultaneously the independent variable (X) has a real effect on the dependent variable (Y).

Testing criteria:

1. If F calculates ≤ F table at a confidence level of 95% or a significance probability value greater than 0.05 (5% real level), then H_0 is accepted, which means that simultaneously the independent variable (X) has no real effect on the dependent variable (Y).
2. If the calculated F > F table at a 95% confidence level or the significance probability value is less than 0.05 (real level 5%) then HI_{is} accepted, which means that simultaneously the independent variable (X) has a real effect on the dependent variable (Y).

b) t-test

The t-test is a partial test of the regression coefficient. This test is carried out to determine the significance of the partial role between the independent variable and the dependent variable by assuming that the other independent variables are considered constant.

Statistically, the t-test formulation is (Gujarati, 2006):

$$t = \frac{bi}{Se\ (bi)}$$

Description: t = Value sought (t count)
bi = i-th regression coefficient
Se = Standard error of the regression coefficient.

Hypothesis formulation:

1. Ho: bi = 0, meaning that the independent variables (Xi) individually have no real effect on the dependent variable (Y).
2. H_1: bi ≠ 0, This means that the independent variable (Xi) individually has a real effect on the dependent variable (Y).

Testing criteria:

1. If t count < t table at a 95% confidence level or the significance probability value is greater than 0.05 (real level 5%) then H_0 is accepted, which means that the independent variables (Xi) individually do not have a significant effect on the dependent variable (Y).
2. If t count > t table at a 95% confidence level or the significance probability value is less than 0.05 (5% level of significance), then Hiis accepted, which means that the independent variables (Xi) individually have a real effect on the dependent variable (Y).

3. Allocative Efficiency

To determine the level of optimization of the use of garlic farming production inputs, it was analyzed using allocative efficiency analysis with the following formula (Soekartawi, 2002):

$NPM_X = P_x$ or

$$\frac{NPMx}{Px} = 1$$

$$Y^* = \sqrt[n]{y1 \times y2 \ldots \times yn}$$

$$Xi^* = \sqrt[n]{x1 \times x2 \ldots \times xn}$$

$$PRxi = \frac{Y*}{Xi*}$$

$PMx_i = \beta i.PRxi$

Information:

$$NPMx_i = PMx_i.Py = \beta i.\ \frac{Y*}{Xi*}.\ Py$$

Description: $NPMx_i$ = Value of Marginal Product of Input X to-i
Y* = Geometric Mean of Garlic Production
Xi* = Geometric Mean of Input Usage X to-i
PRxi = Average Production of Input X to-i
PMx_i = Marginal Product of Input X to-i
Px_i = Price of input X i
Py = Production Price of Garlic
βi = i-th Regression Coefficient

The input optimization testing criteria are:

1. $\frac{NPMx}{Px}$> 1,This means that the use of Xi input is not optimal. To reach the optimal level, Xi input needs to be increased.
2. $\frac{NPMx}{Px}$= 1, meaning that the use of input Xi is optimal and maximum profit is obtained.
3. $\frac{NPMx}{Px}$< 1, meaning that the use of input Xi is not optimal. To achieve the optimal level, input Xi needs to be reduced.

4. One-sample T-test

To analyze the value of optimizing the use of production inputs in garlic farming, a one-sample t-test is used. The one-sample t-test is used to test whether the average of the allocative efficiency data is statistically significantly different when compared to the allocative efficiency value that has been determined based on existing theory or literature. Based on the book written by Soekartawi (2003), it shows that the allocative efficiency value (NPM/Px) for optimal input use is at the value of NPM/Px = 1. Statistically, the one-sample t-test formulation is:

$$t = \frac{\bar{x} - \mu}{S / \sqrt{n}}$$

Description: t = Value sought (t count)
µ = parameter value
x̄ = sample mean
S = Sample Standard Deviation
n = number of samples

Hypothesis formulation:

1. Ho: bi = 0, meaning that the independent variables (Xi) individually have no real effect on the dependent variable (Y).
2. Hi: bi ≠ 0, This means that the independent variable (Xi) individually has a real effect on the dependent variable (Y).

Testing criteria:

1. If t count < t table at a 95% confidence level or the significance probability value is greater than 0.05 (real level 5%) then H_0 is accepted, which means that the independent variables (Xi) individually do not have a significant effect on the dependent variable (Y).
2. If t count > t table at a 95% confidence level or the significance probability value is less than 0.05 (5% level of significance), then Hi_{is} accepted, which means that the independent variables (Xi) individually have a real effect on the dependent variable (Y).

3. RESULTS AND DISCUSSION

Analysis of the Influence of the Use of Production Inputs on Garlic Production Results in Sembalun District

To find out the relationship between production input and production quantity, *Cobb-Douglas production function analysis is used,* but before that, it is necessary to know the allocation of production input usage, after that a classical assumption test is carried out on the multiple linear regression model that will be used in the Cobb-Douglas production function analysis. The test aims to determine whether the multiple linear regression model meets the BLUE (Best *Linear Unbiased Estimator)* criteria. BLUE can be achieved if the regression model can meet the classical assumption test.

A. Allocation of Production Input Use in Garlic Farming

In conducting farming, farmers are expected to be able to allocate the use of production inputs efficiently so that the farming business they run can provide optimal results. The allocation can be seen in the table below.

Table 1. Allocation of Production Input Use in Garlic Farming in Sembalun District

Production Input Name	Average/ LLG	Standard Deviation	Geometric mean	Average/Ha	Maximum	Minimum
Seeds (Kg)	237	171	187	827	1000	30
Organic Fertilizer (Kg)	849	908	554	2957	5000	40
Urea (Kg)	82	86	58	285	500	10
ZA (Kg)	91	97	62	318	600	10
Phonska (Kg)	98	94	70	342	600	10
SP-36 (Kg)	91	93	66	318	500	10
Goal (mL)	102	68	82	355	300	15
Sumo (mL)	369	380	260	1286	2500	32
Rovral (gr)	427	268	352	1489	1500	50
TKDK (HKO)	8	7	6	27	41	2
TKLK (HKO)	54	37	44	187	223	15

Source: Primary Data Processed 2022.

B. Classical Assumption Analysis

Before conducting the *Cobb-Douglas production function analysis*, classical assumption testing is first carried out on the data to be used. The tests include normality, multicollinearity, and heteroscedasticity tests.

Normality Test. One of the assumptions of the regression model is that the residuals have a normal distribution. If the residuals do not have a normal distribution, then the significance of the independent variable on the dependent variable in the t and F tests cannot be applied. So, if this assumption is violated, the statistical test becomes invalid. One method that is often used to determine whether a model is normally distributed or not is the *Kolmogorov-Smirnov* (KS) test. The KS test is used to make a hypothesis.

Ho: Residual data is normally distributed

HI: Residual data is not normally distributed.

The criteria are:

- If the significance value is greater than α = 0.05 then Ho is accepted and HI is rejected, meaning that the residual data is normally distributed.
- If the significance value is smaller than α = 0.05 then HI is accepted and Ho is rejected, meaning that the residual data is not normally distributed.

Table 2. One-Sample Kolmogorov-Smirnov Test

Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)
0.877	0.425
a. Test distribution is Normal.	

Source: Primary Data Processed 2022

Based on Table 2the value of Kolmogorov-Smirnov is 0.877 and the significance at 0.425 is greater than α = 0.05. This means that Ho is accepted which indicates that the residual data is normally distributed.

Multicollinearity Test. The multicollinearity test aims to detect whether there is a correlation between independent variables in the regression model used. In a good regression model, there should be no correlation between the independent variables. To detect the presence or absence of multicollinearity in a regression model, it can be seen through the tolerance value and variance inflation factor (VIF). These two measures indicate which independent variables are explained by other independent variables. So, a low tolerance value is the same as a high VIF value (because VIF = 1/Tolerance). If the tolerance value <0.10 or equals the VIF value> 10, it indicates symptoms of multicollinearity.

Table 3. Multicollinearity Test with Tolerance and VIF

Variables	Collinearity Statistics	
	Tolerance	VIF
Seed	.126	7.914
Organic Ferlizer	.299	3.349
Urea Fertilizer	.309	3.238
ZA Fertilizer	.314	3.185
Phonska Fertilizer	.201	4.980
SP-36 Fertilizer	.288	3.474
Goal	.214	4.680
Sumo	.214	4.677
Rovral	.364	2.745
TKDK	.646	1.548
TKLK	.206	4.851
Dummy Land Type	.631	1.585

a. Dependent Variable: Garlic Production

Source: Primary Data Processed 2022

Based on the SPSS output results in Table3, It is found that all independent variables have a Tolerance value greater than 0.10 which means there is no correlation between independent variables with a value of more than 95%. The results of the calculation of the Variance Inflation Factor (VIF) value also show the same thing, all independent variables have a VIF value less than 10. So, it can be concluded that there are no symptoms of multicollinearity between independent variables in the regression model.

Heteroscedasticity Test. The heteroscedasticity test aims to test whether there is an inequality of variance from the residual of one observation to another observation in the regression model. If the variance from the residual of one observation to another observation is different, then it is called heteroscedasticity and if it remains, it is called homoscedasticity. A good regression model is one that does not occur heteroscedasticity or homoscedasticity. To test heteroskedasticity in this study, the Glejser test method is used. The Glejser test is carried out by regressing the absolute value of the residual against the independent variable, using the following regression equation:

$| ei | = bo + bi\ Xi + v$

Where:

$| ei |$ = absolute value of the residuals generated by the regression model

Xi = Independent variable

If the independent variable statistically significantly influences the dependent variable (residual) then there is an indication that there is a heteroscedasticity problem in the model.

Table 4. Heteroscedasticity Test Using the Glejser Test Method

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.122	.163		-.751	.455
Seed	.032	.054	.192	.596	.553
Organic Ferlizer	-.043	.027	-.331	-1.579	.120
Urea Fertilizer	.014	.032	.092	.446	.657
ZA Fertilizer	-.049	.028	-.356	-1.743	.087
Phonska Fertilizer	.074	.038	.499	1.952	.056
SP-36 Fertilizer	-.010	.034	-.060	-.282	.779
Goal	-.059	.043	-.341	-1.376	.174
Sumo	.008	.036	.055	.221	.826
Rovral	.061	.035	.328	1.728	.089
TKDK	-.017	.026	-.093	-.653	.516
TKLK	.040	.050	.200	.794	.431
Dummy Land Type	-.027	.050	-.078	-.544	.589

a. Dependent Variable: Absolute residual

Source: Primary Data Processed 2022
Information:
TKDK = worker from member of the family
TKLK = worker from outside the family

The results in Table 4 clearly show that none of the independent variables have a statistically significant effect on the dependent variable of the absolute value of the residual. This can be seen from the probability of significance of each independent variable, all of which are greater than $\alpha = 0.05$, so it can be concluded that this regression model does not contain any heteroscedasticity problems or is homoscedastic.

C. Cobb-Douglass Production Function Analysis

In this study, the input and output variables included in the *Cobb-Douglas production function model* consist of dependent variables, namely production and independent variables including seeds, organic fertilizer, urea, za, phonska, sp-36, goal, sumo, rovral, TKDK, TKLK and dummy variables of land types. The results of the analysis using the *Cobb-Douglas function* are shown in the table below.

Simultaneous Significance Testing

Table 5. Results of the ANOVA and Model Summary in the Cobb-Douglas Production Function Regression Analysis

Model	Sum of Squares	df	Mean Square	F	Sig.	R Square

Regression	34,618	12	2,885	67.295	0.000	0.933
Residual	2.486	58	.043			
Total	37.104	70				

Source: Primary Data Processed 2022

Based on the ANOVA test or F-test, the F-count value is 67.29 > F table (1.92) with a probability of 0.000; because the probability is much smaller than α = 0.05, Ho is rejected. This significance also shows that together (simultaneously) all independent variables (Xi) entered into the model have a significant effect on the dependent variable (Y) in this case the level of garlic production. In the model accuracy test or model suitability (*goodness of fit*) the value of the determination coefficient (R2)is 0.93. This value shows that all independent variables entered into the model can explain the dependent variable by 93.3%, while the remaining 6.7% is explained by other factors outside the model.

Testing Significance and Partial Regression Coefficient (t-Test)

To analyze production inputs that affect garlic production in Sembalun District, partial testing was conducted (t-test at a 5% level of significance). The t-test is used to determine the effect of independent variables (Xi) separately or individually on the dependent variable (Y) at a 95% level of confidence or a level of significance (α = 0.05).

Table 6. Results of the t-test on the Cobb-Douglas Production Function Regression Analysis on Garlic Farming in Sembalun District

Model	Unstandardized Coefficients			t	Sig.	Sig/ non-Sig
	Symbol	βi	Std. Error			
(Constant)	α	2.152	.288	7,477	.000	
Seed	β1	.725	.096	7,559	.000	Sig.
Organic Ferlizer	β2	.166	.048	3,460	.001	Sig.
Urea Fertilizer	β3	.022	.057	.386	.701	Non-sig.
ZA Fertilizer	β4	-.125	.050	-2,508	.015	Sig.
Phonska Fertilizer	β5	.142	.067	2.108	.039	Sig.
SP-36 Fertilizer	β6	.019	.060	.309	.758	Non-sig.
Goal	β7	-.014	.076	-.188	.852	Non-sig.
Sumo	β8	.169	.064	2.633	.011	Sig.
Rovral	β9	-.042	.062	-.673	.504	Non-sig.
TKDK	β10	-.065	.047	-1,390	.170	Non-sig.
TKLK	β11	-.105	.089	-1.184	.241	Non-sig.
Dummy Land Type	β12	.229	.089	2,573	.013	Sig.

Source: Primary Data Processed 2022

Based on the results of the Cobb-Douglas function analysis in Table 6, the regression coefficient values for each input are as follows:

a. Seed (X1)

Based on Table 11 The regression coefficient value for the seed variable (β1) is 0.725, which means that for every 1% increase in the seed variable and other variables are considered constant, garlic production will increase by 0.725%. After being tested with a t-test at a real level of 0.05, a significance value of 0.000 <α=0.05 (significant) or t-hit of (7.559)> t-table (2.001) was obtained, which means that Ho is rejected, Hi is accepted. Partially, the addition of the seed variable (X1) has a real or significant effect on increasing garlic production (Y). This shows that it is necessary to add the seed variable (X1) because it has a real or significant effect on garlic production (Y). This is in line with research conducted by (Twowindy et al., 2021) where the seed variable has a positive effect on the level of garlic production in Tawangmangu District, Karanganyar Regency.

b. Organic Fertilizer (X2)

Based on Table 11 The regression coefficient value for the organic fertilizer variable (β2) is 0.166, which means that for every 1% increase in the organic fertilizer variable and other variables are considered constant, garlic production will increase by 0.166%. After being tested with a t-test at a real level of 0.05, a significance value of 0.001 <α=0.05 (significant) or t-hit of (3.460)> t-table (2.001) was obtained, which means that Ho is rejected, Hi is accepted. Partially, the addition of the organic fertilizer variable (X2) has a real or significant effect on increasing garlic production (Y). This shows that it is necessary to add the organic fertilizer variable (X2) because it has a real or significant effect on garlic production (Y). The results of this study are also the same as the results of a study conducted by (Twowindy et al., 2021) where the organic fertilizer variable has a positive effect on the level of garlic production in Tawangmangu District, Karanganyar Regency.

c. Urea Fertilizer (X3)

Based on Table 11 The regression coefficient value for the urea fertilizer variable (β3) is 0.022, which means that every 1% increase in urea fertilizer variable and other variables are considered constant, garlic production will increase by 0.022%. After being tested with a t-test at a real level of 0.05, a significance value of 0.701> α = 0.05 (non-significant) or t-hit of (0.386) <t-table (2.001) was obtained, which means that Ho is accepted, and Hi is rejected. Partially, the addition of the urea fertilizer variable (X3) has no real and non-significant effect on increasing garlic production (Y). This shows that there is no need to add the urea fertilizer variable (X3) because it has no real or non-significant effect on garlic production (Y). The same results were also obtained by research from (Trianti, 2017)which stated that the use of urea fertilizer did not have a significant effect on the level of garlic production in Lambitu District, Bima Regency.

d. ZA Fertilizer (X4)

Based on Table 11 The regression coefficient value for the seed variable (β4) is -0.125, which means that for every 1% increase in the za fertilizer variable and other variables are considered constant, garlic production will decrease by 0.125%. After being tested with a t-test at a real level of 0.05, a significance value of 0.015 <α=0.05 (significant) or t-hit of (-2.508)> t-table (2.001) was obtained, which means that Ho is rejected and Hi is accepted. Partially, the addition of the za fertilizer variable (X4) has a real or significant effect on the decrease in the level of garlic production (Y). This shows that it is necessary to reduce the za fertilizer variable (X4) because it has a real or significant effect on garlic production (Y).

e. Phonska Fertilizer (X5)

Based on Table 11 The regression coefficient value for the phonska fertilizer variable (β5) is 0.142, which means that every 1% increase in the Phonska Fertilizer variable and other variables are considered constant, garlic production will increase by 0.142%. After being tested with a t-test at a real level of 0.05, a significance value of 0.039 <α=0.05 (significant) or t-hit of (2.108)> t-table (2.001) was obtained, which means that Ho is rejected and Hi is accepted. Partially, the addition of the phonska fertilizer variable (X5) has a real or significant effect on increasing garlic production (Y). This shows that it is necessary to add the phonska fertilizer variable (X5) because it has a real or significant effect on garlic production (Y).

f. SP-36 (X6) Fertilizer

Based on Table 11 The regression coefficient value for the urea fertilizer variable (β6) is 0.019, which means that for every 1% increase in the SP-36 fertilizer variable and other variables are considered constant, garlic production will increase by 0.019%. After being tested with a t-test at a real level of 0.05, a significance value of 0.758> α = 0.05 (non-significant) or t-hit of (0.309) <t-table (2.001) was obtained, which means that Ho is accepted and Hi is rejected. Partially, the addition of the SP-36 fertilizer variable (X6) has no real and non-significant effect on increasing garlic production (Y). This shows that there is no need to add the SP-36 fertilizer variable (X6) because it has no real or non-significant effect on garlic production (Y). Similar results were also obtained by a study conducted by (Sulistyaningsih, 2020)that the use of sp-36 fertilizer did not have a significant effect on the amount of garlic production in Karanganyar Regency.

g. Goal Herbicide (X7)

Based on Table 11 The regression coefficient value for the goal herbicide variable (β7) is -0.014, which means that for every 1% increase in the goal herbicide variable and other variables are considered constant, garlic production will decrease by 0.014%. After being tested with a t-test at a real level of 0.05, a significance value of 0.852> α=0.05 (non-significant) or t-hit of (-0.188) <t-table (2.001) was obtained, which means that Ho is accepted and Hi is rejected. Partially, the addition of the goal herbicide variable (X7) has no real and non-significant effect on increasing garlic production(Rohmawati et al., 2023). This shows that there is no need to add the goal herbicide variable (X7) because it has no real or non-significant effect on garlic production.

h. Sumo Insecticide (X8)

Based on Table 11 The regression coefficient value for the sumo insecticide variable (β8) is 0.169, which means that every 1% addition of the sumo insecticide variable and other variables are considered constant, garlic production will increase by 0.169%. After being tested with a t-test at a real level of 0.05, a significance value of 0.011 <α=0.05 (significant) or t-hit of (2.633)> t-table (2.001) was obtained, which means that Ho is rejected, HI is accepted. Partially, the addition of the sumo insecticide variable (X8) has a real or significant effect on increasing garlic production (Y). This shows that it is necessary to add the sumo insecticide variable (X8) because it has a real or significant effect on garlic production (Y).

i. Fungicide Rovral (X9)

Based on Table 11 The regression coefficient value for the rovral fungicide variable (β9) is -0.042, which means that for every 1% addition of the rovral fungicide variable and other variables are considered constant, garlic production will decrease by 0.042%. After being tested with a t-test at a real level of 0.05, a significance value of 0.504> α = 0.05 (non-significant) or t-hit of (-0.673) <t-table (2.001) was obtained, which means Ho is accepted and HI is rejected. Partially, the addition of the rovral fungicide variable (X9) has no real and non-significant effect on increasing garlic production (Y). This shows that there is no need to add the rovral fungicide variable (X9) because it has no real or non-significant effect on garlic production (Y).

j. TKDK (X10)

Based on Table 11 The regression coefficient value for the TKDK variable (β10) is -0.065, which means that for every 1% increase in the TKDK variable and other variables are considered constant, garlic production will decrease by 0.065%. After being tested with a t-test at a real level of 0.05, a significance value of 0.170> α=0.05 (non-significant) or t-hit of (-1.390) <t-table (2.001) was obtained, which means that Ho is accepted, and HI is rejected. Partially, the addition of the TKDK variable (X10) has no real and non-significant effect on increasing garlic production (Y). This shows that there is no need to add the TKDK variable (X10) because it has no real or non-significant effect on garlic production (Y). Similar results were also obtained by research conducted by Sulistyaningsih (2020) where the significance value of labor production input was more than 0.05, which means that the use of labor does not have a significant effect on garlic production in Karanganyar Regency.

k. TKLK (X11)

Based on Table 11 The regression coefficient value for the TKLK variable (β11) is -0.105, which means that for every 1% increase in the TKLK variable and other variables are considered constant, garlic production will decrease by 0.105%. After being tested with a t-test at a real level of 0.05, a significance value of 0.241> α=0.05 (non-significant) or t-hit of (-1.184) <t-table (2.001) was obtained, which means that Ho is accepted, and Hi is rejected. Partially, the addition of the TKLK variable (X11) has no real and non-significant effect on increasing garlic production (Y). This shows that there is no need to add the TKLK variable (X11) because it has no real or non-significant effect on garlic production (Y),

l. Land Type (Dummy)

Based on Table 11 The regression coefficient value of the land type dummy variable (β12) is 0.229, which means that the level of garlic production in the rice field type is 0.229% greater than the level of production in the field type assuming other variables remain constant. After being tested with a t-test at a real level of 0.05, the significance value for the land type dummy variable is 0.013 <α=0.05 (significant) or t-hit is (2.573)> t-table (2.001) which means Ho is rejected and HI is accepted. This indicates that partially the qualitative variable of land type has a significant effect on the level of garlic production in Sembalun District.

Based on the results of the regression analysis in table 4.14, the following regression equation was obtained:

$Ln\ Y = Ln\ 2.152 + 0.725\ Ln\ X1 + 0.166\ Ln\ X2 + 0.022\ Ln\ X3 – 0.125\ Ln – 0.105\ Ln\ X11 + 0.229\ D + \mu$.............................. (i)

$Ln\ Y = 0.766 + 0.725$ .... (ii)

Equation (ii) is transformed back into the *Cobb-Douglas production function* by replacing Ln with the following:

$Y = \text{anti}_{Ln}^{0.766} X_1^{0.725} X^{2}_{0.166} \mu$ .... (iii)

$= 2.152\ X_1^{0.725} X_{2}^{0.166} X_3^{0.022}$ .... (iv)

The Return to Scale $\sum \beta i = 1{,}121 > 1$ which shows that the scale of garlic farming in Sembalun District is in a state of**val**ue *is increasing return to scale* (IRS). This shows that if all inputs that have a significant effect are increased, then the scale of additional input use will result in a larger scale of additional output. The IRS condition also shows that the production level is in area I (Irrational), in this area farmers are still able to obtain a more profitable production level when a number of inputs are still added, so it is said to be irrational if the use of inputs is not increased. (Wahab, Rusydi, and Nirwana 2021) (Wahab, Rusydi, and Nirwana 2021)

D. Analysis of the optimization level of garlic production input usage in Sembalun District

The analysis of the level of optimization of input use referred to in this study is whether the use of inputs (seeds, organic fertilizers, urea, za, phonska, sp-36, goal herbicide, sumo insecticide, rovral fungicide, family labor, and non-family labor) has been allocated optimally to obtain the highest level of production. This condition will lead to an efficient production situation, namely when farmers are able to allocate the use of their inputs in such a way that the marginal product value (NPM) of an input is equal to the price of the input. Such efficiency is called allocative efficiency or price efficiency. The results of the analysis of the level of optimization of input use in this study are presented in the following table:

Table 12. Analysis of Optimization of Input Use in Garlic Farming in SembalunDistrict

No	Input-Output	Regression Coefficient	GeoMe an	Input-Output Prices	NPM	Px	NPM/ Px
1	Intercept	2,152					
2	Seed	0.725	186.59	30764	56858.34	30764	1.85
3	Organic Ferlizer	0.166	553.75	821	4386.65	821	5.34
4	Urea Fertilizer	0.022	58.36	2313	5516.05	2313	2.38
5	ZA Fertilizer	-0.125	61.64	1808	-29674.89	1808	-16.42
6	Phonska Fertilizer	0.142	70.30	2411	29558.71	2411	12.26
7	SP-36 Fertilizer	0.019	65.60	2521	4238.19	2521	1.68
8	Goal	-0.014	81.72	589	-2507.02	589	-4.26
9	Sumo	0.169	260.10	217	9507.68	217	43.73
10	Rovral	-0.042	352.16	650	-1745.21	650	-2.68
11	TKDK	-0.065	5.97	114445	-159326.88	114445	-1.39
12	TKLK	-0.105	44.29	84941	-34692.79	84941	-0.41
	PRODUCTION (Kg)		1933.15	7570			

Source: Primary Data processed 2022.

Based on the results of the analysis of the optimization level of input usage in Table 12, it can be seen that of the 11 production inputs that have been analyzed, there are 6 production inputs whose use is not yet efficient and 5 production inputs whose use is inefficient.

The types of production inputs that are not yet used efficiently are seeds, organic fertilizers, urea, phonska, sp-36 and sumo insecticides. NPM/Px values greater than one indicates that the production level can still be increased by adding these inputs. These additions can be in the form of quantitative or qualitative inputs.

1. The level of optimization of seed input usage obtained NPM/Px value of 1.85> 1. This shows that the use of seed input of 186.59 kg on a land area of 0.29 ha is not efficient and needs to be added, both in terms of quantity and quality of the seeds. The most optimal weight of garlic seeds to use is between 1.5 - 3 grams per clove. Meanwhile, for seed requirements per hectare, 704 - 1156 kg of seeds are needed with the assumption that the clove weight is 2 grams. If the land area used for farming is 0.29 ha, the recommended seed requirements range from 204.16 - 335.24 kg. Based on these recommendations, farmers can add 17.57 - 148.65 kg of seeds (P3TP, 2019).
2. The level of optimization of the use of organic fertilizer input obtained an NPM/Px value of 5.34 > 1. This indicates that the use of organic fertilizer input of 553.75 kg on a land area of 0.29 ha is not efficient and needs to be added. The recommended use of organic fertilizer is 10-20 tons per hectare. So, for a land area of 0.29 ha, the recommended use of organic fertilizer ranges from 2900 - 5800 tons. Based on these recommendations, farmers can add organic fertilizer of 2367 - 5247 kg
3. The level of optimization of urea fertilizer input usage obtained NPM/Px value of 2.38 > 1. This shows that the use of urea fertilizer input of 58.36 kg on a land area of 0.29 ha is not efficient and needs to be added. For urea fertilizer needs in garlic farming, it is recommended to use 300 kg per hectare of land area. So for a land area of 0.29 ha, the recommended use of urea fertilizer is 87 kg. Based on this recommendation, farmers can add 28.64 kg of urea fertilizer (BPTP, 2018).
4. The optimization level of phonska fertilizer input usage obtained an NPM/Px value of 12.26 > 1. This shows that the use of phonska fertilizer input of 70.30 kg on a land arwagabea of 0.29 ha is not efficient and needs to be added. The amount of phonska fertilizer usage recommended for garlic farming is 400-600 kg per hectare. On a land area of 0.29 ha, the recommended use of phonska fertilizer is between 116-174 kg. Based on these recommendations, farmers can add urea fertilizer of 45.7 - 103.7 kg (Ministry of Agriculture, 2018).
5. The optimization level of the use of sp-36 fertilizer input obtained an NPM/Px value of 1.68 > 1. This shows that the use of sp-36 fertilizer input of 65.60 kg on a land area of 0.29 ha is not efficient and needs to be added. The recommended use of sp-36 fertilizer is 375 kg per ha. So, for a land area of 0.29 ha, the recommended use of sp-36 fertilizer is 108.75 kg. Based on these recommendations, farmers can add 43.15 kg of urea fertilizer (P3TP, 2019).
6. The optimization level of sumo insecticide input usage obtained NPM/Px value of 43.73 > 1. This shows that the use of sumo insecticide input of 260 ml on a land area of 0.29 ha is not efficient and needs to be added. The recommended dosage of sumo insecticide usage is 2 ml per liter of water.

Furthermore, the inputs whose use is inefficient indicate that additional use of these inputs can result in a decrease in production levels, so their use needs to be reduced. The calculation of allocative efficiency involves the prices of the output and inputs used. From the analysis results, there are 5 inputs whose use is inefficient, namely za fertilizer, goal herbicide, rovral fungicide, family labor and non-family labor.

1. The level of optimization of the use of za fertilizer input obtained an NPM/Px value of -16.42 <1. This indicates that the use of za fertilizer input of 61.64 kg on a land area of 0.29 ha is inefficient or its use is excessive and needs to be reduced. The recommended use of za fertilizer is 200 kg per ha. So, for a land area of 0.29 ha, the recommended use of sp-36 fertilizer is 58 kg. Based on these recommendations, farmers can reduce the use of urea fertilizer by 43.15 kg ((Department of Agriculture, 2009).
2. The optimization level of goal herbicide input usage obtained an NPM/Px value of -4.261 <1. This indicates that the use of goal herbicide input of 81.72 ml on a land area of 0.29 ha is inefficient, or its use is excessive and needs to be reduced. The recommended dosage of goal herbicide usage is 1.25 ml per liter of water.
3. The optimization level of the use of rovral fungicide input obtained an NPM/Px value of -2.68 <1. This indicates that the use of goal herbicide input of 352.16 grams on a land area of 0.29 ha is

inefficient or its use is excessive and needs to be reduced. The dosage of rovral fungicide use is 2 grams per liter of water.

4. The optimization level of TKDK input usage obtained an NPM/Px value of -1.39 < 1. This indicates that the use of TKDK input of 5.97 HKO on a land area of 0.29 ha is inefficient or its use is excessive and needs to be reduced.
5. The optimization level of TKLK input usage obtained an NPM/Px value of -0.41 <1. This indicates that the use of TKLK input of 44.29 HKO on a land area of 0.29 ha is inefficient or its use is excessive and needs to be reduced.

E. Analysis of Optimization Value of Garlic Production Input Use in Sembalun District

To analyze the value of optimizing the use of production inputs in garlic farming, a one-sample t-test is used. The one-sample t-test is used to test whether the average of the allocative efficiency data is statistically significantly different when compared to the allocative efficiency value that has been determined based on existing theory or literature. Based on the book written by (Sukartawi 1989)it shows that the allocative efficiency value (NPM/Px) for optimal input use is at the value of NPM/Px = 1. The test was carried out at a 95% confidence level, with the following results:

Table 13. Results of One Sample t-Test Analysis

One Sample Statistics					
Test Value = 1	N	Mean	t	df	Sig.
	11	3.8645	.638	10	.538

Source: Primary Data processed 2022.

Based on the results of the one-sample t-test analysis, the $_{\text{calculated t value}}$ = 0.638 <t $_{\text{table}}$ = 2.228 with a significance value of 0.538> α = 0.05. This indicates that H_0 is accepted, which means that the average allocative efficiency value is equal to one or in accordance with the parameter value used. The average allocative efficiency value of the sample production input is 3.86, meaning that on average the use of production inputs in garlic farming has not reached the level of price efficiency, so on average the use of production inputs needs to be added to achieve an optimal level of use. This is different from the results of research conducted by Seran (2020) where the average allocative efficiency in local garlic farming in SaenamVillage was -0.511. An efficiency value of less than 1 indicates that local garlic farming in Saenam Village is inefficient, so it is necessary to reduce the use of production inputs to make it more efficient. These differences in results may occur due to differences in the inputs analyzed, different allocations of input usage and analyses conducted at different price levels.

4. CONCLUSION AND SUGGESTIONS

Conclusion

From the results of the research and discussion that has been carried out, it can be concluded that:

1. Of the 12 production inputs, there are six production inputs that have a significant effect on the level of garlic production, namely seeds, organic fertilizers, za, phonska, sumo insecticides and also dummy land types. The input of seed production, organic fertilizers, phonska, sumo insecticides and land types have a positive effect, while the input of za fertilizer has a negative effect. Other inputs such as TKDK, TKLK, fungicide rovral, and pesticide goal have an insignificant and negative effect on the level of garlic production in Sembalun sub-district. Then, for the input of urea and sp-36 fertilizers, they have an insignificant and positive effect on the level of garlic production in Sembalun sub-district.
2. There are six types of production inputs whose use is not yet efficient (efficiency value > 1), namely seeds, organic fertilizer, urea, phonska, sp-36 and sumo insecticide. The other five inputs which include za fertilizer, goal herbicide, rovral fungicide, family labor and non-family labor are used inefficiently (efficiency value < 1).
3. The average value of allocative efficiency is equal to one or in accordance with the value of the parameters used. The average value of allocative efficiency of 3.86 indicates that on

average the use of production inputs in garlic farming has not reached the level of allocative efficiency.

Suggestion

From the results of the discussion and conclusions that have been obtained, the researcher can provide several suggestions, including:

1. Garlic farmers in Sembalun District are advised to pay attention to the use of production inputs in their farming. Production inputs such as seeds, organic fertilizers, phonska, za and sumo insecticides require more attention because they have a significant effect on the amount of garlic production. The use of seed inputs of 187 kg, organic fertilizers 554 kg, phonska 70 kg, and sumo insecticides 260 ml on a land area of 0.29 ha needs to be increased, while the use of za fertilizer of 62 kg on a land area of 0.29 ha needs to be reduced.
2. For garlic farmers in Sembalun District who have two types of land, namely rice fields, and fields, it is recommended to cultivate garlic in the rice field type of land because the level of production produced is greater than that of the field type of land.
3. It is suggested that the government, through the technical implementation unit of agricultural extension in Sembalun District conduct an extension related to the level of use of production inputs, such as the optimal number of seed and fertilizer use for a certain land area. The results of this study can also be used as a reference for determining the subsidy price of seeds and fertilizers, as well as the highest and lowest selling prices of garlic production.

REFERENCES

BPS. 2021. 1 *Statistik Indonesia 2021*. 1st ed. Jakarta: Badan Pusat Statistik. https://www.bps.go.id/id/publication/2021/02/26/938316574c78772f27e9b477/statistik-indonesia-2021.html

BPS Kabupaten Lombok Timur. 2020. *KecamatanSembalon Dalam Angka 2020*. https://lomboktimurkab.bps.go.id/id/publication/2020/09/28/939178c4d6249afb69b064cd/kecamatan-sembalun-dalam-angka-2020.html

BPTP. 2018. 1 *Panduan Budidaya Bawang Putih*. 1st ed. Sirabaya: BPTP. https://repository.pertanian.go.id/server/api/core/bitstreams/d8f7867f-6645-40d6-9246-d257ed0bf712/content (November 16, 2024).

CR Kothari. 2004. 1 *Research Methodology*. 1st ed. New Delhi: New Age International Publisher. https://repository.dinus.ac.id/docs/ajar/Kothari_-_Research_Methodology_Methods_and_Techniques_-_2004.pdf

Gujarati, DN. 2006. 1 *Dasar Dasar Ekonometrika*. 1st ed. Surabaya: PTGelora Aksara Pratama. https://books.google.co.id/books/about/DASAR_DASAR_EKONOMETRIKA_jilid_1.html?hl=id&id=nxD6uRCpZOcC&redir_esc=y

Rohmawati, I., Masyhuri, and A. Suryantini. 2023. “PRODUCTION EFFICIENCY OF GARLIC IN KARANGANYAR REGENCY.” Abstrak. Gadjah Mada University. https://etd.repository.ugm.ac.id/penelitian/detail/221383

Sukartawi. 1989. 1 *Prinsip Dasar Ekonomi Pertanian*. 2nd ed. ed. Sukartawi. Malang: Radjawali. https://balaiyanpus.jogjaprov.go.id/opac/detail-opac?id=66905

Sulistyaningsih, C.R. 2020. "KAJIAN EFISIENSIPENGGUNAAN FAKTOR-FAKTOR PRODUKSI PADA USAHATANI BAWANG PUTIH DI KABUPATEN KARANGANYAR." *METRIK SERIAL HUMANIORA DAN SAINS*: 33–39. https://publikasi.kocenin.com/index.php/huma/article/view/106/100

Trianti, S. 2017. "AnalisisPendapatan Dan EfisiensiPenggunaan Input Pertanian Bawang Putih Di Lambitu, Kabupaten Bima." Mataram University. https://eprints.unram.ac.id/2944/

Twowindy, L., A. Suryantini, and Mashury. 2021. "ALLOCATIVE EFFICIENCY OF GARLIC FARMING IN TAWANGMANGU SUB-DISTRICT KARANGANYAR REGENCY." Abstract. Gadjah Mada University. https://etd.repository.ugm.ac.id/penelitian/detail/205083

Wahab, A., BU. Rusydi, and N. Nirwana. 2021. "EfektivitasPenggunaan Input Dalam Usaha Tani Bawang Merah Di Kecamatan Baraka KabupatenEnrekang." *Media Ekonomi* 21(1): 34–42. https://jurnalnasional.ump.ac.id/index.php/MEDEK/article/view/11782/4171