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PRODUCTION ANALYSIS OF THE ENVIRONMENTALLY FRIENDLY RICE CROP IN SUPPORT OF SUSTAINABLE AGRICULTURE

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ABSTRACT

This study aims to: (1) determine the characteristics of semi-organic and non-organic rice farming systems in the Pringgasela district, East Lombok Regency; (2) analyze the factors that influence the production of rice cultivation in the Pringgasela district, East Lombok Regency; (3) describe the driving and inhibiting factors of semi-organic and non-organic rice cultivation in Pringgasela district, East Lombok Regency. The research method used in this study is quantitative research. The unit of analysis in this study was the semi-organic and non-organic rice farming system in the Pringgasela district, East Lombok Regency. The number of respondents is determined by quota sampling up to 40 respondents, where the sampling was divided based on a predetermined quota consisting of 20 semi-organic farmer respondents and 20 non-organic farmer respondents. The results showed that the differences in the characteristics of semi-organic and non-organic rice farming systems were from the aspect of the cultivation method; use of fertilizers and pesticides; environmental sustainability; and product quality. Based on the results of the analysis of the factors influencing the production of rice, show that the land area variable (X1), fertilizer (X3), and labor (X5), and the dummy variable (X6) has a significant effect on rice production. The driving factor for rice farming activities with a semi-organic system is production costs which are relatively cheaper and environmentally friendly. However, the constraints are the availability of organic fertilizers is still limited, and the production capacity is still less compared to rice farming with non-organic systems.

INTRODUCTION

Agriculture is an important sector for meeting the food needs of the world's population. However, conventional methods in rice production systems often face challenges in terms of continuity and being friendly to the environment (Rukmana, 2012). Excessive use of chemical fertilizers, use of harmful pesticides, and inefficient irrigation patterns can lead to land degradation, water pollution, and environmental damage (Azmi et al, 2022).

To overcome this problem, the implementation of environmentally friendly rice production is becoming increasingly important. Organic rice production systems adopt a sustainable approach that aims to reduce negative impacts on the environment while maintaining crop productivity and quality (Wihardjaka, 2021). Implementing this system can help reduce the use of chemical fertilizers and pesticides, increase the use of organic farming techniques, and adopt more efficient irrigation practices (Gamage et al, 2023).

Industry players in agriculture continue to do various ways to increase rice productivity, among them is not to use non-organic (chemical) fertilizers and pesticides. Many farmers do not realize that using non-organic fertilizers and non-organic pesticides that are not prudent will result in a shift in the balance, negatively impacting humans (Wahyuni and Adriansyah 2020). Based on these conditions, human beings are trying to find planting techniques that are safe and good for the environment and human beings, thus an eco-friendly rice production system using fertilizer based on rice has emerged. in organic materials. Organic agriculture is the response to the green revolution promoted in the 1960s that caused a reduction in soil fertility and environmental damage due to the uncontrolled use of chemical fertilizers and pesticides (Ningsih, et al, 2019).

East Lombok Regency is one of the potential rice production areas where the majority of the population earn their living from agriculture. In East Lombok Regency, rice cultivation is carried out in all regions with an average production of 451,970 quintal and a productivity of 56.89 quintal/ha (BPS Kabupaten Lombok Timur, 2020). Pringgasela District is one of the areas of East Lombok Regency that produces rice using an environmentally friendly (semi-organic) farming system, as well as conventional (non-organic) systems. The increasing need for food has encouraged players in the agricultural sector to increase crop productivity and develop a variety of food ingredients so that agricultural products can be consumed continuously (Sekhon, 2014).

Sustainable agriculture is an agricultural concept that is not only profit-oriented, but also has an environmentally friendly vision, so that in the process of sustainable agricultural cultivation it pays attention to economic, social and ecological aspects (Mayadewi, 2011). The organic rice farming system aims to reduce land degradation, soil erosion and soil degradation (Chalise et al, 2019). By using the principles of sustainable agriculture, such as the use of organic

fertilizers, efficient water management, and natural pest control, this system can help maintain soil fertility and the sustainability of natural resources, which are very important for sustainable rice production (Shrestha, 2020).

However, the implementation of environmentally friendly rice production still faces challenges and the factors that influence it. Various factors that can influence implementation include social, economic, technical, and political factors. For example, farmers' lack of awareness of the importance of sustainable agriculture, limited access to environmentally friendly agricultural technologies (Herawati et al, 2017), and policies that do not support the adoption of environmentally friendly rice production systems (Darwis and Rachman, 2013). Therefore, it is important to investigate the implementation of environmentally friendly rice production and the factors that influence it. By understanding the factors that influence implementation, effective measures can be identified and implemented to increase the widespread adoption of organic rice production systems. This research will provide valuable information for farmers, researchers, and other stakeholders to develop better strategies to implement environmentally friendly and sustainable rice production systems.

Based on the description above, the purposes of this research are: (1) to describe Characteristics of semi-organic and non-organic rice farming systems in Pringgasela District, East Lombok Regency (2) to analyze the factors influencing rice crop production in Pringgasela District, East Lombok Regency; (3) to describe the driving and inhibiting factors of semi-organic and non-organic rice cultivation in Pringgasela district, East Lombok Regency.

RESEARCH METHODS

The research method used in this study is a quantitative method. The unit of analysis in this study was the semi-organic and non-organic rice farming system in the Pringgasela district, East Lombok Regency. This research was carried out in the Pringgasela district, East Lombok Regency. Determination of sample area by the deliberate display, based on the consideration that semi-organic and non-organic rice farming systems are only cultivated in the village. The semi-organic rice cultivation system in this study is a cultivation system in which farmers do not use chemicals directly in their activities. Where the fertilizer used is organic fertilizer (compost), as well as organic pesticides. It's just that the irrigation system used is in addition to utilizing ground water, it also uses river water. The river water here is still mixed with river water that originates from the upper reaches of the river. where the upstream area of the river still has agricultural land that uses chemical fertilizers, so it is still exposed to chemicals. Meanwhile, the non-organic rice cultivation system is rice cultivation that uses chemical fertilizers and pesticides in its farming activities.

Method of Collecting Data

The determination of the number of respondents is determined by quota sampling up to 40 respondents, where the sampling is shared based on a predetermined amount or quota consisting of 20 surveyed semi-organic farmers and 20 surveyed non-organic farmers.

Data Analysis Method

For describe Semi-organic and non-organic rice cultivation systems were carried out using a descriptive analysis. This analysis is used by tabulating the data and the results are analyzed descriptively. To analyze of the factors that influence the production of semi-organic rice and non-organic rice in the Pringgasela district, it was carried out using Multiple Linear Regression (Soekartawi, 2002). Regression analysis is basically a study of the dependence of the dependent (linked) variable on one or more variables. variable independent variable (independent variable), with the aim of estimating and/or predicting population averages or known values of independent variables (Ghozali, 2011). The form of the multiple linear regression equation used in this study is as follows:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e$$

Variables (Ghozali, 2011). The form of the multiple linear regression equation used in this study is as follows:

Information:

Y	= Agricultural production of rice (Quintiles)
X_1	= arable land area (hectares).
X_2	= Seed (Kg).
X_3	= Fertilizer (Kg).
X_4	= Pesticides (Liters).
X_5	= Labor (people's daily work).
X_6	= dummy variable (0= non-organic rice; 1= semi-organic rice)
a	= intercept
b_1- b_6	= Regression coefficient

RESULTS AND DISCUSSION

Characteristics of Semi-Organic and Non-Organic Rice Farmer Households

1. Age of Respondents

In general, age can affect a person's productivity in doing farm work. Based on the analysis results show that the semi-organic and non-organic system of rice cultivation, most of the respondents were in the age range of 46 to 50 years, with 7 people or 35 percent. This shows that most of the farmers surveyed in this study belong to the productive age group and have sufficient potential for

agricultural business activities. By comparison, farmers who are less than 55 years of age for farmers running a semi-organic rice production system account for 85 percent, while non-organic rice farmers account for up to 65 percent. This means that farmers who are of productive age prefer semi-organic rice production systems compared to non-organic rice production systems.

2. Respondents' Education Level

based on the analysis results show that farming using a semi-organic system, the education level of the most respondents is 11 people or 55 percent, which consists of high school education level. Meanwhile, in the Non-Organic system of rice farming, the education level of the most respondents was 11 people or 55 percent consisting of elementary school education level. This is interesting, which means that most farmers applying semi-organic rice farming systems are farmers who have better education compared to most farmers practicing conventional rice farming. This shows that the low level of education of the surveyed farmers will greatly affect the respondent's ability to make decisions in their agricultural activities, including the farmer's decision to take risks to change the production system by adopting the latest technology in rice cultivation (Tanaya et al, 2020).

3. Agricultural Experience

Based on agricultural experience, most of the farmers (35 percent) with semi-organic and non-organic rice cultivation systems have had 11-20 years of farming experience. This means that the farmers in the research location are relatively experienced in cultivating rice plants (Ardhianta et al, 2020).

4. Land Area

The average land area owned by semi-organic rice farmers is 0.52 ha where most of the surveyed farmers have a land area between 0.51 - 0.60 and 0.61 - 0.70 Ha, each of which is 25 percent. While the average land area owned by non-organic system rice farmers is 0.32 ha, most of the surveyed farmers have land areas ranging from 0.21 to 0.30 ha up to 30 percent. All farmers surveyed, both farmers managing organic and semi-organic rice farming systems, own their land privately (no rent). This is because there are not many farmers renting or leasing their land or sharing the profits, because for the farmers themselves, it is more profitable and promising. Because if you rent the land, the results obtained will be automatically shared with the land owner, then if you rent the land, the land owner will automatically lose the land to obtain the results of your cultivation.

Differences in Characteristics of Semi-Organic and Non-Organic Rice Farming

Differences in the characteristics of growing semi-organic rice and non-organic rice include cultivation methods, the use of fertilizers and pesticides,

environmental sustainability, and product quality. Here is a more detailed explanation of these differences:

1. ***Cultivation Method***

Semi-organic rice field: The cultivation of semi-organic rice follows the principles of agro-ecology and uses natural methods to maintain the balance of the ecosystem (Banerjee et al, 2021). Organic materials, such as compost and green manure, are used as fertilizers, and pest and disease control is carried out naturally, such as selecting pest-resistant varieties and using natural enemies of pests. It's just that the irrigation system still has the potential to mix with chemicals (although not much). Because irrigation still uses several times the river water, while upstream there are rice crops that use synthetic-based fertilizers.

Non-Organic rice field: Non-organic rice cultivation generally uses conventional methods that involve the use of chemical fertilizers, synthetic pesticides, and herbicides to increase yields and combat pests and diseases.

2. ***Use of Fertilizers and Pesticides***

Semi-organic rice field: Organic fertilizers like compost, green manure and other organic matter are used in semi-organic rice cultivation. Organic fertilizers provide nutrients slowly and increase soil fertility naturally (Wahyuni and Parmila, 2019). Pest and disease control is carried out using biological methods, ecosystem management and the use of approved organic products.

Non-Organic rice field: Synthetic chemical fertilizers are used in non-organic rice cultivation to provide rapid and targeted nutrition. Synthetic pesticides are also used to kill pests and plant diseases. The use of chemical fertilizers and pesticides can increase the risk of environmental damage and chemical residues in agricultural products (Ayesha, 2023).

3. ***Environmental Sustainability***

Semi-organic rice: The cultivation of semi-organic rice aims to maintain the balance of the ecosystem, increase soil fertility and reduce the negative impact on the environment. The use of organic fertilizers and natural pest control methods helps maintain soil quality, biodiversity, and groundwater availability.

Non-Organic rice field: Non-organic rice cultivation uses chemicals that can contaminate the soil, water, and air. The use of chemical fertilizers and pesticides can cause a decrease in soil quality, loss of biodiversity, water pollution, and chemical residues in the environment (Kumar et al, 2019).

4. Product Quality

Semi-organic Rice – Semi-organic rice is usually produced without using synthetic chemicals, thus the product is claimed to be more natural and free from chemical pesticide residues. Semi-organic rice can also have a more distinctive flavor and aroma due to a greater diversity of microorganisms and soil nutrients.

Non-Organic rice field: Non-organic rice has the potential to contain chemicals, which in the medium and long term have the potential to become health problems.

Factors Affecting Agricultural Production

Table 1. Results of analysis of factors affecting rice crop production in Pringgasela district, East Lombok Regency, 2022.

Variable	*Symbol*	*coefficients*	*p value*
Intercept	b_0	0.760388	0.0243
Arable land area (ha).	b_1	0.545272	0..0*
Seed (Kg).	b_2	-0.006529	0.8975
Fertilizer (Kg).	b_3	0.160854	0.0025*
Pesticides (Liters).	b_4	0.030708	0.3383
labor (people's daily work).	b_5	0.182857	0.0067*
dummy variable	B_6	-0.109476	0.0000*
R Square	R^2	97,25%	
F-test		195.1219	
		0.000000	

Source: Primary Data, 2023 (processed)

Information:

*: Significant at 5 percent alpha level

Testing the value of the regression coefficient simultaneously is intended to see the suitability of the model or *Goodness of Fit*. Furthermore, to analyze the technical-functional relationship of each input to production output, a partial test was carried out on the significance of the relationship between each of these inputs to output.

The coefficient of determination (R^2) of 97.25% indicates that the rice production factor model, which consists of seeds, fertilizers, pesticides, land area, labor, and dummy variables, can explain 97.25% of the variety of changes in rice production (Table 1). Other variables not included in the production function model affect the residual portion, which is 2.75%. In addition, the results of the F test show that the p-value is smaller than a (5%), which indicates that simultaneously the production factor has a significant effect on rice production, so the model is indeed feasible to use. These results are in line with research conducted by Akbar, Budiraharjo, and Mukson (2017), where all production input factors affect rice production simultaneously.

Based on the results of the t test, it is known that the inputs of land area, fertilizer, labor, and the dummy variable (rice production system) are independent variables that have a significant effect on rice production at a significant level of 5%. On the other hand, seed and pesticide variables were considered to have no significant effect on rice production.

Variable land area has a positive impact on rice production. With a land area coefficient of 0.545272, and the significance value is 0.00000 <0.05 (Table 1). the significance value is 0.00000 <0.05 (Table 1). That is, each addition of arable area has a significant impact on the level of production. Every 1% addition of land area will increase rice production by 0.545272 percent. This is in line with research conducted by Mafor et al, (2015) who found that land area is expressed as a variable that influences rice production. Furthermore, research of Santoso's (2015) provides a similar explanation, saying that land area is the most important and crucial variable in determining rice production.

Fertilizers show a positive sign in rice production. The significance value of the fertilizer variable is 0.00271 <0.05. This result indicates that each addition of fertilizer really has an impact on increasing production. This supports the findings of a previous study by Murdiantoro (2011) which found that the amount of fertilizer had a positive and significant impact on the amount of rice production. A similar conclusion was found by Supartha et al. (2012), who found that the combined treatment of solid and liquid organic fertilizers showed a significant impact on the amount of rice production.

The number of workers has an effect on production. The labor coefficient of 0.18265 indicates that output will increase with each addition of labor. The partial test results with a p-value at the 5% significance level show that a significance value of 0.0054 is less than 0.05, indicating that each additional workforce does indeed have an impact on the increase in production. This result is also supported by the research results of Iskandar et al, (2018); and Juliyaanti and Usman (2018) who found that the number of workers actually affected rice production. This is because heavy fertilization, weeding, and spraying are done intensively during tillage and soil maintenance.

The rice cultivation system is a dummy variable in this study, where the results show a negative sign, and are declared as variables influencing rice production. This means that each addition of production factors to the dummy variable has a real impact on the increase in production. The value of the regression coefficient of the dummy variable has a negative sign of -0.10827, which indicates that both statistically and manually it can be seen that the production and income generated by the cultivation of rice with non-organic systems still yields higher yields compared to semi-organic system farming (1 = semi-organic, 0 = non-organic). The findings of this investigation are in line with the previous study by Priadi et al. (2007) found that organic rice farming systems produced lower yields than non-organic rice, where after 150 days of

planting the seeds, non-organic seeds produced higher yellow grains, i.e. up to 44.8 percent compared to organic seeds 39.6 percent.

Meanwhile, it was stated that the seed variable does not have a significant or insignificant effect on rice production. These results are in line with the research carried out by Suarna (2021) which revealed that the seed production factor did not have a real influence on rice production, since although there were a large number of seeds sown, it was not accompanied by an increase in land area, the production yield would not be as much as expected. It was also stated that the pesticide variable does not have a significant effect on rice production. The difference in the use of organic and non-organic pesticides actually affects the amount of produce produced. This is because non-organic pesticides are more practical to use and can react very quickly and efficiently on a large scale.

Supports and inhibitors of semi-organic and non-organic rice cultivation in Pringgasela district, East Lombok Regency

In an agricultural activity, of course, there will be supporting and inhibiting factors in each process of its activities.

1. ***Supporting Factors of Agricultural Activities***

The driving factor for rice cultivation activities using semi-organic systems is the cost of production facilities, which are relatively cheaper and easier to obtain compared to rice cultivation using semi-organic systems.to use a non-organic system. In the cultivation of semi-organic rice, all the processes are carried out from planting harvest using organic products so that it is good for human health and the environment in the future.

Meanwhile, the driving factor for rice cultivation activities using non-organic systems is the higher production yield compared to rice cultivation using semi-organic systems. This is due to the presence of chemical inputs in the production process so that plant growth is faster and obtained greater production (Mariyono, 2023).

2. ***Obstacle Factors to Agricultural Activities***

The inhibiting factor of semi-organic system rice cultivation is that the availability of organic fertilizers is still limited, but what is needed is a lot, besides that the production of semi-organic system rice cultivation is less compared to that of organic fertilizers. rice cultivation. using non-organic systems that use chemicals, especially when starting to implement semi-organic rice cultivation.

While the factors that inhibit growing rice with non-organic systems, i.e. the continuous use of non-organic fertilizers and pesticides, can damage soil nutrients, especially if not balanced with manure and compost.

CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions

The differences in the characteristics of semi-organic and non-organic rice farming systems include the aspects of cultivation methods; use of fertilizers and pesticides; environmental sustainability; and product quality. The variables of land area (X_1), fertilizer (X_3) and labor (X_5) have a positive and significant sign of rice production. In addition, the dummy variable input (X_6) has a negative sign and is stated to have a significant effect on rice production. The driving factor for rice farming activities using a semi-organic system is the cost of production facilities which are relatively cheaper and easy to obtain and use environmentally friendly products. It's just that the availability of organic fertilizers is still limited, besides that the production of rice farming using semi-organic systems is less when compared to rice farming using non-organic systems.

Suggestion

We recommend that rice farming using a semi-organic system be continued because apart from being profitable, this farming is also friendly to farming actors and the surrounding environment. In conducting rice farming with a semi-organic system, it is recommended to use varieties or seeds that have good quality and the number of see ds used according to the recommended optimum level.

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