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Analysis of Organic Rice Farming (Oryza sativa) in Gentungan Village, Mojogedang Subdistrict, Karanganyar Regency

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Abstract

The significant role of the agricultural sector in driving national economic advancement is widely recognized, with rice assuming a pivotal global position as a staple food, closely trailing wheat and corn in significance. Particularly prominent in Asia, rice constitutes a fundamental dietary staple for a substantial portion of the populace, emphasizing its criticality. Within Indonesia, rice cultivation carries profound strategic implications, influencing both economic and political stability. This study endeavors to achieve three primary objectives: firstly, to assess the financial dynamics of organic rice cultivation; secondly, to examine the impact of various production factors on organic rice farming; and thirdly, to evaluate the effectiveness of production factor utilization within this framework. Employing a deliberately selected research site, farmers were randomly sampled for data collection purposes. Methodologically, the analysis integrated the Cobb-Douglas production function alongside cost and NMPx/Px analyses. Findings reveal that the income yielded from organic rice farming per planting season on a 0.18-hectare plot amounted to Rp 3,333,367 per UT/MT or Rp 18,333,519 per Ha/MT, based on an organic rice price of Rp 6,800/Kg. Total revenue reached Rp 6,858,933 per UT/MT or Rp 37,724,132 per Ha/MT, with overall farming costs totaling Rp 3,525,566 per Ha/MT or Rp 19,390,613 per Ha/MT. The study concludes by recommending enhancements in the efficiency of seed and natural pesticide production factors, alongside addressing inefficiencies in organic fertilizer and labor utilization.

Keywords: Organic rice, production factors, efficiency.

Introduction

Rice (Oryza sativa) is a highly significant food crop in the world, following wheat and maize. It remains a crucial staple for the majority of the global population, particularly in Asia. Rice holds a strategic position in Indonesia due to its substantial influence on economic and political stability (Purnamaningsih, 2006).Farm managers (farmers), in general, are aware that the use of production facilities will impact their farming results. However, many farmers, constrained by simplicity of thought and limited intellectual capacity stemming from low formal education, acknowledge this reality.

The Mulyo I Farmer Group first obtained certification for organic rice products in 2011, followed by verification by the Karanganyar Regency Government in Central Java, which is engaged in the development of organic rice. They officially received certification from the Organic Certification Institute (LeSOS) with

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verification number 098 – LPSO – 005 – IDN – 10 – 14, covering the period from October 5, 2014, to October 5, 2017. Organic rice farming originated from the harsh condition of the land and the increasing pest attacks that farmers couldn't avoid due to the use of inorganic fertilizers and pesticides. The prolonged use of inorganic fertilizers typically has adverse effects on soil conditions, making it quickly harden, less capable of retaining water, and eventually turning acidic, thereby reducing plant productivity

Farming endeavors necessitate the provision of inputs, commonly denoted as production factors, and the associated costs entailed therein, commencing from the cultivation process. Enhanced profitability in organic rice cultivation hinges upon the adept management of farming operations, judicious utilization of production factors, mitigation of production expenditures, and their harmonization with augmented crop yields. A consequential augmentation in farmers' returns ensues from the adept reduction of incurred production costs, juxtaposed with heightened production levels and favorable market valuations. Against this backdrop, the researcher endeavors to ascertain the extent of production expenditures, revenues, and net gains. Moreover, an exploration into the influence exerted by production factors encompassing labor, land allocation, seed provision, organic fertilizers, and botanical pesticides on the output of organic rice cultivation is pursued. The researcher further endeavors to evaluate the efficacy of production factor utilization within the milieu of organic rice cultivation in the locale of Gentungan, situated within the Mojogedang District of the Karanganyar Regency.

Method

Basic Research Method

The basic method employed in this research is the analytical descriptive survey method. The research implementation involves survey research, where a set number of samples are selected, and standardized questionnaires are provided. Respondents are individuals providing data by answering the questionnaire (Morrisan, 2014).

Sampling Method

The sampling location for the research is determined purposively, considering that the area is certified for organic rice farming. Meanwhile, the selection of farmer samples is conducted through simple random sampling, involving 30 farmers distributed across Gentungan Village.

Data Collection Method

a) Observation

This technique involves direct observation of the observed object to provide a clear overview of the subject under study. Collected data are related to production factors and organic rice cultivation techniques in the research area.

b) Interview

This technique is utilized to gather primary data through direct interviews with sampled farmers using a predefined questionnaire related to organic rice.

c) Record-Keeping

This method is employed to collect primary data through recording information obtained from interviews and secondary data from institutions associated with the research.

Types and Sources of Data

a) Primary Data

Primary data are acquired via direct interviews conducted with a representative selection of agricultural practitioners, employing a predetermined questionnaire. This dataset encompasses the identification of farmers, particulars regarding land ownership, utilization of production inputs, farming methodologies, and output quantities. These data are procured through both observational methods and interview sessions.

b) Secondary Data

Secondary data are collected through records from villages, institutions, or relevant organizations associated with the research. Secondary data encompass rainfall data, topography, population status, economic conditions, social conditions, and agricultural conditions.

Data Analysis Method

a) Production Function Analysis

To identify factors influencing organic rice production, the Cobb-Douglas production function analysis is employed, with the following formula:

$Y = a\ X1b1X2b2X3b3\ X4b4X5b5$

When :

Y = Production result (kuintal)
X1 = labor (HKP)
X2 = land area (Ha)
X3 = seed (Kg)
X4 = manure (Kg)
X5 = botanical pesticides (Lt)
a = intercept coefficient
b1… b5 = The estimated value of the parameter quantity

b) Analysis of the Efficiency in Utilizing Production Factors

The determination of factor production efficiency can be ascertained through the application of price efficiency, whereby the equivalence between the marginal product value of input (NPMxi) and the input price (Pxi) is established. The expression for computing price efficiency utilizing the Cobb-Douglas production function methodology is as follows :

$\frac{\text{bi.Y.Py}}{\text{x}} = Px$ atau NPMxi = Pxi

Or $\frac{NPMxi}{Pxi} = 1$

View :

bi = Regression coefficient of production factors.

Y = production

Py = production price

X = number of production factors

Pxi = prices of production factors

NPMxi = value of input marginal product Xi

when :

NPMxi/Pxi < 1: The use of production factors (input) is inefficient

NPMxi/Pxi = 1: The use of production factors (input) is efficient

NPMxi/Pxi > 1: The use of production factors (input) is not yet efficient

Result and Discussion

Farming Calculations

a. Farming Costs

The mean fixed expenditures associated with organic rice cultivation over a single planting cycle in Gentungan Village, situated within the Mojogedang District of the Karanganyar Regency, are delineated in Table 1

Tabel 1. The Average Fixed Costs in Organic Rice Farming for One Planting Season in Gentungan Village, Mojogedang District, Karanganyar Regency.

No	Types of Costs	Per UT (Rp)	Per Ha (Rp)
1.	Land tax	33.333	183.332
2.	Land lease	1.283.333	7.058.332
3.	Irrigation Fees	65.667	361.169
4.	Tool Depreciation		
	a. Hoe	17.356	95.458
	b. Sprayer	31.178	171.479
	c. Bag	77.167	424.419
	d. Sickle	9.156	50.358
	Amount	1.517.190	8.344.545

Source: Primary Data Analysis

The average fixed costs incurred by farmers in operating organic rice farming, most of which are used for land rental, while land tax is the smallest fixed cost. The magnitude of the average fixed costs for one planting season is Rp 1,517,190/UT/MT or Rp 8,344,545/Ha/MT..

1) Variable Costs

The average variable costs in organic rice farming for one planting season in Gentungan Village, Mojogedang Subdistrict, Karanganyar Regency, can be observed in Table 2.

Table 2. Average Variable Costs in Organic Rice Farming for One Planting Season in Gentungan Village, Mojogedang District, Karanganyar Regency.

No	Production Factors	Physique		Production cost	
		Per UT	Per Ha	Per UT (Rp)	Per Ha (Rp)
1.	Labor (HKP)	40,42	222,32	1.493.209	8.212.650
2.	Seed (Kg)	9	49,5	110.500	607.750
3.	Manure (Kg)	3,350	18,425	1.675.000	9.212.500
4.	Vegetable pesticides (Lt)	3	16,5	13.000	71.500
	Jumlah	55,77	306,745	3.291.709	18.104.400

Source : Primary Data Analysis

Based on table 2, the average variable costs used for organic fertilizer and labor, the total variable cost in organic rice farming for one planting season is Rp 3,291,709/UT/MT or Rp 18,104,400/Ha/MT.

1. Total Cost

The aggregation of fixed expenditures and variable outlays constitutes the comprehensive or total financial outlay endured by agricultural practitioners engaged in the cultivation of organic rice, as delineated in Table 3.

Table 3. Average Total Cost in Organic Rice Farming for One Growing Season in Gentungan Village, Mojogedang District, Karanganyar Regency.

No	Types of Costs	Per Farming (Rp)	Per Hektar (Rp)
1.	Fixed cost	1.517.190	8.344.545
2.	Variable Costs	3.291.709	18.104.400
	Amount	4.808.899	26.448.945

Source : Primary Data Analysis

Based on Table 3, it can be determined that the total cost incurred by farmers in organic rice cultivation for one planting season is Rp 4,808,899 per UT (hectaric ton) or Rp 26,448,945 per hectare per MT (metric ton).

2) Income

The financial metric known as income is determined by subtracting total costs, encompassing both fixed and variable expenditures, from total revenue. Table 4 provides a detailed depiction of the mean income derived from organic rice cultivation over a single planting season within Gentungan Village, located in the Mojogedang District of Karanganyar Regency.Table 4. Average Income in Organic Rice Farming for One Growing Season in Gentungan Village, Mojogedang District, Karanganyar Regency.

No	Types of Costs	Per Usahatani (Rp)	Per Hektar (Rp)
1.	Agricultural Revenue	6.858.933	37.724.132
2.	Total Agricultural Costs	4.808.899	26.448.945
3.	Agricultural Income	2.050.034	11.275.187

Source : Primary Data Analysis

The Impact of the Use of Production Factors in Organic Rice Farming

The equation incorporates various production factors, encompassing labor, land area, seed inputs, organic fertilizers, and botanical pesticides. Utilizing a modified Cobb-Douglas model, the production function is delineated, albeit nonlinear in nature. To facilitate multiple linear regression analysis, a transformation of the model into a linear equation is imperative. Consequently, the original equation undergoes a logarithmic

conversion to conform to a multiple linear regression framework. The ensuing analytical outcomes are delineated in Table 5.

Table 5.Testing Variables Influencing Organic Rice Farming Production in One Growing Season in Gentungan Village, Mojogedang Sub-District, Karanganyar Regency.

Coefficients[a]					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
1 (Constant)	2.987	.187		15.947	.000
Logx1	.276	.077	.235	3.597	.001
Logx2	.604	.060	.653	10.105	.000
Logx3	.081	.005	.113	16.348	.000
Logx4	-.020	.011	-.019	-1.851	.077
Logx5	.036	.010	.029	3.725	.001
a. Dependent Variable: LogY					

Source : Primary Data Analysis

The Impact of Input Factors on Organic Rice Yield

1. Through an examination utilizing the t-test within the framework of the Cobb-Douglas production function equation, it is discerned that various input factors exert distinct influences on the production of organic rice. The analysis reveals noteworthy findings regarding the role of labor (X1), land area (X2), seed quality (X3), manure application (X4), and natural pesticides (X5) in shaping organic rice production outcomes.
2. Regarding labor (X1), the t-test analysis demonstrates a significant effect on organic rice production. The regression coefficient, or elasticity, pertaining to labor within the production function is computed at 0.276. This implies that a marginal increase of 1% in labor input, relative to the mean labor utilization of 40.42 person-days per hectare per metric ton (HKP/UT/MT) or 222.32 HKP/Ha/MT, with all other factors held constant, leads to a corresponding rise of 0.276% in production output from the average of 1009 Kg/UT/MT or 5550 Kg/Ha/MT.
3. Similarly, land area (X2) exhibits a significant influence on organic rice production as indicated by the t-test analysis of the Cobb-Douglas production function equation. The regression coefficient for land area is determined to be 0.604, signifying that a marginal increase of 1% in land area utilization, relative to the mean land usage of 0.18 hectares per metric ton (Ha/MT), leads to a substantial rise of 60.4% in production output from the average production levels.
4. Furthermore, the impact of seed quality (X3) on organic rice production is found to be statistically significant. The analysis reveals a regression coefficient of 0.081, indicating that a marginal increase of 1% in seed quality, relative to the mean seed usage of 9 kg/UT/MT or 49.5 kg/Ha/MT, results in an 8.1% increase in production output from the average production levels.

5. In contrast, the application of manure (X4) exhibits no significant effect on organic rice production, as evidenced by the t-test analysis. The regression coefficient for basic manure usage is calculated at -0.020, suggesting that a marginal increase of 1% in basic manure utilization, relative to the mean usage of 3.350 Kg/UT/MT or 18.425 Kg/Ha/MT, results in a negligible decrease of 2% in production output from the average production levels.
6. Finally, natural pesticides (X5) are found to significantly influence organic rice production. The t-test analysis yields a regression coefficient of 0.036, indicating that a marginal increase of 1% in natural pesticide application, relative to the mean usage of 3 liters/UT/MT or 16.5 liters/Ha/MT, leads to a 3.6% increase in production output from the average production levels.
7. In summary, the findings underscore the varying impacts of input factors on organic rice production, emphasizing the significance of labor, land area, seed quality, and natural pesticides in enhancing yield outcomes, while highlighting the negligible effect of manure application.

The Efficiency of Organic Rice Farming Production Factors.

Efficiency analysis of production factors in organic rice farming for one planting season in the village of Gentungan, Mojogedang, Karanganyar can be observed in Table 6.

Table 6. Analysis of the Efficiency of Factors of Production in Organic Rice Farming during One Planting Season in Gentungan Village, Mojogedang District, Karanganyar Regency.

Production Factors	NPMxi	Pxi	$\frac{NPMxi}{Pxi}$
Labor (X_1)	46.850	65.000	0,72
Land area (X_2)	23.023.138	33.333	690,70
Seed (X_3)	61.751	13.000	4,75
Manure (X_4)	-40.962	500	-81,82
Vegetable Pesticides (X_5)	82.334	5000	16,47

Sumber : Data Primer

The efficiency analysis is explained as follows:

1. Labor (X1)

The examination of factor input utilization efficiency reveals that the labor employed in organic rice cultivation within Gentungan Village, situated in Mojogedang District, Karanganyar Regency, manifests an NPMxi/Pxi ratio of 0.72. This value signifies suboptimal utilization of labor resources, as it falls below unity, indicative of inefficiencies in labor allocation.

2. Land Area (X2)

Analyzing the efficiency of factor input utilization demonstrates that the land area allocated for organic rice cultivation in Gentungan Village, located in Mojogedang

District, Karanganyar Regency during the year 2015, exhibits an NPMxi/Pxi ratio of 690.70. This observation suggests that the utilization of land area remains suboptimal, given that the NPMxi/Pxi ratio exceeds unity.

3. Seed (X3)

Efficiency analysis pertaining to factor input utilization indicates that the seed usage in organic rice cultivation within Gentungan Village, situated in Mojogedang District, Karanganyar Regency during the year 2015, yields an NPMxi/Pxi ratio of 4.75. This finding implies inefficient utilization of seeds, as the NPMxi/Pxi ratio surpasses unity.

4. Manure (X4)

Examination of factor input utilization efficiency reveals that the application of manure in organic rice cultivation within Gentungan Village, located in Mojogedang District, Karanganyar Regency during the year 2015, results in an NPMxi/Pxi ratio of -81.92. This outcome underscores inefficient utilization of manure resources, as the NPMxi/Pxi ratio exceeds unity.

5. Organic Pesticide (X5)

The analysis of factor input utilization efficiency indicates that the deployment of organic pesticides in organic rice cultivation within Gentungan Village, situated in Mojogedang District, Karanganyar Regency during the year 2015, yields an NPMxi/Pxi ratio of 16.47. This observation suggests inefficient utilization of organic pesticides, as the NPMxi/Pxi ratio surpasses unity.

Conclusion

a. Conclusion

1. The mean profitability derived from organic rice cultivation within a single growth cycle spanning an area of 0.18 hectares is Rp 3,333,367 per unit per ton (UT/MT) or Rp 18,333,519 per hectare per ton (Ha/MT). Assuming the prevailing organic rice price in the corresponding month is Rp 6,800 per kilogram, the aggregate revenue generated from organic rice cultivation amounts to Rp 6,858,933 per UT/MT or Rp 37,724,132 per Ha/MT. The total expenses incurred in the farming process stand at Rp 3,525,566 per Ha/MT or Rp 19,390,613 per Ha/MT.
2. Various production elements, encompassing land area, seed selection, application of organic fertilizers, botanical pest control measures, and labor

allocation, collectively exert a discernible influence on the organic rice yield. Specifically, the pivotal role of seed selection in determining organic rice output is unmistakable, while the utilization of organic fertilizers demonstrates negligible impact on the overall production. Furthermore, the utilization of botanical pesticides and labor allocation significantly impacts the organic rice cultivation process.

3. Despite the integral role played by production factors such as seeds, organic fertilizers, botanical pesticides, and labor in organic rice cultivation, the attainment of an optimal blend or operational efficiency remains elusive. Moreover, the deployment of production factors such as organic fertilizers and labor is characterized by inefficiencies.

b. Recomendations

1. Upon scrutinizing the efficacy of factor production employment, it becomes evident that the utilization of production factors remains suboptimal. Hence, it is advised to augment the utilization of said factors, with a particular emphasis on seeds and organic fertilizers. It is imperative to heed the recommendations delineated by the agricultural consortium to ensure harmonization with the prevailing land conditions.
2. Moreover, the regional governance body ought to streamline the provision of seeds, organic fertilizers, and eco-friendly pesticides to bolster the advancement of organic rice cultivation. Such support holds the promise of bolstering crop yields and uplifting the socioeconomic status of agricultural practitioners.

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