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Analysis of BSF Maggot Farming Income in the Context of Organic Waste Management in NTB Province, Indonesia

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ABSTRACT: This study investigates the factors influencing the income of Black Soldier Fly (BSF) maggot farmers in the NTB province of Indonesia. Utilizing a descriptive quantitative analysis method, data were collected from 32 maggot farmers through purposive sampling. The primary data were obtained via questionnaires administered to the selected farmers. The analysis employed a multiple regression model to evaluate the impact of various factors on farmers' income. The results indicate that the average monthly income of BSF maggot farmers is Rp 5,938,750 (364.35 USD). The income is significantly influenced by the amount of production, production cost, and selling price. Specifically, an increase in production amount and selling price positively correlates with higher income, while an increase in production cost negatively affects income. These findings highlight the critical role of efficient production practices and market strategies in enhancing the economic viability of BSF maggot farming.

KEYWORDS: Black Soldier Fly (BSF), Magot Farming, Farmer's Income, Waste Management

INTRODUCTION

Waste management remains a significant challenge in Indonesia, exacerbated by the increasing population. According to the National Waste Management Information System (SIPSN) of the Ministry of Environment and Forestry (KLHK), waste generation in 2022 reached 19.45 million tons, a 37.52% decrease from 31.13 million tons in 2021. Food waste constituted the largest portion, accounting for 41.55% of the total waste generated in 2022. If not managed properly, this waste can lead to severe environmental pollution.

In the West Nusa Tenggara (NTB) province, the Environment and Forestry Service estimates that waste generation reached approximately 2,223.33 tons per day and 814,803.96 tons per year across all districts in 2022. The Black Soldier Fly (BSF) larvae, or maggots, have been identified as a potential solution for processing food waste. BSF larvae can rapidly decompose the nutrients in food waste, addressing the substantial volume of organic waste in landfills and mitigating environmental problems. Consequently, using maggots for organic waste decomposition has gained attention, particularly among farmers who utilize maggot products as feed.

BSF maggots are highly beneficial due to their high protein content, which is advantageous for feed formulation, and their antifungal microbial properties, which enhance resistance to bacterial and fungal infections (Auliani et al., 2021; Bahtiar & Kamelia, 2023; Ounga et al., 2023). This adds significant value to maggot production, making it a viable alternative for animal feed. Studies analyzing the Receipt and Cost (R-C) Ratio (Waluyo & Nugraha, 2020; Fauzi & Sari, 2018) indicate that maggot farming can be profitable and feasible to cultivate. Further research (Nurdi et al., 2023; Prihartini, 2022) confirms that BSF maggot cultivation is a viable and profitable venture for farmers. Qualitative and quantitative analyses (Supena et al., 2021; Ulya & Dewi, 2022) also highlight the high profitability of BSF maggot farming. Additionally, organic waste processing using BSF maggots through bioconversion technology has been found beneficial for agriculture (Kahar et al., 2020; Wardhiani, 2022; Ambarwati & Yulianto, 2023). However, Ounga et al. (2023) noted that the lack of marketing and a focus solely on reducing household organic waste led to losses in some maggot farming ventures.

Fahmi (2015) and Ambarwati (2023) demonstrated that maggots are highly efficient in decomposing organic waste, with protein content reaching 45-50% and fat content between 24-30%. BSF maggot bioconversion is superior to other insect-based methods and offers a cost-effective protein source for livestock (Purnamasari, 2019; Kahar et al., 2020). This approach also helps mitigate environmental pollution and organic waste accumulation.

Over the past five years, maggot farming research has focused on four main areas: 1) Organic waste processing using bioconversion technology (Ambarwati & Yulianto, 2023; Auliani et al., 2021; Kahar et al., 2020; Ounga et al., 2023; Wardhiani, 2022); 2) Feasibility of maggot cultivation (Waluyo & Nugraha, 2020; Bahtiar & Kamelia, 2023; Fauzi & Sari, 2018; Nurdi et al., 2023; Prihartini, 2022); 3) Organic waste processing as alternative animal feed (Supena et al., 2021; Ulya & Dewi, 2022); and 4) Income analysis influenced by various factors (Listiani et al., 2019; Luntungan, 2019; Pirngadi et al., 2023; Tamalia et al., 2019; Zartika et al., 2023). However, there is limited research on the income prospects of BSF maggot farming from the farmers' perspective.

This study aims to analyze the income generated from BSF maggot farming as a strategy for organic waste management in NTB province. Nurdi et al. (2023) emphasized that maggot cultivation is a profitable business providing raw materials for organic animal feed, which is highly demanded by farmers. Using multiple linear regression analysis, this study investigates the impact of land area, price, production cost, and labor on farming income (Pirngadi et al., 2023; Pinem & Aritonang, 2022). The data for this study is cross-sectional and employs quantitative methods aligned with previous research (Listiani et al., 2019; Pinem & Aritonang, 2022; Pirngadi et al., 2023; Tamalia et al., 2019; Zartika et al., 2023).

METHODOLOGY

This study employs a descriptive quantitative analysis method and was conducted in the NTB province. The sampling technique used is purposive sampling, where samples are selected based on specific criteria. A total of 32 samples were collected from BSF maggot farmers.

Primary data was gathered directly by researchers through fieldwork, using questionnaires administered to the selected BSF maggot farmers. The data collection aimed to gather detailed information about the farmers' experiences and operations.

The analysis model used in this study is a multiple regression model, designed to analyze the income of maggot farmers in NTB province. The multiple regression equation used in this analysis is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e$$

Where:

Y = BSF maggot farming income

β_0 = Intercept describes the average effect of all variables on the income of BSF maggot farmers (Y)

$\beta_1..\beta_5$ = Regression Coefficient

X_1 = Production Amount (kg)

X_2 = Production Cost (Rp)

X_3 = Selling Price (Rp)

X_4 = Labor (Tk)

X_5 = Working time (Hours)

e = Error

RESULTS

Based on the econometric analysis, the multiple linear regression equation is as follows:

$$Y = -9401699.759 + 4101.641X_1 - 635X_2 + 1478.417X_3 + 63856.945X_4 + 309893.395\ X_5 + e$$

(-2.542) (10.175)* (-4.343) (2.977)* (0.760) (1.397)

F Statistics : 37.782*

Adj. R^2 : 0.879

The numbers in parentheses are t statistical.

*Significant on α 5%

Interpretation of equations

Number of Production: The regression coefficient for the amount of production is 4101.641, indicating a positive relationship. This means that for every 1 kg increase in production, the income of BSF maggot farmers will increase by 4101.641 units. This result suggests that the variable (X_1) (amount of production) significantly contributes to increasing the income of BSF maggot farmers. The calculated t-value is 10.175, which is greater than the t-table value of 1.703, indicating that number of production has a significant effect on income.

Production Cost: The regression coefficient for production cost is -0.635, indicating a negative relationship. This means that every 1 unit increase in production cost will negatively affect the income of BSF maggot farmers. The calculated t-value is 4.343, which is higher than the t-table value of 1.703, indicating that production cost has a significant effect on income.

Selling Price: The regression coefficient for the selling price is 1478.417, indicating a positive relationship. This means that for every 1 unit increase in the selling price of maggots, the income of BSF maggot farmers will increase. The calculated t-value is 2.977, which is greater than the t-table value of 1.703, indicating that selling price has a significant effect on income.
Labor: The regression coefficient for labor is 63856.945, indicating a positive relationship. This means that every 1 unit increase in labor will increase the income of BSF maggot farmers by 63856.945 units. However, the calculated t-value is 0.760, which is less than the t-table value of 1.703, indicating that labor does not have a significant effect on income.
Working Hours: The regression coefficient for working hours is 309893.395, indicating a positive relationship. This means that every 1 unit increase in working hours will affect the income of BSF maggot farmers. However, the calculated t-value is 1.397, which is less than the t-table value of 1.703, indicating that working hours does not have a significant effect on income.
F and Adjuted R^2 Test Results: The Adjusted R^2 value of 0.856 indicates that the variables of production amount, production cost, selling price, labor, and working hours collectively explain 85.60% of the variance in the income of BSF maggot farmers. The F-statistic significance level of 0.001 is smaller than the overall significance level of 0.05. This indicates that the independent variables, namely Amount of Production (X_1), Production Cost (X_2), Selling Price (X_3), Labor (X_4), and Working Hours (X_5), have a significant combined effect on the dependent variable, Income (Y).

DISCUSSION

Effect of Production Amount on Income

This study demonstrates that the variable of production amount is positively correlated and significantly influences the income of BSF maggot farmers. This finding aligns with the research conducted by Luntungan (2019) and Tamalia et al. (2019). It indicates that an increase in production will positively affect the income of BSF maggot farmers in NTB province.

Effect of Production Costs on Income

The study reveals that the production cost variable is negatively correlated and does not significantly affect income. This result is consistent with the studies by Pirngadi et al. (2023), Listiani et al. (2019), Zartika et al. (2023), and Fitriana (2020), which found that production costs do not influence farmers' income. However, this finding contradicts the studies by Isnaini (2020) and Luntungan (2019), which showed that production costs significantly impact farmers' income. The results suggest that higher production costs tend to generate lower income.

Effect of Selling Price on Income

The study indicates that the selling price variable is positively and significantly correlated with income. This result is consistent with the findings of Pirngadi et al. (2023), Tamalia et al. (2019), and Fitriana (2020), which showed that the selling price has a significant effect on farmers' income. These findings highlight the crucial role of selling price in increasing the revenue of BSF maggot businesses.

Effect of Labor on Income

The study shows that the labor variable does not have a significant effect on income. This result aligns with the studies conducted by Listiani et al. (2019) and Zartika et al. (2023). However, it differs from the findings of Pinem and Aritonang (2022), Pirngadi et al. (2023), and Tamalia et al. (2019), which indicated that labor affects farmers' income.

Effect of Working Hours on Income

The study reveals that the working hours variable does not significantly affect farmers' income. Thus, the working hours spent producing BSF maggot products do not impact the income of BSF maggot farmers. This finding contradicts the study by Fitriana (2020), which showed that working hours significantly influence farmers' income.

CONCLUSION

This study found that the income of BSF maggot farmers in NTB province was Rp 5,938,750 (364.35 USD) per month. The income of maggot farmers is significantly influenced by the variables of production amount, production cost, and selling price. Specifically, an increase in the amount of production and selling price leads to higher income for maggot farmers. Conversely, an increase in production cost results in lower income for maggot farmers.

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