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Analysis of Additional Income from Maggot Cultivation at TPS 3R Muria, Kedundung Village, Mojokerto City

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ABSTRACT

Organic waste is an increasingly serious problem in urban areas as populations and economic activities grow. One potential solution is the use of Black Soldier Fly (BSF) larvae, commonly known as maggots, which can convert organic waste into biomass with economic value as animal feed; the residual material may also be used as an organic soil amendment. This study aimed to estimate the additional income generated by maggot cultivation at TPS 3R Muria, Kedundung Village, Magersari District, Mojokerto City, and to identify strategies for business development. The study used a descriptive quantitative approach and collected data through interviews, observations, and document analysis. The manuscript reports an average harvest of 50–70 kg per cycle and a selling price of IDR 5,000–8,000 per kg. The reported revenue-to-cost (R/C) ratio is 1.87, suggesting financial feasibility based on the cost and revenue figures presented. Proposed development strategies include improving production efficiency, diversifying products (such as dried maggots and residual compost), and expanding marketing channels. The findings suggest that maggot cultivation may support organic-waste management and provide supplementary income; however, the underlying cost data and respondent numbers must be reconciled before the financial results can be considered definitive.

Keywords: Black Soldier Fly (BSF), maggot cultivation, supplementary income, TPS 3R, circular economy, R/C ratio

1. INTRODUCTION

Waste management is a major environmental challenge in Indonesia, particularly in urban areas such as Mojokerto City. Data from the National Waste Management Information System (SIPSN), managed by the Ministry of Environment and Forestry, indicate that organic materials constitute a substantial share of the national waste stream. When poorly managed, organic waste decomposes, can generate methane, cause unpleasant odors, and attract disease vectors. The 3R principle—Reduce, Reuse, and Recycle—is therefore an important approach to more sustainable waste management (Nordic et al., 2023). One potential approach is bioconversion using Black Soldier Fly (BSF) larvae.

Maggots have economic value because they contain protein and fat and may serve as an alternative ingredient in animal feed, including fish feed (Fauzi & Sari, 2018). The residual material from the process, often referred to as kasgot, may also be used as an organic soil amendment. The economic contribution of maggot cultivation at community-based waste-management facilities, however, needs to be assessed using transparent production and financial records. TPS 3R Muria in Kedundung Village, Magersari District, Mojokerto City, has adopted a

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community-based approach to integrated waste management and includes maggot cultivation as part of its organic-waste management activities (Bahtiar & Kamelia, 2023). In addition to processing organic waste, this activity may create work opportunities, support the local microeconomy, and encourage community-based social entrepreneurship.

This study is expected to provide preliminary information for local policymakers considering community-based circular-economy initiatives and the potential replication of waste-management models such as TPS 3R Muria. Its findings may also inform efforts to develop environmentally oriented local businesses and contribute to relevant Sustainable Development Goals (SDGs).

2. RESEARCH METHOD

Research Location and Period

The study was conducted at TPS 3R Muria, Kedundung Village, Magersari District, Mojokerto City, East Java, Indonesia. The manuscript cites the 2023 publication of Mojokerto Municipality in Figures for local demographic information (BPS, 2023). The research period is not specified in the submitted manuscript and must be added.

Population and Sampling

The population was described as people involved in the maggot business at TPS 3R Muria, including unit managers, daily workers involved in sorting waste and feeding or processing maggots, personnel responsible for sales, and people who record or manage the business finances.

The manuscript states that a census was used and that 10 people involved in the maggot business were selected as respondents. However, the abstract refers to five active managers, and the results section also identifies five active managers. The authors must clarify the actual population and respondent count and use the same figures consistently throughout the manuscript.

Data Collection

Interviews were conducted with relevant personnel to obtain information about production activities, costs, sales, and business management. The interview procedure and the roles of the interviewees should be described more specifically. Observations were used to document the cultivation process, including waste sorting, feed preparation, larval rearing, harvesting, and product handling.

Document analysis was used to examine available records relevant to production, costs, sales, and business operations. The types and coverage of documents reviewed should be specified.

Data Analysis

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The data were analyzed descriptively to examine production activities and the financial performance of the maggot business. The analysis was intended to calculate fixed costs, variable costs, total costs, total revenue, net income, and the revenue-to-cost (R/C) ratio. The calculations use the following formulas:

$$TC = TFC + TVC$$

Information:

Total cost (TC)

Total fixed cost (TFC)

Total variable cost (TVC)

$$TR = P \times Q$$

Information:

Total revenue (TR)

Selling price per unit (P)

Quantity of output sold (Q)

$$PD = TR - TC$$

Information:

Net income (π)

Total revenue (TR)

Total cost (TC)

3. RESULTS AND DISCUSSION

Overview of the Research Location

Waste-management infrastructure in Magersari District includes household waste bins, waste banks, temporary waste collection facilities (TPS), and final disposal facilities (TPA). The availability and operation of these facilities provide the context for community-based waste-management activities in the district. Any specific claims about household-level access or waste separation should be supported by the relevant local data or field observations.

TPS 3R Muria operates a maggot-cultivation unit as one approach to processing organic waste and potentially generating supplementary income. The manuscript reports five active managers responsible for sorting, feeding, harvesting, and selling maggots. Household organic waste is used as a feed source. The facility reportedly includes a waste-sorting area, a fermentation area, and a simple cultivation unit. The authors should provide evidence for the stated operating period and clarify whether all five managers participated in the study.

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Maggot Production

Based on field observations and interviews with waste-management personnel, TPS 3R Muria receives approximately 7–8 tonnes of mixed waste per day from households, food stalls, schools, and markets in and around Kedundung Village. The incoming waste is sorted before organic material is selected for further processing.

The manuscript estimates that 20%–30% of the incoming waste is organic material potentially suitable for maggot feed, equivalent to approximately 1.5–2.5 tonnes per day. Materials considered unsuitable, such as hard items, oily waste, or waste contaminated with chemicals, are excluded. The manuscript reports that the selected material is fermented for 3–5 days using EM4 and sugar water before being supplied to BSF larvae. The reported production cycle is 12–15 days, although the authors should clarify whether this refers to the larval rearing period alone or the complete process.

The manuscript reports that larvae are reared under ambient conditions, with temperatures of approximately 29–32°C and no dedicated humidity-control equipment. Managers reportedly turn the feed regularly to manage moisture and decomposition. Larvae grow from a few millimetres to approximately 1.5–2.5 cm and darken as they approach the prepupal stage. These temperature and growth observations should be identified as measured data or estimates based on interviews.

The reported harvest is generally 50–70 kg of live maggots per cycle, with a maximum of approximately 100 kg under favourable conditions. Harvest volume is said to depend on feed quantity and quality and environmental conditions. After harvesting, the larvae are packed in bags or containers with adequate ventilation. The reported selling price is IDR 5,000–8,000 per kg. The manuscript also mentions a potential price of IDR 30,000–50,000 per kg for dried maggots; this figure should be supported by a documented market source or clearly identified as an indicative price rather than an actual sale price at the study site.

Potential buyers include local poultry and fish farmers, organic vegetable growers, and environmental communities. The manuscript suggests that there may be a market for maggots and related products in Mojokerto City and surrounding areas. This market potential should be supported with information on actual buyers, sales volume, frequency of transactions, or documented market enquiries. The manuscript also reports that financial records are maintained manually by the TPS coordinator rather than through a standardized bookkeeping system.

Constraints in Maggot Harvesting at TPS 3R Muria

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Harvesting is an important stage in the BSF cultivation cycle at TPS 3R Muria. According to the manuscript, harvesting generally occurs every 12–15 days, depending on feed availability, weather, and larval growth. The submitted text introduces harvesting constraints but does not identify the specific constraints or report their frequency or impact. The authors should add the actual findings from interviews and observations; otherwise, this subsection should be removed.

Financial Analysis of the Maggot Business at TPS 3R Muria

The financial performance of the maggot business was assessed using production costs, revenue, net income, and the revenue-to-cost (R/C) ratio. The calculations should be based on the same accounting period and the same set of respondents or business operations.

Table 1. Average variable costs of TPS 3R Muria

Cost item	Annual cost (IDR/year)	Average monthly cost (IDR/month)
Electricity and water	2.400.000,00	200.000,00
EM4 and fermentation inputs	1.200.000,00	100.000,00
Transportation	1.200.000,00	100.000,00
Packaging	2.100.000,00	175.000,00
Work-related consumption	3.000.000,00	250.000,00
Total	9.900.000,00	825.000,00

Source: Primary data, processed by the authors (2025).

Table 1 lists reported operating expenses, including electricity and water, EM4, transportation, packaging, and work-related consumption. The table reports total variable costs of IDR 9,900,000 per year, equivalent to IDR 825,000 per month. However, Table 3 uses variable costs of IDR 1,980,000 per year. These figures are inconsistent and must be checked against the original records before the income and R/C calculations are finalized.

Table 2. Reported equipment costs and annual depreciation at TPS 3R Muria

Equipment item	Reported equipment cost (IDR)	Reported annual depreciation (IDR/year)
Permanent cement cultivation tank	750.000,00	150.000,00
Plastic containers (50–100 L)	450.000,00	90.000,00
Sieve/netting	125.000,00	25.000,00
Shovel	100.000,00	20.000,00
Cover netting	250.000,00	50.000,00

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Digital scale	333.333,33	66.666,67
Packaging containers	75.000,00	15.000,00
Total	2.083.333,33	416.666,67

Source: Primary data, processed by the authors (2025).

The table lists equipment used in maggot cultivation, including cultivation tanks, plastic containers, sieves, shovels, netting, scales, and packaging containers. The table reports equipment costs totalling IDR 2,083,333.33 and a second total of IDR 416,666.67. The second column heading and the depreciation period are unclear. Please verify the original purchase costs, useful lives, residual values (if applicable), and annual depreciation calculations, and label the columns accordingly.

Table 3. Reported annual revenue, costs, and net income at TPS 3R Muria

Item	Amount (IDR/year)
Reception	4.492.800,00
Variable Costs	1.980.000,00
Fixed Costs	416.666,67
Total Production Cost	2.396.666,67
Average Income	2.096.133,33

Source: Primary data, processed by the authors (2025).

According to Table 3, annual revenue is reported as IDR 4,492,800.00, total production costs as IDR 2,396,666.67, and net income as IDR 2,096,133.33. The arithmetic subtraction is consistent with these three figures. However, the variable cost in Table 3 (IDR 1,980,000.00) does not match the total variable cost reported in Table 1 (IDR 9,900,000.00). Consequently, the net-income figure should be treated as provisional until the cost data are reconciled.

Table 4. Revenue-to-cost (R/C) ratio of the maggot business

Item	Amount (IDR/year)
Reception	4.492.800,00
Total Production Cost	2.396.666,67
R/C Ratio	1.87

Source: Primary data, processed by the authors (2025).

The R/C ratio is calculated by dividing total revenue by total production costs. Using the figures in Table 4, IDR 4,492,800.00 divided by IDR 2,396,666.67 gives an R/C ratio of approximately 1.87. An R/C ratio greater than 1 indicates that revenue exceeds the costs included in the calculation. This conclusion remains conditional on correcting the inconsistencies in the

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variable-cost and fixed-cost tables and confirming that all values refer to the same period and scope.

IFAS and EFAS Matrix Analysis

The Internal Factor Analysis Summary (IFAS) evaluates internal strengths and weaknesses by multiplying each factor's weight by its rating. The weights within each factor group should sum to 1.00 if the groups are normalized separately. The rating scale and criteria used in this study should be explained, and all subtotals should be recalculated from the displayed weights and ratings.

The External Factor Analysis Summary (EFAS) applies the same approach to external opportunities and threats. The authors should ensure that weights, ratings, scores, and subtotals are arithmetically consistent and explain how the factors and ratings were determined.

Table 5. IFAS Matrix for BSF Maggot Cultivation at TPS 3R Muria

No	Internal factors	Weight	Rating	Score (weight × rating)
	Strengths	A	B	(Axb)
1	Abundant Volume of Organic Waste	0,24	4	0,94
2	Very Low Production Costs	0,18	3	0,53
3	Maggots Have Economic Value	0,24	4	0,94
4	ContributionTowards Waste Reduction	0,12	2	0,24
5	Basic Knowledge of Maggot Cultivation Has Been Acquired	0,24	4	0,94
	Subtotal	1,00	17	3,59
	Weaknesses	A	B	(A×B)
1	Lack of Manpower	0,13	1	0,13
2	Simple and Manual Equipment	0,25	2	0,50
3	Unstructured Financial Management	0,25	2	0,50
4	Inconsistent Feed Quality	0,25	2	0,50
5	Production Scale Still Small	0,25	1	0,25
	Subtotal	1,00	8	1,88
	Total		S/Sv	5,46

Source: Primary data, processed by the authors (2025).

The IFAS matrix identifies five strengths: the availability of organic waste, the reported low production costs, the economic value of maggots, the contribution to waste reduction, and the managers' basic cultivation knowledge. It also identifies five weaknesses: limited labour, simple

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equipment, unstructured financial records, inconsistent feed quality, and a small production scale. The factor scores and subtotals must be recalculated. In particular, the displayed weights for the weakness factors add up to more than 1.00, and the stated overall total should not be interpreted until the weighting method and calculations have been corrected.

The manuscript reports a strength score of 3.59 and a weakness score of 1.88, producing a difference of 1.71. Because the displayed weakness weights and score totals require verification, this difference should be regarded as provisional. A strategic recommendation based on the IFAS position should be made only after the matrix has been recalculated and its method explained.

Table 6. EFAS Matrix for BSF Maggot Cultivation at TPS 3R Muria

No	External factors	Weight	Rating	Score (weight × rating)
	Opportunity	A	B	(Axb)
1	Potential Local Market	0,29	4	1,14
2	Potential of Maggot Derivative Products	0,14	2	0,29
3	Education and Socialization Program	0,21	3	0,64
4	Adiwiyata Program & Waste Bank Support	0,14	2	0,29
5	Digital Marketing	0,21	3	0,64
	Subtotal	1,00	14	3,00
	Threats	A	B	(A×B)
1	Inconsistent Waste Supply	0,13	1	0,13
2	Unpredictable Weather Conditions	0,25	2	0,50
3	3 Dependence on Coordinator	0,25	2	0,50
4	4 Market Competition and Alternative Products	0,13	1	0,13
5	5 Threats of Pests and Contamination	0,25	2	0,50
	Subtotal	1,00	8	1,75
	Total		S/Sv	4,75

Source: Primary data, processed by the authors (2025).

The EFAS matrix lists five opportunities: local market potential, potential derivative products, education and outreach programmes, support from Adiwiyata programmes and waste banks, and digital marketing. It also lists threats related to inconsistent waste supply, weather variability, dependence on the coordinator, market competition, and pests or contamination. The

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authors should confirm the rating scale and recalculate each score and subtotal using the displayed weights and ratings.

The manuscript reports an opportunity score of 3.00 and a threat score of 1.75, giving a difference of 1.25. However, the displayed threat weights do not sum to 1.00, and the total row is not clearly defined. These results should therefore be treated as provisional until the EFAS matrix is corrected. Any strategy derived from the matrix should be linked explicitly to the verified findings.

4. CONCLUSION

This study describes maggot cultivation at TPS 3R Muria as an activity that may contribute to organic-waste processing and provide supplementary income. Based on the revenue and cost figures currently shown in Table 4, the R/C ratio is approximately 1.87, which would indicate that revenue exceeds the costs included in that calculation. However, the manuscript contains inconsistent variable-cost figures and unresolved details in the fixed-cost and IFAS/EFAS tables. The claim that the business is financially feasible should therefore be considered preliminary until the authors verify the source records, standardize the accounting period, and recalculate all financial indicators. After verification, development priorities may include improving bookkeeping, ensuring consistent feed quality, strengthening production management, and assessing actual demand for fresh and processed products.

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