BUSINESS FEASIBILITY OF BLACK SOLDIER FLY (BSF) MAGGOT CULTIVATION: FINANCIAL INDICATORS AND SWOT-BASED STRATEGY

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ABSTRACT

Black Soldier Fly (BSF) maggot cultivation is increasingly recognized as a circular-economy solution that converts organic waste into protein-rich biomass for animal feed while reducing the burden of organic waste management. This manuscript rewrites an Indonesian-language business plan into a journal-ready feasibility paper using financial indicators and SWOT-based strategy. Feasibility is evaluated using Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PP), and Break-Even Point (BEP), while strategic diagnosis uses Internal Factor Evaluation (IFE), External Factor Evaluation (EFE), and SWOT positioning with an explicit strategy matrix. Results from the provided dataset show a positive NPV of IDR 96,766,363,636 at a 10% discount rate and an IRR of 1635%, with a short payback period of 0.061 years (approximately 88 days). The IFE score (2.77) and EFE score (3.30) position the business in Quadrant I at coordinates (1.21, 0.67), indicating an aggressive growth orientation. The main managerial implications are (i) prioritizing capacity and facility upgrades to avoid growth bottlenecks; (ii) strengthening promotion and market education to address awareness gaps; and (iii) adopting practical technology for traceability and quality assurance to sustain differentiation amid competition. Overall, the feasibility evidence suggests strong investment attractiveness and strategic potential, conditioned on disciplined scaling and partnership execution.

Keywords*: Black Soldier Fly, Maggot, Feasibility Study, NPV, IRR, Payback Period, IFE, EFE, SWOT, Circular Economy, Waste Valorization.*

INTRODUCTION

Insect-based protein has become increasingly relevant in the context of sustainable food and feed systems, driven by feed ingredient price volatility, pressure on marine resources, and rising attention to circular-economy business models. BSF larvae (Hermetia illucens) are particularly attractive because they can bioconvert organic waste streams into larval biomass and by-products, potentially reducing landfill burdens while generating feed inputs. In Indonesia, the dual challenges of organic waste management and the demand for affordable feed inputs create a favorable context for BSF maggot enterprises. However, feasibility at the enterprise level depends on (i) investment viability under local cost structures; and (ii) strategy quality under a competitive and operationally complex environment. This study presents a journal-ready feasibility paper based on an underlying Indonesian business plan, focusing on financial metrics (NPV, IRR, PP, BEP) and a structured strategic diagnosis using IFE/EFE and SWOT positioning (Dormants et al., 2017; Fahmi, 2015; Rangkuti, 2003).

Research objectives

This paper has three objectives. First, it reports investment feasibility indicators directly from the underlying business-plan dataset. Second, it summarizes the internal and external strategic conditions using IFE/EFE matrices. Third, it translates SWOT positioning into implementable strategic priorities through a SWOT strategy matrix, addressing common critiques that SWOT is often used descriptively without clear implementation pathways (Hill & Westbrook, 1997; Chermack & Kasshanna, 2007).

RESEARCH METHODS

All quantitative values and factor ratings in this manuscript are transcribed from the internal dataset "Maggot Business Plan_ Analisis Finansial & Matrix SWOT" (internal document; n.d.). The dataset contains: (i) payback period and BEP-related parameters; (ii) feasibility summary (NPV, IRR, PP); (iii) a cashflow-and-IRR table (Year 0–Year 3); (iv) IFE and EFE matrices; (v) SWOT diagram coordinates; and (vi) a SWOT strategy matrix (SO, WO, ST, WT strategies). Where itemized CAPEX/OPEX is not provided, this paper reports the available aggregate values to avoid speculative reconstruction.

Financial feasibility indicators

The paper reports NPV (discount rate 10% as stated in the source dataset), IRR, payback period, and BEP-related parameters. The indicators are reported as provided in the dataset and reformatted into Appendix tables for journal readability. The payback period is also expressed in days for interpretability.

Strategic analysis procedure

The IFE/EFE matrices quantify weighted internal and external factors using weights, ratings, and resulting scores. SWOT positioning is interpreted through quadrant logic; Quadrant I corresponds to an aggressive growth strategy. The SWOT strategy matrix is used to derive implementable strategic priorities. The discussion section organizes strategies into operational scaling, commercialization, technology adoption, and partnership governance.

RESULTS AND DISCUSSION

Results: Strategic Diagnosis (IFE/EFE and SWOT)

1. Internal factors (IFE)

The IFE total score is 2.77 (Appendix 4). The strengths include product quality, economical pricing, workforce expertise, raw material availability, and a strategic location. Weaknesses include limited labor, limited promotion, minimal production facilities, limited capacity, and suboptimal management (Appendix 4).

2. External factors (EFE)

The EFE total score is 3.30 (Appendix 5). Opportunities include broad and clear marketing activities, technology development, increasing demand, local government support, and strong customer relationships. Threats include competitors with similar products, uncertain natural disasters, uncooperative partners, competitors offering lower prices, and low public awareness of the product (Appendix 5).

3. SWOT positioning and strategy matrix

The business is positioned at (1.21, 0.67) and lies in Quadrant I, indicating an aggressive growth strategy orientation (Rangkuti, 2003) (Appendix 6). The SWOT strategy matrix in the dataset proposes SO, WO, ST, and WT strategies linking specific strengths/weaknesses to opportunities/threats (Appendix 7).

Discussion

1. Interpreting feasibility signals in practice

The reported feasibility indicators indicate strong investment attractiveness, especially the positive NPV and short payback period. In practice, such strong values often imply that operational continuity and market absorption are the central risks rather than purely financial break-even. For biological production systems, scale-up can create new constraints through input supply variability (organic waste streams), process control, and product consistency. Therefore, growth-oriented feasibility should be paired with operational risk controls, including SOPs, batch documentation, and quality checks.

2. Growth bottlenecks implied by IFE weaknesses

While the SWOT quadrant suggests an aggressive strategy, the IFE matrix flags

potential bottlenecks: minimal facilities and limited capacity can cap output, and limited labor can increase process variability and reduce quality. These weaknesses suggest that scaling should follow a phased pathway. Phase 1 focuses on stabilizing quality and throughput at current scale. Phase 2 expands capacity through facility upgrades and workforce planning. Phase 3 consolidates market reach and contractual relationships. This sequencing aims to prevent a mismatch between demand generation and production capability.

3. Translating SWOT strategies into operational programs

Appendix 7 proposes strategies that can be operationalized as concrete programs. The SO strategy emphasizes increasing production to serve a wider market, leveraging product quality, pricing, workforce skills, raw material availability, and strategic location. Operationally, this requires capacity planning, equipment procurement, and process standardization. The WO strategy emphasizes building partnerships with similar businesses for large-scale marketing—this can be interpreted as cooperative marketing networks, aggregator models, or shared distribution channels. The ST strategy emphasizes product differentiation and competitive pricing to mitigate competitor pressure, which should be supported by consistent quality specifications and customer proof points (e.g., performance trials). The WT strategy emphasizes improving promotion and management while addressing limited facilities and labor—this aligns with building a basic management system (recordkeeping, KPIs, budgeting) and a structured promotion plan.

4. Commercialization and market education

Low public awareness of maggot products is identified as a threat. This implies that marketing is not only a sales function but also an education function. A practical approach is to prioritize B2B segments with clearer economic incentives (fish farms, poultry farms, feed formulators) and to run demonstration trials to document outcomes (feed conversion, growth rates, cost savings). Customer relationship strength is identified as an opportunity; thus, customer retention mechanisms (after-sales support, consistent supply, responsive quality handling) are strategic assets.

5. Technology adoption as a resilience lever

Technology development is identified as a major opportunity. For small-to-medium enterprises, technology adoption can start with practical tools: environmental monitoring (temperature/humidity), standardized feeding protocols, batch logs for traceability, and basic moisture/quality checks for dried products. These steps reduce variability and support differentiation when competitors compete on price. Over time, stronger traceability can support certification and access to more demanding markets.

6. Partnerships and governance

The EFE matrix includes risks related to uncooperative partners. This points to the importance of governance arrangements, including written agreements with waste suppliers, clear quality requirements, and defined roles in distribution partnerships. Local government support is listed as an opportunity; partnerships can be framed around waste management objectives and community value creation, strengthening social license to operate and reducing input supply uncertainty.

7. Limitations and future research

This paper is limited to the dataset provided in the underlying business plan. Future work should extend the analysis by adding (i) itemized cost structure; (ii) sensitivity analysis for key drivers such as price, waste supply, mortality rates, and labor costs; and (iii) operational performance measures across production cycles. Such additions would support stronger generalizability and readiness for journal peer review.

CONCLUSION

Based on the financial and strategic evidence reported in the underlying dataset, the BSF maggot business demonstrates strong feasibility signals and is strategically positioned for growth. Quadrant I positioning suggests leveraging strengths to capture opportunities, but the IFE-identified weaknesses imply that growth must be managed through phased capacity expansion, professionalized management, and strengthened promotion. The appendices provide journal-ready tables for feasibility and strategic matrices to support transparency.

Declarations

Funding: This study received no external funding.

Conflicts of interest: The author declares no conflicts of interest.

Data availability: All quantitative values in this manuscript are derived from the internal business plan dataset cited in Section 3.1.

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