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Optimizing the Marketing Potential of BSF Maggot as a Decomposer of Organic Waste to Overcome Social Problems in Murtigading Village, Bantul, D.I. Yogyakarta

Iman Hasanudin, Yohan Budianto, Zuhud Ahnaf Fauzi
Universitas Gadjah Mada, Indonesia
Email : imanhasanudin0304@mail.ugm.ac.id, yohanbudianto@mail.ugm.ac.id, zuhudahnaffauzi@mail.ugm.ac.id
Correspondence: imanhasanudin0304@mail.ugm.ac.id*

KEYWORDS
Organic Waste; Bsf Maggot; Cultivation; Marketing; Social Problems

ABSTRACT
The improper management of organic waste has become a serious issue in Murtigading Village, Bantul, Yogyakarta. Black soldier fly (BSF) maggot cultivation offers an efficient solution for decomposing organic waste. However, the marketing of BSF maggots remains a challenge due to a lack of community knowledge and business strategies. This research aims to optimize the marketing potential of BSF maggots to address both waste management and social problems in the village. A descriptive qualitative method was employed, involving interviews, field surveys, and literature reviews. The study analyzed the strengths, weaknesses, opportunities, and threats (SWOT) of BSF maggot marketing, supported by a Pentahelix model that involves collaboration between the community, government, private sector, media, and academics. The results show that there is significant market potential for BSF maggots, with demand from industries in Surabaya requiring up to 5 tons of maggots per shipment. Furthermore, marketing through digital platforms like online shops offers a cost-effective solution for increasing sales, reducing the reliance on traditional methods. This research concludes that with improved marketing strategies and support from key stakeholders, BSF maggot cultivation could become a profitable industry while solving the village's waste problem.

Introduction

Waste has become a serious problem along with the increase in population. Indonesia produces around 2 million tons of waste and is expected to increase to 2.59 million tons by 2030. Sustainable Development Goals (SDGs) 12 are the main points related to waste, namely responsible consumption and production. SDGs 12 directs each country to implement policies to manage organic and inorganic waste as a result of residual production (Čičková et al., 2015). In addition, SDGs 15 regarding the environment, namely maintaining terrestrial ecosystems, is also in harmony with waste, which with wise waste management can maintain environmental quality. In addition,

SDGs 17 regarding partnerships to achieve the goals in which implementation in the field requires integration and cooperation from various authorities (Kusnandar, 2022).

Currently, BSF maggot is the best decomposer of organic waste. However, behind its high utility, not many have cultivated and been able to market BSF maggot due to the lack of public interest in BSF maggot (Diener et al., 2011; Hasanah et al., 2023). The Yogyakarta Regional Environment Agency has indeed provided maggot cultivation training in several areas, one of which is in Murtigading Village. In fact, it did not work as it should and many stopped not continuing BSF maggot cultivation after receiving training. People prefer to throw their waste into the private sector to be disposed of in landfills. The reason is the absence of profit prospects (business) so that people have difficulty marketing cultivated maggot and the problem of unpleasant odors in BSF maggot feed (Bapedda DIY, 2022; Dewantoro & Efendi, 2018).

Marketing in the era of globalization that is increasingly accelerating has made marketing through online media such as online shops an option that is in demand by many people. In addition to its flexible users, the goods delivered can get to the appropriate destination address. This is certainly inversely proportional to the conventional method which requires buyers to visit the location where the desired item is located. In addition to wasting a lot of time, effort, and money, of course, it is not uncommon to cause disappointment where the desired item is not found (Chakti, 2019).

The high demand for BSF maggot has become an urgency to intensify marketing through online media. According to an interview with one of BSF's maggot farmers in Yogyakarta, it was found that one of the industries in Surabaya needs a supply of maggot from Yogyakarta of 5 tons. This shows that there is still a lot of potential for BSF maggot marketing that can be expanded. In addition, BSF maggot marketing using online media allows people to sell their maggot without having to own a store directly, of course this will save capital costs.

Based on the BSF maggot marketing problem that we wrote, Murtigading Village has two temporary waste shelters that function as shelters and incineration as well as waste processing sites, especially organic by utilizing BSF maggots. The condition of the existing TPS is decreasing in quality because the performance of waste processing, especially organic waste by BSF maggots, has been stopped due to social problems and limitations in the financing and management aspects of TPS. In addition, the potential role of BSF maggot as a decomposer is not optimally utilized by TPS managers in Murtigading Village (Nayak et al., 2023). In fact, BSF Maggot has the potential to create high-profit business opportunities. Thus, the competitiveness and marketability of BSF maggot in Murtigading Village is constrained and caused by the absence of the BSF maggot marketing program. Later, the public will gain knowledge of BSF maggot marketing through online media and advanced processing to increase the selling value of the product to be marketed. So, the community benefits from the results of the sale of BSF maggot that does not cause odour and the problem of organic waste that accumulates at the TPS can be solved as a result of increasing public interest in BSF maggot cultivation.

This paper aims to formulate an effective strategy in overcoming marketing problems in Murtigading Village, Bantul, related to organic waste through BSF maggot cultivation, providing counselling on marketing, processing, and cultivating BSF maggot, and recommending an integration system between partner companies, the government, and the community. The benefits of this research include increasing social sensitivity and student skills, increasing competence and

employment for the people of Murtigading Village, as well as providing a basis for the government to design training and community empowerment programs for the development of BSF maggot cultivation and efficient marketing strategies.

Materials and Methods

Research Mindset

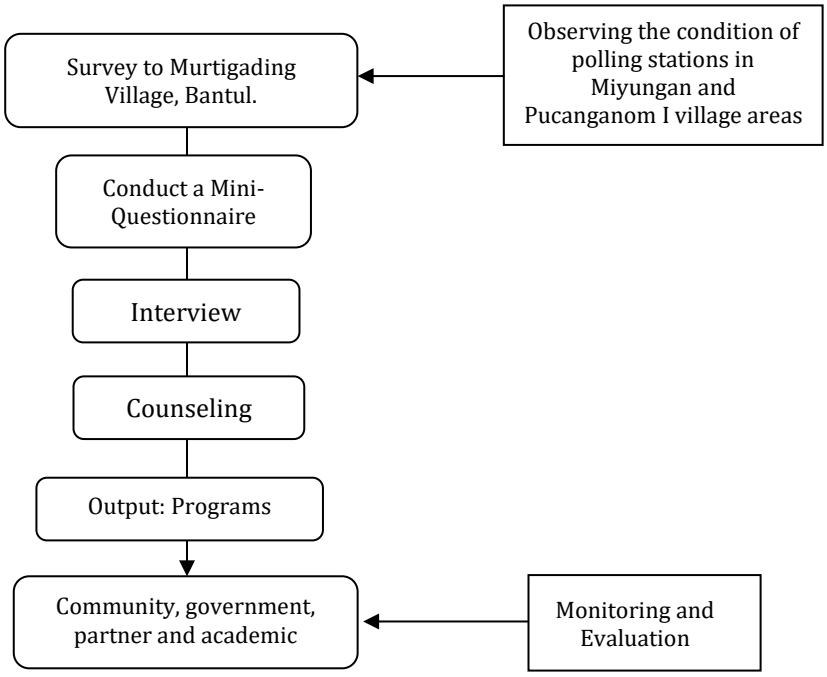

Figure 1. Research Mindset Scheme

Source: Author's Analysis, 2024

Nature of Research

This research is descriptive, namely data is collected in the form of words, pictures, and not numbers. The data produced is in the form of primary data and secondary data. Primary data was collected from interviews with residents and persons in charge of Bumi Murtigading Village, Sanden, Bantul, while secondary data was obtained through journal analysis related to the purpose of writing, namely optimizing the marketing of BSF maggots.

Data Collection Methods

The selected data collection method is as follows:

1. Interview: conducted on all residents and one person in charge of Bumi Desa in Murtigading Village.

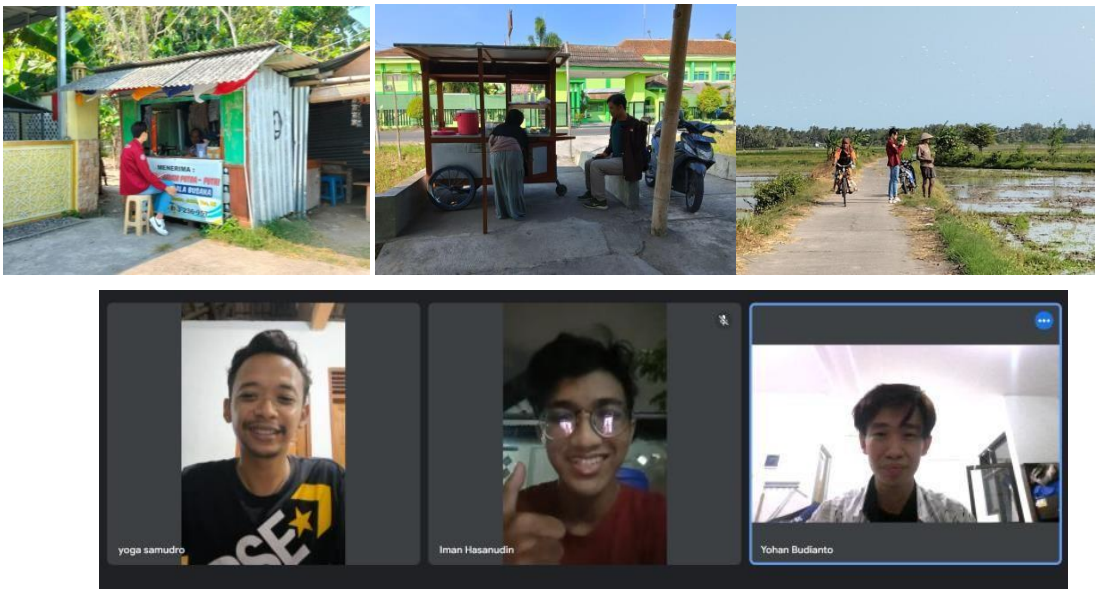

Figure 2. Documentation of Interviews with Residents and PJ Bumi Desa

Source: Author's Documentation, 2024

2. Field survey and documentation: taking pictures of the polling station in Murtigading Village.

Figure 3. Cross-section of TPS Pucanganom 1 (Left) and TPS Mayungan, Murtigading (Right)

Source: Author's Documentation, 2024

Analysis Methods

SWOT Analysis

SWOT analysis is a method to evaluate strengths, weaknesses, opportunities, and threats in social problems in Murtigading Village.

Figure 4. SWOT Analysis Source: Author's Analysis, 2024

Pentahelix Diagram Analysis

A *pentahelix diagram* is a model that describes cooperation between five elements of *stakeholders* in planning. The *pentahelix collaboration* aims to support joint innovation, namely advancing the socio-economic potential of the region (Syahbudi, 2021). The synergy of the five elements is academics, the community, the government, the media, and the private sector. The *pentahelix* diagram formulated to optimize the marketing potential of BSF maggot in Murtigading Village is shown as follows.

Figure 5. Pentahelix Diagram Analysis

Source: Author's Analysis, 2024

Results and Discussions

Murtigading Village is administratively located in Sanden District, Bantul Regency, Special Region of Yogyakarta. Murtigading Village has an area of 4.38 km^2 or 18.91% of the total area of Sanden District, which for every 23.16 km^2 consists of 18 villages and 75 RTs. The population is 8,431 people with a population density of 1,925 per km^2. The majority of the residents of Murtigading Village work as farmers and farm labourers. In addition to being one of the places close to tourist destinations in Yogyakarta, Murtigading Village is also one of the areas that has started to

integrate waste structurally properly and the utilization of organic waste into products that have useful value (Salamah et al., 2022).

The role of BumDes in managing waste in Murtigading Village is very important. As a result of the closure of the Piyungan Landfill, Murtigading Village has anticipated by making a TPS based on homemade incinerators. However, the influence of the smoke is a further problem. BSF maggots are very suitable, if applied in these cases. However, it has not been carried out comprehensively to the community. The BumDes of Murtigading Village has only been studying BSF maggot cultivation independently for about two months and has not yet run because it has not benefited from BSF maggot cultivation, so the BumDes has not been able to spread knowledge for BSF maggot cultivation to the community before getting profits.

When maggots consume different types of organic waste, the maggot's digestive enzymes convert organic matter into simpler forms. This process is called catabolism (Alvarez et al., 2019). Organic waste tends to be short-chained so that the nutrients produced are easily digested and absorbed. After going through the digestive process, the organic matter that has been digested is then converted into pupa, which can be reused as organic fertilizer or can be used as animal feed. So that later the maggot that has been harvested can be processed first or marketed directly and organic waste that is usually only thrown into the landfill and then accumulates causing unhealthy environmental pollution can reduce its volume (Julita et al., 2020; Lee et al., 2018).

The problem of organic waste causes various kinds of impacts that threaten the environment, such as methane gas which is a greenhouse gas that contributes to the climate. In addition, organic waste that accumulates so that it produces methane gas can cause respiratory diseases of people living around the garbage pile and can threaten the economy of the surrounding community due to the unpleasant smell.

Table 1. SWOT Analysis Results

	Strengths	**Weaknesses**
Opportunities	**S-O Strategy**	**W-O Strategy**
	The increase in the cultivation of BSF maggot by the community which will later be processed to improve product quality and marketed through online marketing to expand market reach in order to meet the high demand for BSF maggot	The high demand for BSF maggot can be used by the community as an additional income field through maggot cultivation so that later the government can provide more possible support in continuous training programs or equipment assistance
Threats	**S-T Strategy**	**W-T Strategy**
	The community can practice the knowledge from the author's team for good BSF maggot cultivation so that organic waste for	Government necessary to optimize support for the community to cultivate BSF maggots properly so that they do not
	BSF maggot feed does not cause unpleasant odors and in order to produce quality BSF maggot products so that the smooth marketing of maggot can increase additional income of the community	causing a foul smell in order to increase people's desire for maggot cultivation so that organic waste that often accumulates into pollution in TPS/TPA can reduce its volume

Source: Author's Analysis, 2024

Table 2. Results of Pentahelix Diagram Analysis

No.	Stakeholder	Role
1.	Community	a. Participatory planning and implementation = The community received direction from the government to develop a BSF maggot marketing planning process by involving the participation of the Murtigading community and its implementation. b. Policy evaluation = The subject as well as the object affected by government policies in the implementation of the BSF maggot marketing strategy so that it needs to be assessed/evaluated for the sustainability of the program.
2.	Government	a. Counseling = The results of recommendations and inventions from academics and the private sector, the government is the main actor who goes directly to the Murtigading community to provide BSF maggot marketing management teaching. b. Empowerment = Facilitation of implementative practices for the community with funds from the development budget and regional expenditure. c. Assistance = Responsible for supervising and assisting the community so that the program is on target. Policy regulator = The process of setting formal policies for the direction of BSF's maggot marketing optimization program. d. Policy regulator = The process of setting formal policies for the direction of BSF's maggot marketing optimization program.
3.	Private	a. Increasing financial income = Earning profits from private third parties that will help in handling economic resources for program implementation. b. Initiation of marketing ideas = Innovation of private companies/businesses in the novelty of marketing optimization is needed. c. Increasing financial income = Earning profits from private third parties that will help in handling economic resources for program implementation. d. Initiation of marketing ideas = Innovation of private companies/businesses in the novelty of marketing optimization is needed.
4.	Media	a. Publication of marketing information = Implementation of branding regarding the marketing potential of BSF maggot in Murtigading Village so that the outside community knows and is affected. b. Communication network = Liaison/connection in the process of delivering public policies to the community so that social problems can be solved. c. *Marketplace* = Utilization of digital mass media as a marketing place for BSF maggot to increase the attractiveness of potential buyers/customers.
5.	Academy	a. Marketing model innovation recommendations = Distribution of the implementation of scientific fields for the benefit of the Murtigading community in optimizing the marketing potential of BSF maggots,

	especially animal husbandry, economics, and business management. b. Empowerment = Together with the government to empower the potential of BSF maggot in Murtigading Village. c. Assistance = Together with the government to assist the community in the implementation of the program to optimize the marketing potential of BSF maggot in Murtigading Village.

Source: Author's Analysis, 2024

SWOT Analysis Discussion

The SWOT table in the appendix's analysis shows that BSF maggot has the potential to be a long-term solution for processing organic waste. However, to optimize the marketing potential of BSF maggots, a comprehensive approach to overcoming weaknesses and threats is necessary. Educating the public and strong branding can increase market demand. Adequate infrastructure and strategic partnerships will also support business growth.

Discussion of Pentahelix Diagram Analysis

From the analysis of the pentahelix diagram, it can be found that the relationship and cooperation between five stakeholders in planning the BSF maggot marketing optimization program in Murtigading Village, Sanden, Bantul can be found. The results of the synergy of the roles of each stakeholder can increase the probability of success of the marketing program. The collaboration strategy of the five stakeholders, namely the community, government, the private sector, the media, and academics, can be detailed through the table in the appendix.

Using BSF maggots for organic waste management offers a dual solution to environmental and economic challenges. Several studies have emphasized the efficacy of BSF maggots in decomposing organic waste efficiently. Banks & Lo (2023) argue that BSF larvae can reduce organic waste by up to 50%, transforming it into valuable biomass that can be used as animal feed or compost. This supports the argument that BSF maggot cultivation not only mitigates environmental harm but also provides economic benefits through by-products like animal feed and fertilizers.

The market potential for BSF maggots is another critical aspect to consider. According to Thapa & Schlegel (2021), the demand for sustainable and alternative protein sources for animal feed is growing rapidly, driven by the rising costs of traditional protein feeds like soybean and fishmeal. This aligns with the high demand observed in Surabaya for BSF maggots, which can reach up to 5 tons per shipment. Such figures highlight the commercial viability of BSF maggot cultivation as a profitable business model in the context of sustainable development.

However, the success of this model hinges on community involvement and multi-stakeholder collaboration. As noted by Meijer & Baumber (2024), sustainable business models, particularly in the global South, require strong partnerships between communities, governments, and private enterprises to thrive. This observation underscores the importance of the Pentahelix model applied in this study, which integrates the roles of community members, government, media, private partners, and academics. Through this model, each stakeholder plays a crucial role in ensuring the success of BSF maggot marketing and sustainability.

One of the primary challenges identified in this study is the lack of awareness and education among local communities regarding BSF maggot cultivation and marketing. Wang et al. (2020) argue that community education and capacity-building programs are essential for the long-term success of sustainable waste management initiatives. This is particularly relevant for Murtigading

Village, where more comprehensive outreach and training programs are needed to empower residents to engage in maggot cultivation and capitalize on its economic potential.

In summary, the findings of this research indicate that BSF maggot cultivation can be a highly effective solution for both waste management and economic development, provided that there is adequate community involvement and multi-stakeholder collaboration. The arguments presented by previous studies reinforce the idea that a well-structured approach, incorporating both market strategies and educational initiatives, is necessary for long-term success in this sector.

Conclusion

BSF maggot has immense potential in processing organic waste, enhancing the quality of animal feed, serving as compost, and boosting the immune system of livestock. To optimize cultivation and ensure the sustainability of maggot marketing, it is crucial to align with Sustainable Development Goals (SDGs) 12, 15, and 17, while also supporting the local economy, given the high market demand for BSF maggots. Through community counselling on cultivation and marketing, and integration between the community, partners, and government, this study shows that, with the right strategy, BSF maggots can address not only organic waste issues but also provide significant social benefits by increasing community income in a sustainable circular economy model. Based on the analysis, the authors recommend the following: (1) The Murtigading community should increase participatory involvement in programs initiated by the government and stakeholders; (2) The local government should enhance cooperation by providing necessary facilities and supporting policies for the social and economic welfare of the community; (3) The private sector should strengthen its role in assisting the BSF maggot marketing program until successful implementation is achieved; (4) The media should continuously update and evaluate marketing strategies to ensure the program's success; and (5) Academics should increase research interventions that empower communities through effective collaboration..

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