



Financial Management and Marketing Optimisation of BSF (Maggot) Cultivation for the Empowerment of Housewives

Optimalisasi Tata kelola Keuangan dan Pemasaran Budidaya Lalat BSF (Maggot) untuk Pemberdayaan Ibu Rumah Tangga

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Abstrak

Pengelolaan limbah organik dapur di kawasan padat penduduk seperti Kelurahan Mlatiharjo, Semarang Timur, menghadapi tantangan penumpukan sampah, bau tidak sedap, dan ketergantungan pada TPA dengan biaya transportasi tinggi. Program pengabdian ini bertujuan untuk meningkatkan kemampuan ibu rumah tangga dalam mengelola keuangan dan pemasaran usaha budidaya BSF secara efektif untuk mendukung pemberdayaan ekonomi rumah tangga dan keberlanjutan komunitas. Pendekatan partisipatif-aplikatif diterapkan melalui penyuluhan, pelatihan teknis, serta pendampingan intensif tata kelola keuangan dan pemasaran digital. Monitoring dan evaluasi menggunakan pendekatan mixed methods dengan desain pre-post intervention dan observasi. Hasil evaluasi menunjukkan capaian pelatihan dan pendampingan dalam aspek pemahaman kondisi keuangan, pengelolaan transaksi keuangan, pemanfaatan aplikasi keuangan, pengelolaan konten promosi, dan optimalisasi website sebagai media pemasaran mencapai 70%–75% yang termasuk dalam kategori cukup baik.

Keyword: budidaya maggot BSF, Tata_kelola keuangan, Pemasaran digital, Ekonomi sirkular

Abstract

The management of kitchen organic waste in densely populated areas, such as Mlatiharjo village in East Semarang, faces challenges including waste accumulation, unpleasant odors, and reliance on landfills, which entails high transportation costs. This community service program aims to enhance housewives' ability to effectively manage the finance and marketing of black soldier fly (BSF) farming businesses to support household economic empowerment and community sustainability. A participatory-applied approach was implemented through outreach, technical training, and intensive mentoring on financial management and digital marketing. Monitoring and evaluation utilized a mixed-methods approach with a pre-post intervention design and observation. Evaluation results indicate that the success rate of training and mentoring in the areas of understanding financial conditions, managing financial transactions, utilizing financial applications, managing promotional content, and optimizing websites as marketing tools reached 70%-75%, which falls into the "fairly good" category.

Keyword: BSF maggot cultivation, finansial management, digital marketing, circular economy.

1. Introduction

The management of household organic waste is one of the main challenges in densely populated urban areas, including in Indonesia. Data from the National Waste Management Information System (SIPSN)[1] shows that Central Java ranks fourth in terms of waste generation in Indonesia, reaching 1.311.314,51 tonnes per year or 3.592,64 tonnes per day, with municipal waste production reaching 544,36 tonnes per day. With household waste being the largest source at 56,74%, and only 30% of waste being managed. This means that 70% is not being properly managed, which will accumulate in landfills, producing leachate, methane gas, hydrogen sulphide, ammonia, and other volatile compounds that pollute the air, soil, and water. This situation is exacerbated by the limited capacity of landfills and the high cost of waste transportation, which can reach 60-70 per cent of the total municipal waste management budget.

Mlatiharjo Village in East Semarang subdistrict is a densely populated area covering 64,71 hectares with a population of 4.886 people divided into 6 community units (RW) and 41 neighbourhood units (RT) [2]. The majority of residents work as civil servants, industrial and construction workers, and pensioners. The main problem faced by residents is the accumulation of kitchen organic waste, which causes unpleasant odours, attracts pests (flies, cockroaches, rats), and degrades the quality of the residential environment. On the other hand, community awareness and knowledge about how to process organic waste independently are very low. Black Soldier Fly (*Hermetia Illucens*) or BSF maggot farming offers a simultaneous solution to organic waste and household economic problems. BSF larvae are saprophagous, capable of consuming various types of organic waste (vegetable scraps, fruit, rice, eggshells, livestock manure, and agro-industrial residues) with a dry mass reduction rate of 50-70 percent within 3-7 days, much faster than conventional composting, which takes weeks[3], [4]. BSF larvae also produce enzymes that accelerate decomposition without causing foul odors, and can suppress pest populations by competing for organic substrate[5].

From a nutritional perspective, BSF larvae contain 30-53 percent crude protein and 8-47 percent fat based on dry matter, making them a high-protein alternative feed source for fish, poultry, and other livestock[6], [7]. The high price of conventional high-protein feed makes BSF maggots an economical solution for farmers and a business opportunity for maggot breeders. In addition to larval biomass, BSF cultivation produces a by-product called frass, which can be used as an organic fertilizer rich in nitrogen, phosphorus, and potassium [5], [8]. [9] modeled the financial feasibility of BSF-based waste processing units in Surabaya, Indonesia, using three scenarios: fully centralized, centralized breeding with decentralized treatment. The results of the analysis show that small to medium-scale BSF units can achieve a positive Net Present Value (NPV) if designed with the right business model, especially if the product sold is larvae (Larvae oil), which has a higher value than fresh larvae. The decentralized scenario also provides social benefits in the form of local job creation and reduced waste transportation costs [10].

Meanwhile [11] and [12]state that the development of BSF at the community level by smallholder farmers can create an inclusive business model that improves community welfare. Community-scale BSF units require simple skills, low capital, and limited land, so they can be run by vulnerable groups with limited educational backgrounds. The success of community maggot businesses is largely determined by business model design, product pricing, and appropriate marketing capabilities. [5], [13] have confirmed that in a comprehensive review, BSF has a wide range of applications in industry and agriculture, including waste bioconversion, animal feed production, chitin and chitosan extraction, biodiesel and biogas production, entomoremediation of organic pollutants and heavy metals, and the use of frass as organic pollutants and heavy metals, and the use of frass as organic fertilizer. This specific fact reinforces the argument that BSF maggot cultivation at the community level, such as in Mlatiharjo Village, is not merely a technical solution for waste management, but also a gateway to a broader and more sustainable agribusiness value chain.

BSF cultivation is increasingly recognised as an innovative solution in organic waste management that is not only environmentally friendly but also has the potential to provide direct economic benefits for micro-businesses and households. [14], [15] proves that BSF cultivation training contributes to increasing the community's knowledge and skills in organic waste management while also opening up business opportunities with economic value (e.g., animal feed and larval marketing). Additionally, optimising the marketing of BSF farming products is a crucial aspect for increasing household income through economic diversification for homemakers.

Housewives often play the role of primary managers of organic waste in the household as well as micro-entrepreneurs in local economic activities. However, limited knowledge about business financial management and product marketing hinders the optimisation of their income. Many empowerment programs show that good financial management and marketing strategies can increase business productivity and the long-term economic sustainability of families [15].

The Mlatiharjo sub-district has taken the initiative in environmental management through a herbal village program in RW 04 that utilizes household waste. Housewives who are members of the village's Family Empowerment and Welfare Organization (PKK) have a strong desire to manage waste into useful items and a source of additional income. In addition, PKK members are now cultivating maggots, having previously received training in maggot cultivation, from the technical aspects of producing maggot eggs to producing maggots that are ready for sale.

Although the women of the Mlatiharjo PKK have begun raising black soldier fly (BSF) maggots following initial training and have produced market-ready larvae, critical gaps are hindering the scale and sustainability of the business: (1) a lack of professional financial management and marketing; and (2) an informal institutional structure without a collective PKK business entity for centralized management. This gap has prevented the full realization of the potential for a 50-70% reduction in waste and the generation of income from fish feed and livestock farming.

This community service initiative offers an integrative approach through a holistic BSF community value chain: managerial digitization in finance and marketing, and a business-based PKK model. Unlike previous fragmented programs, this approach adopts the model proposed by [9] with a focus on women's empowerment, addressing a gap in rural/industrial BSF studies [5].

Based on the above description, the main issues addressed by this community service activity are: how to improve housewives' ability to manage the finances of their black soldier fly (BSF) farming businesses more efficiently and sustainably; and how to optimize marketing strategies for BSF farming products to expand market reach and increase the economic value of the products. Meanwhile, the objective of this community service activity is to improve the ability of housewives to effectively manage the finances and marketing of BSF farming businesses for the economic empowerment of households and the sustainability of the community.

2. Materials And Method

This community service activity was designed using a participatory and applied approach, with the stages of the activity as presented in Figure 1.

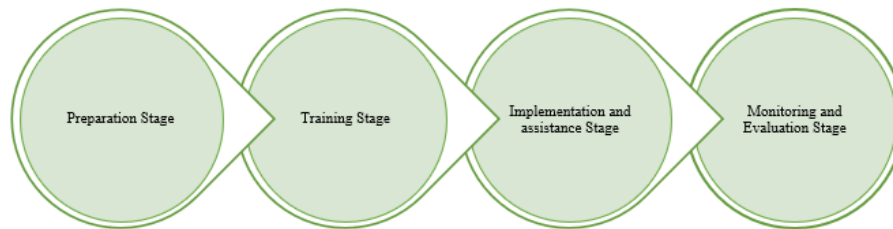


Figure 1. Stages of service implementation

The community service program consists of four phases: the preparation phase, the training phase, the implementation and mentoring phase, and the monitoring and evaluation phase. This program employs a pre-post intervention design. A pre-test was conducted during the preparation phase to establish a baseline, involving coordination between the community service team and the partner (the PKK of Mlatiharjo Village), as well as a survey of the current state of maggot farming operations in the field.

In the next phase, the team conducted the program through training, implementation, and the mentoring phases, carried out intensively over three months, followed by a post-training evaluation (post-test) to measure significant changes. Understanding and achievement were assessed by comparing the partners' practices with the agreed-upon competency standards, calculated as a percentage of achievement.

The data collection instruments consisted of semi-structured interviews and structured observation sheets. Semi-structured interviews were conducted with the administrators and members of the Mlatiharjo PKK both before and after the intervention. The outline of interview questions related to understanding the financial condition of the business included: (a) cash receipts, cash disbursements, assets, liabilities, capital, revenue/sales, and expenses; (b) the concepts of cost of goods sold (COGS) and profit margin; (c) the ability to identify the financial position of both individuals and the PKK organization.

Direct observations were conducted before and after the mentoring sessions using a checklist covering four technical domains, including financial transaction management, implementation of Bank Indonesia's SI_APIK application, management of promotional content, and website optimization. Interview and observation data were analyzed using thematic content analysis to triangulate findings.

3. Results And Discussion

3.1 Overview of the PKK Organization in Mlatiharjo Village, Semarang

The Family Empowerment and Welfare (PKK) of Mlatiharjo urban village is a family empowerment group that actively develops two main potentials in its area, namely herbal villages and maggot cultivation, as part of the sustainable family environment and economy movement. Through these two programs, PKK not only focuses on social activities and family development but also on environmental management, utilization of small plots of land, and strengthening the economic independence of residents.

The herbal village in Mlatiharjo was developed based on the concept of integrated organic farming in harmony with nature, which encourages residents, especially PKK mothers, to plant, care for, and utilize various medicinal plants in their residential environment. The existence of this herbal village supports a healthy lifestyle based on medicinal plants, beautifies the environment, and serves as a medium of education for the community on the use of herbal plants as a preventive health measure for families.

On the other hand, PKK Mlatiharjo has developed as a family empowerment group that is not only active in social and community affairs, but also innovative in managing organic waste through the cultivation of maggots (Black Soldier Fly/BSF larvae) that have economic value. The involvement of PKK mothers in this activity has made maggot cultivation an environmental and household economic movement that is integrated with village programs and university collaborations.

The maggot cultivation program at PKK Mlatiharjo began with community service and training activities provided by a team of lecturers and partners, who introduced maggots as a solution for managing organic kitchen waste and as an additional source of income for families. This activity includes socialization of organic waste management, technical training in maggot cultivation, provision of facilities such as maggot houses, and ongoing assistance so that PKK mothers are able to manage the production cycle independently and sustainably.

Over time, maggot farming in the Mlatiharjo PKK community has not only served as a waste reduction activity but has also become part of the circular economy ecosystem in the village. Maggot products are used as animal feed and a source of protein, while farming residues can be used as organic fertilizer, thereby supporting family food security and urban farming in the area. Through synergy between the PKK, the village government, and universities, the Mlatiharjo PKK now has a reputation as a PKK group that is adaptive to environmental issues and capable of developing productive businesses based on maggot cultivation and household organic waste management.

As the PKK organization in Mlatiharjo village grows, it needs to strengthen its financial management and marketing more systematically. Currently, economic activities are based on volunteerism and mutual cooperation, but they are not fully supported by a financial recording system, cost management, and an integrated marketing strategy that can optimize the economic value of PKK products.

3.2 Preliminary survey as community service database

This community service project began with a survey of the partners' needs to serve as a database for the project. The survey results are presented in Table 1.

Table 1. Survey results on financial and marketing literacy

Mentoring Aspect	Survey Method	Results
Understanding of financial conditions	Interviews and discussions	40% (Low)
Understanding transactions	Review of simple cash books	30% (very low)
Understanding financial applications	Review of records in financial applications	Unfamiliar with financial applications
Content management	Observation of direct practices	Not yet capable
Utilization of websites as a promotional medium	Website monitoring	Only aware of it, but has never used it

Survey results indicate that PKK mothers' knowledge regarding business conditions, financial record-keeping practices, and digital marketing remains limited. In light of these findings, the community service program prioritizes financial management and marketing strategies for maggot farming. Financial management for maggot farming covers basic accounting principles, transaction recording, production cost calculation, and the preparation of digital financial reports. The financial record-keeping material focuses on the use of a free application from the Bank of Indonesia called SI APIK, which is practiced during the training. Meanwhile, the marketing strategy focuses on website creation and its operation.

3.3 Implementation of Financial Training using the Si-APIK application

The implementation of financial management training and mentoring for the Mlatiharjo PKK focused on strengthening the capacity of PKK women in managing maggot farming businesses professionally and sustainably. The financial training used the SI APIK application, which is a free application from Bank Indonesia. The training was held on October 2, 2025, using an interactive workshop method involving 24 PKK members who manage maggot farming. The main material was delivered by Dr. Aida Nahar, SE, M.SI, AK, CA, covering daily transaction recording using the SI APIK application, calculating the cost of maggot production (consisting of organic feed, BSF seeds, and labor costs), and reading monthly financial reports. Participants were taught to calculate the maggot production cycle and determine competitive selling prices based on production costs of Rp. 15,000/kg with a profit margin of 30-40%.

Financial recording training using the SI APIK application, which is a free application from Bank Indonesia for MSMEs in Indonesia. SI APIK can be used via Android, which offers easy access for new users through the official Bank Indonesia website. The registration process is quite simple, starting with filling in personal data such as full name, national identification number, e-mail address, and creating a secure password. The clear and systematic registration steps enable rapid technology adoption among new users. SI APIK is a financial information recording application developed by Bank Indonesia specifically for MSMEs and micro businesses such as the PKK Mlatiharjo maggot farming business. This mobile application is

designed to be simple and user-friendly, enabling digital financial recording without the need for a continuous internet connection, making it suitable for PKK groups with basic digital literacy.

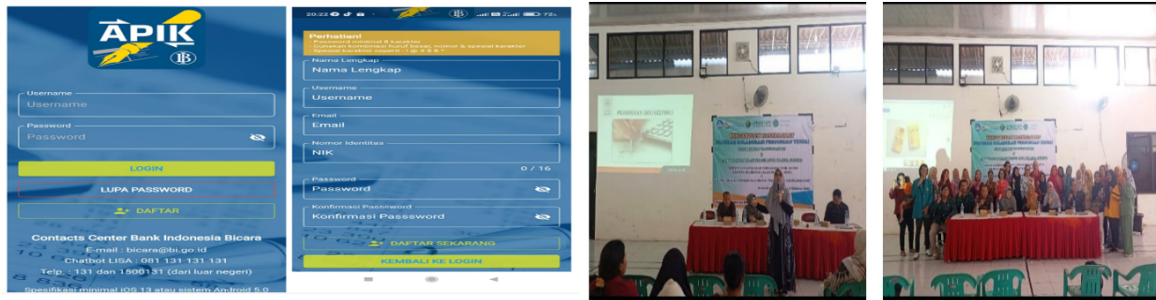


Figure 2. SI APIK Financial Application (Source: bi.go.id/siapik) and Financial Management Training Documentation

The application provides a data menu for processing business information (goods, customers, suppliers, and assets), a transaction menu for recording cash inflows (maggot sales) and cash outflows (purchases and operational payments); and a report menu that automatically generates balance sheets, income statements, cash flows, and financial trend analyses in accordance with the financial accounting standards for micro, small, and medium entities (SAK EMKM). Additional features include accounts receivable and payable management, opening balances, and budgeting, which make it easier for PKK to separate business and personal finances and plan for reinvesting profits.

SI APIK replaces error-prone manual recording with a structured system that improves transparency and accountability among group members. The digital financial reports generated become official documents for applying for loans from banks, cooperatives, or government empowerment programs, while also meeting Bank Indonesia's financing requirements for MSMEs to "move up a class." For short-cycle businesses such as maggot farming, the application enables real-time monitoring of financial positions and quick decision-making related to production or marketing.

The financial management training session using Bank Indonesia's Si-APIK app at the Mlatiharjo Sub-district Office took place in a solemn yet enthusiastic atmosphere. The PKK women attended the training by opening the app on their own smartphones. Their eyes were fixed intently on the projector screen displaying the app's dashboard. Participants practised data entry through case simulations provided by the training team. Following the training, which adopted a real-world case approach, participants are expected to be able to implement the application independently using transaction data from their respective maggot farming businesses.

3.4 Marketing Training Implementation

The implementation of marketing training and assistance for PKK Mlatiharjo focused on strengthening digital and conventional strategies to market maggot cultivation products as a sustainable business. The training was held on October 2, 2025, attended by 24 PKK members who cultivate maggots. The training was delivered by Dr. Ali, SE, MM and Fatchur Rohman, SE, M.Si, covering topics such as packaging, Instagram and WhatsApp Business content, and websites to promote maggots as premium animal feed.

The maggotsemarang.com website was created by a dedicated team and launched on September 9, 2025, with an average of 30 visitors per month. This simple website has five main pages, namely Homepage (the default page used to attract visitors and inform them about the website's content), About Us (PKK Mlatiharjo profile), Product and Service (contains the types of products sold: fresh maggots, dry maggots, and BSF eggs), Gallery (photos of the cultivation process and product photos), and Contact Us (contact for orders integrated with a WhatsApp chat button for direct orders). The packaging design and the marketing strategy training documentation is presented in Figure 3, and the website is presented in Figure 4.

The digital marketing training session for maggot products at the Mlatiharjo Village Hall was conducted with great vigour and enthusiasm. All participants carefully studied the website www.maggotsemarang.com whilst engaging in intensive discussions about the existing content and formulating constructive suggestions for improvements. In addition to evaluating the website content, the training also provided practical guidance on creating and managing promotional content on Instagram to support a multi-channel marketing strategy.

3.5 Assistance with Financial Management and Website Administration

Financial assistance, management and website management activities are the next steps in the community service program, which aims to strengthen the managerial and digital marketing capacities of PKK women in developing sustainable maggot farming businesses. This assistance is designed to ensure that the knowledge and skills acquired through training can be consistently applied in daily business practices.

Financial management assistance focuses on the implementation of simple, accountable, and sustainable financial recording. The service team assists participants in operating their finances through the Bank Indonesia SI APIK application. Assistance is provided directly using actual transactions that have already occurred so that participants can understand and apply financial management practices in accordance with the conditions of the maggot farming business they are running.



Figure 3. Packaging design and Maggot Marketing Strategy Training

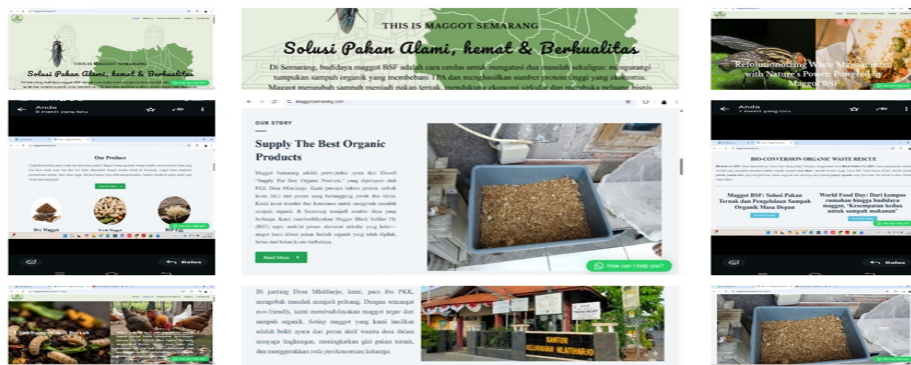


Figure 4. Website maggots Semarang.com

In addition to financial aspects, the assistance also includes website management as a means of information and digital marketing for maggot farming businesses. Participants are assisted in learning about website functions, simple content management, and the use of websites to introduce products, farming activities, and business contact information. This assistance aims to increase business visibility and expand marketing reach through easily accessible digital media.

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The assistance was provided both online and offline. Online assistance was provided via WhatsApp, both through chat and phone calls. Meanwhile, offline assistance was provided on November 24, 2025, in Mlatiharjo Village, Semarang. At the same time as the assistance, the community service team handed over product packaging and labels as well as equipment in the form of an electric oven to produce dried maggots. Additionally, the service team also handed over website management and intellectual property rights (IPR) of the website to the partner (PKK Chairperson).

Mentoring activities make a significant contribution to the sustainability of maggot farming businesses. The integration of effective financial management and the utilization of digital technology is expected to enhance business professionalism, expand market reach, and foster the long-term economic independence of the community. As stated by [16], [17], [18], [19] Corporate digital transformation enhances corporate governance, leading to increased business professionalism and sustainable practices. By utilizing digital technology, companies can reduce information asymmetry and enhance innovation capabilities, ultimately supporting market expansion and economic independence.

3.6 Monitoring and Evaluation

Monitoring and evaluation were conducted through direct surveys, interviews, and discussions with PKK Mlatiharjo members during the assistance period. The results of the observations and interviews are summarized in Table 2.

Table 2. The results of the monitoring and evaluation of governance and website management assistance

Mentoring Aspect	Evaluation Indicator	Evaluation Method	Achievements and categories
Understanding of financial conditions	The participants can explain the financial position of the business.	Interviews and discussions	70% (Fairly Good)
Understanding transactions	Participants record transactions	Simple cash book audit	75% (Good)
Understanding financial applications	The PKK treasurer records the data in the application.	Recording checks in financial applications	70% (Fairly Good)
Content management	PKK admins can update website content independently	Direct observation of practice	75% (Good)
Utilization of websites as a promotional medium	The website is used to display products and business information	Website monitoring	75% (Good)

From the results of monitoring and evaluation, it appears that the financial management of PKK mothers is still quite good. Commitment to record-keeping and disciplined record-keeping habits are key to successful financial management. In addition, content management and website utilisation are already good.

4. Conclusion

The community service programme aimed at empowering women from the PKK (Family Welfare Movement) in Mlatiharjo Sub-district through Black Soldier Fly (BSF) maggot farming successfully improved the knowledge, technical skills, and managerial capacity, particularly in finance and digital marketing, by approximately 70%-75% in managing kitchen organic waste as a source of additional income. Extension services, practical training, and guidance on financial management and digital marketing have brought about a paradigm shift from viewing waste as a burden to an economic asset, with the establishment of an independent and professional PKK business entity using the Bank Indonesia Si-APIK application and website maggotsemarang.com. The next community service agenda includes strengthening business sustainability through monthly monitoring for six months after the program, laboratory-quality testing of maggot and cashew products for livestock feed certification, and developing a website and official social media accounts for the Mlatiharjo PKK business entity. The follow-up program will focus on product diversification (protein flour, kasgot fertilizer), market expansion to local fish farmers and livestock breeders through a Memorandum of Understanding (MoU) with local farmer groups, and replication of the model to other neighborhood units (RW) in Mlatiharjo Village and neighboring villages.

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