

# Community empowerment in the production of dry maggots in Dirgantara Village in Yogyakarta

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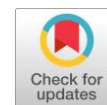
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## ABSTRACT

This study examines a community empowerment initiative in Dirgantara Village in Yogyakarta that focuses on producing dry maggots to address challenges in waste management and economic development. The project targets the issue of organic waste by using maggots, specifically the larvae of the Black Soldier Fly, to efficiently decompose organic material. This method not only mitigates environmental pollution but also creates a valuable product that can be sold as animal feed, offering a sustainable income source for the community. The initiative uses a problem-based learning approach, engaging local residents through educational workshops and practical demonstrations to improve their understanding and skills in organic waste management. Results show a significant increase in community members' understanding and awareness of sustainable waste practices. The Dirgantara Village project demonstrates how integrating innovative and sustainable practices can effectively address ecological challenges and enhance economic prospects, serving as a model for other communities facing similar issues.



## KEYWORDS

Dry maggot  
Organic waste  
Black soldier fly  
Maggot  
Ecological challenges



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## 1. Introduction

Waste is a problem that has not been resolved until now. The waste problem does not only occur in Indonesia, but also internationally. Population growth, changes in consumption patterns, and people's lifestyles affect waste production [1], [2]. Indonesian people lack awareness of managing waste. As evidence, research shows that 70% of the total waste in urban areas is not fully handled [3]. The Special Region of Yogyakarta as one of the student cities in Indonesia also has a persistent waste problem. Sleman Regency is the second largest waste contributor after the city of Yogyakarta in the Piyungan landfill [4]. The study results also stated that more than 32% of people have bad behavior in managing waste [5].

Waste problems are also experienced in the environment of this Community Service activity partner. The partner of this activity is the Dirgantara Asri Village Community which is located in Jragung hamlet Jogotirto Subdistrict Berbah Sleman, Special region of Yogyakarta. Partners do not have a sustainable program related to the problem of waste in the surrounding environment, both organic and inorganic waste. The partner and all residents of Dirgantara Asri village need to have the awareness and commitment to think about the waste problem [6], [7]. Several reports have shown that community associations in certain neighborhoods can be involved in waste management in the community, for example, waste banks [8], implementing the "Muse (Let's Turn Waste into Eco-Enzyme)" method [9], as well as processing organic waste with BSF maggots [10]–[12].

Partners have a strong future program in waste management, although it has not fully received a good response from residents. For example, the behavior of people who still do not have an awareness in managing waste healthily. In addition, the absence of a healthy organic and inorganic waste management system also adds to the problems in the environment. One of the phenomena of poor waste management in the partner's environment is the disposal of waste by officers who take care of waste out of place, namely in puddles adjacent to the OPAK river. Moreover, the closure of the Piyungan landfill adds to the

complexity of this problem. This condition triggers the dumping of waste in the river when it rains heavily. Another phenomenon that occurs in the partner neighborhood is that some residents prefer to throw garbage directly into the river. These behaviors have an impact on the sustainability of the river ecosystem and even trigger flooding [13].

The activity partner has a profile that is linear with the proposed Community Service activity, which is related to waste management. The RT management in Dirgantara Asri village as an organizational forum for driving community activities has a mission to support aspects of cleanliness, religiosity, security, environmental development, and cadre. The hygiene aspect leads to programs on waste management. The waste bank is a future aspiration program, and has been initiated before, but has not run optimally. The current program is Sedekah Sampah, a program that focuses on inorganic waste management. The program has generated income for partners and is used for youth organization activities. Because the focus is mostly on inorganic waste, organic waste has not been well utilized. Currently, organic waste accounts for more waste than inorganic waste.

The partner wishes to complement the waste management program, especially organic waste. Maggot cultivation is one of the partner's goals to reduce the burden of organic waste at the partner location. Organic waste from food waste is a good material for maggot development [14], [15]. In an effort to increase marketability, the maggot will be dried and packaged properly [16]. Marketing of various media is carried out so that maggot is well distributed and provides additional income for partners.

The purpose of this Community Service activity is to increase the understanding of residents around partners in waste management and partner skills in organic waste management systems. The understanding of residents around partners in waste management correlates with the success of partners in implementing a waste management system [17]. Residents' understanding of waste management can take the form of a commitment to choose organic and inorganic waste, actively participate in the waste alms program, and manage household waste healthily. Understanding about the waste management system in the partner's environment is important to reduce the burden of the Piyungan landfill to accommodate waste that reaches 40 tons per day. There are at least four high risks of Piyungan landfill management: air pollution, groundwater pollution, reduced environmental aesthetics, and surface water pollution.

The waste management raised in this Community Service activity is "Dry maggot production through inorganic waste alms program." This program educates residents to donate organic waste as food for maggot development. Almsgiving waste is one of the suitable strategies and has succeeded in minimizing the critical phase of the waste burden in the community [18]. In a certain period, the partners collect maggots and dry them with a drying machine. Drying the maggot adds value to the sales, so that the partner's income will be maximized [19]. The dried maggot is packaged and marketed to increase the income of Community Service partners. The income of Community Service partners can serve as an economic driver for various purposes.

The focus of Community Service activities is to empower partners to be skilled in managing the organic waste alms program. The forms of activities to improve partners' skills in managing the organic waste alms program are counseling, tool introduction, tool making, and mentoring. With the Community Service activities aimed at increasing partner awareness and skills in the organic waste alms program as a basis for dry maggot production, it is hoped that it can answer partner problems related to organic waste.

## 2. Method

The Community Service activity entitled "PKM Production of Dried Maggot in the Organic Waste Alms Program in Dirgantara Asri Village" is a partner group that is not economically productive. The partner problems raised in this Community Service activity are in the field of environmental health. The proposed Community Service is a driving force to reduce organic waste production that cannot be utilized properly. Community Service materials cover the nature of maggots, the advantages of dry maggots, the production process of dry maggots, the social environmental impact, and the marketing of dry maggots. Problem based learning is the method we use in this community service activity.

Community Service activities that have been arranged above cannot produce a significant impact if the support from partners is not maximized. Therefore, partners in this Community Services activity are committed to actively participating in the activity. Partners as empowered parties have active participation as participants, facilitating the activity site both preparation and implementation, organizing activities, and up to the commitment to continue the dry maggot production program based on organic sampag alms

complete. Partners are also committed to providing a waste alms house, which is the center for dry maggot production.

Monitoring and evaluation is one of the parts implemented in this community service. Monitoring and evaluation of Community Services activities were carried out by testing partners' understanding of the dried maggot production program within the organic waste alms program. This method aimed to measure the increase in partners' understanding of the dried maggot production program in the organic waste alms program. By comparing the test results before and after their involvement, we were able to determine the effectiveness of the training sessions and the overall impact of the program on enhancing their capabilities.

### 3. Results and Discussion

Community service activities begin with the initial step in the form of coordination of implementation. This coordination process is not only carried out among the team members themselves, but also involves partners involved in the activity. This step is important to ensure that all parties have the same understanding of the objectives and plans for implementing activities, so that no miscommunication can hamper the service process. In this first activity, the team also took measurements of the initial knowledge of partners for dry maggot. The first activity is shown in Fig. 1 below.



Fig. 1. Planning of community service activities

After the coordination process is completed, the team then continues with the implementation of the activities in accordance with the plan that has been prepared. The main focus of this service activity is to provide in-depth knowledge of dry maggot production to partners. It is hoped that this knowledge will be a strong basis for fostering the enthusiasm and motivation of partners in carrying out dry and sustainable dried maggot production, so as to improve their welfare. The second activity is shown in Fig. 2 below.



Fig. 2. Implementation of community service activities

At the activity stage, the community service team not only introduces theory, but also implements a simulation of the practice of aquaculture and drying Maggot. Through this simulation, partners get a direct

understanding of each step in the Maggot production process, ranging from preparation of raw materials, regulating ideal environmental conditions for maggot growth, to effective harvesting techniques. In addition, the Maggot drying simulation allows partners to learn the right method to reduce the water content in Maggot so as to produce a final product that is more durable and has a high selling value. With this practical experience, Mitra is expected to be able to develop the ability to be independent in managing the Maggot cultivation business. The simulation activity is shown in Fig. 3 below.



**Fig. 3.** Simulation of Cultivation and Maggot Drying

The final stage of this series of activities is an evaluation, where the team evaluates the effectiveness of the activities that have been carried out. This evaluation is carried out by spreading a test of understanding to partners to measure the extent to which their knowledge increases after following the socialization and getting information about dry maggot. The results of this evaluation are very important to see the success of the program and as a material consideration for improving future activities. The third activity is shown in Fig. 4 below.



**Fig. 4.** Evaluation of community service activities

At the evaluation phase, we succeeded in collecting data relating to the extent to which partners understand the theme of service to the people that have been appointed. The data obtained is used to measure the effectiveness of the service program and helps us determine the area that needs to be improved. Thus, this evaluation not only assesses the level of understanding of partners but also becomes the basis for future program improvement. Evaluation data can be described in Table 1 below.

**Table 1.** The data of the pre-test and post-test

Subject	Data pre-test	Kategori	Data post-test	Category	Gain
1	6	Medium	10	High	4
2	5	Medium	9	High	4
3	3	Low	8	High	5
4	4	Low	9	High	5
5	5	Medium	7	High	2



Subject	Data pre-test	Kategori	Data post-test	Category	Gain
6	4	Low	7	High	3
7	3	Low	6	High	3
8	4	Low	7	High	3
9	4	Low	8	High	4
10	4	Low	9	High	5
11	3	Low	8	High	5
12	5	Medium	7	High	2
13	6	Medium	7	High	1
14	5	Medium	7	High	2
15	4	Low	8	High	4
16	3	Low	6	Medium	3

Table 1 was analyzed using Wilcoxon Signed Rank Test. Testing results in data success data activities to increase partner understanding of the cultivation and drying of maggot. The Wilcoxon Signed Rank Test test is assisted by using the SPSS program and the results are translated in Table 2 below.

**Table 2.** The results of analysis of wilcoxon signed rank test

	Posttest - Pretest
Z	-3.536 <sup>a</sup>
Asymp. Sig. (2-tailed)	.000

In this section, interpreted the results of the analysis outlined in Table 2. Based on the results of the calculation of the Wilcoxon Signed Rank Test, the z value obtained is -2.731 with p value (Ashmp. SIG 2 Tailed) of 0,000 which is less than the critical limit of research 0 , 05. These results show that the hypothesis decision means that there is a significant difference between the pretest and posttest groups. Post-test data shows a better level than pretest, so the community service program is concluded to be successful in increasing the understanding of partners for the cultivation and drying of maggot.

The community empowerment initiative in Dirgantara Village, focused on producing dry maggots, is a major advancement in addressing waste management and boosting economic development. By turning organic waste into valuable resources, this project offers a practical and eco-friendly solution to the problem of waste accumulation [20]–[23]. It not only helps reduce waste but also provides economic benefits by creating new income opportunities for residents through the sale of maggots [24], [25]. This initiative demonstrates how sustainable practices can be integrated into community life, promoting environmental sustainability and economic growth simultaneously. As a result, it serves as a model for other communities looking to address similar challenges.

The persistent issue of waste management in Indonesia, particularly in urban areas, is exacerbated by rapid population growth, changes in consumption patterns, and lifestyle shifts. Dirgantara Village faces these challenges acutely, as improper waste disposal practices have led to environmental degradation, including pollution of local waterways. This program addresses the need for sustainable waste management solutions by focusing on organic waste, which often goes unutilized and contributes to environmental issues such as water pollution and ecosystem disruption [26], [27].

Maggot cultivation, specifically using the larvae of the Black Soldier Fly, presents an innovative approach to organic waste management. Maggots are highly efficient decomposers, capable of breaking down organic waste rapidly and transforming it into valuable biomass [28]. This process not only reduces the volume of waste that must be managed but also produces a high-protein feed supplement that can be used in animal husbandry, thereby closing the loop in organic waste management [29]. The program in Dirgantara Village aims to educate and empower local residents to utilize maggot cultivation as a means of reducing the organic waste burden. By teaching community members the skills needed to cultivate and process maggots, the project not only tackles the waste problem but also creates an opportunity for economic empowerment.

A key aspect of the program's success is its focus on community engagement and education. By involving residents in every step of the process, from waste collection to maggot cultivation and drying, the program ensures that the community is fully invested in its success [30]. Educational workshops and practical demonstrations are crucial components, as they equip residents with the knowledge and skills needed to sustain the initiative independently. The program's educational component emphasizes the importance of distinguishing between organic and inorganic waste, a critical skill for effective waste management. By fostering a deeper understanding of waste segregation, the program not only improves current practices but also lays the groundwork for more comprehensive waste management solutions in the future.

Despite its successes, the program faces several challenges. Cultural perceptions of waste and maggots may hinder participation, and ongoing education is necessary to shift these perceptions. Furthermore, scaling the program to reach a wider audience requires additional resources and support. However, these challenges also present opportunities for innovation and growth. By developing partnerships with local governments, educational institutions, and non-governmental organizations, the program can expand its reach and impact. Additionally, integrating technology, such as mobile applications for waste tracking and management, can enhance the program's efficiency and appeal.

#### 4. Conclusion

In conclusion, the community empowerment initiative in Dirgantara Village through dry maggot production demonstrates the transformative potential of sustainable waste management practices. By turning waste into a resource, the program not only addresses environmental concerns but also creates economic opportunities for the community. Through education, engagement, and innovation, this initiative sets a precedent for other communities facing similar challenges, highlighting the importance of integrated approaches to sustainable development.

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