SOCIALIZATION OF THE BLACK SOLDIER FLY (Hermetia illucens) UTILIZATION AS COMPOST AND ENVIRONMENTALLY FRIENDLY ANIMAL FEED TO FARMERS IN DISASTER PRONE ZONE, BENJOT VILLAGE, CIANJUR

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ABSTRACT

Focus this activity is on the use of Black Soldier Fly (BSF) (Hermetia illucens) as compost and environmentally friendly animal feed for farmers in disaster-prone zones, in Benjot Village, Cianjur. The purpose of this activity is to increase the knowledge and understanding of farmer group partners in the use of BSF biotic components to increase environmentally friendly agricultural and livestock production and to increase the knowledge and understanding of farmer group partners in organic waste management. Method used was socialization, workshops, and field assistance to farmer groups in Benjot Village. This event aims to provide an in-depth understanding of BSF's potential to decompose organic waste into compost and a source of animal feed. In addition, a direct approach is provided through workshops, where farmer group partners can be directly involved in the utilization of BSF biotic components and organic waste management. The results of this community service activity show a significant increase in the knowledge and understanding of farmer group partners regarding the benefits of BSF in processing organic waste into high-quality compost and highly nutritious animal feed. Farmers are also able to manage organic waste more effectively, reducing environmental impact and the same time creating valuable resources from waste.

Keywords: black soldier fly, disaster-prone zones, environmentally friendly, organic waste

INTRODUCTION

Benjot Village is one of the villages in Cugenang District, Cianjur Regency, which was affected by the earthquake. Benjot Village is rich in various natural resources, with surface water or river resources as a potential source of irrigation for agricultural activities, including animal husbandry and fisheries. Agricultural activities such as cultivating food crops, horticulture, and chicken farming are the livelihoods of the people in Benjot village. Agricultural and animal husbandry activities create various food product processing businesses from food and beverage-based Micro, Small, and Medium Enterprises (MSMEs).

The character of the Benjot village community, who care about nature and the environment, aligns with Community Service activities (PKM), namely using Black Soldier Fly (BSF) (Hermetia illucens) as a source of compost and an environmentally friendly alternative to catfish feed. In Benjot village, there are eight farmer groups affected by the earthquake, and as partners in PKM activities are the Dewi Sri Farmers Group, with a chairman named Muhammad Nur, having the address at Kampung Dadap Jajar 03/06 Benjot Village, Cugenang District. The determination of the Dewi Sri farmer group as a partner is because the Dewi Sri Farmer Group is included in the classification of farmer groups who are still beginners.

The objectives of the PKM educational activity on the utilization of BSF as compost and environmentally friendly catfish feed to support the development of emergency food processed products are (Noviana & Sukwika, 2020; Rukmini, 2020; Utami et al., 2020; Sholahuddin et al., 2021; Sukamdani et al., 2022): (1) Increase knowledge and understanding of farmer group partners in the utilization of BSF biotic components to increase agricultural and livestock production as an environmentally friendly local food source; (2) Increase the knowledge and understanding of farmer group partners in the management of organic waste generated from partner farming and livestock activities.

The focus of PKM activities is to inspire the enthusiasm of farmer group partners to continue to carry out their agricultural activities with an approach to utilizing natural resources and the environment that can be produced by themselves, existing around them as input for agricultural production facilities. The information on agricultural production facilities in question is the availability of organic compost and catfish feed. Hopefully, local food security in Benjot village after the earthquake will continue to build. The availability of organic compost as a substitute for chemical fertilizers will quantitatively improve the environment, in this case, the soil quality index and biology in the

context of environmental quality management (Widjastuti et al., 2014; Sukwika & Noviana, 2020; Sukwika, 2021; Sukwika et al.,2022; Sukamdani et al., 2023).

METHOD

Approach Method

The method of implementing the activities that will be used includes (1) lectures, (2) discussions, (3) demonstrations, and (4) direct interaction and evaluation through pre-test and post-test. Partners in implementing these activities were the Dewi Sri farmer group in Benjot Village, Cugenang District, Cianjur Regency which was affected by the earthquake. The stages of implementing the exercise are:
The stages of implementing the activities to be carried out consist of:

1) Discussion. Discussions were held with the Benjot Village Farmers Group regarding the technical implementation of socialization and demonstrations, which will be held in the first week of December 2022.
2) Socialization. The socialization was carried out with lectures and discussions about BSF and BSF production, using BSF in producing organic compost, using BSF as an alternative feed based on local raw materials for catfish cultivation, and processing catfish into several processed disaster food products (smoked catfish and shredded catfish). The socialization was carried out face to face, which began with a pre-test activity to see the partner's initial understanding of the material to be socialized. Students will assist with pre-test activities by distributing and collecting questionnaires from partners.

Socialization about Black Soldier Fly (BSF) (Hermetia illucens), BSF production, and the use of BSF in producing organic compost will be delivered by Dr. Maya D. D. Maharani, an outreach about the use of BSF in creating catfish feed will be delivered by Dr. Tatan Sukwika. Dr. Julfi R. Amelia will provide the socialization of catfish processing into several disaster emergency food processed products.

Procedures

Community service procedures in socializing Black Soldier Fly (BSF) as environmentally friendly compost and animal feed to farmers can involve several stages. Here are some standard steps that may be involved in the process (Maharani et al., 2023):

1. Initial Planning: (a) Identification of target audience: Determine the farmer or community groups that will be the target of this outreach. (b) Goal setting: Describe the purpose of outreach, whether it is to provide information, help develop skills, or some other purpose. (c) Determining the location and time: Determine the right location and time to carry out socialization according to the availability and needs of the target audience.
2. Information Collection: (a) Learn more about the Black Soldier Fly (BSF): Collect the latest information on the biology, life cycle, benefits, and how to care for BSF larvae. (b) Understanding of compost and animal feed: Prepare sufficient knowledge on processing BSF larvae into quality compost and animal feed.
3. Development of Socialization Materials: (a) Preparation of presentation materials: Create informative and interesting materials, including presentation slides, brochures, videos, or other materials that can assist in conveying information.
4. Implementation of Outreach: (a) Presentation session: Conduct a presentation on the benefits and ways to use BSF larvae as compost and animal feed. Include case examples or case studies to provide a better understanding. (b) Practical demonstrations: Do live demonstrations on raising BSF larvae, processing organic waste, and comp compost. (c) Debriefing: Allow participants to ask and answer questions regarding the material presented.
5. Field Practice: (a) Independent practice: Invite participants to do hands-on training in the field, such as managing BSF larvae rearing or trying to make compost. (b) Guidance: Provide guidance and instructions during field practice so that participants feel more confident in carrying out the steps taught.
6. Evaluation and Feedback: (a) Evaluation of the event: Evaluate the socialization event through a questionnaire or an open discussion session to measure the extent to which participants understand and feel helped by the information provided. (b) Feedback: Use participant feedback to improve future outreach events' quality.
7. Follow-Up: (a) Further development: Provide participants with contact information or additional resources to support them in developing future BSF larvae utilization practices. (b) Monitoring and mentoring: Conduct Monitoring and mentoring of participants to ensure correct and successful implementation of practices.
8. Documentation: (a) Document the entire process: Keep notes, photos, and materials used during outreach for documentation and reporting purposes.

Stages of Activity

The socialization activity will end with a discussion and question and answer session with partners.

1. Demonstration. The demonstration was carried out using role-playing techniques and direct interaction. Demonstration activities included BSF cultivation techniques, Black Soldier Fly (BSF) bioconversion techniques in compost production, and catfish cultivation techniques. Demonstration activities will be carried out by the entire PKM team and assisted by students. Partners will be directly involved in demonstrations that will be held in the 2nd and 3rd week of December 2022.
2. Evaluation. Socialization and training activities will end with a post-test to see the level of knowledge and understanding of partners after the activity is carried out. Students will assist post-test activities in distributing and collecting questionnaires from partners. The evaluation will be held on the 2nd and 3rd week of December 2022. Reports and articles will be prepared in the 4th week of December 2022.

Figure 1. Photo of the assistance activity process

RESULTS AND DISCUSSION

Prior to starting the activity, participants take a pre-test to assess their initial understanding of questions about household lamps and their manufacturing process. At the end of the activity, a post-test is administered to measure any improvements in their knowledge based on the material covered. The evaluation of activity outcomes in relation to Specific Instructional Objectives (SIO) is based on specific measurement parameters, namely (1) Perception of black soldier fly larvae. (2) Perception of the use of black soldier fly larvae as a compost maker. (3) Perception of the use of black soldier fly as animal feed. (4) Perception of organic waste for black soldier fly larvae. (5) Perception of emergency feed products. (6) Perception of critical characteristics for emergency feed.

The pre-test questions are identical to those on the post-test. This test is designed to evaluate the effectiveness of the training activities by including questions aligned with the Specific Instructional Objectives (SIO) targeted in this service activity. Table 1 provides details on the SIO composition for both the pre-test and post-test.

Table 1. The composition of sio in the pre-test and post-test

No	Specific Instructional Objectives (SIO)	Question points.	Number of questions	Proportion
1	Perception of black soldier fly larvae	1	1	10
2	Perception of the use of black soldier fly larvae as a compost maker	2, 3	2	20

3	Perception of the use of black soldier fly as animal feed	4, 5	2	20
4	Perception of organic waste for black soldier fly larvae	6, 7	2	20
5	Perception of emergency feed products	8, 9	2	20
6.	Perception of critical characteristics for emergency feed	10	1	10

Table 1 and Figure 2 are compared to assess the change in the percentage increase in SIO achievement before and after the service activities.

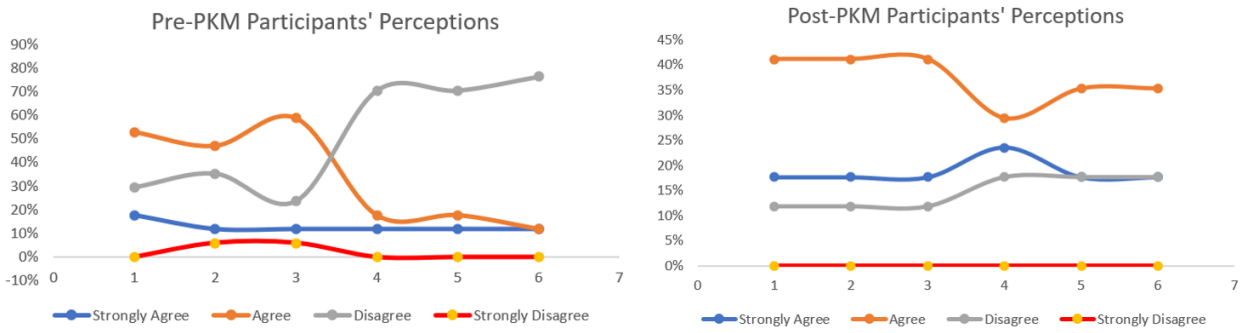

Figure 2. Comparison of SIO achievements before and after service

According to Figure 3, among participants who supported using black soldier fly (Hermetia illucens) for compost and eco-friendly animal feed, the SIO score was 34% before the community service activities and increased to 37% afterward. Similarly, those with a Strongly Agree perception rose from an average of 13% before the activities to 19% after. Additionally, 51% of participants initially had a negative perception, but this figure dropped to 15% following the socialization efforts. Overall, each SIO saw an average increase of 4.41%. This indicates a significant improvement in public knowledge about using black soldier fly for compost and environmentally friendly animal feed, achieving the primary goals of the community service. It is hoped that this enhanced understanding will spread to other residents and contribute to improving community welfare. (Sukwika, 2021; Sukwika et al., 2022; Sukamdani et al., 2023.

Black Soldier Fly (BSF) is an insect that has potential in organic waste processing and animal feed production. BSF larvae are very efficient at converting organic waste into compost and can also be used as high-protein feed for livestock. Some of the potential benefits and achievements of outreach include (Utami et al., 2020; Sholahuddin et al., 2021; Maharani et al., 2023):

1. Organic Waste Treatment: BSF larvae can eat various types of organic waste, including food scraps, agricultural waste, and others. By utilizing these larvae, organic waste can be turned into quality compost which can be used to increase soil fertility.
2. Animal Feed: BSF larvae have a high protein content, making them suitable as a source of protein feed for livestock such as chickens, fish, pigs, and others. Using BSF larvae as animal feed can help reduce dependence on traditional meals, often sourced from expensive and unsustainable feed ingredients.
3. Reduction of Environmental Impact: By converting organic waste into compost and animal feed, using BSF larvae can help reduce the impact of garbage on the environment. This alternative can help reduce pollution and environmental damage due to organic waste disposal.
4. Increasing Farmers' Income: Socialization regarding the use of BSF larvae as compost and animal feed can help farmers utilize organic waste that was previously considered waste. Thus, farmers can obtain additional income from selling compost or animal feed produced.
5. Increasing Environmental Awareness: This kind of outreach activity can also increase public awareness regarding the importance of organic waste management and efforts to maintain a cleaner and more sustainable environment.

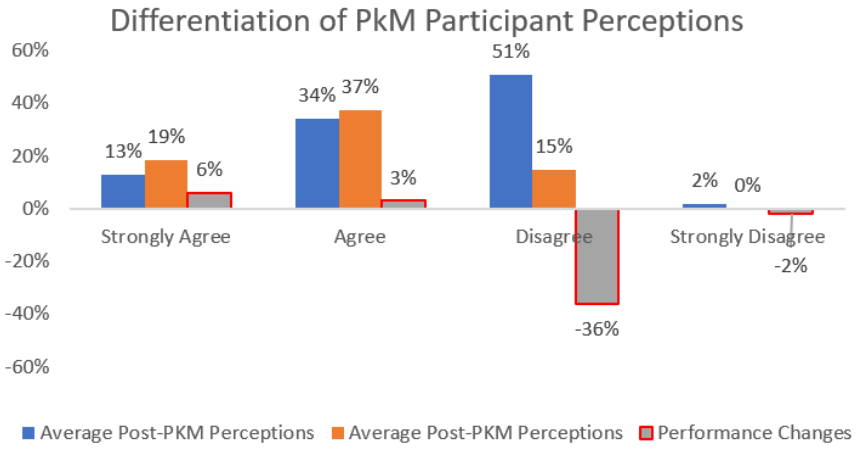

Figure 3. Comparison of SIO achievements before and after service activities

In this community service journey, we have tried to spread knowledge about using Black Soldier Fly (BSF) as an innovative solution for managing organic waste and animal feed. Through this outreach, we hope to provide new insights and inspiration to farmers to implement sustainable practices in agriculture and the environment (Widjastuti et al., 2014; Rukmini, 2020; Noviana & Sukwika, 2020; Utami et al., 2020; Sholahuddin et al., 2021; Maharani et al., 2023).

The results achieved:

1. Introduction to BSF Potential: Participants have been introduced to the extraordinary potential of the Black Soldier Fly in decomposing organic waste into high-quality compost. They understand that BSF larvae are not only decomposers but also a rich source of nutrition for livestock.
2. Utilization of Sustainable Animal Feed: Participants already know the benefits of high nutrition possessed by BSF larvae as animal feed. They realize that using BSF larvae can help reduce dependence on conventional feed, which is often expensive and not environmentally friendly.
3. Reduction of Environmental Impact: Participants understand that using BSF larvae in organic waste treatment can help reduce negative environmental impacts. By turning waste into compost, they can make a real contribution to preserving the ecosystem.
4. Increased Practical Knowledge: Participants gain theoretical knowledge and practical experience in rearing and harvesting BSF larvae and composting. It will enable them to apply the concepts in the field.

Our Hope for the Future are that the results of this outreach continue to become concrete actions in the field. We hope farmers apply organic waste processing practices using BSF larvae and use them as animal feed. In doing so, we have helped create a cleaner environment, reduce waste, and increase agricultural productivity.

CONCLUSION

Based on the research objectives mentioned above, several conclusions can be drawn:

1. Increasing Knowledge and Understanding in Utilizing black soldier fly (Hermetia illucens) Biotic Components: Through community service efforts, it can be concluded that the first goal has been achieved. Farmer group partners have experienced increased knowledge and understanding regarding using BSF biotic components in increasing agricultural and livestock production. It can be seen from their participation in activities and a deeper understanding of how BSF can be integrated as an environmentally friendly local food source.
2. Increased Knowledge and Understanding of Organic Waste Management: The objectives of the two studies were also achieved. Farmer group partners have gained better knowledge and understanding regarding managing organic waste from their agricultural and livestock activities. They may have learned the best methods and practices for turning organic waste into valuable resources that align with green goals, such as compost or animal feed.

Through this effort, the conclusion is that community service has provided significant benefits in increasing farmer group partners' knowledge and understanding of using BSF biotic components and organic waste management. Thus, this effort has the potential to contribute to increasing agricultural and livestock production sustainably while reducing environmental impact through better organic waste management. With continued collaboration and application of the knowledge gained, the hope is that farmer group partner communities can develop more sustainable practices and support their welfare and the sustainability of the surrounding environment.

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REFERENCES

Maharani, M. D. D., Sukwika, T., Amelia, J. R., Reza, M. A., & Rachmani, N. R. (2023). Sosialisasi Pangan Darurat di Desa Wangun Jaya, Kecamatan Cugenang, Kabupaten Cianjur, Jawa Barat. *Bubungan Tinggi: Jurnal Pengabdian Masyarakat*, 5(1), 165-172.

Noviana, L., & Sukwika, T. (2020). Pemanfaatan sampah organik sebagai pupuk kompos ramah lingkungan di kelurahan Bhaktijaya Depok. *Jurnal Pengabdian UntukMu NegeRI*, 4(2), 237-241.

Rukmini, P. (2020). Pengolahan sampah organik untuk budidaya maggot black soldier fly (BSF). In *Seminar Nasional Pengabdian Kepada Masyarakat UNDIP 2020* (Vol. 1, No. 1).

Sholahuddin, S., Sulistyo, A., Wijayanti, R., Supriyadi, S., & Subagiya, S. (2021). Potensi Maggot (Black Soldier Fly) sebagai Pakan Ternak di Desa Miri Kecamatan Kismantoro Wonogiri. *PRIMA: Journal of Community Empowering and Services*, *5*(2), 161-167.

Sukamdani, N. B., Sukwika, T., & Eddyono, F. (2022). Edukasi manajemen sampah untuk peningkatan kapasitas sdm pada pengurus kelompok disabilitas kota Bogor. *RESWARA: Jurnal Pengabdian Kepada Masyarakat*, *3*(2), 826-833.

Sukamdani, N. B., Sukwika, T., & Sulistyadi, Y. (2023). Determination of Policy Development Priorities in Integrated Waste Management Site at Bantargebang Bekasi. *KnE Social Sciences*, 215-228.

Sukwika, T. (2021). Penentuan faktor kunci untuk pengembangan pengelolaan TPST-Bantargebang berkelanjutan: Pendekatan MICMAC. *TATALOKA*, *23*(4), 524-535.

Sukwika, T., & Noviana, L. (2020). Status Keberlanjutan Pengelolaan Sampah Terpadu di TPST-Bantargebang Bekasi: Menggunakan Rapfish dengan R Statistik. *Jurnal Ilmu Lingkungan*, *18*(1), 107-118.

Sukwika, T., Sukamdani, N. B., & Maharani, M. D. D. (2022). Analysis of two dimensional sensitivity as decision support alternative waste management in TPST Bantargebang. *Berkala Sainstek*, *10*(2), 68-76.

Utami, I., Putra, I. L. I., Khotimah, K., & Pangestu, R. G. (2020). Maggot Black Soldier Fly sebagai agen degradasi sampah organik dan pakan ternak warga mergangsan Yogyakarta. *LOGISTA-Jurnal Ilmiah Pengabdian kepada Masyarakat*, *4*(2), 127-135.

Widjastuti, T., Wiradimadja, R., & Rusmana, D. (2014). The effect of substitution of fish meal by Black Soldier Fly (Hermetia illucens) maggot meal in the diet on production performance of quail (Coturnix coturnix japonica). *Anim. Sci*, *57*(2), 125-129.