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Maggot Cultivation Training as Alternative Feed in Fish Cultivation for Indonesian Migrant Workers at PCIM Kuala Lumpur, Malaysia

Pelatihan Budidaya Maggot sebagai Pakan Alternatif dalam Budidaya Ikan bagi Pekerja Migran Indonesia di PCIM Kuala Lumpur, Malaysia

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ABSTRACT. The Special Branch of Muhammadiyah Malaysia accommodates Indonesian Migrant Workers (IMW) from the Kampung Bharu, Kampung Pandan, and Kepong areas. The main problem that arises for IMW is the economy. One activity that can help the IMW economy in Malaysia is entrepreneurship through fish farming. Freshwater fish farming has good prospects for development and can be used as a source of income. However, feed costs can reach 60-70% of fish production costs, so it is necessary to find alternatives to replace commercial feed with good nutritional quality and lower prices, including maggots. This activity aims to improve the knowledge and skills of partners in cultivating maggots as an alternative feed in fish farming. This activity is research-based community empowerment as a transfer of knowledge and technology to target partners to improve knowledge and skills about maggot farming. Community service activities are carried out using participatory and collaborative approaches; partners actively participate in activities and collaborate. Community service activities are carried out in 5 stages: coordination of activity preparation with partners, counseling on maggots, potential and how to cultivate them, maggot farming training, mentoring, and activity evaluation. The program's success rate was measured using the one-group pre-test and post-test. The results of the activity showed that 85% of partner members understood the potential of maggots and how to cultivate them from the previous 52.5% (exceeding the target of 80%); 85% were able to implement maggot cultivation from the previous 40% (exceeding the target of 80%). The evaluation showed that this community service activity could help partners overcome the problem of providing cheap and potential alternative fish feed and fish cultivation problems. Based on the evaluation, there needs to be a continuation of the program to assist partners in overcoming various problems to improve the economy, one of which is through fish cultivation.

Keywords: black soldier fly (BSF); Indonesian migrant worker; alternative feed in fish cultivation, maggot.

ABSTRAK. Pimpinan Cabang Istimewa Muhammadiyah (PCIM) Malaysia mewadahi Buruh Migran Indonesia (BMI) dari wilayah Kampung Bharu, Kampung Pandan, dan Kepong. *Permasalahan utama yang muncul pada* BMI adalah ekonomi. Salah satu kegiatan yang dapat membantu perekonomian BMI di Malaysia adalah wirausaha melalui budidaya ikan. Budidaya ikan air tawar memiliki prospek yang baik untuk dikembangkan dan dapat dijadikan salah satu sumber penghasilan. Namun, biaya pakan dapat mencapai 60-70% dari biaya produksi ikan, sehingga perlu dicari alternatif pengganti pakan komersial dengan kualitas gizi yang tetap baik dan harga lebih murah, salah satunya adalah maggot. Kegiatan ini bertujuan meningkatkan pengetahuan dan keterampilan mitra dalam budidaya maggot sebagai pakan alternatif dalam budidaya ikan. Kegiatan ini merupakan pemberdayaan

masyarakat berbasis riset sebagai transfer knowledge dan teknologi kepada mitra sasaran untuk meningkatkan pengetahuan dan keterampilan tentang budidaya maggot. Kegiatan pengabdian dilaksanakan menggunakan metode pendekatan partisipatif dan kolaboratif, yaitu mitra berpartisipasi aktif dalam kegiatan dan berkolaborasi. Kegiatan pengabdian dilaksanakan dalam 5 tahap, yaitu: koordinasi persiapan kegiatan dengan mitra, penyuluhan tentang maggot: potensi dan cara budidayanya, pelatihan budidaya maggot, pendampingan, dan evaluasi kegiatan. Tingkat keberhasilan program diukur dengan metode *one group pre-test and post*-test. Hasil kegiatan menunjukkan 85% anggota mitra memahami tentang potensi maggot dan cara budidayanya dari sebelumnya 52,5% (melebihi target 80%); 85% mampu mengimplementasikan budidaya maggot dari sebelumnya 40% (melebihi target 80%). Hasil evaluasi menunjukkan kegiatan pengabdian ini dapat membantu mitra dalam mengatasi masalah penyediaan pakan ikan alternatif yang murah dan potensial dan masalah budidaya ikan. Berdasarkan evaluasi, perlu adanya keberlanjutan program untuk mendampingi mitra mengatasi berbagai persoalan untuk meningkatkan perekonomian, salah satunya dengan budidaya ikan.

Kata kunci: *black soldier fly* (BSF); maggot, pakan alternatif dalam budidaya ikan; tenaga kerja Indonesia.

INTRODUCTION

The Muhammadiyah Special Branch Leadership (MSBL) Malaysia accommodates Indonesian Migrant Workers (IMW) from the Kampung Bharu, Kampung Pandan, and Kepong areas. IMW has lived in the MSBL area for decades, with a relatively low level of education and even no formal education. Based on an interview with the Head of PCIM Malaysia Community Service, Mr. Drs. Khoirudin, one of the problems that often arises for IMW is the economy. One activity that can help the IMW economy in Malaysia is entrepreneurship through fish farming. Freshwater fish farming has good prospects for development and can be used as a source of income. This activity is very positive; besides optimizing free time, it can also increase income if pursued seriously. Fish farming does not always require a large area of land; it can also use a tarpaulin pond in the yard, even using a bucket as a cultivation container (fish farming in a bucket), so anyone can do this activity. However, feed costs can reach 60-70% of fish production costs (Dirican, 2021; Mulia *et al.*, 2023). The increase in feed prices was triggered by the increase in the price of raw materials, especially fish meal. In artificial feed, the primary source of protein comes from fish meal. The fish meal component in the feed formulation reaches almost 60% of all feed components (Annamalai *et al.*, 2021). High commercial feed prices can reduce farmers' profits. Therefore, it is necessary to find alternatives to replace commercial feed with good nutritional quality and cheaper prices. The proposal team has conducted research and downstream research in the form of community service on several materials that can be used as feed, making fish feed, and utilizing adhesives (binders) to improve the quality of the fish feed. The results show that alternative feed can substitute commercial feed and is effective and efficient in increasing the growth of freshwater fish (Mulia *et al.*, 2023; Mulia & Maryanto, 2014; Mulia *et al.*, 2014a; 2014b; 2014c; 2015; 2016; 2017; 2021).

One of the potential feed ingredients is Hermetia illucens or Black Soldier Fly (BSF) maggots. BSF maggots can be used as alternative feed for freshwater fish (Fajri & Hamaryani, 2020). Maggots are animals belonging to the Diptera Order. Maggots come from BSF fly larvae (Sani *et al.*, 2024).

Maggot cultivation can be done easily and in an environmentally friendly way by utilizing organic waste. Therefore, maggots are called bioconversion agents, which means that maggots will degrade organic waste into simple compounds and utilize them as nutrients used for their growth so that they can reduce the amount of waste and be more environmentally friendly (Fajri & Hamaryani, 2020). Research on the use of maggots in gourami cultivation has also been carried out with a research team and has succeeded in becoming a substitute feed that increases fish growth (Nadifah *et al.*, 2024). Based on these problems, this community service activity aims to improve the knowledge and skills of partners in maggot cultivation as an alternative feed in fish cultivation.

METHOD

Time and Place of Activity

The community service activity was carried out in August 2024 in Kampung Pandan, Malaysia. The partners were migrant workers, administrators of the Muhammadiyah Special Branch Leadership of Kampung Bharu, Kampung Pandan, Kepong, administrators of the Muhammadiyah Special Branch Leadership of Malaysia, and Aisyiyah mothers who are members of the Aisyiyah Special Branch Leadership. The number of partners is 25 people. Community service activities were carried out using a participatory and collaborative approach.

Activity Implementation Method

This activity is research-based community empowerment as a transfer of knowledge and technology to target partners to improve knowledge and skills about maggot cultivation. Community service activities were carried out using a participatory and collaborative approach, namely, partners actively participating in activities and collaborating. Community service activities were carried out in 5 stages, namely: (1) coordination of activity preparation with partners; (2) counseling on maggots: potential and cultivation methods; (3) maggot cultivation training; (4) mentoring, (5) activity evaluation (Figure 1).

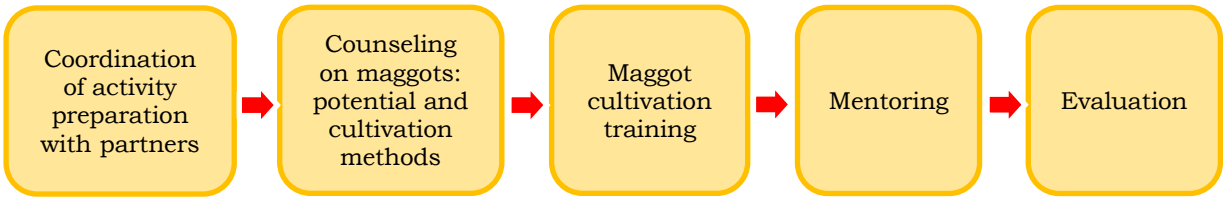


Figure 1. Stages of Implementation of Community Service Activities

Activity preparation is coordinated with partners to agree on the activities to be implemented, including the time and place of implementation. The implementation of the activity begins with the provision of a pre-test questionnaire to measure the initial knowledge of partners before the training, followed by counseling on the potential of maggots and how to cultivate them, as well as maggot cultivation training. Mentoring activities are carried out to assist partners in monitoring maggot cultivation activities. Evaluation of activities includes providing post-test questionnaires and interviews with partners regarding implementing activities and their impacts. The level of program success is measured using the one-group pre-test and post-test method (Mulia *et al.*, 2023; 2024a; 2024b). The indicators of this program's success are that partners can understand the potential of maggots and how to cultivate them and implement maggot cultivation by at least 80%.

RESULTS AND DISCUSSION

Community service activities have been carried out to solve partner problems. Preparation coordination has been carried out well with partners. Partners welcomed this activity positively. The implementation of the activity began with remarks from the Vice Rector IV of UMP, Mr. Assoc. Prof. Akhmad Darmawan, Ph.D., followed by remarks from the Head of the UMP Research and Community Service Institute, Mrs. Prof. Dr. Sri Wahyuni, M.Si. The activity was continued by providing a pre-test questionnaire to measure the initial knowledge of partners.

Furthermore, material was provided on the potential of maggots, how to cultivate them, and maggot cultivation training (Figure 2). The material was delivered using an interactive lecture method with PowerPoint media. After the material was delivered, a discussion and question-and-answer session with the training participants continued. Discussions and questions and answers were carried out to find solutions to solving partner problems.

Figure 2. Provision of Community Service Materials

Maggot (*Hermetia illucens*) is a type of natural feed that has the potential for fish feed because it contains high protein and can be mass-produced (Ginting *et al.*, 2022) (Figure 3). Maggot can be cultivated in organic waste media and used as freshwater fish feed (Pérez-Pacheco et al., 2022). The results of research by Andari *et al.* (2021) showed that maggots contain 42.63% protein, while Azir *et al.* (2017) stated that maggots contain 41.22% protein and have trophocytes storage organs that function to store the nutrient content in the culture media they eat. Maggots have excellent bioconversion capabilities, which can consume rotting organic substrates and convert them into biomass with high biological value, consisting of protein and lipids that can be used as a source of fish feed nutrients (Andari *et al.*, 2021; Yana *et al.*, 2022).

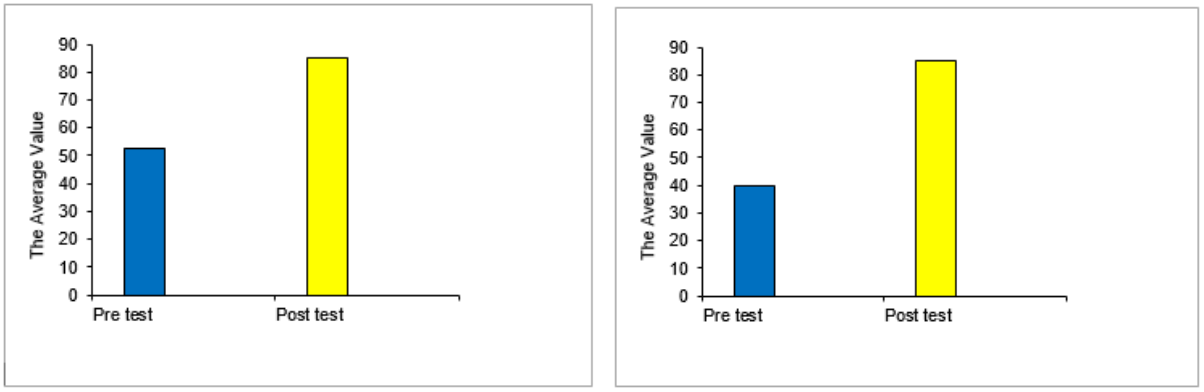
Figure 3. Maggot *Black Soldier Fly* (BSF)

The ability of maggots to decompose organic waste as a breeding medium makes maggots easy to mass produce (Amandanisa & Suryadarma, 2020; Ginting *et al.*, 2022). The advantages of maggots as a substitute feed are shown by the results of research by Fauzi & Sari (2018), namely, using 50% pellets and 50% maggots can save catfish feed costs by 22.74%. Xu *et al.* (2021) stated that maggot porridge can be used as a supplement to salmon feed, while the results of research by Fitriani *et al.* (2023) showed that maggots can also be used as an alternative feed for snakehead fish. Were *et al.* (2021) stated that fish feed containing maggots can replace fish meal for tilapia and catfish feed. Although the protein content of maggots is higher than that of commercial feed, the use of commercial feed is still needed because the use of feed containing two or more protein sources will produce better

fish growth than fish that are only fed with one protein source (Suwarsito & Susylowati, 2024; Suwarsito *et al.*, 2024).

The evaluation stage of the activity was carried out using interview techniques with partners and providing post-test questionnaires. Partners were very enthusiastic and actively discussed, both during training and mentoring. The implementation team and partners actively shared knowledge and experience to find solutions to overcome fish farming problems. The interview results showed that partners gained a lot of knowledge and experience in fish farming, especially maggot farming as an alternative feed in fish farming.

The program's success rate was measured by the pre-and post-test (Figure 4). Community service activities resulted in 85% of partner members understanding the potential of maggots and how to cultivate them, up from 52.5% (exceeding the target of 80%); 85% were able to implement maggot farming, up from 40% (exceeding the target of 80%). The evaluation results showed the need for program sustainability to assist partners in overcoming various problems in fish farming and their business management.



Maggot potential counseling and how to cultivate Maggot cultivation training

Figure 4. The average value of the pre-test and post-test results for community service activities; blue=pre test, yellow=post test

Community service activities have succeeded in helping to solve partner problems. This activity has helped improve partner knowledge and skills in maggot cultivation. The same thing also happened in community service activities in Kastela Village, Ternate, which improved knowledge and skills in maggot cultivation as a substitute for fish feed (Andriani *et al.*, 2020). Community service activities in Balongbendo Village, Balongbendo District, and Sidoarjo Regency have also improved knowledge and skills in maggot cultivation (Nurhayati *et al.*, 2022). Partner problems in Sariwangi Village, Parongpong District, West Bandung Regency related to waste management and high factory feed prices have been resolved by cultivating maggots as fish feed (Yudistria & Rusyandi, 2023).

CONCLUSION

Implementing community service activities has positive implications for partners' ability to cultivate maggots. Partners are very enthusiastic about participating in extension and training activities. Partners show an increased understanding of the potential of maggots, how to cultivate them, and the ability to implement maggot cultivation as an alternative feed in fish farming, reaching 85%. The evaluation results show the need for program sustainability to assist partners in developing fish farming businesses and increasing their potential to improve the family economy.

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