

Training On Organic Household Waste Processing And Aquaponic Production In Grand Watu Dodol Banyuwangi

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Submitted: 16, January, 2026

Revised: 19, February ,2026

Published: 24, February, 2026

Abstract

Grand Watu Dodol (GWD) is one of the major tourist destinations in Banyuwangi Regency and attracts a large number of visitors. Tourism activities in the GWD area are accompanied by various trading activities, which inevitably generate organic waste. This waste mainly consists of food residues from visitors, including fruit and vegetable scraps, leftover rice, and uneaten side dishes. At present, this waste is disposed of only at temporary waste disposal sites (TPS), resulting in environmental problems such as unpleasant odors and limited waste-handling capacity. Organic waste generated in the GWD area has considerable potential to be utilized as raw material for compost production and as a growing medium in aquaponic systems or BUDIKDAMBER (Fish Cultivation in Buckets). Leftover rice, fruits, and vegetables can be processed into compost with the assistance of maggot larvae, while root and stem residues can be used as planting media in aquaponic or BUDIKDAMBER systems. Composting not only produces organic fertilizer but also generates maggot larvae that can be utilized as poultry feed. In addition, aquaponic systems can produce vegetables and fish as by-products, which may contribute to nutritional fulfillment and provide additional income for local business actors operating in the Grand Watu Dodol tourist area.

Keywords: Black Soldier Fly; maggot; aquaponics; catfish; organic waste management

Abstrak

Grand Watu Dodol (GWD) merupakan salah satu destinasi wisata di Kabupaten Banyuwangi yang menghasilkan sampah organik dari aktivitas perdagangan dan konsumsi pengunjung, seperti sisa buah, sayur, nasi, dan lauk pauk. Sampah tersebut selama ini hanya dibuang ke tempat pembuangan sementara (TPS) sehingga menimbulkan permasalahan lingkungan berupa bau tidak sedap dan penumpukan limbah. Kegiatan pengabdian ini bertujuan meningkatkan kapasitas pelaku usaha di kawasan GWD dalam mengelola sampah organik menjadi produk bernilai tambah melalui pengomposan berbantuan larva lalat tentara hitam (Black Soldier Fly) dan pengembangan sistem akuaponik/BUDIKDAMBER (Budidaya Ikan dalam Ember). Metode pelaksanaan meliputi tahap sosialisasi, pelatihan praktik, dan pendampingan. Sosialisasi dilakukan untuk memberikan pemahaman mengenai pengolahan sampah organik, pelatihan difokuskan pada praktik pembuatan kompos dan instalasi akuaponik, sedangkan pendampingan dilakukan untuk memastikan keberlanjutan penerapan teknologi oleh mitra. Hasil kegiatan menunjukkan bahwa sampah organik berupa sisa nasi, buah, dan sayur dapat diolah menjadi pupuk kompos serta menghasilkan larva yang berpotensi sebagai pakan unggas. Selain itu, pemanfaatan sisa akar dan batang sayuran dalam sistem akuaponik mampu menghasilkan sayuran dan ikan lele sebagai sumber pemenuhan nutrisi sekaligus peluang tambahan pendapatan bagi pelaku usaha di kawasan wisata Grand Watu Dodol.

Kata kunci: lalat tentara hitam; belatung; akuaponik; ikan lele; pengelolaan sampah organik

INTRODUCTION

Grand Watu Dodol (GWD) is a coastal tourist attraction located in Wongsorejo District, Banyuwangi Regency, East Java, Indonesia. The destination offers various tourism activities, including marine recreation, island tours, culinary tourism, and environmental education programs. The strategic location and high accessibility of GWD attract a large number of visitors, which consequently stimulates the growth of food vending and trading activities in the area.

However, the increase in tourism-related activities also leads to the generation of substantial organic waste, particularly food residues such as leftover rice, vegetables, fruits, and side dishes. At present, most of this waste is disposed of at temporary waste disposal facilities without further processing. This practice contributes to environmental problems, including unpleasant odors, waste accumulation, and inefficient waste handling. Although organic waste management strategies have been widely studied, their practical implementation in tourism-based community settings remains limited.

Previous studies have demonstrated the effectiveness of Black Soldier Fly (*Hermetia illucens*) larvae in decomposing organic waste and accelerating compost production (Mulyani et al., 2021; Zhu et al., 2015). In addition, aquaponic systems, particularly the BUDIkdAMBER (Fish Cultivation in Buckets) method, have been promoted as low-cost and space-efficient technologies suitable for small-scale community applications (Suryana et al., 2021; Mahmoud et al., 2023). These systems allow the integration of fish and vegetable cultivation, where fish waste serves as a nutrient source for plant growth (Goddek et al., 2015; Yildiz et al., 2017).

Despite the availability of these technologies, there has been limited integration of Black Soldier Fly-based composting and BUDIkdAMBER systems as a unified community-based waste management model, particularly in tourism areas. Most initiatives focus either on composting or aquaponics separately, without establishing a circular system that converts organic waste into multiple value-added outputs, such as compost, animal feed, vegetables, and fish. Furthermore, the application of such integrated systems in coastal tourism destinations like Grand Watu Dodol has not been previously documented.

Scientifically, the integration of Black Soldier Fly composting and aquaponic systems represents a practical application of circular economy and sustainable waste management principles at the community level. This approach not only reduces environmental burdens but also transforms organic waste into economically valuable products. Therefore, this community service program was designed to implement and evaluate an integrated organic waste management model combining Black Soldier Fly-assisted composting and BUDIkdAMBER-based aquaponic production in the Grand Watu Dodol tourism area. The program aims to strengthen community capacity, promote sustainable waste utilization, and create additional economic opportunities for local business actors.

MATERIAL AND METHOD

The community service activities were conducted in several stages to achieve the targeted outcomes (Asfar et al., 2020). The program was implemented through three main stages: socialization, training, and accompaniment. Indicators of program success in the Grand Watu Dodol Tourism Area are presented in Table 1.

Table 1. Indicators success Porgram Devotion To the Community

Stage activity	Description Activity	Indicator Success
Socialization	Delivery material related to handling waste specifically waste food along with its utilization become fertilizer compost with maggot and waste assistance root vegetables like kale, celery, leaves onion, etc as plant principal in aquaponics as well as BUDIkdAMBER	Understanding partner-related utilization of waste food as material standard compost and waste root vegetables as Aquaponic plants.
Training	Training to partner in processing waste food to become fertilizer compost with maggot assistance and utilization of waste root vegetables For aquaponic plants as well as BUDIkdAMBER	Partners are capable to process waste food to become fertilizer compost and making BUDIkdAMBER
Accompaniment	Accompaniment addressed to help solve problems faced by partners in making compost not making aquaponics as well as BUDIkdAMBER	Partners are capable of implementing training programs in life a day

RESULTS AND DISCUSSION

Activities Socialization

The initial stage of the community service activities conducted in the Grand Watu Dodol tourist area, Banyuwangi, began with the delivery of materials related to the potential use of maggots or Black Soldier Fly (*Hermetia illucens*) larvae in processing household organic waste into compost fertilizer. The materials were presented to all partner participants, consisting of food vendors and tourism area managers. Participants were provided with an understanding of the optimal conditions required for composting, including the selection of appropriate raw materials from household organic waste, as well as optimal composting parameters such as temperature control, substrate addition, aeration, pH conditions, and processing duration, in order to produce high-quality compost (Onwosi et al., 2017).

In addition, the community service team delivered materials related to the aquaponic/BUDIkdAMBER method, which utilizes vegetable root residues from household organic waste as planting materials in cultivation systems. The presentation of materials on organic waste management, particularly food waste utilization for compost production using maggots and the development of aquaponic systems, is illustrated in Figure 1.

The socialization stage also emphasized the concept of circular economy in community-based waste management, where organic waste is not viewed as residual material but as a resource that can be transformed into economically valuable products. Previous studies have shown that Black Soldier Fly larvae are highly efficient in converting organic waste into biomass rich in protein and lipids, while simultaneously reducing waste volume significantly (Surendra et al., 2020). This bioconversion process supports sustainable waste reduction strategies and aligns with environmentally friendly waste management practices in tourism-based communities.

Furthermore, strengthening community understanding through participatory education is a critical factor in ensuring the long-term adoption of sustainable technologies. According to Lopes et al. (2022), community-based environmental education programs significantly improve knowledge retention and behavioral change related to waste management practices. Therefore, the socialization stage was designed not only to transfer technical knowledge but also to build environmental awareness and motivate participants to adopt integrated composting and aquaponic systems as part of their daily activities.



Figure 1 . Socialization Processing Waste House Ladder Organic And Manufacturing Aquaponics in the Grand Watu Dodol Tourist Area Banyuwangi

Training Activities

The training activities were divided into two main components: (1) compost production using household organic waste assisted by Black Soldier Fly larvae, and (2) development of aquaponic systems using the BUDIKDAMBER (Fish Cultivation in Buckets) method.

Compost Production Using Black Soldier Fly Larvae

The composting training began with the collection and sorting of organic food waste, including leftover rice, side dishes, fruits, and vegetables. Fallen leaves from ornamental coastal plants were added to improve substrate structure and balance the carbon-to-nitrogen (C/N) ratio. The raw materials were homogenized manually to ensure uniform particle size and facilitate larval feeding activity. Black Soldier Fly larvae were then introduced into the prepared substrate under semi-closed conditions for approximately seven days.

During the process, moisture content and aeration were maintained through periodic stirring to prevent anaerobic conditions and odor formation. The use of Black Soldier Fly larvae accelerates organic matter degradation through enzymatic activity and mechanical fragmentation, significantly reducing waste volume within a short period (Gold et al., 2020). Recent studies have also reported that larval bioconversion can reduce organic waste mass by 50–70% while producing nutrient-rich frass suitable for use as organic fertilizer (Barragán-Fonseca et al., 2022). This approach not only improves composting efficiency compared to conventional methods but also generates high-protein larval biomass with potential application as animal feed.

Aquaponic System Development (BUDIKDAMBER)

The second component of the training focused on aquaponic system construction using the BUDIKDAMBER method. Materials included vegetable root residues (water spinach, onion leaves, and celery), catfish fingerlings, microbial starter (EM4), monosodium glutamate as a supplementary nutrient source, and mineral water. The utilization of vegetable residues from trading activities reflects a circular resource approach, where waste materials are reintegrated into food production systems.

The aquaponic units were constructed using 75-L buckets equipped with faucets for water management. Used plastic bottles (AMDK) were perforated at the bottom and installed as planting holders above the water surface. Catfish were stocked in the water medium, and vegetable residues were placed in the planting holders to initiate growth. In aquaponic systems, fish excretion produces ammonia, which is converted by nitrifying bacteria into nitrites and nitrates that are absorbed by plants as nutrients (Goddek et al., 2019). Proper aeration and microbial balance are essential to maintain water quality and fish health, ensuring optimal nutrient cycling within the system.

Recent research highlights that small-scale aquaponic systems are effective for urban and community-based food production due to their low water consumption, minimal land requirement, and efficient nutrient recycling (Love, D.C., et al., 2021). Therefore, integrating Black Soldier Fly composting with BUDIKDAMBER systems provides a complementary model in which organic waste is first converted into compost and larval biomass, while residual nutrients are further utilized in fish and vegetable products.



Figure 2 . Training Processing Waste House Ladder Organic And Manufacturing Aquaponics in the Grand Watu Dodol Tourist Area Banyuwangi

Accompaniment and Evaluation

Mentoring activities were conducted to identify solutions to problems and constraints encountered during the community service program (Asfar et al., 2020). This assistance was provided to enhance partners' understanding of the training materials that had been delivered. The mentoring activities related to household organic waste processing and aquaponic system development in the Grand Watu Dodol tourism area, Banyuwangi, are presented in Figure 3.



Figure 3 . Accompaniment Processing Waste House Ladder Organic And Manufacturing Aquaponics in the Grand Watu Dodol Tourist Area Banyuwangi

As part of the activity, an evaluation was conducted by administering questionnaires to all community service partners. The evaluation employed a scoring method with a scale ranging from 1 to 10, where scores of 1–5 indicated insufficient understanding, while scores of 6–10 indicated that participants were able to understand and implement the material provided. Further details of the evaluation results are presented in Figures 4 and 5.

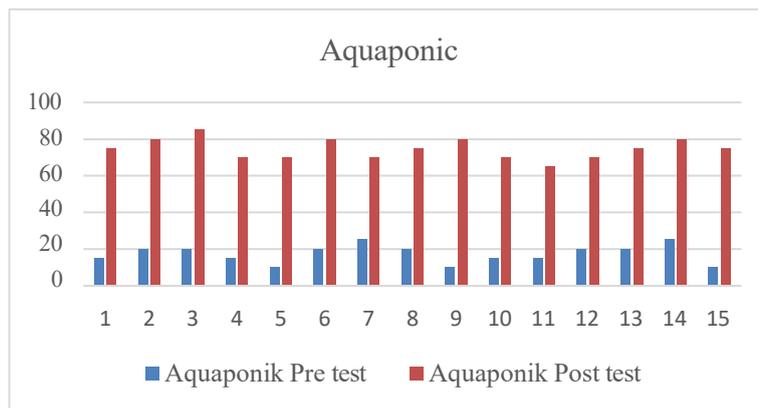


Figure 4. Evaluation results *pre-test* and *post-test* training aquaponics in the Grand Watu Dodol Tourism area

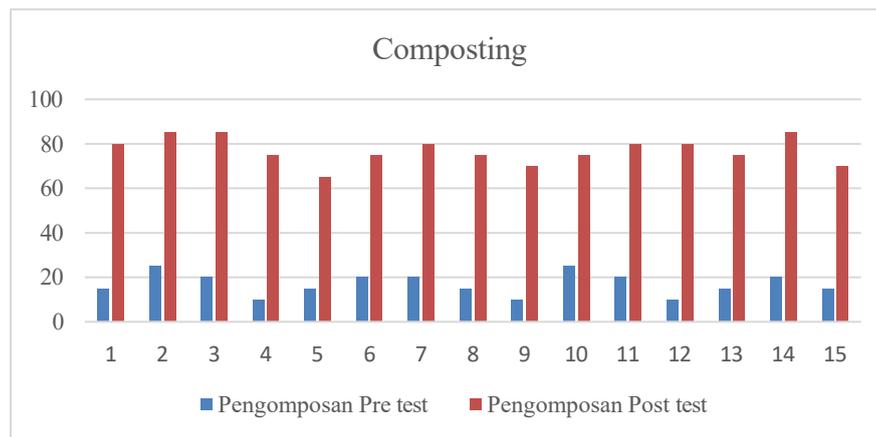


Figure 5. Evaluation results *pre-test* and *post-test* training composting in the Grand Watu Dodol Tourism area.

The evaluation results presented in Figures 4 and 5 indicate that all community service participants in the Grand Watu Dodol tourist area were able to understand and implement the materials provided, including the procedures for producing compost from household organic waste and the development of aquaponic systems utilizing vegetable root residues generated from trading activities in the coastal area.

CONCLUSION

The training activities on household organic waste processing and aquaponic system development in the Grand Watu Dodol Tourism area contributed to increased knowledge and skills among local business actors. Processing organic waste into compost with the assistance of maggots is expected to address the problem of waste accumulation while simultaneously producing valuable outputs in the form of organic fertilizer and BSF/maggot larvae, which can be utilized as poultry feed. Furthermore, the development of aquaponic systems using household vegetable waste is expected to increase the income of business actors, as well as provide vegetables and fish produced through aquaponic cultivation.

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