Jurnal Abdi Masyarakat (JAM)
Volume 11 Nomor 1 | September 2025

p-ISSN: 2460-352X
e-ISSN: 2686-5623

ORGANIC HOUSEHOLD WASTE MANAGEMENT INTO COMPOST AND MULTIFUNCTIONAL ECO-ENZYME: TOWARDS AN ENVIRONMENTALLY FRIENDLY CLIMATE VILLAGE IN BOJONG NANGKA VILLAGE

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Article Info:

Keywords:
Organic Waste, Compost, Eco-enzyme, Climate Village, Multimedia Nusantara University

Article History:
Received : 10-9-2024
Revised : 14-11-2025
Accepted : 29-11-2025

Article Doi:
10.22441/jam.v11i1.29886

ABSTRACT

The purpose of this article is to review the management of household organic waste in Bojong Nangka Village through the development of compost and eco-enzyme from that organic waste as a sustainable alternative. The findings of this project are expected to be able to cut the organic waste and raise awareness of the importance of proper and fair waste management by the community. In this program, the method used includes socialization, training, and supervision in the development of organic waste processing. From the results obtained, that organic waste processing in the form of conversion of compost and enzymes can reduce waste and generate useful environmental products. This activity also supports the implementation of Kampung Iklim which aims to create a cleaner and healthier environment.

How to cite

INTRODUCTION

Proper management of organic waste is still a serious problem, both in cities and villages. The inefficiency of organic waste processing causes greenhouse gas emissions, especially methane that are released from the waste decay process in landfills. In Indonesia itself, organic waste reaches 60% of the total national waste and most of it has not been managed properly, causing problems such as odors, stagnant leachate, and high waste transportation costs. In the context of climate change, community-based organic waste management is a mitigation strategy recommended by several government studies and programs. The Climate Village Program is one of the examples given to the community to carry out environmental action to be a good example of Bojong Nangka Village, one of the villages that has received guidance from this program and has shown a strong commitment and cooperation in better organic waste management. Under the framework of this program, processing waste into compost and eco-enzymes

p-ISSN: 2460-352X
e-ISSN: 2686-5623

is a very effective alternative because in addition to reducing the volume of waste, organic waste management at the household level produces more sustainable products that can be reused by the population. Compost is a major product that serves as an organic fertilizer that can restore nutrients to the land and growing soil, while eco-enzymes play a powerful role as eco-friendly products such as cleaning liquids, odor cleaners, and plant liquid fertilizers. Eco-friendly products produced from organic waste also act as a catalyst for increasing public awareness about the importance of waste management in their respective task rooms. Thus, this article attempts to survey the education, training and assistance of organic waste processing in Bojong Nangka Village and analyze its impact on increasing knowledge, participation and environmental mitigation within the framework of the Climate Village Program.

METHOD

This research was carried out by involving the people of Bojong Nangka Village in various activities. The method of implementing this community service activity consists of three stages, namely: (1) preparation, (2) implementation, and (3) monitoring-evaluation.

1. Preparation

- Identification of the main problems related to organic waste in Bojong Nangka Village through initial observation.
- Preparation of training modules for composting and eco-enzymes.
- Coordination with village officials and ProKlim community groups.

2. Implementation

The activity was held on June 2, 2024 at Multimedia Nusantara University and was attended by residents of Bojong Nangka village. Implementation includes:

- Socialization of the basics of organic waste management and its benefits for the environment.
- Demonstration of composting and eco-enzyme making using household kitchen waste.
- Independent practice of participants with the assistance of students and instructors.
- Discussion and questions and answers regarding technical obstacles and product utilization.

3. Monitoring and Evaluation

- Monitoring of the eco-enzyme fermentation process and composting for several weeks.
- Short interviews to measure the improvement of participants' understanding.
- Documentation of outputs (compost and eco-enzymes) and residents' follow-up plans.

Table 1. Execution Methods:

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Step	Activity	Description	Output
1. Preparation	Early Observation	Identifying organic waste problems in the Bojong Nangka Village environment.	Map of organic waste problems.
Preparation of modules & training materials	Create materials about compost, eco-enzymes, tools, and procedures.	Modules & SOPs for composting & eco-enzyme.	
Coordination with villages	Contact the village apparatus, determine the participants, time, and place.	Training schedule and participant list.	
2. Implementation	Sosialisasi teori	Introduction to climate change issues, organic waste, and the benefits of compost & eco-enzymes.	Increased initial understanding of participants.
Demonstration	The instructor shows the steps of making eco-enzyme & compost.	Participants understand the technical process.	
Self-Practice	Participants make eco-enzymes and compost with student assistance.	Early products eco-enzyme & compost.	
Daily discussion and evaluation	Questions and answers about obstacles and implementation at home.	Participant feedback and process improvement.	
3. Monitoring & Evaluation	Advanced monitoring	Check the progress of eco-enzyme fermentation and compost for several weeks.	Data on fermentation success.
Brief interview	Measure knowledge improvement & behavior change.	Results of program impact evaluation.	
Result documentation	Collect photos, videos, and field notes.	Complete activity reports.	

p-ISSN: 2460-352X
e-ISSN: 2686-5623

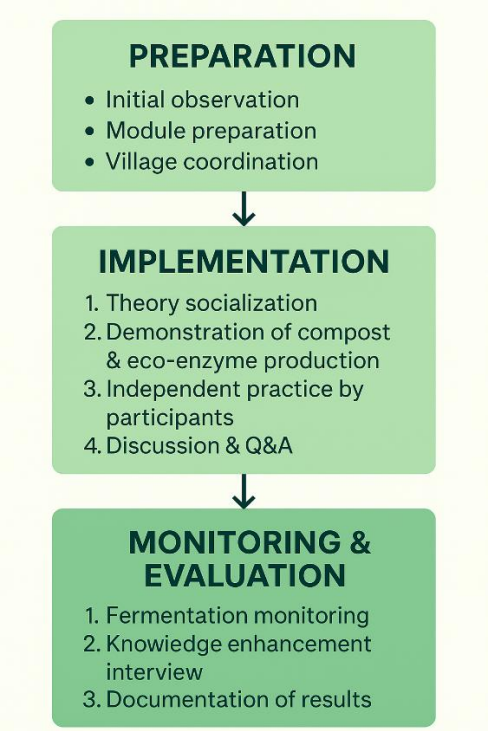

Figure 1. Flowchart Method

RESULTS AND DISCUSSION

Pengelolaan sampah organik telah menjadi topik penting dalam berbagai studi lingkungan karena berkaitan langsung dengan upaya mitigasi perubahan iklim dan keberlanjutan lingkungan. Sampah organik, yang terdiri dari sisa-sisa makanan, daun-daun, dan material organik lainnya, jika tidak dikelola dengan baik dapat menyebabkan peningkatan emisi gas rumah kaca seperti metana (CH4) dan karbondioksida (CO2) yang berasal dari dekomposisi anaerob di tempat pembuangan akhir (TPA). Oleh karena itu, pengolahan sampah organik melalui metode seperti komposting dan pembuatan eco-enzyme merupakan langkah signifikan dalam mengurangi emisi dan beban lingkungan dari sampah organik.Kompos: Proses Dekomposisi dan Manfaat Lingkungan

Compost is the result of the process of decomposition of organic matter by microorganisms, such as bacteria, fungi, and actinomyces, under controlled conditions. This process is known as composting, which is basically a form of aerobic decomposition, in which oxygen plays an important role in the sustainability of the metabolism of microorganisms responsible for decomposing organic matter into humus or compost. The decomposition of this organic matter occurs gradually, through thermophilic and mesophilic processes, which involve an increase in the internal temperature of the organic matter deposit due to the activity of microorganisms, before finally returning to the ambient temperature.

The literature shows that compost has tremendous benefits for the environment and agriculture. According to research by Haug (1993), compost is able to improve soil quality through increasing humus content and soil structure. Compost improves soil aeration and water retention capacity, making it very beneficial to increase agricultural yields sustainably. In addition, the use of compost also reduces reliance on synthetic chemical fertilizers which often leads to long-term degradation of soil quality.

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Another study conducted by Bernal et al. (2009) showed that compost also plays a role in reducing greenhouse gas emissions. Composting organic matter diverts the anaerobic decomposition process that usually occurs in landfills, which produces methane gas as a byproduct. Methane is a more potent greenhouse gas than CO2, so reducing methane through direct composting helps reduce the negative impact on climate change. Therefore, the composting method plays a dual role: as an efficient organic waste management and as a climate mitigation method.

Eco-Enzyme: Sustainable Innovation in the Utilization of Organic Waste

In addition to compost, eco-enzymes are an increasingly popular alternative to organic waste processing. Eco-enzymes are solutions produced from the fermentation of organic waste, especially fruit and vegetable peels, in a mixture of water and brown sugar over a period of time, usually about three months. This process involves the activity of microorganisms that ferment the organic matter, turning it into a liquid rich in enzymes, organic acids, and various other active substances that benefit the environment.

According to research by Heng et al. (2017), eco-enzymes have a wide range of practical uses, including as natural fertilizers, household cleaners, odor reductions, and even as anti-fungal or anti-bacterial agents. Eco-enzymes have also been shown to be able to neutralize harmful chemical compounds in the environment. For example, in wastewater treatment, eco-enzymes can be used to reduce the content of ammonia and nitrates, which are major pollutants in industrial wastewater.

The benefits of eco-enzymes are not only limited to their function as environmentally friendly household products. Research has also shown that the process of making eco-enzymes can help reduce the amount of organic waste that ends up in landfills. This reduces the pressure on urban waste management systems that are often overwhelmed by the amount of waste generated every day. Diverting organic waste to be used as eco-enzymes directly reduces the volume of waste that must be handled by landfills, while reducing methane gas emissions resulting from anaerobic organic waste decay in landfills.

The Potential of Organic Waste Management in the Context of Climate Villages

Both compost and eco-enzymes have great potential in supporting the Climate Village program, especially at the village level or small communities such as Bojong Nangka Village. The Climate Village is a government program that aims to increase community participation in facing climate change challenges through community-based adaptation and mitigation actions. One of the concrete steps that can be taken in this context is the management of organic waste locally.

The use of simple technologies such as composting and the manufacture of eco-enzymes can have a great impact on reducing greenhouse gas emissions, while creating products that are economically and ecologically beneficial to the local community. Compost can be used to improve soil in agricultural land or yards, while eco-enzymes can be used for various household purposes and environmental management.

Existing studies, such as those conducted by Lim et al. (2020), show that the implementation of a community-based organic waste management system is able to reduce up to 50% of the volume of waste that enters landfills, while increasing public awareness of the importance of environmental sustainability. Therefore, the implementation of integrated organic waste management through compost and eco-

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e-ISSN: 2686-5623

enzymes can be a model of success in creating villages that are environmentally friendly, sustainable, and contribute to climate change mitigation.

Tabel 2. Result of activity

Component	Before Research	After Research
Knowledge of compost	32 % Understand	95% Understand
Eco-enzyme knowledge	18%	92%
Number of participants		47 People
Products produced		20 litres of Eco-Enzyme, 15 kg of composes

Activity Documentation:

- Foto sosialisasi

Figure 2. Socialisation

- Foto praktik pembuatan kompos

Figure 3. Practice

p-ISSN: 2460-352X
e-ISSN: 2686-5623

- Foto produk kompos & eco-enzyme

Figure 3. Result

Quotes from the residents of Bojong Nangka Village:

"So far, we have just thrown kitchen waste into the trash. After participating in the training, I just understood that fruit peels and vegetable residues can be processed into eco-enzymes and compost. It turns out to be very easy and very beneficial for plants at home."

Ibu Sari, Resident of RT 04/RW 09 Bojong Nangka Village

"Young people are usually less interested in waste, but after seeing the process and its benefits, we wanted to continue this activity. The eco-enzyme we made has been tried to clean the patrol post and the results are good."

Rizky, Karang Taruna of Bojong Nangka Village

"I've been gardening for a long time, but I just realized that the rest of the kitchen can be a liquid fertilizer. I will teach the neighbors to reduce household waste together."

Mrs. Mimin, Elderly Resident of RW 08

"This training really helps us run the Climate Village program. With compost and eco-enzymes, we can reduce organic waste by almost half. Hopefully this activity can be sustainable."

Mr. Suyono, a community leader of the village of Bojong Nangka

Some residents revealed that this program provides a new perspective on the potential of organic waste. "So far, we have just thrown kitchen waste into the trash. Only through the training do we know that fruit peels and vegetable residues can be processed into

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eco-enzymes and compost," said Mrs. Sari, one of the training participants. The head of RT in his neighborhood revealed the same thing, "This program is an eye-opener, Sis. Residents started collecting organic waste, and tried the composting process themselves as well," added Mr. Hendra, Chairman of RT 06 Bojong Nangka Village.

CONCLUSION

The training program organized by Bojong Nangka Village has helped increase literacy, practical skills, and community participation in the use of organic waste, especially household waste into compost and eco-enzymes. In addition to reducing the volume of waste that has the potential to go to landfills, the main product of this waste management activity can also be purchased by local residents as ecological products whose selling price is cheaper than similar products. Therefore, this program is included in the environmental mitigation and adaptation goals under the Climate Village Program. The implementation of this program shows that people are starting to be aware and actively participate in utilizing their household waste.

The compost produced supports local agriculture by acting as organic fertilizer, while eco-friendly enzymes can be used as natural cleaners and liquid fertilizers. Both products help reduce the use of toxic chemicals and improve soil fertility. This organic household waste management training is expected to produce several positive outcomes, both for the participants and for the environment. Some of these include significantly increased knowledge, practical skills gained, increased environmental awareness, real action in the community, eco-friendly products, and networking and collaboration.

SUGGESTION

Application at Home and Community is learning that must be done directly by participants. So that participants are asked to immediately apply the knowledge gained to start making compost and eco-enzymes in each participant's home. And not only that, of course participants can also share this knowledge with their families and neighbors and the community around the participants. Advanced Training by holding advanced training or mentoring sessions can deepen participants' knowledge about advanced organic waste management techniques. It can even be with case studies or field visits to communities or institutions that have been successful in implementing good waste management. Collaboration with Other Parties As the name implies, participants should collaborate with other parties such as schools, government institutions or non-profit institutions that first run organic waste management programs. This aims to accelerate and intensify the dissemination of information and good practices in the community. The Environmental Awareness Campaign, which we aim to provide, participants should be the initiators in expanding environmental awareness in the environment. Therefore, the committee advised participants to create campaigns in the form of semiar or workshops or other social services that are specifically to show the importance of organic waste management and its practices. Monitoring and Evaluation are very important for participants regarding this issue. The committee suggested monitoring and evaluation of the implementation of organic waste management in the participants' households. This aims to make it easier to find difficult points and of course solutions and observe how much positive impact the training provided. This is the author's suggestion to optimize the results of this training to have an even greater impact.

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e-ISSN: 2686-5623

THANK YOU NOTE
The author would like to express his deepest gratitude to Multimedia Nusantara University for the support and opportunities provided so that this community service journal can be carried out properly. This support is a great motivation for us to continue to contribute to the development of science and community service.

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