

**ECOENZYME WORKSHOP: A STEP FOR ZERO WASTE  
AT HOUSEWIVES GROUP RT.13 PONDOK BETUNG, TANGERANG SELATAN****Anggun PUSPITASARI<sup>1\*</sup>, Arin FITHRIANA<sup>2</sup>, and Putra TAQWA<sup>3</sup>***<sup>1-3</sup>Universitas Budi Luhur**\*[anggun.puspitasari@budiluhur.ac.id](mailto:anggun.puspitasari@budiluhur.ac.id)***ABSTRACT**

Waste management is a common problem. Household waste got at first rank in existing waste. Household activities produce waste every single day. Sustainable waste management is needed to reduce and decompose waste into zero waste. Zero waste need active participation from the community in supporting sustainable development. This community service activity is workshop producing eco-enzyme with partners from housewives' groups of RT. 13 Pondok Betung Pondok Aren, Tangerang Selatan. This activity aims to increase the understanding and the participation of community, especially housewives, to be responsible for what have been produced and consumed as part of sustainable development. Processing organic waste into eco-enzymes is a responsible step contribute to zero waste. The implementation method is divided into three stages, namely preparation, implementation and reporting. Since the preparation stage, this activity has received a positive response from participants to actively participate in preparing for the implementation of the program. The raw materials for eco-enzymes are easily obtained in the residential environment, as well as the simple producing techniques that increase the enthusiasm of participants. Through this workshop, participants increasingly understand the simple techniques of managing waste circularly into useful items as part of sustainable development.

**Keywords:** workshop, eco-enzyme, zero waste, sustainable development

**INTRODUCTION**

Environmental problems are very diverse and closely related to our lives. What we do unknowingly has an impact on the environment. Inclusively what we produce and consume. This seems trivial, but if accumulated it will become a common problem. The waste that we produce every day has become a global problem that requires commitment in handling it. For example, food, such as fruits and vegetables that we consume every day rests the waste. Even just fruit skins and seeds, if simply thrown away, it will disturb the environment because it takes time to decompose that will be smell odors and attracts flies. Therefore, this community service activity is intended as education and training for waste management to become zero waste and can provide benefits to humans through the produce of eco-enzymes.(Marlina, 2020)

Partners in community service on this community-based empowerment scheme are groups of housewives in RT.013/RW.001 Pondok Betung, Pondok Aren, South Tangerang. This group has routine activities such a housewives group at Family Empowerment and Welfare or PKK groups such as Posyandu, Posbindu, religious studies, social gatherings, gymnastics, community service and counseling, coaching and other activities related to the functions, duties and programs of PKK. Pondok Betung is an urban village area which located at DKI Jakarta borders. Consisting of 8 Citizens' Associations (RT) and 72 Neighborhood Associations (RW).(SIPITUNG (Sistem Informasi Kelurahan Pondok Betung) , n.d.) As a satellite area of capital city with increasing population density, urban problems are faced by this area, including waste management. The types of waste residual in this area are mostly inorganic waste. While organic waste, because there is no sorting activity, was mixed together and will be collected every two to three days by regular garbage collectors. Waste sorting which carried out by households is just waste that can be exchanged or sold to junk dealers passing by the area, such as cardboard, books, cans, bottles. Although there are regular garbage collectors, there are still residents who manage their own waste by piling it up and burning it, especially on empty land. Untidy waste disposal also causes waste to be in the water channels. Therefore, the activities of housewife groups in the environment require support from men in running the program smoothly.(Fardhini, 2019)

Some inhabitants took the initiative to manage waste independently, but still left behind typical waste problems. Even though several times the housewives group carried out outreach and coaching activities on waste management, the waste is still an obstacle in achieving the goals of one of the main PKK programs, namely environmental sustainability. Although it has not become a crucial problem, waste management is significant, especially in dense settlements. Education and workshops on waste processing are nothing new. Even the village head authority has let in RT.013

housewives' groups in waste management program several times, however, sustainable implementation that encourages community volunteerism in managing waste is still a challenge.(Gunadi et al., 2020)

These conditions tend to basic partner problems, among others understanding the importance of waste management in the environment, waste management skills and waste processing skills. Based on this background, one simple step to reduce household waste is to sort waste generated from household activities and reprocess it into useful products. Workshop of eco-enzyme produce is the choice of community development team because of it is a solution that is considered appropriate and beneficial in a sustainable manner. This training was chosen as an alternative to solving the problem of waste in the surrounding environment and in everyday life. Household activities, especially in the kitchen, are often carried out by mothers every day. This activity produces a lot of diverse kitchen waste. The eco-enzyme producing workshop was carried out considering that the benefits produced have the potential economic value. So this community development activity was developed based on two focus subjects, namely social humanities related to sustainable development by being responsible for production and consumption activities, which related to sustainable development goals point 12. The second subject is management that related to waste management by the community on producing eco-enzymes.(Cici Wuni & Ahmad Husaini, 2021)

Eco-enzyme is one of popular environment friendly on the zero waste program activities. Eco-enzyme is multi-purposes liquid which produced from organic waste fermentation, such fruits peel and vegetables mixed by sugar and water. This process is not only reducing organic waste that accumulate in final disposal site, but also produce some useful for household daily life activities even farming. In the context of zero waste, eco-enzyme become effective solution by utilizing the advantages ingredients which considered as waste and improve it being useful thing. (Putra et al., 2022) The activity paralyzed the main principle of zero waste by prioritize waste reduction, reuse and recycle. By producing eco-enzyme, each people can create direct contribution to reduce organic waste volume from their household residual waste.(Galintin et al., 2021)

In addition to the benefits of reducing waste, eco-enzymes also have various practical uses. This liquid can be used as a multi-purpose cleaner, natural pesticide, and even organic fertilizer. This places eco-enzymes not only reduce waste, but also reduce the need for chemical household products that can gradually damage the environment. The zero-waste movement supported by the produce and use of eco-enzymes. This not only raises awareness about waste management, but also encourages people to be wiser in utilizing natural resources. Thus, eco-enzymes become an integral part of the zero-waste strategy that aims to build a cleaner environment and sustainable.(Basri et al., 2022)

## METHOD

Implementation method adjusted to partner's problem. In this occasion, the problem is developed from two focus subject areas, namely understanding waste management as part of sustainable development (social humanities) and waste management through waste processing workshops with simple appropriate technology (management). Based on the two focus subject areas, it is then developed into four detailed priority problems. There are understanding waste and it impact to environment, understanding waste management as a responsibility for production and consumption, waste management workshops through producing of eco-enzymes and simple waste management to create zero waste. To solve these problems, the methods chosen in implementing the activity include socialization or sharing knowledge, questions and answers, discussions and workshops. While the evaluation is carried out by giving quizzes to participants about the material and workshops that have been delivered. The implementation method of this activity is carried out through three stages, namely the preparation stage, the implementation stage and the reporting stage. The following are the details of the stages of the activity implementation method:

1. First stage; Preparation for program implementation: at this stage, discussions are held both internally and externally with partners. Internal discussions are with team covering the objectives of the activity, achievements and implementation strategies. While discussions with partners cover the strategy for implementing the program in achieving objectives, implementation techniques, administration and sharing additional information regarding the situation and conditions of the participants. The University Team continues by submitting permits letter and proposals to both the university and partners. At this stage, each party has its own role.

At this preparation stage, the role of partners represented by the RT head includes:

- Providing information about waste management problems faced by partners.
- Providing permission to team on implementing community development activity program in their authority.
- Signing the Application and Cooperation Letter
- Preparing facilities and infrastructure

- Assisting communication with community as the active participants

The role of universities, in this case is carried out by the proposal team:

- Discussing strategies and problem solving related to waste management problems faced by partners
- Submitting permit proposals for conducting the solutions to partners and universities
- Preparing implementation stuff

2. Second stage; Implementation; is the implementation of the program activities that have been agreed upon by partners including problem solving with actively partners participation. The forms and scope of this stage include:
  - a. Socialization; in the form of education and sharing knowledge about waste management as part of sustainable development.
  - b. Training or Workshop; waste sorting as part of waste management and processing waste to reduce waste as a step towards zero waste.
  - c. Application of Technology; producing eco-enzymes as part of a simple technology implementation that is easy to apply and waste management for the sustainability and continuity by implementing this simple technology.
  - d. Assisting and Evaluation; utilization of simple technology and evaluation of partners' understanding on waste management and processing towards zero waste.

In this second stage, both the team consisting of lecturers supported by student involved actively as part of external campus activities. In this activity, both lecturers and students gain experience on interacting in community related to the implementation of sustainable development and utilize simple technology in waste management and waste processing. In this case, simple technology can be utilized by the community in the form of eco-enzymes and waste management.

At this implementation stage, the role and participation of partners include:

- Partners participate and supervise the process of activities; such as socialization and sharing knowledge about waste management as part of sustainable development participated by groups of housewives. The RT administrators also supervise and ensure that activities run smoothly.
- Partners also actively participate in preparing raw materials such as organic waste to be processed and managed. The waste prepared is adjusted to the needs of the workshop for producing eco-enzymes.
- Partners actively participate in workshops on processing waste with simple technology by making eco-enzymes with materials that are easily available around the residence.
- Partners actively participate in socialization of waste management organizations
- Partners are involved in evaluating understanding of waste management by discussing and raise up the questions.

The role of universities conducting by team and supported students are:

- Preparing materials and equipment; material for sharing knowledge about waste management, preparing questions for the quiz and questionnaires. Students help to prepare equipment, participant readiness, and activity locations.
- Preparing materials for waste processing workshops on using simple technology by producing eco-enzymes. The goal of activities been achieved if participants are able to apply and understand in sorting of waste that accordance the need to produce eco-enzymes, materials and equipment.
- Conducting evaluations. Evaluations are given to partners in order to determine the level of understanding and target achievement.

3. The third stage; is the final stage consist of evaluation and reporting: The team evaluates participants regarding the sustainability of the program considering that the production process of eco-enzymes takes about three months to and after that, eco-enzymes can be used by the participant in the community. Partners role is providing permission to monitor the sustainability of program implementation.

## RESULTS AND DISCUSSION

The community development activity was carried out on August 2024 in Pondok Betung Village at 09.00 WIB. Located at Balai Warga, the activity was attended by a group of housewives from RT 13, Pondok Betung Village, Pondok Aren, South Tangerang. The activity was carried out according to the method. The program began with socialization or sharing knowledge about understanding waste management as part of sustainable development. The

waste problem is a common problem, even the waste has become a classic problem and tends to get worse from year to year. This reality is in line with the increasing population which is directly caused to the volume of waste that have been produced from human activities. The waste produced is dominated by organic waste as much as 60-70% and the rest is non-organic waste 30-40%. (Katinka, 2023)

Nowadays, everyone of all ages knows that waste can disrupt human life activities. Unfortunately, waste cannot be separated from human life activities. Even, it can be said that every human activity cannot be separated from waste, which can be interpreted that every time humans do activities, they will produce waste. Of course, not all of it can be categorized as waste. Waste is the remains of unwanted human activities. (Alvianta et al., 2021; Fithriana & Annissa, 2018; Titikkata, 2022) If there is something unwanted in every activity, it will form an accumulation of waste. This is where handling of unwanted goods or remains is needed. Waste management is not just about throwing away waste, but also requires an understanding to manage in order to reduce environment lost. This understanding expected will increase certain behaviors in handling waste. This behavior is related to people's knowledge about how to dispose of waste and how this behavior can affect the environment in which the community is located. This behavior is interactions carried out by individuals with their environment. (Chazanah & Bayu Dani Nandiyanto, 2022) If individuals in society do not have knowledge about how to dispose of waste, then this behavior has several influences, such as the accumulation of waste, and the unpleasant odor from the pile of waste, and even tends other waste problems to arise. The existence of waste can hinder human life activities, so requires special knowledge in managing waste. In addition, it causing direct problems, incorrect waste management can also reduce environmental quality standards. In several big cities, the waste problem has encouraged certain parties to offer waste management services. In some cases, this phenomenon actually worsens environmental problems in a sustainable manner. This is especially the case with the many illegal waste managements that actually cause environmental damage that leads to criminal acts. (Andreswari et al., 2002) It can be said that waste management is not just about handing over waste to the waste management institution, but also requires knowledge and understanding of sustainable waste management.

Socialization and sharing knowledge on waste management is very needed to support achievement of sustainability of development as a whole. The community is expected to know and understand waste management in a simple and independent way correctly. So that it does not cause further problems. At the global level, waste management has begun to apply innovative ideas and philosophies such as zero waste and circular economy. (Widyananda et al., 2021) Both are sustainable development paradigms that view waste as a valueless and unavoidable by-product produced at the end of a product's life phase. On the other hand, this view argues that waste is a misallocated resource or a resource in transition. Waste is produced in the transition phase between production and consumption activities. Waste can be circulated in the production and consumption processes. Therefore, in circular economic activities, there are no wasted goods or zero waste.

One form to conduct of zero waste is the utilization an organic waste into eco-enzymes. In this case, it can be said an organic waste, whose people do not want to accept can be circulate into products and can be utilized for human life. Eco-enzymes are one solution because eco-enzymes contain organic acids, namely lactic acid and acetic acid, which have the potential to inhibit bacterial growth by producing bacteriocin proteins. The eco-enzyme fermentation process will last for three months. In the first month, this process will produce alcohol, in the second month, the process will produce acetic acid and in the third month it will produce enzymes. In the third month, the enzymes are ready to be harvested and utilized. This eco-enzyme fermentation has high microbial activity, so it can be utilized to inhibit microbial growth. (Janarthan et al., 2020)

The production of eco-enzymes can be easily done by every household. This is because the raw materials for making them are unknowingly available in the residential environment. Household activities produce both organic and non-organic waste. Both organic and non-organic waste can be reused or circulated through certain techniques to produce goods that can be reused, even have economic value. Both types of waste are even produced every day in daily life activities. Likewise, the products produced in the form of eco-enzymes have economic value because of the benefits generated from the eco-enzymes. This relates to sustainable development. There is responsibility for the production and consumption activities carried out. Therefore, the eco-enzyme workshop is the focus of this community development program activity.

The eco-enzyme workshop was guided by Mrs. Tutik Asnawi as a key- person from Bank Sampah Budi Luhur. On her speech Simply put, eco-enzyme is produced through fermentation of fresh fruit/vegetable waste that has not rotted yet. Waste is added with sugar and water with a ratio of 1:3:10 without the addition of other ingredients, such stimulating enzyme. this mixed ingredient is pure and simple. In general, the modifications made are changing the type of sugar and the type of fruit/vegetable waste used as raw materials. Characterization is mainly focused on

evaluating enzyme content and activity. Various use of eco-enzymes is found as liquid fertilizers, antimicrobial agents, wastewater treatment processes, and sludge treatment processes. Eco-enzymes can also be used as disinfectants and hand sanitizers. (Alim et al., 2023)The eco-enzyme making process is assisted by students. Participants are divided into six groups so that the information and workshops presented facilitate active participation of participants. In addition to the above materials, the eco-enzyme storage media in this workshop utilizes inorganic waste available on site. Residents of RT. 13 has been started sorting waste, although it is still very simple activity, by sorting waste that can be easily reused, such as used cans, plastic bottles, glass bottles, books and paper. Plastic gallon bottles that have been sorted and collected by residents become a storage medium for eco-enzymes. Used mineral water gallons are first cleaned from dirt or other objects that will affect the eco-enzyme making process. Gallons or eco-enzyme storage containers must be ensured to be clean from all dirt or objects stuck in them. Because if there are still objects or dirt visible, it will affect the fermentation process which can cause the eco-enzyme making to fail. Likewise, fruit or vegetable waste that is used as an ingredient for making eco-enzymes is also ensured to be clean. It is better to wash the fruit or vegetables first before peeling or cutting them, so that the unused remains are also clean.



Figure 1. Socialization of waste management as part of sustainable development by the team (Ms. Anggun) and a workshop on producing eco-enzymes by Mrs. Tutik



Figure 2. Eco-enzyme making process by participants

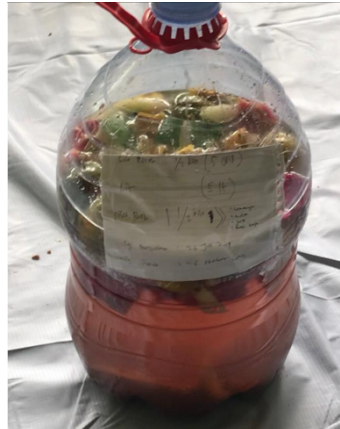


Figure 3. A mixture of eco-enzyme ingredients ready for fermentation

The prepared ingredients are put into the prepared media (bottle or gallon or something with lid tight). In addition to facilitating and accelerating the fermentation process, all ingredients such the remaining fruit, rid or vegetable waste and red or coconut sugar are cut into small pieces to make it easier to put them into the bottle or gallon. After all the ingredients are put in, the bottle or gallon is tightly closed. Make sure the lid is tightly closed to prevent air or other objects that interfere with the fermentation process from entering. Next, the bottle or gallon of eco-enzyme media is labeled consist the information about the composition, date of producing and date of harvesting. Harvesting means when the eco-enzyme has been settled and ready to use. It required about three-month for the eco-enzyme producing process until it is ready to use. This activity was carried out in early August, so it is estimated that the eco-enzyme has formed and can be used after three months, it about in early November. During the fermentation process in the first month, the bottle or gallon lid should be opened once a day to release the gas produced by the fermentation process. After the gas comes out, the lid can be tightened again. The gas produced in the first month is O<sub>3</sub> gas (ozone) which is useful for reducing the greenhouse effect and is equivalent to the existence of ten trees. O<sub>3</sub> gas can reduce carbon dioxide (CO<sub>2</sub>) in the atmosphere that blocks heat in the clouds. Eco-enzyme can also convert ammonia into nitrate (NO<sub>3</sub>) as a natural hormone and beneficial nutrients for plants. In the second month, the bottle or gallon lid should be opened once a week. like the first month, it done to release the ozone in order to prevent the bottle or gallon exploded. Until the third month is enough to wait for the formation of eco-enzyme.(Galintin et al., 2021)

The making process of eco-enzymes carried out by groups of housewives in the Rt.13 Pondok Aren, Pondok Betung Tangerang Selatan also requires management to regulate the availability of materials, storage media, supervision of the fermentation process, storage of eco-enzyme production results, utilization and distribution. Therefore, this community development activity also socializes the importance of organizing the entire process together within the framework of waste management. So that this becomes a shared responsibility for sustainable development in the Rt. 13 community.

Until this article was written, the eco-enzyme production was still in process. However, the enthusiasm of the participants, especially housewives, was very high because the process production was easy to practice and the ingredients easy to get. Also, they benefited from the activity. Participants gained an understanding that reducing and eliminating waste altogether requires patience and perseverance. Eliminating waste to zero means circulating waste into useful items. Waste cannot be avoided because every human activity produces waste. However, reducing and circulating encourages the achievement of zero waste and sustainable development. From sharing knowledge, the participant got the insights about circular waste knowledge which tend to gain the economic benefit that helpful for living. The next community development program will explore the utilizing eco-enzymes by adding visual identity to support a sustainable economy for community.

## CONCLUSION

Sustainable waste management is a shared endeavor in achieving sustainable development. Training on proper waste management and sustainable waste management for community is an inevitable need. The community contribution as a waste producer implies responsibility for what is produced and consume. Eco-enzyme production training is a medium for community contribution to zero waste that can be done simply and independently. Although it takes time to get benefits from this activity, increasing understanding of proper waste management encourages circular economy activities. In the opposite condition, economic benefits and benefits obtained from the circular economy encourage the community to be actively involved in contributing to zero waste. It can be said that zero waste can be realized if the community has felt the economic benefits of sustainable waste management.

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