



Optimization of Organic Waste Processing Using Bio-Compound Method Through Pineapple Fermentation

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Abstract

Waste processing through pineapple fermentation is one of the efforts to improve environmental cleanliness and also as a form of optimizing the lack of understanding of environmentally friendly and sustainable waste management practices. This community service activity aims to increase community awareness and understanding of the urgency of processing organic waste as a solution to increasingly critical environmental problems and equip participants with practical skills in processing organic waste into products that have added value, both from an economic and ecological perspective and encourage active community involvement in waste management at the household level as the smallest unit in the community structure, which is later expected to create long-term effects in waste management at a broader level. With a participatory approach, involving community activities in all stages, this community service build understanding and enthusiasm among residents. The results show that the community empowerment carried out in RW 07 Karang Besuki Village is that the community understands how to process waste easily does not require a long time in the process, and produces useful products that are also economically and socially empowering. Hopefully, through the socialization and training provided, the community will continue to care about their environment, especially environmental cleanliness.

Keywords: Pineapple Fermentation, Probiotics, Bio-Compound

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INTRODUCTION

Garbage is an object that is worthless or has no value found in the community environment (Putra & Jaya, 2022). In Indonesia, we can see garbage everywhere, especially in urban areas, which has become a big problem for the Indonesian climate. Garbage in Indonesia is a very serious social, economic, and cultural problem. Almost all cities in Indonesia have problems processing garbage (Agustina et al., 2017). The current waste problem in Malang City is caused by the many sources of waste that have emerged. This has created a problem for the environment because Malang City is a strategic city with a dense population. The rapid progress of industrial, economic, and educational activities has led to environmental problems, one of which is the problem of waste management. To overcome these environmental problems, waste management efforts are needed that can create a clean and more sustainable environment for future generations (Nindya et al., 2022; Pradana, 2023; Thaha et al., 2022). One of the efforts that can be

made to overcome the waste problem is to process and recycle waste. So, it is hoped that the waste that has been processed will become useful for the community (Muhaimin & Jumriani, 2023).

Understanding how to process waste properly is necessary so the community can know how to process waste according to environmental needs (Khoiriyah, 2021). Therefore, we need to understand the location of the waste management activities that will be carried out in this community service activity plan. This activity focuses on working with a partner, the PKK RW 07 group, Karang Besuki Village, in Sukun District, Malang City. Establishing a partnership with the PKK RW 07 group, Karang Besuki Village is expected to be able to implement a waste sorting program at the household level. This program involves separate waste sorting for organic and non-organic materials and providing facilities for recycling recyclable waste (Toriquddin et al., 2024).

Waste management is a major challenge for many communities, especially those often facing limited resources and knowledge (Achmad, 2024). If left untreated, organic waste in the local environment can become a source of environmental pollution and health problems (Simanjorang, 2014). In addition, the issues faced by the PKK RW 07 group partnership, Karang Besuki Village, related to waste processing include a need for more understanding of environmentally friendly and sustainable waste processing practices. To increase the efficiency and sustainability of waste processing, the Bio-Compound method is implemented using the pineapple fermentation method as an attractive alternative. However, in-depth cooperation and collaboration are required with the PKK RW 07 group partnership, Karang Besuki Village, to implement this method correctly. Therefore, the field of activity will be to provide counseling and training on waste processing using the pineapple fermentation method.

RW 07 Karang Besuki, Sukun District, Malang City, has a fairly high population density, producing much waste daily. The waste problem in RW 07 Karang Besuki, Sukun District, Malang City, can be overcome by implementing one of the waste processing methods, the Bio-Compound method. The pineapple fermentation bio-compound method has great potential in converting organic waste into compost or useful probiotics (Yuliono et al., 2022). The pineapple fermentation process can increase the activity of microbes that play a role in decomposing waste and producing compost and probiotics faster and with better quality (Utina & Baco, 2023). All waste can be recycled, including organic waste that we usually get from household waste produced from the kitchen. Organic waste can be recycled and made into a planting medium instantly in our yard using the Bio-Compound method.

Organic waste can be processed using pineapple fermentation and made into Bio-Compound. With this processing method, the gas produced by organic waste is reduced, does not emit odor, and waste is processed without taking a long time. Waste processing using the Bio-Compound method through pineapple fermentation has many benefits, such as helping to clean parasites in the intestines, helping to cure sinusitis, sore throats, gout, and so on. Pineapple processing can be used to make probiotics or drinks, and the results of the probiotics can be mixed into a solution containing pineapple skin. In both of these results, it will be very beneficial for the local community.

Implementing this community service activity will pay attention to the sustainability aspect of the waste processing project. This involves understanding how the PKK RW 07 group partners, Karang Besuki Village, can independently continue the waste processing operation after completing the project, including equipment maintenance and procurement of raw materials. In addition, it will also be ensured that waste processing not only produces useful products but also empowers the PKK RW 07 group partners, Karang Besuki Village, economically and socially. One of the aspects underlying this community service activity is the great potential of the pineapple fermentation method in converting organic waste into probiotics and Bio-Compound. The fermentation process

can produce high-quality compost that can be used as organic fertilizer, thus helping to increase local agricultural productivity. Therefore, not only is the waste problem resolved, but new opportunities are also created for the economic empowerment of the local community. Thus, the community service activity regarding this counseling and training is not only about solving concrete problems but also about building capacity and strengthening the independence of the PKK RW 07 group partners, Karang Besuki Village, in facing environmental challenges.

METHOD

This community service is implemented through socialization and program assistance by conducting training for making products from pineapple skin mixed with Bio-compound probiotic materials. The target of this community service activity is the PKK mothers of RW 07, Karang Besuki Village. PKK mothers dominate the target of this activity, which is to increase knowledge and insight into the benefits of potential resources, especially pineapples, in helping environmental sustainability in processing organic waste (Fiasari et al., 2024). The implementation method used in waste management activities using the Bio-compound method for the community of RW 07 Karang Besuki, Sukun District, Malang City, is as follows.



Figure 1. Stages of Community Service Activities
Source: Author, 2024

The organic waste processing program using the Bio-Compound method is implemented through several structured stages. It begins with program planning, forming a team of 4 members. This team then prepares a proposal and designs the program in detail, a process that takes place from September to Program Preparation Implementation, Socialization Training, and Implementation Evaluation Program Planning in December. The next stage is program preparation, which includes field survey activities, internal group training, collecting relevant data, and preparing media and materials needed for socialization, training, and evaluation. After thorough preparation, the team proceeds to implement socialization in the community. In this socialization, the community is given direction regarding the Bio-Compound method for waste processing, hoping to increase their participation and understanding of the program. This socialization also aims for the program to run systematically and in a structured manner with full support from the community. The next stage is training and implementation, where the community will be

given knowledge and practical skills in implementing the Bio Compound method. The training stage aims to provide theoretical and conceptual impacts on the community so that they can carry out waste processing practices using the bio-compound method. The training was conducted by forming small groups consisting of the PKK RW 07 group, Karang Besuki Village, Sukun District, Malang City. The training stages include several processes, namely:

- 1) Provide the main ingredients, pineapple, and other ingredients, such as sugar and water.
- 2) The first stage is to make probiotics, 300 grams of pineapple flesh is needed and fermented using 1 liter of demineralized water and 50 grams of granulated sugar.
- 3) Probiotics are put into a container with a wide lid (fermented for \pm 5-7 days).
- 4) After 7 days of fermentation, the fermented solution water is filtered and heated to a temperature of 60-70 degrees (pasteurization), and after cooling at room temperature, it is stored in the refrigerator.
- 5) Next, make BioCompound. The ingredients needed to make BioCompound are 300 grams of pineapple skin, 50 grams of sugar, 1 liter of plain water, and 100 ml of probiotic water.
- 6) Bio-Compound is put into a container with a wide lid (fermented for \pm 5-7 days).
- 7) After 7 days of fermentation, the solution can process organic waste. It uses 50 ml of solution put into 1 liter of plain water.

Meanwhile, the implementation stages of waste processing with the Bio-Compound method include production and utilization. The success indicator of this stage can be seen from the community's understanding of managing organic waste using the BioCompound method. In addition, the community can use this method sustainably and utilize organic waste to become fertilizer using the Bio-Compound method, which will later benefit the community (Gaspersz & Fitrihidajati, 2022). The final stage is mentoring and evaluation. This step is carried out to solve the challenges that arise during waste processing and to produce products in fertilizer and planting media. From the assessment of waste processing using the Bio-Compound method, it was concluded that it is important to continue to strengthen collaboration, respect each other, and understand the role of each partner in the ongoing project. This shows that the Bio-Compound method effectively manages organic waste, indicating great potential in promoting environmentally balanced and sustainable waste processing.

Implementing the community service program for waste processing using the Bio-Compound method in RW 07 Karang Besuki, Sukun District, Malang City, involves a series of structured and comprehensive steps. The initial stage begins with an in-depth discussion about the program and conducting regular and active consultations with supervising lecturers to ensure the right direction. The team also collaborates with related parties to support the program's implementation. Internal coordination between group members is carried out intensively to clarify the division of tasks and responsibilities of each. In addition, the team prepares an additional agenda that functions to support the smooth running of the community service program. As a final stage, an evaluation of activities is carried out to ensure the effectiveness of implementation. Through this systematic approach, it is hoped that the community service program can run optimally and significantly impact the target community.

In implementing the organic waste processing program using the Bio Compound method in RW 07 Karang Besuki, Sukun District, Malang City, the participation of partners, especially the PKK group RW 07, plays a very important role. The PKK group RW 07 contributes significantly to improving environmental cleanliness and plays an active role in waste management. They are involved in various programs, ranging from reforestation and waste management to environmental protection. The role of the PKK RW 07 group, Karang Besuki Village, is not only limited to participation in all activities held but also in

optimizing the smooth running of activities that have been arranged. With the active involvement of the PKK RW 07 group, Karang Besuki Village, this program is expected to run more effectively and provide a sustainable positive impact on the local community.

Therefore, the evaluation of program implementation makes a design to measure and evaluate the results of activities an important step in the project or activity management process. This helps ensure that the goals and objectives can be achieved effectively. By designing a systematic and structured evaluation process, the organization or project team can ensure that the activities are effective and can provide the expected impact of the goals set. With the kitchen waste processing program using the Bio-Compound method, it is hoped that the community can get results from its processing because kitchen waste or household waste produced by each resident can be managed with good and correct methods so that when the processing runs well, the community will get sustainable results and provide positive impacts both in terms of the environment and the social community in RW 07 Karang Besuki, Sukun District, Malang City.

RESULT AND DISCUSSION

Community service programs are a real manifestation of social concern and responsibility, whether carried out individually or in groups, to improve the standard of living and broaden the community's horizons through various activities that meet local needs (Habib, 2021). The implementation of this concept is realized in the form of socialization that focuses on optimizing organic waste processing using the bio-compound method through the pineapple fermentation process. The activity was held at Literacy Park RW 07, Karangbesuki Village, Malang City, which was chosen as a strategic location considering the high potential for organic waste management in the area and the community's enthusiasm for developing a sustainable environment.

This program has three main interrelated objectives. First, to increase public awareness and understanding of the urgency of organic waste processing as a solution to increasingly critical environmental problems. Second, to equip participants with practical skills in processing organic waste into products that have added value to both the economy and the environment. Third, to encourage active community involvement in waste management at the household level as the smallest unit in the community structure, which is expected to create long-term effects in waste management at a wider level.

The bio-compound method with pineapple fermentation was chosen because it has several advantages, such as easily obtained raw materials, a relatively simple processing process, and results that can be used for various purposes, such as organic fertilizer and planting media. Through this program, the community can implement the skills they have acquired daily to reduce the volume of organic waste in landfills.

Program Planning

Program planning is a crucial step in community service to ensure that the activities can effectively and efficiently achieve their goals (Manzilah et al., 2023). The implementation of the socialization of the optimization of organic waste processing through the bio-compound method with pineapple fermentation in RW 07, Karangbesuki Village, began with program planning, where a team of 4 members was formed. This team then prepared a proposal and designed the program in detail, a process that took place from September to November. The next stage is program preparation, which includes field survey activities, internal group training, collecting relevant data, and preparing media and materials needed for socialization, training, and evaluation. After thorough preparation, the team continued to the stage of implementing socialization in the community.

In this socialization, the community was given direction on the Bio Compound method for waste processing, hoping to increase their participation and understanding of the program. This socialization also aims for the program to run systematically and

structured with full support from the community. The next stage is training and implementation, where the community will be given knowledge and practical skills in implementing the Bio Compound method. The training stage aims to provide theoretical and conceptual impacts on the community so that they can carry out waste processing practices using the bio-compound method.

Implementation of Socialization

The socialization activity of optimizing organic waste processing using the bio-compound method through pineapple fermentation held in RW 07, Karangbesuki Village, is an implementation of a community service program planned systematically and structured. The selection of the RW 07 Literacy Park as the location for implementation is considered very strategic, considering its easily accessible location and adequate facilities for learning activities. The enthusiasm of the PKK mothers who attended this activity showed the community's high interest in the issue of organic waste management in their environment. In its implementation, the community service team began the activity by providing a comprehensive understanding of the urgency of organic waste management and its impact on environmental sustainability. The material presented not only focused on theoretical aspects but also emphasized the practical benefits the community can directly feel. Participants were invited to understand that organic waste management is an obligation and investment for a better environmental future.

The next stage focuses on providing materials, training, or practice in making probiotics or pineapple starters and bio-compounds using pineapple fermentation. By presenting expert speakers and the community service team, they show each process stage in detail, from selecting raw materials and determining the right composition to the correct fermentation technique. The interactive delivery method allows for a two-way dialogue between the presenters and participants. The PKK mothers were allowed to ask questions, share experiences, and discuss various obstacles that might be faced in implementation in the field. The success of this activity is not only measured by the high level of participation but also by the formation of stronger social bonds among participants. This activity builds a spirit of cooperation and awareness of the importance of maintaining environmental cleanliness.



Figure 2. Presentation of Material by Resource Person

The positive impact of this socialization can be seen from the emergence of participants' initiatives to form small groups that will routinely practice the bio-compound method in their environment. This shows that the goal of creating sustainable behavioral changes in organic waste management is starting to bear fruit. Furthermore, this activity has opened the community's insight into the potential of organic waste that has so far been considered worthless to become a useful resource. This program is expected to be a

learning experience for the community to create a cleaner and healthier environment in RW 07, Karangbesuki Village. By applying the bio-compound method with pineapple fermentation, the community contributes to reducing the volume of organic waste and participates in efforts to preserve the environment sustainably. The success of this program can be a pilot model for other regions in developing an effective and environmentally friendly organic waste management system.

Program Assistance

Program mentoring is an important stage in the implementation of socialization and optimization of organic waste processing through the bio compound method with pineapple fermentation in RW 07, Karangbesuki Village. PKK mothers of RW 07, Karangbesuki Village, will gain knowledge and skills in processing organic waste; mentoring aims to ensure that the techniques taught can be applied effectively in their daily lives. Below are pictures of probiotic and bio compound training guided by expert speakers and community service teams, depicting the atmosphere of the activity and the interaction between participants and instructors.



Figure 3. Practical Process of Making Probiotics and Bio-Compounds

In implementing the mentoring program, the community service team focused on two main aspects, namely, the manufacture of probiotics and bio-compounds, delivered comprehensively by experts in their fields. The training process was structured with a special emphasis on fermentation techniques involving two main components of pineapple fruit. First, participants were taught how to extract and ferment pineapple flesh to produce high-quality probiotics. Second, they were introduced to the technique of processing pineapple skin through fermentation to produce effective bio-compounds. In this practical process, participants acted as passive listeners and were actively involved in every stage of the process. The resource person opened up a wide discussion space, allowing participants to ask various questions about the technical obstacles they faced in their daily practices. Every challenge conveyed by the participants was responded to with practical solutions, adjusted to the conditions available in their environment. This mentoring activity aimed to provide knowledge and build participant independence in managing organic waste. Through a deep understanding of the fermentation process and proper processing techniques, participants are expected to be able to develop their skills sustainably. The expected long-term impact of this program is creating an effective organic waste management system at the household level, which will ultimately contribute

significantly to reducing the volume of organic waste and improving overall environmental quality (Hapsari et al., 2024).

A deep understanding of the composition and process of making bio-compounds through pineapple fermentation is a key factor in the success of organic waste processing. This method's very important initial stage is the creation of probiotics or pineapple starters, which will play an important role in fermentation. Making this starter requires easily obtained ingredients and simple equipment generally available in households. The basic composition required consists of one liter of demineralized or boiled water, 300 grams of fresh pineapple flesh, and 50 grams of granulated sugar. To support an accurate manufacturing process, equipment such as glass or food-grade plastic containers, digital scales to measure ingredients accurately, and measuring cups to ensure the appropriate volume of liquid is needed. The pineapple starter fermentation process takes an optimal time of seven days under controlled conditions. After the fermentation, the pineapple solids and the fermented liquid are separated through filtration. The separated liquid then goes through a pasteurization stage by heating at a controlled temperature between 60-70 degrees Celsius. This process aims to inhibit the growth of unwanted microorganisms while maintaining beneficial probiotics.

After the liquid reaches room temperature, the starter is packed in sterile bottles and stored in the refrigerator to maintain its quality and effectiveness. The pineapple starter that has been produced has a shelf life of up to one month when stored at low temperatures in the refrigerator. Storage at low temperatures is important to maintain the activity of beneficial microorganisms that play a role in the organic waste processing process. This starter will be an active component in manufacturing bio-compounds for kitchen waste processing, resulting in an efficient and sustainable organic waste processing cycle. The making of bio-compounds is a further stage after producing probiotics or pineapple starters, which go through a process and composition that meets standards. A bio-compound can be defined as a solution containing beneficial microorganisms that can decompose organic waste, especially kitchen waste, into planting media or organic fertilizer. In making quality bio-compounds, the right formulation of ingredients is required, consisting of 1 liter of water, 300 grams of pineapple skin, 100 ml of probiotics or pineapple starters produced previously, and 50 grams of sugar. These components are then fermented in a closed container for 3-5 days. Applying bio-compounds is done by dilution, where 50-100 ml of bio-compound is dissolved in 1 liter of water before being mixed with kitchen waste. This mixture can then be used as a planting medium. Bio-compounds have various benefits, not only as a decomposer of organic waste into planting media but also in improving water and soil quality.

The training program for making pineapple-based probiotics and bio-compounds has been implemented by involving the PKK RW 07 mothers' group in Krangbesuki Village as participants. After delivering comprehensive material and direct practice sessions, the participants showed a significant understanding of making fermented products using pineapple fermentation.



Figure 4. Documentation of the Results of the Probiotic and Bio-Compound Making Practical Work

The available visual documentation shows the real results of the practice of making pineapple-based probiotic starters and bio-compounds that the participants have successfully produced. This success indicates the effectiveness of the applied training method, where the combination of theoretical explanation and direct practice positively impacts participants' ability to produce products according to the expected standards. This achievement also illustrates the potential for program sustainability, considering that participants have acquired adequate technical skills to develop independent probiotic and bio-compound production, which can benefit the local community.

CONCLUSION

Community service activities aim to provide education and training to the community, especially the PKK RW 07 mothers' group in Karangbesuki Village, regarding the use of pineapple as a material for decomposing organic waste into compost fertilizer through a fermentation stage called probiotics and bio compounds. Probiotics and bio compounds are organic waste decomposers that are easy to make and affordable. In this activity, it is hoped that the community will be more motivated towards environmental cleanliness. It can also continue from the socialization given and create a positive social impact by empowering the community to manage waste independently.

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