



Strengthening a Sustainable Economy Based on the Green Economy and SDGs through Liquid Organic Fertilizer (POC) Innovation from Household Waste by the Sekarwangi PKK Women

Dhany Efita Sari¹, Endang Setyaningsih², Sitti Retno Faridatussalam³, Hanifah Tria Intan Jelita⁴,
Raden Ahmed Abdillah⁵

^{1,2,3,4,5}Universitas Muhammadiyah Surakarta

email: des576@ums.ac.id¹, endang.setyaningsih@ums.ac.id², sitti.rf@ums.ac.id³, a210220031@student.ums.ac.id⁴,
a210240002@student.ums.ac.id⁵

ABSTRACT

Household organic waste has emerged as a major environmental issue in Dibal Village, Ngemplak District, Boyolali Regency, since most vegetable, fruit, and leaf residues are simply discarded, causing unpleasant odors and environmental pollution. This challenge is even more pronounced given that among the 74 active members of the “Sekarwangi” PKK women’s group, 27 work as vegetable farmers and market vendors, making them the primary contributors of organic waste in the form of unsold vegetables and fruits. Paradoxically, such waste holds significant potential to be transformed into liquid organic fertilizer (POC), which is both beneficial for home gardening and economically valuable. This community engagement program was designed to provide practical solutions through technical training, the distribution of anaerobic composters, and continuous mentoring for all PKK members. The implementation consisted of five stages: socialization, hands-on training in POC production using bio-activators, distribution of 74

composting units, weekly fermentation monitoring, and evaluation through product trials and satisfaction surveys. The program demonstrated a remarkable behavioral transformation: from merely discarding waste to actively converting it into valuable products. By the reporting period, three harvest cycles had been completed, yielding a total of approximately 124 liters of POC (equivalent to 8 Le Minerale gallons)—far exceeding the initial target of 50 packages. When converted into commercial packaging, the production amounts to 496 bottles of 250 ml (priced at IDR 10,000, potential revenue IDR 4,960,000) or 248 bottles of 500 ml (priced at IDR 20,000, with the same value). Part of the POC has been utilized for household gardening, while the remainder is ready for commercialization as a community product. This program has proven effective in reducing organic waste, fostering awareness of the green economy, and strengthening the community's economic independence. Recommendations for future action include product and packaging standardization, enhancement of digital marketing strategies, and market expansion through local bazaars or agricultural partnerships to ensure that the economic potential can be sustainably realized, thereby contributing to the achievement of the Sustainable Development Goals (SDGs).

Keywords: Organic Waste; Liquid Organic Fertilizer (POC); Women's Community Group (PKK); SDGs; Green Economy

1. Introduction

Household organic waste is one of the most common environmental problems encountered at the community level. Data from the Ministry of Environment and Forestry (KLHK, 2022) shows that organic waste accounts for the largest proportion of total national waste generation, reaching over 60%. Organic waste generally comes from food scraps, vegetables, fruit, and leaves. If not managed properly, it can have negative impacts on health and the environment. The decomposition process of organic waste produces methane gas, which can exacerbate the greenhouse effect and produce unpleasant odors that disturb community comfort (Isradi et al., 2024). This situation highlights the importance of implementing environmentally friendly organic waste management, especially at the household level.

A similar phenomenon was also found in Dibal Village, Ngemplak District, Boyolali Regency, Central Java. This village is known for its significant agricultural potential, particularly in the cultivation of green vegetables, which is widely managed by the local community. However, this potential is

accompanied by the emergence of organic waste problems. Based on observations and initial discussions with the “Sekarwangi” Family Welfare Movement (PKK) Team in Lemah Abang Hamlet, RT 003/004, it was discovered that the majority of household waste, consisting of vegetable, fruit, and leaf scraps, is simply dumped into the surrounding environment without processing. This not only creates a pungent odor and piles of waste, but also degrades environmental sanitation. The PKK women of Dibal Village, with 74 active members, face a similar problem. Daily household and agricultural activities generate large amounts of organic waste, but there is no structured management system, resulting in waste simply piling up and potentially polluting the environment.

However, if properly managed, organic waste can be processed into useful products, one of which is liquid organic fertilizer (POC). POC is the result of the fermentation of organic materials, both from household and agricultural waste, with the help of certain microorganisms, resulting in a solution rich in macro- and micronutrients (Azis et al., 2024). POC has been shown to increase soil fertility, improve soil structure, and encourage plant

growth. According to research by Wibowo et al. (2022), using organic fertilizer (POC) from kitchen waste can increase vegetable crop productivity by 25% compared to using single chemical fertilizers. Furthermore, POC is more environmentally friendly because it leaves no harmful residues in the soil or groundwater.

Numerous studies confirm that composting is an effective method for addressing organic waste issues. Umami et al. (2024) found that composting can reduce organic waste generation by up to 60% and produce compost that is beneficial for sustainable agriculture. Similar results were reported by Setyaningsih et al. (2017), who utilized leaf litter as compost as a creative solution for waste management on campus. This research demonstrated that by utilizing simple technology, communities can independently process waste, thus not only reducing pollution but also providing direct benefits in the form of fertilizer.

At the community level, the use of organic waste for POC production has been widely adopted in community empowerment programs. Ahmad et al. (2024) reported the success of a program processing household waste into POC, which reduced organic waste generation while increasing environmental awareness among residents. The POC product is not only used for garden farming but is also marketed in simple packaging, providing additional income for community groups. A similar finding was demonstrated by Dewi et al. (2020), who stated that household-based composting activities can be an alternative for implementing a circular economy in villages, offering low production costs and promising profit potential.

Although the benefits of organic fertilizer (POC) have been widely recognized, its implementation at the household level still faces several obstacles. These include limited public knowledge regarding POC production techniques, limited resources such as composters, and a lack of awareness of the importance of organic waste management (Budiningtyas et al., 2024). Therefore,

interventions such as training, mentoring, and the provision of facilities are needed to support the community in processing organic waste into POC.

This community service program in Dibal Village aims to address these issues by providing practical solutions based on the application of science and technology. Through outreach activities, technical training, and composter distribution, women from the Family Welfare Movement (PKK) of Dibal Village are trained to process household organic waste into liquid organic fertilizer. This program is expected to provide benefits.

2. Method

This community service activity was designed to provide solutions to the household organic waste management challenges faced by the women's family (PKK) of Sekarwangi, Dibal Village. The program was implemented using a participatory approach, with all PKK members actively involved in every stage of the program. In general, the implementation method consisted of five main stages: outreach, technical training, tool distribution, mentoring, and evaluation.

The first stage was outreach, which served as an initial step to educate the women's family (PKK) of Sekarwangi regarding the dangers of improperly managed organic waste and its potential for utilizing it as a value-added product. During this stage, the community service team explained the negative impacts of disposing of waste directly into the environment and introduced the concept of liquid organic fertilizer (POC) as an alternative solution. The outreach activities involved group discussions, presentations, and interactive Q&A sessions to explore participants' prior knowledge.

The second stage was technical training on producing POC using an anaerobic composter with the aid of a bioactivator. During this stage, participants were introduced to the raw materials used, the fermentation process, and how to maintain the quality of the POC to meet standards. The training was conducted using a

live demonstration method, where participants practiced the steps of filling organic material into the composter, adding bioactivator, and monitoring fermentation conditions. This hands-on approach was chosen to facilitate participants' understanding and enable them to apply the knowledge gained in their homes.

The third stage involved the distribution of 74 anaerobic composters to all members of the Sekarwangi Family Welfare Movement (PKK). Providing composters is a strategic step to ensure each household has its own means of processing organic waste. This allows for sustainable waste management at the family level without having to rely on shared facilities.

The fourth stage is weekly mentoring. During this stage, the community service team monitors the fermentation process in participants' homes and ensures the quality of the resulting organic fertilizer (POC). The mentoring included field visits, technical consultations, and recording any challenges encountered by participants. This activity aims to ensure that the PKK members of Sekarwangi not only understand the theory of POC production but also develop skills in maintaining consistent production.

The fifth stage is evaluation, which is conducted to assess the success of the program and measure the benefits received by participants. The evaluation was conducted through a POC trial on garden plants to assess its effectiveness, as well as a participant satisfaction survey to determine the program's positive impact. The results of this evaluation served as the basis for developing recommendations for the program's sustainability and the potential for developing POC-based businesses in Dibal Village.

Briefly, the implementation method is depicted in the flowchart in Figure 1. This diagram facilitates the reader's understanding of the stages of the activity, from outreach to evaluation.

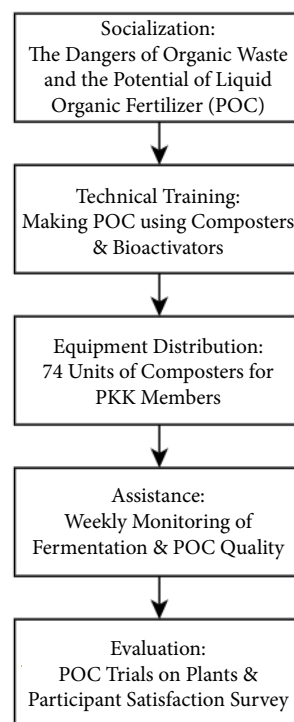


Figure 1. Flowchart of Community Service Activity Implementation Method

3. Results and Discussion

A. Results

The community service activities carried out in Dibal Village, Ngemplak District, Boyolali Regency, actively involved all 74 members of the "Sekarwangi" Family Welfare Movement (PKK). The participant participation rate reached 100%, indicating the seriousness and high enthusiasm of the partners for the solution offered, namely processing household organic waste into liquid organic fertilizer (POC). This condition is very important to note because the success of a community empowerment program is determined not only by the design of the activities offered, but also by the level of partner involvement in each stage. Before the activities were carried out, the majority of PKK members did not understand the concept of sustainable organic waste management. Household organic waste in the form of vegetable, fruit, and leaf scraps is generally just thrown away in yards or open areas. This situation causes unpleasant odors, the potential for the emergence of disease

vectors, and environmental pollution around the settlement. The following is an explanation of each activity that has been carried out by the community service team.

Socialization

The first phase involved the socialization of the program for processing household organic waste into liquid organic fertilizer (POC). The socialization aimed to introduce the concept of a green economy and the

importance of sustainable waste management to all members of the “Sekarwangi” Family Welfare Movement (PKK) in Dibal Village. This activity successfully attracted all 68 of the 74 active members, demonstrating a high level of participation from the outset. The session also introduced the activity stages, program objectives, and expected benefits, both environmental and household economic, to the participants.



Figure 1. Socialization Activities

Assistance in Making POC from Household Waste Phase I

The first phase of mentoring was conducted for 30 PKK members. Participants received an anaerobic composter, a monitoring card, and a poster with instructions on how to use the composter. Through this mentoring, participants received practical training on how to incorporate organic materials (vegetable,

fruit, and leaf waste), add bioactivators, and record fermentation. The first phase of the POC harvest was carried out using a door-to-door method, with the implementation team going to members' homes to empty the composter. The equipment used included jerry cans, gloves, masks, and trowels to maintain hygiene and safety.



Figure 2. Assistance Activities for the Use and Distribution of Bioactivator Composter to Produce POC from Household Waste

Assistance in Making POC from Household Waste Phase II

The second phase of mentoring was aimed at 44 members who did not receive assistance in the first phase. This activity followed the

same format, including the distribution of composters, monitoring cards, and posters, as well as technical training on POC production. Thus, all 74 PKK members received equal assistance.





Figure 3. Assistance Activities for the Use and Distribution of Phase II Bioactivator Composter to Produce POC from Household Waste

POC Harvest

After the second phase of mentoring was completed, the activity continued with the first, second, and third phases of the POC harvest. The harvesting process continued with team visits to members' homes to assist with

the draining and collection of the results. The three harvests yielded a total of approximately 124 liters of POC (8 gallons of Le Minerale). When converted into marketable packaging, this yielded 304 250 ml bottles and 152 500 ml bottles.

Table 1. POC Production Targets and Realizations

Indicator	Target	Achievements	Percentage (%)
POC packaging production	50 bottles	304 bottles (250 ml) / 152 bottles (500 ml)	608% / 304%
Number of active participants	74 people	74 people (100%)	100%
Potential income	–	Rp3,040,000 (250 ml) / Rp3,040,000 (500 ml)	–

The potential revenue is calculated based on a selling price of Rp10,000 for 250 ml and

Rp20,000 for 500 ml. Both schemes generate the same economic value, Rp3,040,000.





Figure 4. POC harvest stages I, II, and III

Monitoring and Evaluation

Activity monitoring is conducted every two weeks to ensure the composter is running smoothly. Through monitoring, the team identified several technical issues, such as leaks in the composter taps, which were experienced by several members. These issues were immediately addressed with simple technical improvements, ensuring optimal fermentation. Evaluations were also conducted by recording harvest volume, fertilizer quality, and documenting use on yard plants.

Participant Satisfaction Survey

A satisfaction survey was conducted after three POC harvests. The results showed that the majority of members were satisfied with the mentoring activities, both in terms of technical aspects, environmental benefits, and economic impacts. They noted a cleaner environment, reduced odors, and a significant decrease in organic waste generation. Furthermore, members expressed pride in being able to produce a valuable product with relatively little capital, only for packaging.

Tabel 2. Hasil Survei Kepuasan Peserta

Rated aspect	Very satisfied (%)	Satisfied (%)	Enough (%)	Not satisfied (%)
Kegiatan sosialisasi & pendampingan	65	35	0	0
Manfaat lingkungan (lingkungan lebih bersih, sampah berkurang)	70	30	0	0
Manfaat ekonomi (produk dapat dijual)	60	38	2	0
Kemudahan penggunaan komposter	55	42	3	0
Pendampingan dan solusi atas kendala teknis	62	36	2	0

The survey results in Table 2 show that more than 90% of participants were in the satisfied to very satisfied category in every aspect, both related to mentoring activities, environmental benefits, economic benefits, and technical support.

B. Discussion

After participating in a series of outreach, training, and mentoring sessions, the participants demonstrated significant changes in both knowledge and technical skills. All 74 members of the “Sekarwangi Family Welfare Movement” (PKK), including 27 farmers and vegetable vendors at the market, were able to directly practice making

liquid organic fertilizer (POC) using an anaerobic composter with a distributed bioactivator. The initial program target was only 50 POC packages, but by the reporting period, three harvests had been recorded, with a total production of approximately 124 liters. Converted into marketable packaging, this amount is equivalent to 304 250 ml bottles or 152 500 ml bottles. With a selling price of Rp10,000 for a 250 ml bottle and Rp20,000 for a 500 ml bottle, the resulting economic value reached Rp3,040,000, far exceeding the initial target. This achievement not only demonstrates technical success but also serves as a concrete indicator of the program's success in shifting community behavior from

passively disposing of waste to actively processing waste into value-added products. The organic fertilizer (POC) produced is utilized in two ways. First, most members use it to fertilize their yard plants, partially replacing chemical fertilizers. This has a positive impact on plant health, improves soil fertility, and raises environmental awareness, as organic fertilizers are more environmentally friendly. Second, some of the produce is packaged and marketed collectively by the Family Welfare Movement (PKK) group. Although sales are still limited in the initial stages, this valuable product marks the beginning of a household business based on waste processing with long-term economic prospects.

Changes are also evident compared to conditions before the program. Previously, approximately 80–90% of household organic waste was directly disposed of in the environment without processing. After the program was implemented, more than 60% of organic waste was successfully utilized as POC raw material. The impact is clearly visible in the field: unpleasant odors in yards have decreased drastically, the environment has become cleaner, and the risk of pollution has been reduced. From a socio-economic perspective, PKK women who previously had no additional income from waste management now have a collective business unit with the potential to improve family welfare. Circular economy literacy has also increased, reflected in a shift in mindset that no longer views waste as a burden but as a resource that can be utilized.

Regular monitoring conducted every two weeks also strengthened the program's success. Through this mechanism, the team was able to detect emerging technical issues, such as leaks in the composter's tap. These issues were immediately addressed through simple technical repairs, preventing disruption to the fermentation process. Furthermore, evaluations were conducted by documenting production volumes, testing the use of POC on plants, and recording any challenges encountered. A satisfaction survey conducted after three harvests showed that the majority of members were satisfied to very satisfied with the mentoring activities. They stated that the surrounding environment was cleaner, the odor from the waste was reduced, and they now had a marketable product despite the relatively small capital outlay

(only for packaging costs). These survey results reinforced the finding that the program not only provides environmental benefits but also increases family economic empowerment and social solidarity at the community level. This success can be understood in the context of previous research. Aditya et al. (2022) demonstrated that composting can reduce organic waste volume by up to 60% and increase agricultural productivity. These findings align with results in Dibal Village, where a significant portion of kitchen waste was successfully processed into POC, thereby reducing the amount of waste being thrown away. Setyaningsih et al. (2017) also demonstrated that processing leaf litter into compost is a creative solution for waste management on campus, which in turn can be adapted at the household level.

Furthermore, research by Isa et al. (2024) found that a program for processing household waste into liquid organic fertilizer (POC) not only successfully reduced waste volume but also encouraged the emergence of community-based small businesses. This is highly relevant to the situation in Dibal Village, where the Family Welfare Movement (PKK) group has begun developing a POC sales business, albeit on a limited scale. Chusniatun et al. (2023) and Putri et al. (2024) also emphasize that composting-based circular economy practices can be a low-cost strategy for empowering rural communities, yet have a significant impact on environmental sustainability and economic well-being.

Thus, the results achieved through this program not only address local issues in Dibal Village but also strengthen empirical evidence from previous research.

4. Conclusion

A community service activity in Dibal Village, Ngemplak District, Boyolali Regency, successfully achieved its stated objectives and even exceeded the initial target. All 74 members of the "Sekarwangi" Family Welfare Movement (PKK) were actively involved in the program, including 27 farmers and vegetable vendors, who are major contributors of household organic waste. This full participation was a key factor in the program's success, as behavioral transformation can only be achieved through comprehensive partner involvement.

The results showed a production of approximately 124 liters of Liquid Organic Fertilizer (POC) from three harvests, equivalent to 304 250 ml bottles or 152 500 ml bottles, far exceeding the initial target of 50 containers. With a selling price of Rp10,000 (250 ml) and Rp20,000 (500 ml), the resulting economic value reached Rp3,040,000. This production was used both for yard fertilizer and as a marketable household product. This marked the birth of a collective waste-processing business unit with sustainable prospects.

In addition to its economic impact, the program also had a significant impact on the environment. Before the program, 80–90% of organic waste was directly dumped in open areas, while after the program, more than 60% of the waste was successfully utilized as raw material for organic fertilizer (POC). The immediate impacts felt by the community included reduced odors, a cleaner environment, and increased awareness of the importance of green economy practices.

Routine monitoring and satisfaction surveys confirmed the program's success. Technical challenges, such as leaking composter taps, were quickly resolved through mentoring, and survey results indicated that more than 90% of participants were satisfied or very satisfied with the program. They considered the program beneficial for the environment, increased income, and strengthened group solidarity.

Therefore, this program can be concluded as an effective program in reducing organic waste, increasing household economic independence, and strengthening community-based circular economy literacy. The success in Dibal Village also demonstrates that the application of simple technology with ongoing mentoring can support

the achievement of the Sustainable Development Goals (SDGs), particularly point 12 (sustainable consumption and production) and point 8 (decent work and economic growth).

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6. AI Disclosure Statement

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