EDUMASPUL:
Educational Journal
P-ISSN 2548-8201 | E-ISSN 2580-0469

Vol. [10] No. [2] ([2026])Page 1668-1679
DOI: 10.33487/ edumaspul.v10i2.631

Education on the Utilization of Banana Stems as Liquid Organic Fertilizer and Environmental Care Movement in Jorong Padang Panjang, Nagari Pariangan

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Received	Revised	Accepted	Published
[01-08-2026]	[13-09-2026]	[11-09-2026]	[01-10-2026]

Abstract: Organic waste, such as banana stalks, in Jorong Padang Panjang, Nagari Pariangan, remains largely underutilized, while the cleanliness of public facilities including the local soccer field and the Tabiang prayer house (Surau Tabiang) is not consistently maintained. This community service initiative aimed to enhance the knowledge and skills of local residents specifically the Dasawisma (women's neighborhood group) members in processing banana stalks into liquid organic fertilizer (LOF). Furthermore, it sought to foster community awareness and participation in maintaining environmental cleanliness. The methods employed included public education through outreach sessions and handson training demonstrating the production of LOF using banana stalks, water, EM4 (an effective microorganism inoculant), and palm sugar complemented by environmental stewardship activities such as a community cleanup drive (Operasi Semut), a collective work session (gotong royong) at the soccer field, and the cleaning of the Surau Tabiang. The results indicate high enthusiasm among the Dasawisma members during the LOF production training, although the final product has yet to be tested on plants. The environmental initiatives successfully improved the cleanliness of the soccer field and the Surau Tabiang, with the cleaning of the prayer house receiving the most positive response; however, the Operasi Semut and the soccer field cleanup faced challenges due to low resident participation. This initiative demonstrates that integrating education on waste utilization with tangible environmental action serves as a relevant model for community service in areas with similar characteristics.

Keywords: *Banana Stalks; Gotong Royong (Collective Work); Environmental Cleanliness; Community Service Program (KKN); Liquid Organic Fertilizer*

Abstrak: Limbah organik seperti batang pisang di Jorong Padang Panjang, Nagari Pariangan, umumnya belum dimanfaatkan secara optimal, sementara kebersihan sejumlah fasilitas publik seperti lapangan sepak bola dan Surau Tabiang belum terjaga secara rutin. Kegiatan pengabdian ini bertujuan meningkatkan pengetahuan dan keterampilan masyarakat, khususnya ibuibu Dasawisma sebagai mitra kegiatan, dalam mengolah limbah batang pisang menjadi pupuk organik cair (POC), serta mendorong kepedulian dan partisipasi masyarakat dalam menjaga kebersihan lingkungan. Metode yang digunakan adalah Pendidikan Masyarakat melalui penyuluhan dan Pelatihan melalui demonstrasi langsung pembuatan POC berbahan batang pisang, air, EM4, dan gula merah, dilengkapi dengan gerakan peduli lingkungan berupa Operasi Semut, goro lapangan sepak bola, dan pembersihan Surau Tabiang. Hasil kegiatan menunjukkan antusiasme tinggi dari ibuibu Dasawisma dalam mengikuti pelatihan pembuatan POC, meskipun produk belum sempat diujicobakan pada tanaman. Kegiatan lingkungan berhasil meningkatkan kebersihan lapangan sepak bola dan Surau Tabiang, dengan respons paling positif diterima dari kegiatan pembersihan surau, sementara Operasi Semut dan goro lapangan masih menghadapi kendala rendahnya partisipasi warga. Kegiatan ini menunjukkan bahwa integrasi edukasi pemanfaatan limbah dan aksi nyata kepedulian lingkungan dapat menjadi model pengabdian yang relevan untuk diterapkan pada wilayah dengan karakteristik serupa.

Kata Kunci: Batang Pisang; Gotong Royong; Kebersihan Lingkungan; KKN; Pupuk Organik Cair

QUOTE:	Hildayati Kurnia, Masyitah, Aulia Pradita, Ghina Azizah Andra, & Muhamad Yahya. (2026). Education on the Utilization of Banana Stems as Liquid Organic Fertilizer and Environmental Care Movement in Jorong Padang Panjang, Nagari Pariangan. *Edumaspul: Jurnal Pendidikan*, *10*(2). https://doi.org/10.33487/edumaspul.v10i2.631
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Introduction

Environmental management is one of the issues that requires sustainable community involvement, especially in the management of household and agricultural waste, considering that household knowledge and awareness have proven to be the main determining factor for the sustainability of community participation in waste management (Sekarningrum & Gaus, 2026). This problem is also found in Jorong Padang Panjang which is located on the slopes of Mount Marapi, Nagari Pariangan. Based on the results of observations during service activities, organic and inorganic waste is still found in various community environments. Agricultural waste in the form of banana stems produced after plants are cut down generally has not been utilized optimally. On the other hand, household waste is still found dumped in the area around the spill and water flow, even though domestic waste that is disposed of without treatment can increase bacteriological content and pollute the surrounding water sources (Gufran & Mawardi, 2019). Inorganic waste in the form of food and beverage packaging is also found in a number of environments, including along roads and waterways. This condition shows that waste management and environmental cleanliness are still problems that need common attention.

Environmental problems are also seen in the facilities used by the community. One of them is the football field in front of SDN 16 Pariangan. Based on the results of observations and information from the local community, the field has not been cleaned regularly for about two years so that it is overgrown with very tall, dense, and dense grass, as the management of public spaces often faces short-term and long-term challenges that affect the effectiveness of its maintenance (Said & Tempels, 2025). The condition of unmaintained open spaces, characterized by the accumulation of garbage and uncontrolled vegetation growth, generally arises due to a lack of attention and routine maintenance of the space (Luo et al., 2025). At the local level, similar challenges are also found in the management of sports infrastructure in Indonesia, which is often constrained by unstructured maintenance and weak supervision systems, so it is necessary to optimize management and active community participation (Aprilia & Rusli, 2025). Similar conditions are found in Surau Tabiang which is located around the bathing and shower areas. The surau is used by the community, especially mothers, to carry out worship after activities in the garden or using bathing facilities. However, the cleanliness condition of the surau has not been optimally maintained, even though the level of cleanliness of places of worship has been proven to have a significant effect on the comfort of worshippers in carrying out worship (Kencana et al., 2025).

In addition, garbage is also found along the road which is a space for community activities. This condition shows that environmental problems are not only related to the existence of waste, but also to the maintenance of facilities and public spaces that are used together. One of the efforts that can be made to overcome the problem of organic waste is to process it into liquid organic fertilizer (POC). The use of organic waste as a POC material can be an alternative to waste management while producing products that have a use value, as household waste that was originally just thrown away can be processed into useful products such as liquid organic fertilizer so that it also provides economic value (Nurhadi et al., 2025). Technically, the

addition of EM4 activators to raw materials such as banana stems has been proven to be able to increase the levels of nutrients N, P, and K in the liquid organic fertilizer produced (Indrawati et al., 2020).

Previous service activities show that education and practices in making liquid organic fertilizer can improve people's understanding and skills in utilizing organic waste, as shown by the training on making POC made from banana stems which has been proven to be able to improve the knowledge and skills of the target group (Saragih et al., 2023), in line with the findings that similar training in farmer groups also trained product packaging and marketing skills so as to add economic value to the POC produced (Nge et al., 2023). The processing of household organic waste into fertilizer is also considered to be one of the approaches in reducing waste while providing benefits to the community, considering that the use of household waste into liquid organic fertilizer can mitigate the adverse impact of waste on the environment while fertilizing the soil (Angraini et al., 2024). Thus, education accompanied by direct practice is needed so that people not only know the benefits of organic waste, but also have the skills to process it into useful products.

In addition to waste utilization, efforts to protect the environment require community involvement through real activities. Mutual cooperation, cleaning of public spaces, and environmental cleanliness activities can be a means to build concern for the surrounding environment, as community-based environmental concern involves the active participation of residents in caring for and managing together the environment and its resources, thereby encouraging sustainable behavior and lasting positive impacts (Bird et al., 2025a). At the local level, mutual cooperation and community service activities based on KKN have also been proven to be able to revive the social capital of the community and restore environmental conditions, including the cleanliness of public spaces and the function of water drains (Junus et al., 2026). In this service activity, the movement to care for the environment is manifested through several activities, namely mutual cooperation to clean the football field, clean the Tabiang Surau and wash worship equipment, as well as Operation Ants along the way. These activities are directed to encourage the creation of a cleaner environment while providing direct experience to the community about the importance of maintaining facilities and the environment that are used together.

Based on previous service activities, the use of organic waste into fertilizer and environmental education activities have been carried out extensively. However, service activities in Jorong Padang Panjang integrate education on the use of organic waste through the creation of POC with real activities in the form of environmental care movements. This approach is carried out by connecting waste management with efforts to maintain the cleanliness of facilities and public spaces through mutual cooperation and Operation Semut. The integration of the two approaches is expected to provide a more complete understanding that concern for the environment is not only carried out through waste reduction and utilization, but also through involvement in maintaining the cleanliness of the surrounding environment. Based on this description, this service activity aims to increase the knowledge and skills of the community in utilizing organic

waste through the manufacture of liquid organic fertilizer and encourage community concern and participation in maintaining environmental cleanliness in Jorong Padang Panjang.

Implementation Method

The method used in this service activity is Community Education and Training, which is applied through education and demonstration of making liquid organic fertilizer (POC) made from banana stem waste for Dasawisma mothers in Jorong Padang Panjang, Nagari Pariangan. In addition, environmental activities in the form of Operation Ants, soccer field goro, and cleaning of Surau Tabiang are also carried out as a form of implementation of environmental awareness carried out by KKN students. Community Education activities aim to increase the understanding and awareness of Dasawisma mothers regarding the use of banana stem waste into POC. The activity was carried out once, on Wednesday, July 22, 2026, at Dasawisma 8 Park, Jorong Padang Panjang, and was attended by 10 Dasawisma mothers. The material was delivered by KKN students through the lecture method, assisted by brochures containing the benefits of POC, and showing directly the tools and materials that will be used in making POC. The training activities were carried out in the form of a direct demonstration of POC making by KKN students, using materials in the form of banana sticks, water, EM4, and brown sugar. Mrs. Dasawisma acted as an audience and observer during the demonstration process. The POC produced from this activity amounted to approximately half a large paint bucket, then closed tightly and fermented for two weeks.

After the fermentation period, the POC showed a change in color to a slight brownish accompanied by a rather pungent aroma, as an indication that the fermentation process was going as it should. The success of this activity was seen from the response and enthusiasm of Mrs. Dasawisma during the process of delivering materials and demonstrations, without formal evaluations such as pretestposttests. As a form of concern for the surrounding environment, KKN students also carried out several supporting activities, namely Operation Ants on Sunday, July 5, 2026, along the Jorong Padang Panjang environment, in the form of sorting and collecting garbage along the road; the field goro on July 8, 9, and 13, 2026, with the previous football field conditions filled with long, dense, and dense grass, which were then cut, collected, and burned so that the field was clean and usable again; and the cleaning of Surau Tabiang on July 10, 2026, with the condition of the previous surau dusty, there were many spider nests, as well as dirty and smelly mukena, which were then cleaned along with washing the mukena so that the surau and worship equipment became clean and fragrant. The three activities were carried out by KKN students as a form of concern for cleanliness and environmental management in Jorong Padang Panjang, Nagari Pariangan.

Results and Discussion

A. Results of POC Making Activities

The education and training activities for making POC were attended by 10 Dasawisma mothers and facilitated by 13 KKN students. Qualitatively, the participants showed high enthusiasm during the activity, as seen from their active involvement in the question and answer session. One of the

questions that arose was about how to apply POC to plants, which was answered directly by the students that POC needed to be mixed with water first before use. This enthusiasm was also seen from the response of mothers who stated that the leftover banana stalks that had been left behind or thrown away could be used as a product of useful value, in line with the view that agricultural waste that has been considered a real burden holds great potential as an untapped resource (Bhardwaj et al., 2025). Similar conditions are also found in banana stem waste in various other regions in Indonesia, where the waste has generally not been utilized optimally and tends to be left to rot, while education and training in its treatment have been proven to be able to increase the knowledge, skills, and ecological awareness of the community (Lidas et al., 2025).

The POC manufacturing process begins with the stage of chopping banana stems into small pieces (Figures 7 and 8), followed by the stage of mixing ingredients in the form of water, EM4, and brown sugar into a container containing chopped banana stalks until well mixed (Figures 1 and 2), following a fermentation method made from banana stems with EM4 activators which have been proven to increase the nutrient content of liquid organic fertilizers produced (Indrawati et al., 2020). The activity was also witnessed and attended by Mrs. Dasawisma and students who gathered in the yard around the activity location (Figures 3–6). The POC was then tightly closed and fermented for two weeks, producing a product with a brown color and a distinctive aroma of fermentation. The application of the use of POC that was socialized to Mrs. Dasawisma included two methods, namely spraying on the leaves with a mixture of 100–200 ml POC per liter of water, and watering in the plant's root area with a mixture of 200–300 ml POC per liter of water. Until the preparation of this report, the POC produced had not had time to be tested directly on plants.





Figure 7–8. The process of chopping banana stems as a raw material for POC.





Figure 1–2. The process of mixing EM4, water, and brown sugar on the chopped banana stalks.



Figures 3–6. The enthusiasm of Dasawisma's mother and KKN students during the activity.

B. Results of Environmental Activities

The Operation Ant activity was carried out for two hours, at 09.00–11.00 WIB, with the result that the road conditions that were originally filled with garbage scattered became clean. This activity faced obstacles in the form of low citizen participation so that it was fully implemented by KKN students. The goro activity on the football field resulted in clean field conditions that could be used by residents to play football and other activities (Figure 9). Just like Operation Semut, this activity also faced obstacles of lack of citizen participation in its implementation. The cleaning activity of Surau Tabiang resulted in a clean condition of the surau along with worship equipment (mukena) that had been washed. The surau was used again by residents after being cleaned and received a very positive response from local residents, who even offered a place to dry the mukena that had been washed by KKN students.



Figure *9. The condition of the football field after being cleaned through goro activities.*

C. Education on the Utilization of Banana Stems as Liquid Organic Fertilizer and Environmental Care Movement in Jorong Padang Panjang, Nagari Pariangan

Based on the results of the service activities that have been carried out, efforts to build environmental awareness in Jorong Padang Panjang cannot be separated from two interrelated poles, namely the management of organic waste that is not optimal and the maintenance of public facilities that tend to be neglected. The education and training program for making POC succeeded in changing the perspective of Mrs. Dasawisma towards banana stalks, from waste that has been left alone to raw

materials that have utility value. This is reflected in the high enthusiasm of the participants throughout the activity, although the benefits of the product have not been proven directly because they have not had time to apply it to plants. On the other hand, the series of environmental care movements carried out showed non-uniform results: Operation Seant and goro football fields both faced obstacles of low citizen participation so that practically only they were driven by KKN students, while the cleaning of Surau Tabiang actually received much more positive support and response from the community.

This difference in achievement is interesting to look at further, because it shows that the success of a community-based environmental activity is not only determined by the method of implementation, but also by the extent to which the object or space that is the target of the activity has meaning and emotional closeness to the local community. The success of making liquid organic fertilizer (POC) made from banana stems in this service activity strengthens the empirical evidence that agricultural waste, which has been considered worthless, actually holds great economic and ecological potential if managed with the right approach. The anaerobic fermentation process involving EM4 as a bioactivator has been consistently proven to be able to accelerate the decomposition of organic matter and increase the content of macronutrients such as nitrogen, phosphorus, and potassium in the final product (Indrawati et al., 2020).

The change in brown color and distinctive aroma of fermentation that appeared in the POC as a result of this activity is a qualitative indicator that the biochemical process is taking place as it should, while confirming that simple methods based on local ingredients can be replicated by the community without the need for technology or high production costs. These findings are consistent with the view that the transformation of household organic waste into products that have use value is a strategy to mitigate environmental pollution that at the same time provides direct economic benefits to the community (Angraini et al., 2024), and in line with the findings that training in making POC based on agricultural waste is able to significantly increase the technical capacity of the target group, including in the aspects of packaging and product marketing potential (Nge et al., 2023). The high enthusiasm shown by Mrs. Dasawisma during the education and demonstration process cannot be separated from the role of women as agents of change in household environmental management. Recent studies show that women's involvement in waste management training is greatly influenced by access to education and ease of adaptation to the treatment technology introduced, which in turn contributes significantly to the sustainable improvement of environmental awareness (Asteria & Haryanto, 2021).

The enthusiastic response also confirmed that a participatory approach based on direct demonstrations is more effective in building community understanding than one-way delivery of material, as shown by the findings that the active involvement of target groups in the practice of making POC made from banana stems can improve knowledge and skills in a real and measurable way (Saragih et al., 2023). However, one critical note that needs to be underlined is that the POC produced has not had time to be tested directly on plants until the preparation of this report is

prepared. This condition has implications for the empirically unverified effectiveness of POC on plant growth in the field, so that the real benefits of the product cannot be felt directly by the community, in line with the view that the use value of liquid organic fertilizer is only really actualized when it has gone through the application stage and evaluation of the results on the planting object (Nurhadi et al., 2025). In the aspect of the environmental care movement, the low participation of residents in Operation Ant and Goro activities on the football field is a phenomenon commonly encountered in the Real Work Lecture-based service program (KKN). This condition is in line with the finding that collaboration between students and the community in mutual cooperation activities is often faced with various participatory obstacles, even though the final results of the activities can still be achieved positively through the cooperation established between the parties involved (Kholish et al., 2023).

This phenomenon is also in line with the pattern found in similar service programs in various regions, where KKN students often act as early movers (initiators) in re-fostering the spirit of mutual cooperation which had declined due to changes in people's increasingly individualistic lifestyles (Fadhillah et al., 2024). In a broader context, studies on global volunteerism in waste management also confirm that the success of volunteer-based environmental activities is highly dependent on the existence of core driving groups, while broader community participation tends to be volatile and influenced by complex socioeconomic factors (Voukkali et al., 2025). Thus, the lack of citizen involvement in this activity does not merely reflect the failure of the program, but also illustrates the structural challenges that are indeed commonly faced in community-based service initiatives, including those related to the recovery of social capital and the function of public space (Junus et al., 2026).

The condition of the football field that was left unmaintained for approximately two years before the goro activity was carried out also shows a general pattern in the management of public spaces, namely the emergence of degradation of facilities due to a lack of attention and routine maintenance from related parties (Luo et al., 2025). This phenomenon is also consistent with the short-term and long-term challenges that are commonly faced in the practice of managing public spaces in general, both in terms of institutions and community participation (Said & Tempels, 2025). Furthermore, the maintenance of public sports facilities has a safety dimension that cannot be ignored, considering that systematic evaluation of the condition of sports facilities in residential environments shows that equipment and maintenance management factors are the main determinants of the level of safety of the use of such facilities by the community (Wu et al., 2025). Therefore, the success of restoring the function of the football field through goro activities is not only aesthetically meaningful, but also contributes to the safety and comfort aspects of the use of public facilities by residents, as shown by similar community empowerment case studies that affirm that KKN-based gotong royong activities are able to revive the function of spaces and public elements that were previously abandoned (Pale et al., 2025).

In contrast to the previous two activities, the very positive response from

residents to the cleaning of Surau Tabiang which was even followed by a spontaneous offer to provide a place to dry worship equipment indicates a fundamental difference in the level of emotional attachment of the community to the religious space compared to the public space in general. These findings reinforce the evidence that the level of cleanliness of places of worship has a significant influence on the comfort of worshippers in carrying out worship (Kencana et al., 2025), as well as emphasizing that the management of the cleanliness of mosques or prayer rooms on a regular basis is an important means to improve the quality of the spiritual and physical environment for worshippers (Ferdiyansyah et al., 2022).

The phenomenon of higher enthusiasm of residents for religious activities can also be explained through the perspective of environmental psychology, where community-based cleaning activities are proven not only to have an impact on the physical aspects of the environment, but also to strengthen social cohesion and generate a stronger positive emotional response than cleaning activities in spaces that do not have attachments to personal or cultural values (Wyles et al., 2016). In other words, collective ownership (*sense of ownership*) which is stronger towards the worship space than the public sports room is one of the explanatory factors why the support of the residents is much more real in the cleaning activities of the surau, in line with the community-based environmental awareness framework which emphasizes that the active involvement of the residents in caring for the common space is greatly influenced by the extent to which the space is interpreted as part of their identity and social life (Bird et al., 2025).

Overall, this service activity shows that the integration of education on the use of organic waste and real action on environmental awareness is able to produce a complementary impact. On the one hand, the POC program has succeeded in changing the public's perception of banana stem waste, from something that is considered worthless to a useful product raw material, in line with the principle of sustainable waste management that emphasizes the importance of household knowledge and awareness as a determining factor for the sustainability of community participation in the long term (Sekarningrum & Gaus, 2026). On the other hand, the movement of environmental care through Operation Ants, field goro, and surau cleaning provides concrete experience to the community about the importance of maintaining facilities and shared spaces, as well as being an educational means that complement the problem of domestic waste pollution that has the potential to pollute water sources if left untreated (Gufran & Mawardi, 2019).

The difference in the level of citizen participation in each activity also provides an important lesson that the strategy of community involvement in the next service program needs to consider the dimension of emotional closeness and the direct interest of residents to the object or space that is the target of the activity, instead of applying a uniform approach to all types of environmental activities. The results of the POC making activities in this service are in line with studies that show that the addition of EM4 activators to banana tree trunks is effectively used in the manufacture of liquid organic fertilizer through the fermentation process (Sari & Alfianita, 2018). The enthusiastic response of Mrs. Dasawisma to this activity also emphasized that the

training in making POC made from banana stem waste was able to improve the knowledge and skills of the target group in a real way (Saragih et al., 2023). However, the limitation in the form of untested POC on plants is an important note for the sustainability of the program, considering that the benefits of POC can only be felt directly by the community after the application stage is carried out.

In environmental activities, the constraint of low citizen participation in Operation Ants and field goro is a common challenge encountered in gotong royong-based programs. Collaboration between students and the community in KKN-based gotong royong programs often faces various obstacles. Nevertheless, positive results can still be achieved through good cooperation (Kholish et al., 2023). This condition shows that the role of KKN students as the initial mover is still important, even though the direct involvement of residents is not optimal. In contrast to these two activities, the cleaning of Surau Tabiang actually received a positive response and real support from residents in the form of offers of a place to sunbathe, which indicates that activities directly related to worship facilities tend to be easier to mobilize sympathy and support from the community compared to other general cleaning activities.

Conclusion

This service activity succeeded in improving the knowledge and skills of Mrs. Dasawisma in Jorong Padang Panjang, Nagari Pariangan, in processing banana stem waste into liquid organic fertilizer (POC) through the Community Education and Training approach. The high enthusiasm of the participants showed that education on the use of organic waste that had been left unattended could be well received by the community, even though the POC produced had not had time to be tested directly on plants so that the benefits could not be felt in real terms by the participants. In addition, the environmental care movement through Operation Ants, the football field goro, and the cleaning of Surau Tabiang succeeded in improving the environmental cleanliness conditions in the jorong. The cleaning activities of Surau Tabiang received the most positive response from residents, while Operation Semut and goro field still faced obstacles in the form of low direct citizen participation. Overall, this activity shows that the combination of waste utilization education and real environmental action can be a relevant model of service to be applied in areas with similar characteristics, noting the need for additional strategies to increase citizen involvement in the next environmental cleanliness activities.

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