Vol. 3 No. 4 Edisi Agustus - Oktober 2026 E. ISSN. 3032-2472
Multidisciplinary Indonesian Center Journal (MICJO)
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COMMUNITY EMPOWERMENT IN TELUK MERBAU VILLAGE THROUGH LIQUID ORGANIC FERTILIZER (LOF) PRODUCTION TRAINING

PEMBERDAYAAN MASYARAKAT DI DESA TELUK MERBAU MELALUI PELATIHAN PEMBUATAN PUPUK ORGANIK CAIR (POC)

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DOI: https://doi.org/10.62567/micjo.v3i4.3114

Abstract

Household and agricultural organic waste in Teluk Merbau Village has the potential to be processed into valuable products, but its utilization remains suboptimal. The 2026 Community Service Program (KUKERTA) of Universitas Riau conducted training on liquid organic fertilizer (LOF) production to improve community knowledge and skills in processing organic waste. The activity was conducted on July 23, 2026, at the Kubu Subdistrict Office, targeting PKK members and residents who own home gardens or agricultural land in Teluk Merbau Village. The activity consisted of three stages: socialization and education, training and hands-on practice in LOF production, and assistance during the 14–21-day fermentation process. The materials used included household organic waste, rice-washing water, granulated sugar, and Effective Microorganisms 4 (EM4) as a bioactivator. The results showed that community participation met the established indicators. Participants actively engaged in the presentation, discussion, demonstration, and hands-on practice sessions. The activity also improved participants' understanding and skills in selecting materials, using bioactivators, and carrying out the LOF fermentation process. This program provides an alternative for utilizing organic waste as fertilizer for home gardens and agricultural land while supporting community self-reliance in organic waste management.

Keywords : Organic Waste, Liquid Organic Fertilizer, Em4, Fermentation, Community Service Program (KKN).

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Abstrak

Limbah organik rumah tangga dan pertanian di Desa Teluk Merbau memiliki potensi untuk diolah menjadi produk bernilai guna, namun pemanfaatannya masih belum optimal. Program Kuliah Kerja Nyata (KUKERTA) Universitas Riau tahun 2026 menyelenggarakan pelatihan pembuatan pupuk organik cair (POC) untuk meningkatkan pengetahuan dan keterampilan masyarakat dalam mengolah limbah organik. Kegiatan ini dilaksanakan pada tanggal 23 Juli 2026 di Kantor Kecamatan Kubu, dengan sasaran anggota PKK serta warga yang memiliki pekarangan rumah atau lahan pertanian di Desa Teluk Merbau. Kegiatan ini terdiri dari tiga tahapan: sosialisasi dan edukasi, pelatihan serta praktik langsung pembuatan POC, dan pendampingan selama proses fermentasi yang berlangsung selama 14–21 hari. Bahan-bahan yang digunakan meliputi limbah organik rumah tangga, air cucian beras, gula pasir, dan Effective Microorganisms 4 (EM4) sebagai bioaktivator. Hasil kegiatan menunjukkan bahwa partisipasi masyarakat telah memenuhi indikator yang ditetapkan. Para peserta terlibat aktif dalam sesi pemaparan materi, diskusi, demonstrasi, dan praktik langsung. Kegiatan ini juga meningkatkan pemahaman serta keterampilan peserta dalam memilih bahan, menggunakan bioaktivator, dan melaksanakan proses fermentasi POC. Program ini memberikan alternatif pemanfaatan limbah organik sebagai pupuk untuk pekarangan rumah maupun lahan pertanian, sekaligus mendukung kemandirian masyarakat dalam pengelolaan limbah organik.

Kata Kunci : Limbah Organik, Pupuk Organik Cair, EM4, Fermentasi, Kuliah Kerja Nyata (KKN).

1. INTRODUCTION

Waste management remains an environmental challenge faced by communities, including waste generated from household and agricultural activities. Household organic waste typically consists of vegetable scraps, fruit peels, food leftovers, and leaves, which decompose naturally over time. However, improper management can lead to waste accumulation, unpleasant odors, and increased risk of environmental pollution (Aji et al., 2024; Chamdani et al., 2024). Furthermore, unutilized organic waste represents a loss of potential resources that could otherwise be processed into valuable products, such as liquid organic fertilizer (LOF) (Bai et al., 2025; Suyanto et al., 2024).

As an initial step in program planning, the 2026 Universitas Riau Community Service Program (KUKERTA) team conducted observations and mapped the potential of Teluk Merbau Village. This activity aimed to identify community conditions, regional potentials, and existing problems that could serve as a basis for program development. Based on the findings, the majority of Teluk Merbau Village residents depend on agriculture and plantation sectors for their livelihoods. Meanwhile, household organic waste such as rice-washing water, vegetable scraps, fruit peels, and other organic materials remains underutilized. This situation indicates the potential for organic waste to be processed into more beneficial products for the community while supporting local agricultural and plantation activities.

Organic fertilizer is derived from dead plants, animal manure, and/or animal parts that have undergone processing into solid or liquid form. It may be enriched with mineral additives and/or beneficial microorganisms to increase nutrient content and organic matter in the soil, as well as to improve soil physical, chemical, and/or biological properties (Bai et al., 2025). Liquid organic fertilizer (LOF) offers several advantages, including easier processing that does not require extended time, better absorption by plants, and simpler application methods (Bai et al., 2025; Suyanto et al., 2024). LOF production can be carried out using simple methods suitable for household-scale implementation (Pratiwi et al., 2024; Masrilurrahman et al., 2023). The production process utilizes microorganism activity to decompose organic materials through fermentation. One material that can be used as a bioactivator is EM4 (Effective Microorganisms 4). The use of EM4 in LOF production from organic waste has been implemented through community training programs (Chamdani et al., 2024; Pratiwi et al., 2024). The addition of bioactivators during fermentation aids the decomposition

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of organic materials, enabling waste to be processed into more beneficial products (Chamdani et al., 2024).

The implementation of organic waste processing into LOF can also enhance community knowledge and skills. Several community service activities have demonstrated that training through material delivery and hands-on practice can help communities understand the LOF production process and produce products that meet quality targets (Aji et al., 2024; Bai et al., 2025; Nurbaiti et al., 2022). Approaches involving socialization and direct practice are important because they enable communities not only to receive information about the benefits of LOF but also to gain experience in preparing materials and carrying out the production process (Alkatiri et al., 2024; Chamdani et al., 2024; Pratiwi et al., 2024). Similar training activities have also shown that participants can acquire skills to independently process organic waste into LOF (Elfandari et al., 2023; Masrilurrahman et al., 2023).

The utilization of household waste as raw material for liquid organic fertilizer has also been implemented in various community-based programs. Lestari et al. (2021) demonstrated that using household waste as LOF raw material can serve as a means to increase environmental awareness and knowledge through direct practical activities. Processing waste into LOF provides communities with experience in utilizing organic materials available in their surroundings, ensuring that waste is not merely discarded but processed into beneficial products (Lestari et al., 2021).

Based on this potential for organic waste utilization, the community of Teluk Merbau Village has the opportunity to process household and agricultural waste available in their environment into LOF. This utilization can serve as an alternative for reducing organic waste while providing fertilizer for home gardens and agricultural land (Alkatiri et al., 2024; Suyanto et al., 2024). However, utilizing waste as LOF requires knowledge regarding material sorting, bioactivator usage, material mixing, and proper fermentation processes. Therefore, educational and training activities that provide both understanding and practical skills are necessary (Nurbaiti et al., 2022; Chamdani et al., 2024).

Based on these conditions, a community service activity was carried out through training on liquid organic fertilizer production from household and agricultural organic waste for the residents of Teluk Merbau Village. This activity aims to increase community knowledge regarding organic waste utilization, provide practical skills in LOF production, and encourage the community to transform available waste into valuable products. Through this activity, the community is expected to independently implement LOF production and utilize it to support sustainable plant cultivation (Bai et al., 2025; Chamdani et al., 2024).

2. RESEARCH METHOD

Location, Time, and Participants

The liquid organic fertilizer (LOF) production training was held on Thursday, July 23, 2026, at the Kubu Subdistrict Office. Participants consisted of PKK (Family Welfare Movement) members and residents owning home gardens or plantations in Teluk Merbau Village, with a target of 25–30 people. The activity also involved 1–2 representatives of RT/RW administrators or village officials as supporters to ensure program sustainability.

Tools and Materials

Tools used included:

- Simple composters in the form of plastic buckets equipped with strainers and lids
- Knives
- Cutting boards
- Stirring sticks
- Mineral water bottles

Materials used include:

- Household organic waste such as vegetable and fruit scraps, spoiled rice
- Rice-washing water
- Granulated sugar

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- EM4 bioactivator (diluted)

Implementation Stages and Methods

The LOF production training from household and agricultural organic waste was conducted through three main stages: socialization and education, practical workshop training, and fermentation process assistance.

1) **Socialzation and Education**

The first stage involved delivering materials to participants regarding organic waste management and its utilization as LOF raw material. The material covered the definition and benefits of LOF, types of organic waste that can be utilized, and the benefits of using organic fertilizer for plants and the environment. Participants were also provided with an understanding of the importance of reducing organic waste disposal and transforming it into valuable products.

2) Practical Workshop Training

The second stage involved demonstrations and hands-on practice in LOF production. Participants were introduced to the tools and materials used, then followed the process of chopping organic waste into smaller sizes. The prepared materials were then mixed with rice-washing water, granulated sugar, and diluted EM4 bioactivator solution. The mixture was placed into fermentation containers and covered to create appropriate fermentation conditions. Participants followed each stage directly to understand the LOF production procedure and apply it independently.

3) Fermentation Assistance

The third stage involved assisting the LOF fermentation process for 14–21 days. Monitoring was conducted to ensure the fermentation process proceeded properly. After the fermentation process was complete, the LOF was harvested and filtered to separate the liquid from the remaining organic materials. The filtered LOF was then prepared for use on plants or distributed to participants. This assistance also aimed to ensure participants understood the post-production process and were capable of independently conducting LOF fermentation.

3. RESULT AND DISCCUSSION

This community service activity was implemented as an effort to improve the knowledge and skills of Teluk Merbau Village residents in utilizing household and agricultural organic waste into liquid organic fertilizer (LOF). The activity was held at the Kubu Subdistrict Office on Thursday, July 23, 2026. The main targets consisted of PKK members and residents owning home gardens or plantations, with a target of 25–30 people. The activity also involved 1–2 representatives of RT/RW administrators or village officials as supporting targets to help drive program sustainability in the community.

Based on observations and regional potential mapping, the community of Teluk Merbau Village has activities related to the agricultural and plantation sectors. This condition is supported by the availability of household organic waste such as rice-washing water, vegetable scraps, fruit peels, and other organic materials that can still be utilized. However, the utilization of such waste remains suboptimal, necessitating education and training on processing organic waste into valuable products. This problem became the basis for implementing LOF production training using materials easily obtained in the surrounding environment.

Table 1. Problem Identification and Solutions Provided

No	Problem	Solution Provided
1	Household organic waste has not been optimally utilized	Education on utilizing organic waste as LOF raw material
2	Community knowledge regarding LOF benefits needs improvement	Socialization on LOF benefits for plants and the environment
3	Community lacks skills in LOF production	Demonstration and hands-on practice in LOF production
4	Community needs understanding of	Explanation and assistance on

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	fermentation processes	fermentation processes using EM4
5	Independent LOF utilization has not developed optimally	Assistance and introduction to LOF application methods on plants

The activity began with socialization and education on organic waste management and its utilization as LOF raw material. The delivered material included types of organic waste that could be used, LOF benefits for plants and the environment, the function of additional materials in the fermentation process, and LOF production stages. Material delivery was conducted to provide participants with basic understanding before engaging in LOF production practice.

The activity continued with demonstration and hands-on practice in LOF production. Participants were introduced to the tools and materials used, then followed the process of chopping organic waste, mixing materials, adding EM4 bioactivator solution and sugar, and storing materials in fermentation containers. Direct participant involvement in practical activities was expected to enhance skills in making LOF, enabling the process to be reapplied using organic waste available in their respective home environments. The next stage was fermentation process assistance for 14–21 days. Assistance was conducted to ensure participants understood the storage and monitoring processes during fermentation. After the fermentation process was complete, the LOF was harvested and filtered to separate the liquid from the remaining organic materials. The fermentation product was then prepared for use on plants or distributed to participants.



Figure 1. Delivery of material on organic waste utilization and LOF production to the community of Teluk Merbau Village.

Activity success was assessed based on participant participation levels, increased understanding and skills, product quality, and program sustainability potential. Participant participation levels met the established indicators, namely a minimum of 80% of the main target number. Participants were also actively involved during material delivery, discussions, demonstrations, and LOF production practice. This involvement indicates that the activity was well-received by the community and proceeded according to established objectives.

Table 2. Activity Achievement Indicators

No	Indicator	Achievement Result
1	Number of Participants	Met minimum 80% of target
2	Participant Participation	Participants actively followed socialization, discussions, and practice
3	Knowledge and Skills	Participants understood organic waste types, EM4 functions, and LOF production stages
4	LOF Product	Produced LOF according to initial production targets
5	Product Quality	LOF showed appropriate fermentation characteristics and was ready for use
6	Product Utilization	LOF can be utilized on home garden plants or agricultural land
7	Sustainability	Participants acquired skills that can be reapplied independently

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The LOF production training provided benefits in terms of community knowledge and skills. Participants gained understanding regarding the utilization of household and agricultural organic waste and the stages of processing it into LOF. From a skills perspective, participants gained direct experience in preparing materials, mixing bioactivators, and conducting fermentation processes. Transforming organic waste into LOF also has the potential to reduce household waste volume while providing fertilizer that can be utilized for home garden plants or agricultural land.

Program sustainability is directed toward the community's ability to reuse organic waste available in their surroundings. The involvement of PKK members, residents owning home gardens or plantations, and representatives of RT/RW administrators or village officials is expected to support LOF production implementation after the activity concludes. Sustainable implementation can be carried out by utilizing household organic waste as raw material and producing LOF independently according to community needs.

4. CONCLUSION

The utilization of household and agricultural organic waste into LOF can be implemented as one form of waste management suitable for the potential of Teluk Merbau Village community. Through the 2026 Universitas Riau KUKERTA activity, participants gained direct experience in processing organic materials with EM4 assistance through the fermentation process. This activity also demonstrates that LOF production can be carried out using relatively simple tools and materials available in the surrounding environment.

The training not only produced LOF products but also provided skills that can be reapplied by the community after the activity concluded. Independent waste utilization is expected to reduce unmanaged organic waste while supporting fertilizer needs for home garden plants and agricultural land. Activity sustainability needs to be supported through routine LOF production implementation by the community, utilizing organic waste generated daily.

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