COMMUNITY EDUCATION ON COMPOSTING OF PLANTATION ORGANIC WASTE TO PROMOTE ENVIRONMENTAL SUSTAINABILITY, SUSTAINABLE AGRICULTURE, AND COMMUNITY ECONOMIC EMPOWERMENT

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ABSTRACT

Improperly managed solid waste from palm oil mills and cattle manure has the potential to cause environmental pollution and unpleasant odors and to serve as a breeding ground for disease vectors. Converting such waste into organic fertilizer represents one strategy for supporting sustainable environmental management while simultaneously enhancing the economic value accruing to the community. This community service activity aimed to improve farmers' knowledge and skills in producing organic fertilizer and to develop added value through packaging and marketing strategies. The activity was carried out with the Srigati Farmers' Group in Sido Mukti Village, Dendang Subdistrict, East Tanjung Jabung Regency, using a technical guidance method comprising material delivery, demonstration, hands-on practice in organic fertilizer production, packaging practice using pre-prepared mature compost, and discussion on business development. Evaluation was conducted through observation of participant engagement, a pretest–posttest assessment, and a satisfaction survey. The evaluation results indicated an increase in participants' knowledge following the technical guidance, accompanied by a high level of satisfaction with the training materials and methods. Most participants also expressed readiness to sustainably apply organic-fertilizer production technology. The activity effectively enhanced community capacity to convert organic waste into economically valuable fertilizer, while promoting more environmentally friendly waste management, supporting environmental health, and strengthening the development of organic-fertilizer enterprises grounded in local potential toward sustainable agriculture

Keywords: compost, organic waste, sustainable agriculture, environmental sustainability, community economic empowerment

ABSTRAK

Limbah padat pabrik kelapa sawit dan kotoran ternak sapi yang tidak dikelola dengan baik berpotensi menimbulkan pencemaran lingkungan, bau tidak sedap, serta menjadi sumber berkembangnya vektor penyakit. Pemanfaatan limbah tersebut menjadi pupuk organik merupakan salah satu upaya mendukung pengelolaan lingkungan yang berkelanjutan sekaligus meningkatkan nilai ekonomi masyarakat. Kegiatan pengabdian ini bertujuan meningkatkan pengetahuan dan keterampilan petani dalam memproduksi pupuk organik serta mengembangkan nilai tambah produk melalui pengemasan dan strategi pemasaran. Kegiatan dilaksanakan pada Kelompok Tani Srigati, Desa Sido Mukti, Kecamatan Dendang, Kabupaten Tanjung Jabung Timur, melalui metode bimbingan teknis yang meliputi penyampaian materi, demonstrasi, praktik pembuatan pupuk organik, praktik pengemasan menggunakan kompos matang yang telah disiapkan sebelumnya, serta diskusi pengembangan usaha. Evaluasi dilakukan melalui observasi partisipasi peserta, pretest-posttest, dan survei kepuasan. Hasil evaluasi menunjukkan adanya peningkatan pengetahuan peserta setelah mengikuti bimbingan teknis, disertai tingginya tingkat kepuasan terhadap materi dan metode pelatihan. Sebagian besar peserta juga menyatakan kesiapan untuk menerapkan teknologi pembuatan pupuk organik secara berkelanjutan. Kegiatan ini efektif meningkatkan kapasitas masyarakat dalam memanfaatkan limbah organik menjadi pupuk bernilai ekonomi, sekaligus mendorong pengelolaan limbah yang lebih ramah lingkungan, mendukung kesehatan lingkungan, dan memperkuat pengembangan usaha pupuk organik berbasis potensi lokal menuju pertanian berkelanjutan.

Kata kunci: *kompos, limbah organik, pertanian berkelanjutan, kelestarian lingkungan, pemberdayaan ekonomi masyarakat*

INTRODUCTION

The Srigati Farmers' Group is a community service partner located in Sido Mukti Village, Dendang Subdistrict, East Tanjung Jabung Regency, Jambi Province. This area is dominated by the plantation sector, particularly oil palm, which constitutes one of the community's primary commodities. The presence of palm oil mills in the surrounding area generates solid waste in the form of empty fruit bunches (EFB), fiber, and other organic waste with potential for use as raw material for organic fertilizer.[1,2] The utilization of solid palm oil waste through composting is known to increase soil organic matter content, improve the physical, chemical, and biological properties of soil, and reduce the accumulation of palm oil industry waste.[1-3]

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In addition, most members of the farmers' group also raise cattle, providing an available source of organic material in the form of animal manure that can be processed into economically valuable organic fertilizer. However, if this organic waste is not properly managed, its accumulation has the potential to cause environmental pollution through unpleasant odors, increased fly populations, and pathogenic microorganisms, as well as contamination of soil and water in surrounding residential areas. Such conditions may degrade environmental quality and increase the risk of public health problems.[4,5] Processing organic waste through composting is one approach that can reduce pollution risk while simultaneously enhancing environmental health and the sustainability of the agricultural system.[5,6]

This potential is further supported by the presence of industrial forest plantations managed by PT WKS, particularly acacia plantations, which require a relatively large supply of organic fertilizer to improve soil fertility and support more sustainable cultivation practices. This condition presents an opportunity for the Srigati Farmers' Group to develop an organic-fertilizer production enterprise as a productive business unit that can increase group income while supporting environmental sustainability.[2,6]

Despite considerable resource potential, the farmers' group's organic fertilizer production capacity continues to face several constraints. The primary raw material, animal manure, has been insufficient to meet production needs, as the number of livestock available is not commensurate with demand for organic fertilizer. In addition, the supply of empty-fruit bunch waste from palm oil mills fluctuates, as a substantial portion is also used for the mill's internal operations. This uncertainty in raw-material availability has prevented the continuity of organic-fertilizer production from being optimally maintained.[7,8]

A further challenge faced by the group is the absence of product quality testing based on standard organic-fertilizer parameters, particularly organic matter content, as one of the primary indicators of product quality. This condition means that the quality of the fertilizer produced has not been scientifically verified, making it difficult for the group to enhance product competitiveness or expand marketing access to larger-scale users. Beyond quality considerations, product packaging remains simple sacks that lack information on composition, quality specifications, or usage instructions. Such uninformative packaging diminishes the product's added value, reduces its marketing appeal, and limits opportunities for business development toward a commercial scale.[9]

In light of these conditions, a community service program is needed that focuses not only on increasing organic-fertilizer production capacity but also encompasses strengthening quality control, diversifying raw materials, developing product packaging, and expanding partnership networks. A community empowerment approach that integrates technical capacity building, institutional strengthening, and business development has been shown to enhance group self-reliance and the sustainability of service programs.[10]

This community service activity aimed to empower the Srigati Farmers' Group in Sido Mukti Village, Dendang Subdistrict, East Tanjung Jabung Regency by improving their knowledge and skills in producing solid organic fertilizer from palm oil mill solid waste and cattle manure. In addition to enhancing technical production capacity, the activity was also intended to strengthen the added-value aspects of the product, such as packaging and the inclusion of product specifications. It further aimed to improve the managerial capacity of the farmers' group in business partnership networks and marketing strategy, so that the organic fertilizer produced would have added value and could become a flagship product of the farmers' group.

METHODS

Preparation

The community service activity was conducted in June 2026 in Sido Mukti Village, Dendang Subdistrict, East Tanjung Jabung Regency, with the Srigati Farmers' Group and farmers in the surrounding area as the primary target participants. The method employed combined technical guidance with material delivery, demonstration, hands-on practice, and interactive discussion, so that participants acquired not only theoretical knowledge but also practical skills in producing organic fertilizer. This participatory learning approach has been widely applied in community empowerment programs, as it has been shown to improve understanding and skills and to promote more effective technology adoption than one-way material delivery.[11-12]

The activity began with coordination with the farmers' group's management to determine the schedule and training needs and to invite group members and surrounding farmers to participate.

Technical Guidance and Practice

a. Material Delivery

The activity began with the delivery of material on the potential utilization of local organic waste, particularly palm oil mill solid waste and cattle manure, as raw materials for organic fertilizer. The material covered the characteristics of each substrate, the functions of each material in the composting process, and the benefits of organic fertilizer in improving soil physical, chemical, and biological properties, thereby enhancing soil fertility and supporting sustainable plant growth.[13-15] Participants were also given an explanation of the fermentation stages that play a crucial role in determining the success of the composting process, including a fermentation period of approximately 30 days, turning of the pile every 5–7 days to maintain optimal aeration and temperature, and indicators of compost maturity characterized by a dark brown color, crumbly texture, absence of pungent odor, temperature approaching ambient temperature, and original materials that are no longer readily identifiable.[13,16,17]

b. Technical Guidance on Organic-Fertilizer Production

The following stage involved a demonstration and hands-on practice of solid organic-fertilizer production, actively involving all participants. This activity was intended not only to enable participants to understand the concept of composting theoretically but also to enable them to independently implement each stage of organic-fertilizer production. Through hands-on practice, participants gained experience preparing raw materials, conducting composting, and identifying factors that influence the success of organic-matter decomposition.[11,12]

The demonstration began with the preparation of raw materials, namely empty oil palm fruit bunches (EFB), palm oil fiber, cattle manure, and chopped grass as sources of organic material. The material formulation used in this activity was developed based on the availability of raw materials at the partner site, with the principle of balancing carbon-rich and nitrogen-rich materials in the composting process in mind. Effective Microorganisms-4 (EM4) was used as a bioactivator, and agricultural lime was added to help stabilize pH during composting.[13,16,17] The formulation used to produce 1 ton of organic fertilizer consisted of 300 kg of empty oil palm fruit bunches, 200 kg of palm oil fiber, 300 kg of cattle manure, 200 kg of chopped grass, 1 liter of EM4, and 1–2 kg of agricultural lime.

Prior to mixing, all materials were cleaned of foreign objects and chopped into smaller pieces to increase surface area, thereby accelerating and evening out the decomposition process. All materials were then mixed homogeneously, after which a diluted EM4 solution, prepared according to the usage instructions, was added. The mixture was stirred until it reached a moisture content of approximately 50–60%, characterized by a moist condition in which no water was released when the material was squeezed by hand. The material mixture was then piled at a location protected from rain and direct sunlight and subsequently covered with a tarpaulin to maintain temperature and moisture during the fermentation process.[13,16,17]

To provide participants with a complete practical experience, they also carried out sieving and packaging using pre-prepared mature compost. The compost was sieved to obtain a uniform particle size, then packaged in labeled containers as a market-ready organic fertilizer product.

c. Managerial Mentoring

In addition to production-related aspects, participants received mentoring on product packaging as a strategy for enhancing added value. The material covered the selection of packaging type, the composition of product information on labels, and the importance of product identity in enhancing market competitiveness.[18-20] The activity also included material on business development strategy, including the establishment of partnerships with raw-material supplier companies, organic-fertilizer user companies, and government agencies that could provide support in the form of production facilities and infrastructure assistance.[21,22]

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RESULTS AND DISCUSSION

The technical guidance activity was attended by 30 participants, comprising members of the Srigati Farmers' Group and farmers from the area surrounding Sido Mukti Village, Dendang Subdistrict, East Tanjung Jabung Regency. All participants took part in the full series of activities, including material delivery, demonstration, organic-fertilizer production practice, product packaging practice, and discussion on business development strategy. Participant attendance reached 90%, reflecting the community's strong interest in utilizing organic waste as economically valuable fertilizer.

Activity evaluation was conducted through observation of participant engagement during the training and through pre- and posttest assessments of knowledge levels. The observation results indicated that participants actively participated in both the discussion sessions and the hands-on practice. Most participants were able to re-explain the stages of organic-fertilizer production and to carry out the processes of material preparation, mixing, bioactivator addition, and product packaging in accordance with the material provided. The mean knowledge score increased from 55 on the pretest to 85 on the posttest. This improvement indicates that the technical guidance method combining material delivery with hands-on practice was effective in enhancing participants' understanding, consistent with several community service activities that report that participatory approaches can improve community knowledge and skills in processing organic waste into economically valuable products.[21-23]

Figure 1. Documentation of the community service activity: (left) material delivery; (center) technical guidance on organic-fertilizer production; (right) packaging of the resulting organic-fertilizer product.

Beyond the improvement in technical capacity, this activity produced an outcome: a more informative organic-fertilizer packaging design compared with the previous one. The product, previously packaged in simple plastic sacks, began to be developed using labeled packaging that included product identity, the Srigati Farmers' Group logo, net weight, raw-material composition, usage instructions, and producer information. This mentoring provided participants with an understanding that packaging serves not only to protect the product but also constitutes part of a marketing strategy that can enhance added value, build product image, and improve market competitiveness.[23-25]

The satisfaction evaluation results indicated that 98% of participants reported that the material provided was consistent with the group's needs, 95% considered the hands-on practice method easy to understand, and 97% expressed interest in sustainably applying organic-fertilizer production technology. In addition, the farmers' group expressed readiness to develop the enterprise through continued mentoring, strengthened partnerships, and marketing through digital media and agricultural product exhibitions. These findings indicate that community empowerment, combined with business mentoring, can enhance participants' motivation to sustainably develop enterprises based on local potential.[25-28]

Nevertheless, several aspects still require follow-up. The organic fertilizer produced has not yet been supported by laboratory testing results to determine organic matter content, C-organic content, total nitrogen, C/N ratio, pH, moisture content, and other quality parameters in accordance with the Indonesian National Standard (SNI) or applicable technical provisions for organic fertilizer. In addition, the sustainability of production remains dependent on the continued supply of palm oil mill solid waste, necessitating strengthened partnerships with raw-material suppliers. The development of a more professional packaging design, trademark registration, product legality processing, and optimization of marketing through social media, online marketplaces, and agricultural exhibitions also represent important strategies for enhancing product competitiveness.[22-28]

CONCLUSION

The Green Village community empowerment program demonstrated that education on plantation organic waste-based composting effectively improved participants' knowledge and practical skills in converting plantation organic waste into compost. Through hands-on training and active community participation, plantation residues that were previously underutilized were transformed into valuable organic fertilizer, contributing to environmental sustainability, supporting sustainable agriculture, and creating opportunities for community economic empowerment. The program also strengthened awareness of environmentally responsible organic waste management and encouraged the adoption of sustainable agricultural practices. Continued collaboration among farmer groups, training institutions, local governments, and other stakeholders is recommended to ensure the long-term sustainability and wider implementation of similar community-based initiatives.

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REFERENCES

1. Aziz FA, Ariyanti M. Review: Empty oil palm fruit bunch waste as a source of organic fertilizer for oil palm plants. Paspalum J Ilm Pertan. 2026;14(1):380-389. doi:10.35138/paspalum.v14i1.1168.
2. Supriatna J, Setiawati MR, Sudirja R, Suherman C, Bonneau X. Composting for a more sustainable palm oil waste management: a systematic literature review. ScientificWorldJournal. 2022;2022:5073059. doi:10.1155/2022/5073059.
3. Lim SL, Wu TY, Clarke C. Treatment and biotransformation of highly polluted agro-industrial wastewater from palm oil mills into value-added products: a review. J Hazard Mater. 2015;299:262-276.
4. Meilander J, Caporaso JG. Microbiome science of human excrement composting. The ISME Journal. 2024;18(1):wrae228. https://doi.org/10.1093/ismejo/wrae228
5. Sunar NM, Stentiford EI, Stewart DI, Fletcher LA. The process and pathogen behavior in composting: a review. Proceeding UMT-MSD 2009 Post Graduate Seminar 2009. Universiti Malaysia Terengganu, Malaysian Student Department UK & Institute for Transport Studies University of Leeds. pp: 78-87; ISBN: 978-967-5366-04-8
6. Bernal MP, Alburquerque JA, Moral R. Composting of animal manures and chemical criteria for compost maturity assessment: a review. Bioresour Technol. 2009;100(22):5444-5453.

7. Sánchez-Monedero MA, Cayuela ML, Roig A, Jindo K, Mondini C, Bolan N. Role of organic amendments in improving soil fertility and crop productivity: a review. Agron Sustain Dev. 2019;39:1-18.
8. Agegnehu G, Bass AM, Nelson PN, Bird MI. Benefits of biochar, compost and biochar-compost for soil quality, crop performance and greenhouse gas emissions: a review. Appl Soil Ecol. 2016;103:295-306.
9. Kotler P, Keller KL. Marketing management. 16th ed. Harlow: Pearson; 2022.
10. Chambers R. Rural development: Putting the last first. Harlow: Pearson; 2019.
11. Food and Agriculture Organization of the United Nations. Module I: Preparing for training and facilitating. In: Participatory processes towards co-management of natural resources in pastoral areas of the Middle East: A training of trainers source book. Rome: FAO; 2003.
12. Rahmat I, Samputri S, Syakur A, Sahrani U, Tawil M. Training in compost production from leaves and sugarcane bagasse as an effort to utilize agricultural waste. JKM J Kemitraan Masy. 2025;4(2). doi:10.35580/jkm.v4i2.80176.
13. Amuah EEY, Fei-Baffoe B, Miezah K, Sarpong YA, Obiri-Danso K. Composting as a catalyst for soil health and sustainability: a trend review. Next Res. 2026;8:101478. doi:10.1016/j.nexres.2026.101478.
14. Semenov MV, Zhelezova AD, Ksenofontova NA, Ivanova EA, Nikitin DA. Chicken manure as an organic fertilizer: composting technologies and impact on soil properties (a review). Agric Biol. 2023;58(5):803-823.
15. Hayat, et al. Compost-based organic amendments and synthetic fertilisers enhance soil health and crop yield worldwide. J Sustain Agric Environ. 2026. doi:10.1002/sae2.70157.
16. Anyaoha KE, Sakrabani R, Patchigolla K, Mouazen AM. Critical evaluation of oil palm fresh fruit bunch solid wastes as soil amendments: prospects and challenges. Resour Conserv Recycl. 2018;136:399-409. doi:10.1016/j.resconrec.2018.04.022.
17. Yahya H, Yusri A. Comparison of the addition of EM4 activator and organic leachate water in composting empty bunches palm oil. Indones J Environ Sustain. 2024;1(1):34-49. doi:10.22373/ijes.v1i1.3850.
18. Putri GR, Lubis RF, Arsil F, Sitorus TM, Zulhamidi, Siregar RS. Packaging design technology in efforts to increase the value added of small and medium enterprise products. JICE J Ind Community Empower. 2023;2(1). doi:10.52759/jice.v2i1.191.
19. Najib MF, Februadi A, Djarnika T, Rafdinal W, Lasambouw CM, Nuryati N. Packaging design innovation as a factor in increasing the competitiveness of MSME products in Ciwaruga Village, West Bandung Regency. Dinamisia. 2022;6(1):66-75. doi:10.31849/dinamisia.v6i1.8397.
20. Masi R. Counseling on the role of packaging and labeling to increase the added value of products for community business groups in the OVOP program. Jumat Ekon J Pengabdian Masy. 2026;7(1). doi:10.32764/abdimasekon.v7i1.7140.
21. Bahri S, Ambarwati Y, Notiragayu, Marlina L, Setiawan A. Training for the production of organic fertilizer from kitchen waste in Rukti Endah Village, Central Lampung Regency. Community Empowerment. 2022;7(12):2039-2048.
22. Hartati TM, Ishak L, Ladjinga E. Empowerment of farming communities in Tarau Sub-district, Ternate City, through organic fertilizer production training. J Din Pengabdian. 2022;7(2):243-251.
23. Muliarta IN, Setianingsih NLPP, Sudiarta IW, et al. Training in composting efforts to develop economically value compost products by Family Welfare Empowerment (FWE) Batuan Village, Sukawati District, Gianyar District, Bali. East Asian J Multidiscip Res. 2023;2(7):2641-2654.
24. Wahyurini E, Suryawati A, Gumelar RM, et al. Training in solid and liquid organic fertilizer packaging at the Mekar Sari Farmers' Group, Kelor Hamlet, Bangunkerto, Turi, Sleman. Dharma J Pengabdian Masy. 2023;4(2):88-94.
25. Mufti D, Noviyarsi N, Ulfah M, Burmawi B. Product packaging innovation as an effort to increase MSME competitiveness in a community service program. PengabdianMu. 2026;11(3):706-713.
26. Ansori AD, Nuranti BR, Putra RA. Packaging and branding training to increase the competitiveness of liquid organic fertilizer products in the local market. J Pengabdian Kpd Masy Nusant. 2026;7(1):1801-1810.
27. Kusdiyah E, Siregar MIT, Gading PW, Perkasa TAB, Aurora WID, Darmawan A. Linking household waste management and environmental sanitation to infectious disease prevention: Evidence from Jambi City, Indonesia. Proceedings Academic Universitas Jambi 2025;1:576–84..
28. Wijayanti Z, Hardiningsih DT, Perkasa TAB, Amatullah A. Overview awareness and satisfaction Universitas Jambi medical students towards the use of social media as an oral health literacy platform. Proceedings Academic Universitas Jambi 2025;1:476–90.