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Article

Utilization of Organic Waste to Improve Land Productivity Sustainably in Nagari Kudu Gantiang

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Abstract

Nagari Kudu Gantiang is one of the nagari where most residents are engaged in agriculture and livestock farming. However, the utilization of organic waste such as crop residues and livestock manure has not been optimized. Agricultural waste is often discarded or openly burned, leading to environmental pollution, while farmers remain highly dependent on chemical fertilizers whose prices continue to increase. Based on these conditions, this community service program aimed to enhance the capacity of the women's PKK group in processing organic waste into compost as an effort to promote sustainable agriculture. The methods included counseling, participatory discussions, and compost-making demonstrations using agricultural residues, soil, and livestock manure with the addition of EM4 bio-activator. The activity was attended by 45 participants at the Nagari Kudu Gantiang Office Hall. The results indicated an increase in participants' knowledge and skills in composting techniques, as well as growing awareness of environmentally friendly organic waste management. This program had a positive impact by encouraging household-level composting practices, reducing dependence on chemical fertilizers, and supporting sustainable land productivity at the nagari.

INTRODUCTION

Nagari Kudu Gantiang is one of the nagari located in V Koto Timur Subdistrict, Padang Pariaman Regency, West Sumatra, covering an area of 9,160 hectares, or approximately 14.14% of the total subdistrict area. The nagari consists of six korong: Kampuang Tanjuang, Kampuang Parik, Pasa Balai Kudu, Kampuang Tangah Gantiang, Bukik Kudo-Kudo, and Kampuang Pili. According to administrative data (BPS, 2025), the population of the nagari is 3,545 people, comprising 1,192 households, with the majority relying on the agricultural sector for their livelihood. The main commodities in the area include coconut, banana, papaya, and small-scale cattle farming spread across the nagari. This considerable natural resource potential should ideally be optimized to support food security and improve the local economy. However, resource utilization has not been optimal due to weak management of agricultural and livestock by-products at both household and farmer-group levels.

Agricultural and livestock activities in Nagari Kudu Gantiang generate a large amount of organic waste, including fresh residues such as empty coconut bunches, banana midribs, papaya peels, and cattle manure. Unfortunately, most of these wastes remain unutilized, often left to pile up, buried in open land, or

even burned. Open burning practices have become a serious issue as they degrade air quality and affect public health (Faridawati & Sudarti, 2021). Meanwhile, accumulated waste contributes to environmental pollution through the release of greenhouse gases (GHG), such as methane, produced from anaerobic decomposition (Wardana et al., 2021). This condition indicates that organic waste management at the nagari level has not yet been conducted productively or sustainably.

In addition to organic waste management issues, farmers in Nagari Kudu Gantiang also face challenges related to their high dependency on chemical fertilizers to support crop production. The use of inorganic fertilizers such as urea, NPK, and SP-36 remains dominant, as these are perceived to provide quick and practical results. However, long-term use without balancing organic inputs reduces soil organic carbon, damages soil structure, and decreases land productivity (Lehmann & Kleber, 2015). Dependence on chemical fertilizers also increases farmers' reliance on external inputs, raising production costs. This issue has become more critical since fertilizer prices in Indonesia have significantly increased since 2022, following global supply constraints and rising energy and natural gas prices—the main raw materials for fertilizer production. According to data from the Ministry of Agriculture (2023), the national price of non-subsidized urea fertilizer has risen by more than 80%, while subsidized fertilizer shortages are increasingly common at the farmer level. This directly impacts smallholders, who must bear higher production costs while crop prices remain relatively stable.

These conditions highlight the need for alternative fertilizers that are affordable, easy to produce, and environmentally friendly by utilizing local resources. One relevant and practical solution is the conversion of agricultural and livestock waste into compost. Compost is the result of organic material decomposition, rich in nutrients, and capable of improving soil physical, chemical, and biological properties (Lase, 2025). Agronomically, compost application has been proven to increase soil organic carbon content, improve cation exchange capacity (CEC), enhance the availability of macro-nutrients such as N, P, and K, and improve fertilization efficiency. Additionally, compost promotes soil microbial activity that drives nutrient cycling, thereby improving long-term soil fertility without leaving chemical residues (Friyani D. et al., 2022).

Utilizing local organic waste for compost production also supports sustainable agriculture based on the circular economy approach, which transforms waste into valuable resources. In the case of Nagari Kudu Gantiang, compost feedstock is readily available from agricultural residues such as banana midribs and coconut fibers rich in lignocellulose, as well as nitrogen-rich cattle manure. The composting process can be accelerated using bio-activators such as EM4, which contain decomposing microorganisms (Rahmadiah et al., 2024). Thus, compost production not only reduces environmental pollution but also generates an economically valuable product that farmers can use themselves or sell.

However, the low level of organic waste utilization among farmers and communities is influenced by several barriers, including limited technical knowledge, the absence of systematic training or assistance, and inadequate composting facilities and infrastructure. Therefore, community empowerment efforts are needed through planned, educational, and participatory approaches. Community-based initiatives that enable farmers to produce their own organic fertilizer can reduce dependency on chemical fertilizers while promoting environmentally friendly and sustainable agriculture (Yanti et al., 2023).

The compost-making training activity in Nagari Kudu Gantiang is closely aligned with the Sustainable Development Goals (SDGs) agenda. This program contributes to SDG 2: Zero Hunger by enhancing agricultural productivity and soil fertility, and SDG 12: Responsible Consumption and Production through the transformation of organic waste into beneficial products. Furthermore, developing self-produced organic fertilizer can reduce production costs and improve farmers welfare in the long term. Therefore, this community service initiative aims to strengthen local capacity in managing agricultural and livestock waste into compost through training and the application of simple, low-cost, and practical appropriate technology

EXPERIMENTAL SECTION

The counseling and mentoring activities on the utilization of organic waste for composting were conducted at the Hall of the Nagari Kudu Gantiang Office on Sunday, September 21, 2025, from 09:00 to 12:30 WIB. The event was attended by 45 members of the Pemberdayaan Kesejahteraan Keluarga (PKK) women's organization in Nagari Kudu Gantiang, with Dr. Silvia Permata Sari, a lecturer from the Faculty of Agriculture, Andalas University, serving as the main speaker.

This community service program (PKM) was carried out in collaboration with the Kudu Gantiang Nagari Government and the local PKK women's association. The activity adopted a participatory approach through counseling and hands-on composting training. The implementation stages included:

1. Identification and Field Coordination

Identification and coordination were conducted to determine the types and availability of organic waste materials that would be used during the compost-making process. This stage ensured that the selected raw materials represented local agricultural and livestock residues.

2. Counseling Session

The counseling session was delivered interactively, followed by participatory discussions. The presentation began by addressing environmental problems caused by unmanaged waste. The session then discussed the benefits of compost for improving soil fertility and crop productivity, as well as the economic opportunities arising from small- to large-scale compost production.

3. Composting Demonstration

The composting demonstration served as the core activity of the program. This stage aimed to ensure that participants not only understood the theoretical aspects but also gained practical skills in processing agricultural and livestock waste into high-quality organic fertilizer.

The materials used in compost production included:

- Fresh agricultural residues such as banana stems and leaves, coconut fronds, and vegetable scraps, which were chopped into smaller pieces to accelerate the composting process.
- Soil, used to enrich the nutrient content of the compost.
- Livestock manure, serving as a nitrogen source, microbial inoculant, and moisture retainer.
- EM4 bio-activator, used to accelerate the decomposition process.
- Water, for moistening and dissolving the activator.

The ratio of materials used was 2 parts organic waste: 1 part soil: 2 parts livestock manure. The composting process was carried out aerobically using a layered pile method on a tarpaulin. The first layer consisted of soil, followed by chopped organic waste, then livestock manure. Each layer was moistened with a diluted EM4 solution. This layering process was repeated until all materials were used, after which the pile was covered with a tarpaulin to maintain adequate moisture.

RESULT AND DISCUSSION

This community service activity aimed to optimize the utilization of organic waste as raw material for compost production to improve soil fertility and agricultural productivity in a sustainable manner. Through counseling and training sessions, participants were educated on the importance of organic waste management and the use of livestock manure as a composting resource. During the activity, participants demonstrated great enthusiasm by asking questions and sharing their experiences in managing organic waste at the household and community levels. The mentoring outcomes showed an increase in participants' knowledge and practical skills in processing organic waste into compost that can be directly applied to crops.

In general, most participants were already familiar with compost; however, they still lacked technical knowledge and had never previously participated in systematic training or mentoring on compost production. The counseling sessions effectively enhanced participants' soft skills and understanding of appropriate composting technology. Direct face-to-face interaction between the facilitator and participants also helped build rapport, making it easier for the facilitator to convey information and encourage behavioral change toward sustainable waste management practices. Documentation of the counseling activity is presented in Figure 1.



Figure 1. Opening session and counseling delivered by instructor

A composting demonstration was then conducted using organic waste and livestock manure as the main raw materials. Demonstration activities are an effective method for transferring knowledge, as visualizing and performing a process directly allows participants to understand the information more easily (Yanti et al., 2023). This activity was carried out immediately after the counseling session. The composting site was located beside the nagari office hall, in a shaded area suitable for maintaining optimal composting conditions. The materials were mixed at a ratio of 2 parts organic waste : 1 part soil : 2 parts livestock manure, and arranged in layers. Each layer was moistened with a diluted EM4 solution (1:100 with water) to accelerate the decomposition process.

Table 1. Expected Initial and Final Conditions of Participants After the Community Service Activity

No	Aspect	Initial Condition of Participants	Expected Final Condition
1	Knowledge of organic waste management	Some participants were not yet aware of the benefits of agricultural and household waste as raw materials for compost	Participants understand that organic waste can be utilized to produce eco-friendly compost with economic value
2	Understanding of the benefits of organic fertilizer	Participants were still dependent on chemical fertilizers and lacked understanding of their negative impacts on soil	Participants are able to explain the benefits of compost for soil fertility and sustainable agriculture
3	Technical skills in compost making	Some participants had no prior skills in preparing materials, mixing, or controlling the composting process	Participants are able to independently practice composting techniques using local materials
4	Attitude toward environmental management	Participants were less concerned about agricultural waste and had not yet practiced waste separation	Awareness and positive attitudes toward waste management and environmental care are developed
5	Ability to organize group activities	There were no joint activities related to organic waste management	A working group or PKK compost management team is formed at the nagari level

No	Aspect	Initial Condition of Participants	Expected Final Condition
6	Utilization of composting results	Compost had not yet been used as an alternative fertilizer	Participants apply the compost produced during training to home gardens and farms
7	Household economic potential	Agricultural waste was discarded or burned without added value	Participants recognize business opportunities from small-scale production and sales of local compost



Figure 2. Chopping of organic waste



Figure 3. Composting demonstration



Figure 4. Counseling session atmosphere



Figure 5. Group photo documentation

CONCLUSION

The community service activity titled “Utilization of Organic Waste to Enhance Land Productivity Sustainably in Nagari Kudu Gantiang” was successfully implemented in collaboration with the PKK women’s group as the main partner. Through a participatory approach involving counseling and hands-on compost-making training, participants improved their knowledge and skills in managing agricultural residues and livestock manure into useful compost fertilizer.

This activity had a positive impact by increasing community awareness of the importance of organic waste management. It is expected that, in the future, a PKK working group will be established to carry out follow-up activities, and that micro-enterprise opportunities will emerge from compost production and utilization. The use of compost is expected to improve soil fertility, reduce dependence on chemical fertilizers, and support sustainable land productivity enhancement.

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REFERENCES

BPS. (2025). Kecamatan V Koto Timur Dalam Angka 2025. BPS.

Faridawati, D., & Sudarti. (2021). Pengetahuan Masyarakat Tentang Dampak Pembakaran Terhadap Lingkungan Kabupaten Jember. Jurnal Sanitasi Lingkungan, 1(2), 50–55. https://doi.org/10.31857/s013116462104007x

Friyani D., Worotitjan, Pakasi, S. E., Wiesje J. N., & Kumolontang. (2022). COMPOSTINGTECHNOLOGY MADEFROM WATER HYACINTTONDANO LAKETeknologi PengomposanBerbahan Baku EcengGondok (Eichhorniacrassipes) Danau Tondano. Jurnal Agroekoteknologi Terapan, 3(1), 1–2.

Lase, E. (2025). Pengaruh Pemberian Sekam Padi Bakar Pada Kelembapan Tanah. Jurnal Ilmu Pertanian Dan Perikanan, 02(01), 67–73.

Lehmann, J., & Kleber, M. (2015). The contentious nature of soil organic matter. Nature, 528(7580), 60–68. https://doi.org/10.1038/nature16069

Rahmadiah, I. S., Syadzadhiya, & Qothrunada, Z. N. (2024). Perbandingan Pengaruh Aktivator Effective Microorganisme 4 (EM 4) dan Promoting Microbes (PROMI) Terhadap Kualitas Kompos Organik Di Industri Galangan Kapal. Flora : Jurnal Kajian Ilmu Pertanian Dan Perkebunan, 1(2), 09–21. https://doi.org/10.62951/flora.v1i2.35

Wardana, L. A., Lukman, N., Mukmin, M., Sahbandi, M., Bakti, M. S., Amalia, D. W., Wulandari, N. P. A., Sari, D. A., & Nababan, C. S. (2021). Pemanfaatan Limbah Organik (Kotoran Sapi) Menjadi Biogas dan Pupuk Kompos. Jurnal Pengabdian Magister Pendidikan IPA, 4(1). https://doi.org/10.29303/jpmpi.v4i1.615

Yanti, D., Puari, A. T., & Yanti, N. R. (2023). Pemanfaatan Kotoran Sapi untuk Pertanian Terpadu Berkelanjutan di Desa Batang Tajongkek, Pariaman Selatan, Kota Pariaman. Warta Pengabdian Andalas, 30(3), 480–491. http://wartaandalas.lppm.unand.ac.id/index.php/jwa/article/view/943

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