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TECHNICAL GUIDANCE HOUSEHOLD ORGANIC WASTE FERTILIZER PRODUCTION TO SUPPORT URBAN FARMING ON ANTHROPOGENIC LAND FOR THE DASAWISMA GROUPS

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Abstract*. The continuous availability of household waste represents an adaptive resource potential for organic fertilizer production. The availability of organic fertilizer is highly crucial for optimizing crop cultivation on anthropogenic land (degraded land caused by Type C quarrying) surrounding community residential yards. This Internal Community Partnership Program (PKMI) aimed to enhance partners' understanding of managing degraded land to restore its productivity, and to improve their knowledge regarding the independent conversion of household waste into ready-to-use organic fertilizer. The target partners of this program were the Gunung Sakura and Bunga Sakura Dasawisma Groups in Mandonga Village, Kendari City. The implementation methods comprised program socialization, technical guidance (training) on decomposition engineering utilizing EM4 bioactivator and rice bran through the field capacity method, and periodic monitoring and evaluation. The evaluation results demonstrated that the PKMI program was successfully executed, achieving a program outcomes attainment rate of 80.0%, which exceeded the success indicator target (>75%). Post-activity, the Dasawisma groups achieved a 100% level of comprehension in identifying potential organic waste components. Furthermore, they acquired technical knowledge and skills (100% in the problem-solving aspect) to independently produce solid organic fertilizer within a 14–21 day fermentation period. The generated fertilizer product serves as an effective solution for restoring backyard soil fertility and supporting the sustainability of urban farming.*

Keywords: *anthropogenic land, household waste, organic fertilizer*

Abstrak. Pemanfaatan limbah rumah tangga yang selalu tersedia setiap saat merupakan potensi sumber daya yang adaptif untuk pembuatan pupuk organik. Ketersediaan pupuk organik sangat krusial dalam mendukung optimalisasi budidaya tanaman pada lahan antropogenik (lahan rusam akibat galian C) di sekitar pekarangan rumah masyarakat. Kegiatan Program Kemitraan Masyarakat Internal (PKMI) ini bertujuan untuk meningkatkan pemahaman mitra dalam mengendalikan lahan rusak agar kembali produktif, meningkatkan pengetahuan mengenai konversi limbah menjadi pupuk organik siap pakai secara mandiri. Mitra sasaran program ini adalah Kelompok Dasawisma Gunung Sakura dan Bunga Sakura di Kelurahan Mandonga, Kota Kendari. Metode pelaksanaan pengabdian meliputi tahapan sosialisasi program, bimbingan teknis (pelatihan) rekayasa dekomposisi menggunakan bioaktivator EM4, serta monitoring dan evaluasi berkala. Hasil evaluasi menunjukkan bahwa program PKMI ini berjalan sukses dengan tingkat ketercapaian hasil program mencapai 80,0%, berada di atas target indikator keberhasilan (>75%). Pascakegiatan, kelompok dasawisma telah mencapai tingkat pemahaman 100% dalam mengidentifikasi komponen limbah organik potensial, serta memiliki pengetahuan dan keterampilan teknis (100% pada aspek pemecahan masalah) untuk memproduksi pupuk organik padat secara mandiri dengan durasi fermentasi 14-21 hari. Pupuk yang dihasilkan menjadi solusi efektif dalam pemulihan kesuburan lahan pekarangan serta mendukung keberlanjutan pertanian perkotaan (*urban farming*).

Kata Kunci: lahan antropogenik, limbah ruamah tangga, pupuk organik

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INTRODUCTION

Anthropogenic land is a landscape that has undergone severe degradation due to massive and intensive human activities. The primary characteristics of this land include extremely low fertility levels, compacted soil structure due to mechanical pressure, and the loss of the nutrient-rich topsoil layer, making it generally unsuitable for direct domestic agricultural activities. Nevertheless, optimizing land use around residential areas, such as through urban

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farming concepts, plays a crucial role as the backbone for strengthening household-scale food security. Productive backyard management directly contributes to the targets of the Sustainable Development Goals (SDGs), particularly in eradicating poverty (SDGs-1) and ending hunger through sustainable agricultural systems (SDGs-2).

Kuntariningsih and Supriyadi (2025) emphasized that rapid urbanization linearly degrades the availability of fertile land, presenting urban communities with major challenges in accessing fresh food. In line with this, Atmaningsih et al. (2023) stated that land limitations due to conversion necessitate the optimization of domestic yards by involving women farmers' groups to ensure independent, safe, and sustainable food availability. However, in reality, urban yards are frequently ignored or left abandoned. Nikmatullah et al. (2022) identified that the low utilization of residential land stems from the community's lack of skills in cultivation engineering within limited spaces, which is further exacerbated by the accumulation of poorly managed domestic waste.

This condition is visibly experienced by the community in Mandonga Village, Mandonga District, Kendari City. Based on field observations, Mandonga Village is located approximately 2 km from the capital city of Southeast Sulawesi Province (Kendari City), with a travel time of around 5 minutes. The total area of Mandonga Village is 1.26 km^2, accounting for 36.13% of the total Mandonga District area of 21.74 km^2. The majority of the population in Mandonga Village earn their living as farmers. The climatic condition of Mandonga Village is classified as tropical, with annual rainfall reaching 183 mm/year, averaging 3.2 mm/day. The ambient temperature ranges between 22.6°C – 33.3°C, with humidity levels ranging between 77% – 90.9% (averaging 83.7%). While Mandonga Village has a tropical climate potential with adequate rainfall for horticultural commodities, it faces extreme production space constraints. Type C quarrying activities around the residential areas have drastically altered the landscape, leaving behind hard, compact rock layers and halting the crop cultivation activities previously conducted by the residents. This phenomenon of land abandonment due to the loss of natural soil fertility aligns with the analysis by Bhara et al. (2025) regarding the critical challenges of cultivating vegetables on marginal or degraded post-exploitation lands.

As a corrective solution to these soil nutrient limitations, fertility engineering using soil amendment inputs or *in-situ* organic matter-based fertilizers is key. According to Irmayanti et al. (2023), processing organic household waste into fertilizer is a highly effective circular economy approach to minimize domestic waste volume while simultaneously improving the physical, chemical, and biological properties of the soil. The independent management of kitchen waste, as emphasized by Hamdiani et al. (2018), not only resolves environmental sanitation issues caused by wet waste accumulation in densely populated areas but also provides a nutrient-rich growing medium for small-scale organic farming. Similarly, according to Kusmiyati et al. (2018), the utilization of biological inputs or organic by-products within the Sustainable Food House (RPL) concept is proven to deliver significant ecological and economic added value to family food security.

The utilization of household waste, which is consistently available, serves as an adaptive resource for organic fertilizer production. Organic fertilizer is highly beneficial for improving physical, chemical, and biological soil fertility, which directly boosts the yield of cultivated crops. The organic fertilizer produced from household waste is expected to enhance crop productivity and provide direct benefits to the community.

Crop cultivation activities on anthropogenic land within residential yards contribute positively toward more productive land utilization, the provision of healthy and nutritious food, improved fiber consumption quality, fulfillment of family nutritional needs, reduced household expenditures, and the establishment of new business opportunities that ultimately improve family welfare. Based on the aforementioned situation, the Internal Community Partnership Program (PKMI) of Universitas Halu Oleo conducted technical guidance for Dasawisma Groups in Mandonga Village. The priority problems addressed included: (a) damaged and infertile backyard land conditions, (b) the partners' lack of understanding regarding cultivation techniques in limited spaces, and (c) the absence of skills in processing kitchen waste into ready-to-use fertilizer. This activity aimed to increase the partners' capacity to rehabilitate

marginal lands, provide practical skills in solid organic fertilizer processing, and promote the adoption of eco-friendly agricultural innovations to strengthen family food independence.

IMPLEMENTATION METHOD

Program Socialization

The socialization phase was conducted by the UHO Internal Partnership Program Team for the partners to convey the following aspects: (1) the program action plan, (2) partner participation, and (3) target outputs of the partnership program. This socialization aimed to align perceptions among all parties regarding the upcoming activities. The target partners participated actively by listening to and providing feedback on the work plan arranged by the Faculty of Agriculture UHO Internal Partnership Team. The output of this socialization phase was a clear overview of the community's needs for the team to refine the work plan based on the partners' input. Additionally, it provided an initial assessment of the partners' baseline knowledge and motivation to support the program.

Training

Training activities were conducted to provide information, knowledge, and practical skills to the partner groups regarding household waste organic fertilizer production techniques, fertilizer application, and crop cultivation preparation packages. The cultivation package included growing medium preparation, planting preparation, planting, crop maintenance, and harvesting. The expected output of this activity was an increase in the partner farmers' knowledge and technical skills regarding organic fertilizer technology from household waste and sustainable crop cultivation techniques.

Organic Fertilizer Production from Household Waste

This activity demonstrated the production of solid organic fertilizer from household waste using Effective Microorganisms (EM4) bioactivator. Household waste, including vegetable scraps and food leftovers, was collected and chopped into small pieces (± 2 cm). Subsequently, the raw materials were treated with EM4 to accelerate the decomposition process into organic fertilizer ready for crop application. The organic fertilizer production was carried out through a participatory approach, assisted by the UHO Internal Partnership Program implementation team as the main facilitators.

Monitoring dan Evaluation

The success of this program was evaluated based on the implementation process and the achieved outcomes. The process success indicators included: (1) participants' perceptions regarding the activity mechanism (good, fair, poor), and (2) the participants' knowledge and skills in managing the initiative (cultivation techniques, product processing, and group management). Meanwhile, the outcome aspect was evaluated based on the predefined quantitative targets. The monitoring process was carried out continuously during training by the activity coordinator. The monitoring results served as primary material for monthly field discussions and progress reports. Evaluation was performed twice: at the end of the training phase and at the end of the crop cultivation cycle.

RESULT AND DISCUSSION

Land Clearing for Vegetable Cultivation Sites

The land used for vegetable cultivation was located around the community's residential yards. This land is categorized as anthropogenic land, which has undergone severe damage due to land clearing and excavation activities, leaving behind a hard and compact rock layer. The productivity of this land is extremely low, making it unsupportive of standard crop cultivation. Utilizing this land requires adding a topsoil layer or cultivating crops in polybags enriched with household organic waste to fertilize the growing media.

Land clearing is an essential initial step in the vegetable cultivation sequence to ensure that preparation and planting activities run smoothly. The land was cleared of wild shrubs such

as cogon grass (*Imperata cylindrica*), Siam weed (*Chromolaena odorata*), and creeping vines like *Calopogonium*. The area was also cleaned of plastic waste scattered around the site. The cleared land was then ready for vegetable cultivation activities.

Figure 1. *Land preparation process for vegetable cultivation*

Under extreme anthropogenic soil conditions, such as those in Mandonga, direct planting on the ground rarely yields optimal results due to physical soil stress. Therefore, the team directed the partners to adopt a cultivation system using a new growing medium composed of topsoil and organic matter. This approach aligns with Lumbantoruan et al. (2025), who stated that integrating organic matter enrichment in limited and marginal lands is the best adaptive strategy to ensure sustainable urban food supply in degraded areas. Furthermore, Maharmi et al. (2026) revealed that utilizing pots or polybags combined with organic fertilizer-enriched growing media can overcome space limitations while isolating plant roots from local soil physical stress caused by anthropogenic activities.

Waste Collection and Raw Material Preparation for Organic Fertilizer

Organic waste was collected from households in the form of vegetable scraps, fruit peels, and food leftovers. The collection was carried out in the mornings and evenings, followed by separating organic waste from inorganic materials. The collected vegetable waste was chopped into 2 cm pieces, placed on a tarpaulin, and sun-dried for three days. Chopping into smaller sizes was intended to accelerate composting, while sun-drying aimed to reduce moisture content so that decomposition could occur more rapidly.

The materials for producing household waste organic fertilizer consisted of chopped organic waste, EM4 solution, brown sugar, rice bran, and water. The dried, small-chopped organic waste appeared blackish, had lower moisture content, and produced no pungent odor. These material characteristics made it safe for composting without causing odor nuisance to the surrounding neighborhood. Dry organic materials decompose faster due to optimized moisture levels. This preparation strategy is in line with Chamdani et al. (2024), where household waste management using fine chopping and EM4 bioactivator proved effective in reducing urban organic waste volume while generating nutrient-rich materials.

Tehnical Guidance on Household Waste Organic Fertilizer Production

The community members involved in this technical guidance were women from Mandonga Village who belonged to the Gunung Sakura and Bunga Sakura Dasawisma Groups. Before the activity, most participants had limited knowledge regarding the types of household organic waste that could be processed into fertilizer, the materials and equipment required, appropriate production techniques, and the fermentation period needed to produce quality organic fertilizer. In addition, they recognized that the large volume of household waste generated daily often created environmental and sanitation problems when not managed properly. Delayed waste disposal frequently resulted in unpleasant odors, the proliferation of flies and other disease vectors, and reduced household cleanliness and aesthetic value.

Figure 2. *Training participants consisting of supervising lecturers, students, and the Mandonga Village Dasawisma groups*

The technical guidance began with introductions between the lecturer and student team from the Faculty of Agriculture UHO and the women of the Gunung Sakura and Bunga Sakura Dasawisma Groups. The material was delivered by explaining the types of organic household waste that can be converted into organic fertilizer, namely vegetable scraps, fruit peels, and food leftovers. These materials naturally have a high moisture content, making them difficult to decompose in a short time. Therefore, the application of EM4 effective microorganisms, sugar, and rice bran was introduced to accelerate the composting and decomposition process to only 14–21 days.

In line with research by Purwanta et al. (2023), introducing biological decomposers accelerates the breakdown of complex macro compounds like cellulose into simple compounds ready for plant root absorption. This controlled composting method also adopts the practical principles of Ekawati and Yudatama (2024), where hands-on practice-based technical guidance and regular moisture monitoring serve as primary success factors for technology adoption by the public. Furthermore, Nurmas et al. (2024) stated that transferring knowledge on organic waste fermentation techniques is crucial to shifting the public mindset from a high dependency on synthetic chemical fertilizers toward eco-friendly organic inputs that can be produced independently at the household level.

Figure 3. *Raw materials for household waste organic fertilizer, mixing process, and storage of materials treated with EM4 mixture*

The step-by-step production of household waste organic fertilizer began by spreading the chopped (< 2 cm) and sun-dried organic waste evenly over a tarpaulin. It was then mixed with rice bran and sprayed with a solution of water, EM4, and brown sugar while being thoroughly stirred to achieve a homogeneous mixture. The solution was applied evenly until it reached a field capacity state, characterized by a condition where no water dripped through the fingers when the mixture was squeezed in one's hand. This status represents the ideal moisture level for the composting process.

The well-mixed material was then packed into sacks and stored in a location sheltered from direct sunlight and rain. The material was turned over every 2–3 days to maintain the optimum temperature for composting. The turning process was halted after 14–21 days, at which point the compost exhibited a blackish color, full decomposition, a characteristic organic fertilizer earthy smell, and a cool temperature.

Characteristics of the Produced Organic Fertilizer

The finalized household waste organic fertilizer product was obtained after 14–21 days of composting. The success was indicated by a finer material texture due to decomposition, a dark black colour, a typical non-pungent organic fertilizer aroma, and a stable, ambient temperature. This mature compost can be directly applied to growing media to enhance soil fertility and support household vegetable production.

The use of domestic organic waste as a restoration agent for marginal soils is supported by Alam et al. (2023), who proved that utilizing local resource-based soil amendments successfully improves soil aggregation, cation exchange capacity (CEC), and restores the productivity of degraded lands. This framework is also reinforced by Arifin et al. (2021), who stated that the application of *in-situ* waste-based bio-organic fertilizers significantly improves the availability of essential nutrients, such as phosphate, in the soil.

In the context of agricultural production effectiveness, Herman et al. (2024) reported that the application of household waste compost exerts a significant positive improvement on soil chemical parameters (such as increasing total nitrogen, available phosphorus, and organic carbon), which directly stimulates the enhancement of plant biomass and crop yields. The benefits of applying household waste-based organic matter were also confirmed by Daryanti et al. (2025), who found that utilizing organic nutrients derived from domestic waste combined with biological agents successfully boosts the vegetative and generative growth performance of horticultural crops optimally. Specifically, the findings of Herman et al. (2024) confirmed that the application of household waste-based organic fertilizer at an appropriate dosage delivers a significant impact on increasing plant height, number of leaves, leaf width, leaf length, stem diameter, and cob length of sweet corn.

Figure 4. *Finished organic fertilizer product from household waste*

Evaluation of Community Service Implementation

Monitoring and evaluation were carried out to measure the success rate of this community service activity. Monitoring assessed the field implementation and encountered obstacles, while the final evaluation results are systematically presented in Table 1.

Table 1. *Achievement indicators and realized outcomes*

No.	Achievement Indicator	Method	Realized Outcomes
1.	Problem justification in household organic waste utilization	Survey method	Successfully implemented; community participation reached 70%.
2.	Formulation of justification results	Analysis of actual waste utilization conditions	Completed with high accuracy (85%).
3.	Waste component identification	Determination of methods for sorting organic components	Successfully executed with excellent results (100%).
4.	Justification of problem-solving via training	Analysis of waste-to-fertilizer conversion training	Successfully achieved with optimum outcomes (100%).
5.	Publication of waste utilization for vegetable production	Public media and community engagement dissemination	Partially completed due to administrative delays (45%).
6.	Execution of waste utilization program	Dissemination and socialization to target communities	Successfully conducted with high enthusiasm (80%).
7.	Assessment of application and utilization	Management evaluation of fertilizer application	Well-executed and sustainable (80%).

The evaluation results indicate that the outcome attainment rate of the Community Service activity reached an estimated 80.0%, which stands above the predefined program success indicator threshold of >75%. Consequently, the implementation of this community service initiative was executed successfully in accordance with the expected performance indicators. This outcome aligns with a community service project conducted by Alam et al. (2025), which demonstrated that community service activities generate positive transformations and significantly enhance public awareness regarding the importance of agricultural cultivation practices using organic fertilizers, as well as the long-term sustainability of agricultural land through the optimization of local resources. Furthermore, it is highly expected that the community will begin transitioning from the reliance on inorganic fertilizers toward the implementation of sustainable agriculture by utilizing household waste-based organic fertilizers (Alwi et al., 2022).

CONCLUSSION

The implementation of the Internal Community Partnership Program (PKMI) through technical guidance on utilizing household waste for organic fertilizer production in Mandonga Village was executed successfully and effectively, achieving a program outcome attainment rate of 80.0%. This figure stands comfortably above the predefined program success indicator threshold of >75%. Substantially, this activity has delivered a significant impact on two primary aspects. First, it enhanced partner understanding, as evidenced by the Gunung Sakura Dasawisma Group achieving a 100% comprehension level in identifying potential household organic waste components, such as vegetable scraps, fruit peels, and food leftovers, suitable as raw materials for composting. Second, it improved practical skills, whereby the partner groups acquired the technical knowledge and skills (100% in the problem-solving aspect) required to engineer household waste decomposition using EM4 bioactivator, enabling them to independently produce ready-to-use solid organic fertilizer within a 14–21 day fermentation period. Based on these outcomes, the generated organic fertilizer serves as an adaptive solution to restore and improve the physical, chemical, and biological fertility of degraded anthropogenic land around residential yards.

Based on the successful evaluation results achieved, several strategic and concrete follow-up plans have been formulated for future implementation. The first measure involves the provision of production facilities to address the limitations of the current production scale, alongside continuous assistance in operating mechanical choppers and developing more adequate composter bins to significantly scale up the volume of the organic fertilizer produced. The second measure entails expanding the application to crop cultivation (urban farming) by intensively integrating the manufactured organic fertilizer into residential backyard growing media, both in polybags and through topsoil enrichment, to support the sustainability of household-scale vegetable cultivation. This expansion is continuously pursued to ensure the fulfillment of family nutritional needs while simultaneously opening up micro-business opportunities to improve the community's economic income.

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