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Transforming organic waste into compost: An integrative approach to sustainable agriculture

Sahdan Mustari[1,*], Yusriyanto[2]
[1] *Public Health Study Program, Sekolah Tinggi Ilmu Kesehatan Amanah, Makassar, South Sulawesi 90234, Indonesia;*
[2] *Bachelor of Nutrition Program, Tri Tunas Nasional Institute of Technology and Health, Makassar, South Sulawesi 90234, Indonesia.*
*Correspondence: sahdankaraengrate@gmail.com

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ABSTRACT
Background: Pangkajene and Islands Regency (Pangkep) has a unique geographical character that combines the karst foothills of Pangkep–Maros with a cluster of islands in the Makassar Strait. This condition has given rise to an economy based on agriculture, fisheries, and industry, but on the other hand, it has also created waste management issues, particularly with regard to organic waste from households and traditional markets, which has the potential to cause odours, leachate, and greenhouse gas emissions if not managed properly. **Method:** The study used a descriptive-exploratory qualitative approach with an embedded case study. The main "case" was the ecosystem of organic waste utilisation for compost in Pangkep. **Findings:** This study shows that organic waste is still the dominant fraction in Pangkep Regency, but its management is not yet optimal, causing environmental problems such as odour, leachate, and potential greenhouse gas emissions. **Conclusion:** This study confirms that organic waste in Pangkep Regency has great potential to be processed into compost, but its utilisation is still far from optimal. **Novelty/Originality of this article:** The originality or uniqueness of this article lies in its focus, which not only discusses organic waste management as an environmental issue, but also directly links it to the needs of sustainable agriculture in Pangkep Regency. This article presents an integrative approach by combining the potential of municipal waste and rice straw as compost raw materials, while also assessing product quality based on the SNI 7763:2018/2024 standard.

KEYWORDS: organic waste composting; sustainable waste management; environmental health.

1. Introduction

Organic waste, primarily generated from households, markets, and agricultural activities, is a major environmental challenge worldwide. This approach not only addresses the critical issue of organic waste management but also significantly enhances soil fertility and promotes ecological harmony within agricultural systems (Lhaj et al., 2024; Lida et al., 2024). Composting, a natural decomposition process, transforms organic waste into nutrient-rich material, offering a pivotal and rewarding approach to sustainable agriculture by enhancing soil structure, moisture retention, and nutrient availability (Farouk et al., 2024). When improperly managed, it leads to harmful consequences such as landfill overflow, greenhouse gas emissions, and leachate contamination. However, through controlled decomposition, composting redirects these waste streams into valuable organic fertilizers, thereby mitigating environmental damage and fostering a circular economy

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(Lhaj et al., 2024). This process is further enhanced when enriched compost, fortified with specific organic materials and beneficial microorganisms, is utilized to maximize its nutrient content and biological activity, ultimately supporting soil health and reducing greenhouse gas emissions (Lida et al., 2024). This transformation lessens reliance on synthetic fertilizers and pesticides, fostering a more sustainable agricultural paradigm (Andey et al., 2024; Lida et al., 2024). In many regions, organic waste makes up the largest portion of the waste stream, creating both an environmental problem and an untapped resource for sustainable agricultural practices. The conversion of this waste into compost represents a significant opportunity to mitigate these environmental burdens while simultaneously contributing to regenerative farming systems (Lida et al., 2024). This approach aligns with circular economy principles by promoting nutrient recycling and reducing demand for synthetic fertilizers, thus supporting sustainable agricultural practices and long-term food security (Manea et al., 2024).

Composting offers a sustainable solution to address the environmental consequences of organic waste management by diverting materials from landfills, which are significant sources of methane emissions, and by producing a beneficial soil amendment (Hashim et al., 2021; Manea et al., 2024). Through a natural biological process, organic waste is transformed into valuable compost, a soil enhancer that improves soil fertility, increases water retention, and fosters healthier agricultural ecosystems. This controlled process, distinct from natural decomposition, necessitates regulated environmental conditions to achieve optimal mineralization and maturation of organic matter into a stable, humus-like product (Waqas et al., 2023). This final product, rich in organic matter and nutrients, minimizes the need for chemical fertilizers and reduces environmental impact by diverting waste from landfills (Hissham et al., 2024). This sustainable and cost-effective approach also significantly reduces the emission of greenhouse gases that would otherwise be generated by unscientific dumping of waste in landfills (Andey et al., 2024; Murugesan & Amarnath, 2020; Zgallai et al., 2023). Furthermore, the utilization of advanced composting techniques, such as in-vessel composting and vermicomposting, alongside microbial inoculants, significantly improves efficiency and compost quality (Manea et al., 2024).

Agriculture in Pangkep, particularly rice and horticulture, faces challenges such as soil degradation, fluctuating fertilizer costs, and climate variability (Khoirunnisak et al., 2025). These issues are further compounded by reliance on synthetic fertilizers, which can deplete soil organic matter and contribute to environmental pollution. Integrating organic waste composting addresses these challenges by providing a sustainable source of nutrients, improving soil structure, and enhancing resilience to climate change (Triệu, 2023). The region's farmers have a growing need for sustainable alternatives to chemical fertilizers. Organic compost, derived from the decomposition of organic waste, presents a viable and environmentally friendly solution to these agricultural dilemmas (Novra et al., 2023). Composting organic waste provides an ideal solution by offering locally produced, affordable, and environmentally friendly soil amendments. This method leverages the decomposition of organic materials into stable, nutrient-rich products through the aid of microorganisms, enhancing soil health and crop productivity while sequestering carbon (Tiong et al., 2023). Integrating organic waste management with agricultural needs could enhance local food security and contribute to a more resilient agricultural system. This not only mitigates the environmental impact of waste but also bolsters agricultural productivity through enhanced soil vitality (Faisal et al., 2019).

This study focuses on the potential of transforming organic waste into compost through an integrative approach in Pangkep, aiming to develop sustainable waste management practices that concurrently support soil health and reduce reliance on synthetic inputs in the region's agricultural sector. It explores how the region's waste management systems, which involve community-based models like waste banks and TPS-3R (Temporary Waste Collection Points), can be linked to agricultural practices. This integration is crucial for fostering a circular economy where organic waste is transformed into a valuable resource, ultimately contributing to enhanced soil fertility and reduced dependence on external synthetic fertilizers for crops such as rice and horticulture (Ali & Flayeh, 2023; Bahri et al.,

2022). By utilizing municipal organic waste along with agricultural by-products, such as rice straw, this paper investigates how Pangkep can establish a circular economy that benefits both the waste management and agriculture sectors. Such a synergistic approach would help bridge the gap between waste generation and resource utilization, aligning with broader goals of environmental sustainability and economic viability (Chorolque et al., 2021; Sharma et al., 2023). This interdisciplinary approach offers a pathway to sustainable development, wherein waste is reimagined as a valuable input for agricultural systems rather than a disposal problem (Andey et al., 2024). This study will provide insights into optimizing organic waste valorization for agricultural use, thereby contributing to the broader discourse on sustainable resource management and food security.

In conclusion, an integrated approach to composting in Pangkep offers a promising pathway for sustainable agriculture by converting waste into a valuable resource that enhances soil health, reduces pollution, and supports the local economy. This strategy not only aligns with global sustainability goals but also addresses local challenges by providing a cost-effective and ecologically sound alternative to conventional agricultural inputs (Kansoriya, 2023). By efficiently managing organic waste and converting it into compost, Pangkep can not only address waste management challenges but also improve soil health, support agricultural productivity, and promote long-term environmental sustainability. This systematic study further highlights composting as a pivotal strategy for enhancing soil health, reducing environmental impact, and promoting sustainable agricultural waste management (Lhaj et al., 2024). This paper aims to highlight the importance of transforming organic waste into a resource that enhances both environmental quality and agricultural practices in PangkepThis transformative process not only contributes to a circular economy by valorizing waste but also directly supports the agricultural sector through the provision of nutrient-rich soil amendments, thereby diminishing reliance on synthetic fertilizers and mitigating associated environmental impacts (Novra et al., 2023). This research aligns with principles of the circular economy, emphasizing the recycling of organic waste into valuable resources and supporting global efforts to reduce reliance on synthetic fertilizers (Liu et al., 2025; Mia & Zzaman, 2025). This approach leverages the substantial starch and nutrient content in agricultural byproducts, such as potato peel waste, to enrich compost formulations, fostering plant growth and improving soil health (Garg et al., 2024).

2. Methods

2.1 Research design, data sources, and data collection methods

The research will utilize a qualitative, descriptive-exploratory approach, integrating embedded case study methodology to investigate the current state and potential of organic waste composting in Pangkep, examining current waste management practices, community engagement, and agricultural demands to identify opportunities for synergistic integration. This methodology will involve in-depth interviews with stakeholders, direct observation of composting facilities, and analysis of relevant policy documents to build a comprehensive understanding of the socio-economic and environmental factors influencing organic waste valorization (Xu et al., 2024).

Data will be gathered through a combination of primary and secondary sources. Primary data will include semi-structured interviews with key stakeholders, such as local farmers, waste management personnel, community leaders, and agricultural extension workers. Secondary data will encompass existing reports, policy documents, and statistical information concerning waste generation, agricultural output, and soil quality in the Pangkep region, ensuring a robust analytical framework. These interviews will aim to understand the existing composting practices, challenges faced, and the perception of compost quality among farmers.

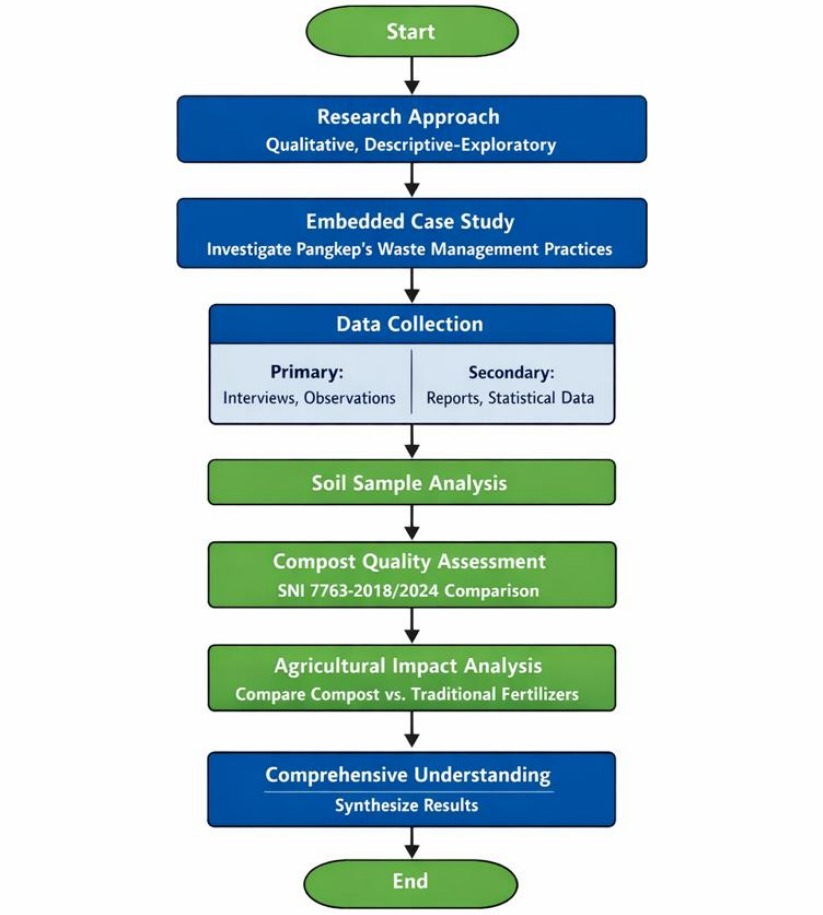

Fig. 1. Flowchart for research methodology

Additionally, observations will be conducted at key sites, including local markets, waste collection points (TPS-3R), and community composting units. This will allow for a detailed understanding of the waste sorting, collection, and composting processes. Furthermore, soil samples from agricultural lands will be analyzed to assess existing nutrient levels and the impact of current fertilization practices, providing a baseline for evaluating the potential benefits of compost application.

2.2 Empirical strategies and analytical framework

Secondary data will be collected from government reports, regional policy documents, and academic studies on waste management and sustainable agriculture practices in Pangkep. This study synthesize information on waste management, sustainability, and supply chain solutions to inform the conceptual framework for enhancing organic waste valorization in agriculture (Muhammad et al., 2023). The study will focus on the quality of compost produced, comparing it with the national standards (SNI 7763:2018/2024) for organic fertilizers. Laboratory tests will be conducted on compost samples to assess key parameters such as organic carbon content, C/N ratio, moisture content, pH, and heavy metal levels.

Additionally, the research will analyze the agricultural impact of compost use by evaluating crop yield data from farms utilizing compost in comparison to those using traditional fertilizers. This comparative analysis will provide empirical evidence of compost's efficacy in enhancing agricultural productivity and soil health, contributing to a holistic understanding of its benefits. This multi-source data collection method will provide a comprehensive view of the current composting ecosystem and its potential for scaling up in Pangkep. This descriptive-exploratory qualitative study, largely conforming to a concurrent embedded design, will integrate quantitative compost quality analysis within a

broader qualitative case study assessment, allowing for a comprehensive understanding of the systems at play (Roy et al., 2021).

3. Results and Discussion

3.1 Waste generation profile and composition (raw material potential)

The total waste generation in Pangkep for 2024 is estimated to be approximately 52,821.49 tonnes annually, which equates to around 144.72 tonnes per day. Table 1 sourced from the SIPSN 2024, reflects the overall waste produced in the region, including both organic and non-organic fractions. Notably, organic waste, which predominantly consists of food waste, makes up a significant portion of the total waste. National estimates indicate that organic waste constitutes about 41.27% of total waste, a pattern consistent with the data from Pangkep. Consequently, the estimated daily organic waste generated in Pangkep amounts to approximately 59.72 tonnes, derived from the calculation of 41.27% of the total daily waste.

Table 1. Waste generation & composition in Pangkep District

Parameter	Data/value	Source
Total waste generation (2024)	±52,821.49 tonnes/year (≈144.72 tonnes/day)	SIPSN 2024
Managed waste	47,144.00	SIPSN 2024
Organic waste (national, 2022)	±41.27% (predominantly food waste)	Ministry of Environment and Forestry
Organic estimate for Pangkep	±59.72 tonnes/day (144.72 × 41.27%)	Calculation
Conservative potential	38.77 tonnes/day (usable potential)	National Standard

However, when considering the "usable potential" for composting, the conservative estimate of organic waste that can be effectively processed is approximately 38.77 tonnes per day. This figure accounts for the portion of organic waste that is not contaminated or unsuitable for composting, aligning with national standards and more realistic projections of what can be managed effectively. The difference between the total organic waste estimate (59.72 tonnes/day) and the conservative usable potential (38.77 tonnes/day) highlights the challenges of waste sorting and contamination, underscoring the need for improved waste management practices to maximize the composting potential in Pangkep. Indeed, the successful implementation of circular economy principles within organic farming often relies on the utilization of societal waste streams for nutrient recycling, yet concerns about contamination from potentially toxic elements and pollutants often hinder their widespread adoption (Bünemann et al., 2023).

These challenges are compounded by nutrient imbalances in raw biowastes and organic fertilizers, which often contain phosphorus and nitrogen that are only partially or slowly available, necessitating chemical and physical modifications to optimize their agricultural utility (Salas et al., 2024). Moreover, such biowaste transformations, while addressing logistical and environmental concerns, can inadvertently reduce the bioavailability of these critical nutrients (Salas et al., 2024). Addressing these multifaceted challenges requires a holistic approach that integrates advanced waste sorting technologies, robust quality control mechanisms, and comprehensive stakeholder engagement to foster a sustainable circular bioeconomy (Hettiarachchi et al., 2020; Kvakkestad et al., 2023).

3.2 Composting performance and compost output estimates

The data from Table 2 illustrates the potential compost output in Pangkep based on different composting scenarios. When utilizing the full estimated organic waste generation of 59.72 tonnes per day, the compost yield can vary depending on the composting method.

In an "urban scheme" using a wet mix, where the yield is around 30-35%, the estimated daily compost output would range from 17.92 to 20.90 tonnes, resulting in an annual output of 6,540 to 7,630 tonnes. Alternatively, when applying a "dry scheme" with more bulking agents to balance moisture content, the compost yield increases to 50-65%, producing between 29.86 and 38.82 tonnes per day, which translates to 10,900 to 14,170 tonnes annually. This significant increase in yield highlights the importance of optimizing composting methods to maximize output.

Table 2. Compost output estimates (based on mass reduction)

Input basis	Compost yield	Daily output	Annual output	Description
59.72 tonnes/day (organic)	30–35	17.92–20.90 tonnes/day	6,540–7,630 tonnes/year	Urban scheme (wet)
59.72 tonnes/day (organic)	50–65%	29.86–38.82 tonnes/day	10,900–14,170 tonnes/year	Dry scheme/more bulking
38.77 tonnes/day (conservative)	30–35%	11.63–13.57 tonnes/day	4,240–4,950 tonnes/year	Potential for use
38.77 tonnes per day (conservative)	50–65%	19.39–25.20 tonnes/day	7,080–9,200 tonnes per year	Potential usable

In contrast, when considering a more conservative estimate of organic waste (38.77 tonnes per day), the compost yield is lower, reflecting the more realistic and usable potential of organic waste that can be processed. In the conservative scenario with a 30-35% yield, daily output would range from 11.63 to 13.57 tonnes, leading to an annual output of 4,240 to 4,950 tonnes. If the composting process is optimized with a 50-65% yield, the daily output would increase to between 19.39 and 25.20 tonnes, yielding between 7,080 and 9,200 tonnes annually. These table show the variation in potential output based on the composition and management of organic waste, emphasizing that efficient composting techniques can significantly enhance production, but proper sorting and waste quality control remain essential for achieving higher yields.

Furthermore, the unpredictability of nutrient content in bio-based fertilizers and their variable plant-availability pose challenges for synchronizing nutrient supply with crop demand, particularly given the imbalanced nutrient ratios often observed in organic sources where phosphorus can be abundant while nitrogen is scarce (Simon et al., 2024). Moreover, the long and costly certification processes for novel bio-based products, coupled with farmers' skepticism regarding product reliability and safety, further impede market acceptance and broader adoption of these sustainable alternatives (Hidalgo et al., 2025). Overcoming these hurdles necessitates the development of standardized analytical tools and robust quality control mechanisms to ensure the safety and efficacy of bio-based fertilizers, thereby building trust among end-users and facilitating market penetration (Wichern et al., 2024).

3.3 Compost quality: Comparison with SNI

Table 3 outlines the compost quality standards based on SNI 7763:2018/2024 and provides essential parameters for assessing the suitability of compost for agricultural use. The standard mandates that the organic carbon content should be at least 15%, ensuring that compost provides sufficient nutrients and soil conditioning properties. The C/N ratio must be ≤25 to ensure a balanced decomposition process that minimizes ammonia volatilization and prevents excessive nitrogen loss. Maintaining this ratio is critical for achieving stable, high-quality compost that is effective in improving soil fertility.

In addition, the moisture content of the compost must fall within the range of 8-25%, which is vital for maintaining microbial activity during composting. A pH range of 4–9 ensures that the compost is neither too acidic nor too alkaline for plant growth. The total NPK content (Nitrogen, Phosphorus, and Potassium) must be ≥2% to provide the essential macro-nutrients for crops. Finally, the compost must adhere to limits on heavy metals to

prevent contamination of the soil and plants, ensuring that the compost is safe for agricultural use. These parameters collectively define the quality of the compost and are essential for maintaining agricultural productivity and environmental safety. This rigorous quality control is particularly crucial given the often variable composition of bio-based fertilizers derived from diverse waste streams, which can inherently possess inconsistent nutrient profiles and introduce contaminants if not properly processed and monitored (Meisam & Hossein, 2018; Salas et al., 2024).

Table 3. Compost quality standards (SNI 7763:2018/2024)

Parameter	SNI requirements	Notes
Organic carbon	≥15%	-
C/N ratio	≤25	-
Moisture content	8–25%	-
pH	4–9	-
Total NPK	≥2%	-
Heavy metals	Certain maximum limits	-

Therefore, comprehensive regulatory frameworks and advanced analytical methods are imperative to guarantee the safety and efficacy of these fertilizers for sustainable agricultural practices (Salas et al., 2024). Additionally, to ensure widespread adoption, bio-based fertilizers must provide sufficient and reliable nutrient amounts in crop-adequate ratios, while also being competitively priced against conventional mineral fertilizers (Salas et al., 2024). Furthermore, the stability of nutrient concentration is a concern for bio-based fertilizers, as they are susceptible to biochemical processes, unlike more stable mineral fertilizers (Kurniawati et al., 2023). The potential presence of heavy metals and pathogens in bio-based fertilizers also necessitates stringent testing and risk assessment to prevent environmental and human health impacts, complicating their widespread application (Kurniawati et al., 2023; Salas et al., 2024).

3.4 Upstream–midstream–downstream supply chain: "As-Is" vs "To-Be"

As indicated in Table 4, the compost requirement for the MT-1 rice field area in Pangkep, which spans approximately 16,832 hectares by 2025, is critical to meeting the agricultural needs of the region. According to the Department of Agriculture and Food**,** the recommended compost dosage ranges from 3 to 10 tonnes per hectare, depending on the soil condition and crop type. When applying the lower end of the dosage (3 tonnes per hectare), the total compost requirement for the rice fields in one season is approximately 50,496 tonnes. On the higher end (5 tonnes per hectare), the compost requirement increases to approximately 84,160 tonnes per season. These estimates are based on calculations derived from the compost dosage guidelines.

Table 4. Compost requirements vs capacity in Pangkep rice fields

Parameter	Value/estimate	Source
MT-1 rice field area (2025)	16,832 ha	Pangkep Regional Government
Recommended compost dosage	3–10 tonnes/hectare	Department of Agriculture and Food
Compost requirement (3 tonnes/ha)	±50,496 tonnes/season	Calculation
Compost requirement (5 tonnes per hectare)	±84,160 t/season	Calculation
Compost capacity from municipal waste	±6,500–14,000 tonnes/year	Estimates in Table 2
Potential for straw compost (5–8 tonnes of straw/hectare → 25–47 thousand tonnes of compost/MT)	±25–47 thousand tonnes/season	Calculation

In terms of compost production capacity, Table 4 shows that the annual compost output from municipal waste in Pangkep ranges from 6,500 to 14,000 tonnes. When considering the potential of integrating straw compost, with estimates ranging from 25,000 to 47,000 tonnes per season, the total available compost is still significantly below the required amount for agricultural use. This highlights the gap between the compost production from waste and the compost required for local agriculture. To bridge this gap, the integration of straw compost, along with improved waste management and composting techniques, will be necessary to meet the agricultural demands of the region effectively . This comprehensive approach would involve not only maximizing compost production from available organic waste but also ensuring that the resulting bio-based fertilizers meet stringent quality standards for nutrient content and safety to foster farmer adoption (Kurniawati et al., 2023; Salas et al., 2024).

Additionally, public investment, community organization, and extension services, similar to successful models in Rwanda, could significantly bolster the widespread adoption and sustained use of these sustainable agricultural inputs (Doda et al., 2025). Such strategies would help overcome challenges related to farmers' technical capacity and provide essential support for adopting Good Agricultural Practices that incorporate bio-based fertilizers and soil management techniques (Idawati et al., 2024). Furthermore, addressing the existing data gaps in economic indicators, particularly in food distribution and consumption, could provide a more holistic understanding of the food system's sustainability and identify additional opportunities for circular economy integration (Acs et al., 2025). A robust circular economy framework would not only enhance resource efficiency but also mitigate environmental impacts by reducing reliance on external inputs and minimizing waste generation across the entire agri-food supply chain (Afrouzi et al., 2023). Such a framework necessitates strategic research and development investments, coupled with innovative policies that encourage collaboration among all stakeholders, from local communities and small farms to large enterprises, ensuring an equitable transition that supports food security and poverty reduction.

3.5 Adoption & Human resource capacity (social findings)

As detailed in Table 5, the social and institutional aspects of organic waste management in Pangkep highlight several key findings. On the upstream side, plastic contamination remains a significant challenge in the markets, with sorting practices not yet uniformly implemented. This contamination hinders the quality of organic waste that can be processed into compost, thus affecting the overall composting efficiency. Observations suggest that improvements in waste sorting at the source are crucial for increasing the viability of composting programs.

Table 5. Social & institutional findings (summary)

Aspect	Field findings	Source
Upstream	Plastic contamination remains high in markets; sorting is not yet uniform	Observations
Middle	TPS-3R is the main hub; organic waste is directed to compost, inorganic waste to RDF	DLH, Stranas PK
Downstream	Farmers emphasise compost quality (odour-free, mature, clear labelling)	Interviews with PPL/farmers
Human resource capacity	Compost training in Parenreng Village (2023) & campus programme (2025)	Local news

In the middle phase, TPS-3R (Temporary Waste Collection Points) plays a central role as the main hub for sorting and processing waste. Organic waste is directed to composting processes, while inorganic materials are directed to RDF (Refuse-Derived Fuel) facilities. This division of waste processing allows for more targeted waste management and resource recovery. On the downstream side, farmers place significant emphasis on compost quality, highlighting the need for compost to be mature, odour-free, and clearly labeled. Interviews with farmers and agricultural extension workers (PPL) reveal that these quality attributes are critical for gaining farmer confidence in using compost. Additionally, human resource capacity is being strengthened through composting training programs in Parenreng Village (2023) and an upcoming campus program in 2025, indicating ongoing efforts to build local expertise and foster community involvement in composting initiatives.

3.6 Discussion

3.6.1 Gap between compost production and agricultural demand: Key findings and implications

The results of this study reveal several key findings regarding organic waste generation and composting potential in Pangkep. The total estimated organic waste generation is approximately 59.72 tonnes per day, based on the national organic waste proportion of 41.27% of the total waste. However, when considering the conservative estimate of usable organic waste for composting, only about 38.77 tonnes per day is effectively available for compost production. The compost output estimates show significant variability depending on the composting method, with higher yields achieved through dry composting schemes. Despite these outputs, there remains a substantial gap between the compost produced and the agricultural demand in Pangkep. For example, the compost required to meet the needs of rice fields in Pangkep ranges from 50,496 to 84,160 tonnes per season, while the compost capacity from municipal waste falls short, producing only between 6,500 and 14,000 tonnes annually. This discrepancy highlights the need for optimizing composting processes and integrating additional organic waste sources, such as rice straw, to meet the agricultural demands in the region.

3.6.2 Optimizing compost yield and overcoming contamination challenges waste management system

The results highlight significant differences in compost yield based on the composting schemes used in Pangkep. The "urban wet scheme" yields a lower compost output of 17.92 to 20.90 tonnes per day, while the "dry scheme," which incorporates more bulking agents, produces a significantly higher yield of 29.86 to 38.82 tonnes per day. This difference emphasizes the critical role of adjusting variables like the C/N ratio and moisture content in optimizing compost production Additionally, these findings underscore the importance of selecting appropriate composting techniques and raw material combinations to maximize efficiency and output, especially when dealing with diverse organic waste streams prevalent in urban environments (“Exploration of Composting Strategies for Sustainable Organic Waste Management in Urban Environments,” 2024; Novra et al., 2023).

The higher yields observed in the "dry scheme" can be attributed to improved aeration and microbial activity, facilitated by the increased presence of bulking agents, which prevent compaction and maintain optimal moisture levels. A balanced C/N ratio is essential for efficient microbial activity and stable compost, while maintaining proper moisture content (between 8-25%) is vital for minimizing odour and enhancing decomposition. However, Pangkep’s waste management system faces challenges that hinder composting efficiency, notably the high level of contamination in organic waste, especially plastic, and the lack of uniform sorting practices at the source. These contaminants not only degrade compost quality but also introduce hazardous substances that can negatively impact soil health and crop safety (Roy et al., 2021). This persistent contamination necessitates

rigorous pre-processing and sorting mechanisms to ensure the production of high-quality compost suitable for agricultural application (Alimuddin et al., 2025). These issues complicate the composting process, reducing the quality of the compost produced and limiting the effectiveness of municipal composting initiatives, thus necessitating stronger waste sorting protocols and community engagement in waste management. Overcoming these challenges requires the development of robust strategies for enhancing feedstock purity, including source segregation programs and advanced mechanical sorting technologies, to optimize compost quality and yield for agricultural applications (Girón-Rojas et al., 2020).

3.6.3 Comparing composting practices and challenges with global standards and technological innovations

When comparing the findings of this study with existing literature on composting and organic waste management, several key similarities and differences emerge. One notable similarity is the consistent emphasis on the carbon-to-nitrogen (C/N) ratio and moisture content as critical parameters for optimizing microbial growth and decomposition efficiency in composting processes (Pezzolla et al., 2021). Numerous studies corroborate that an ideal carbon-to-nitrogen ratio is pivotal for effective composting, ensuring microbial populations have sufficient carbon for energy and nitrogen for protein synthesis (Boutasknit et al., 2024). Like previous research emphasizing the environmental benefits of composting, this study confirms that organic waste can significantly improve soil health and reduce the need for synthetic fertilizers (Mpuangnan et al., 2023). Furthermore, the challenges identified in Pangkep regarding contamination, particularly plastics, and the lack of standardized sorting practices resonate with broader issues in municipal solid waste management globally, where contaminant removal remains a significant hurdle to producing high-quality compost (Manea et al., 2024).

The increase in compost yield observed in the dry composting scheme (50-65% yield) aligns with the general understanding that adding bulking agents improves compost quality by enhancing aeration and moisture balance, leading to higher yields. The level of contamination in Pangkep's organic waste was found to be particularly high, which has a more detrimental impact on compost quality compared to other regions. This heightened contamination impedes the production of safe, high-grade compost, posing a substantial challenge to the circular economy principles that underpin sustainable waste management initiatives (Gastaldi et al., 2024; Policastro & Cesaro, 2022). Additionally, while composting has been shown to reduce dependence on chemical fertilizers, the gap between Pangkep's compost production and the agricultural demand for compost—especially for rice fields—highlights an underutilized potential that differs from more successful composting initiatives, particularly in urban areas with more robust sorting and composting infrastructure. Despite these challenges, integrating best practices and innovations, such as advanced anaerobic digestion, could significantly enhance the efficiency and economic viability of waste management practices in Pangkep (Lin et al., 2018).

3.6.4 Acknowledging the limitations and challenges in waste generation estimations and composting practices

This study acknowledges several limitations that may have affected the accuracy and generalizability of the findings. One limitation is the potential inaccuracies in waste generation estimates, as these figures are based on national averages and local estimates, which may not fully reflect the actual waste composition and volume in Pangkep. These estimations might not fully capture seasonal variations or specific demographic waste patterns, potentially influencing the calculated compost yields and the overall assessment of the composting schemes (Manea et al., 2024). The lack of ideal composting infrastructure, such as centralized composting facilities and efficient transportation networks for organic waste, limits the scalability of composting efforts. Furthermore, the small-scale nature of

the composting experiments conducted in this study may not fully represent the operational complexities and challenges associated with large-scale municipal composting systems, potentially impacting the external validity of the results regarding broader implementation (Iamsomboon et al., 2023).

The local climate also plays a significant role, as the high humidity and rainfall in Pangkep can affect the composting process, particularly in maintaining the ideal moisture content and preventing premature degradation or contamination of the compost (Weidner et al., 2020; Yesaya et al., 2021). Lastly, the methodologies employed in this research, specifically concerning labor time allocation and productivity measurements, presented limitations as perfect identification of individual labor contributions was not feasible, leading to some unaccounted time and differing productivity values between methods. These limitations underscore the need for further research that incorporates more precise waste characterization methods, explores diverse composting technologies adaptable to local climatic conditions, and includes comprehensive economic analyses to evaluate the scalability and sustainability of composting initiatives (Widyatmika & Bolia, 2024; Wonyanya & Uzorka, 2024).

3.6.5 Challenges in scaling composting systems in pangkep: contamination, inconsistent sorting, and market barriers

Several challenges may hinder the effective scaling of composting systems in Pangkep. The high level of contamination from non-organic waste, particularly plastic, is a major barrier to producing high-quality compost. This issue not only degrades the compost's quality but also poses environmental risks if the contaminated compost is applied to agricultural lands (Chuma et al., 2024). This necessitates more rigorous pre-sorting mechanisms and community education campaigns to improve waste separation at the source (Gillespie & Halog, 2022). Inconsistent sorting practices at the source further exacerbate this issue, leading to contamination and reduced composting efficiency. Moreover, the absence of standardized protocols for compost quality assessment and monitoring impedes the development of market confidence and regulatory compliance for compost products in Pangkep (Khoirunnisak et al., 2025).

Limited community engagement and awareness also pose challenges, as many residents may not prioritize waste sorting or composting practices. Additionally, there is a pressing need for more robust local training programs to build capacity in composting techniques and raise awareness of the benefits of composting. Without these improvements, the potential for scaling up composting efforts in Pangkep may be constrained, limiting the region's ability to fully utilize organic waste for agricultural and environmental benefits. For example, more radical strategies such as nutrient extraction from human waste could meet a significant portion of agricultural needs, while the economic viability of commercial composting is often limited by factors such as large land requirements and low profitability (Taylor, 2020; Xu et al., 2023). This situation is further complicated by inadequate compost testing and certification processes, leading to a lack of market confidence and hindering the widespread adoption of compost in agricultural practices (Roy et al., 2021).

4. Conclusion

The study highlights the significant potential of organic waste in Pangkep for transforming into compost to support sustainable agriculture. However, challenges such as inefficient waste sorting, contamination, and inadequate composting infrastructure need to be addressed to fully realize this potential. The study emphasizes the importance of improving waste management systems, including better sorting mechanisms, community education programs, and enhanced composting techniques. Integrating municipal organic waste with agricultural by-products like rice straw will help meet local agricultural compost needs while promoting a more sustainable, circular economy. This approach will improve

soil fertility, reduce reliance on chemical fertilizers, and enhance long-term environmental sustainability. The development of standardized compost quality assessments and stronger local engagement are essential for ensuring compost meets agricultural standards and is widely adopted. Strengthening waste collection infrastructure and policy support will help scale up composting initiatives and integrate them into local agriculture. Addressing these barriers, Pangkep can create a sustainable waste management model, which may be replicated in other regions facing similar challenges.

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During the preparation of this work, the author(s) used a generative AI tool to assist in paraphrasing certain sections for clarity and Grammarly to assist in improving the grammar and academic tone of the manuscript. After using these tools, the author(s) reviewed and edited the content as needed and took full responsibility for the content of the publication.

References
Acs, S., Costa Leite, J., Sanyé-Mengual, E., Caivano, A., Catarino, R., Druon, J. N., Di Marcantonio, F., De Jong, B., Guerrero, I., Gurría, P., M'barek, R., Panagos, P., Puerta-

Piñero, C., Tamosiunas, S., Wollgast, J., & Tóth, K. (2025). Towards sustainable food systems: Developing a monitoring framework for the EU. *Frontiers in Sustainable Food Systems, 8*. https://doi.org/10.3389/fsufs.2024.1502081

Afrouzi, H. N., Ahmed, J., Siddique, B. M., Khairuddin, N., & Hassan, A. (2023). A comprehensive review on carbon footprint of regular diet and ways to improving lowered emissions. *Results in Engineering*, *18*, 101054. https://doi.org/10.1016/j.rineng.2023.101054

Ali, H. H., & Flayeh, H. M. (2023). Rotary in-vessel bio-converting of agriculture wastes into compost. *Iraqi Journal of Agricultural Sciences, 54*(5), 1433. https://doi.org/10.36103/ijas.v54i5.1843

Alimuddin, S., Hamzah, B., Aprianti, E., Hamzah, S., & Samawi, M. F. (2025). Flood mitigation through waste management in Rimuku, Mamuju, Indonesia. *Engineering Technology & Applied Science Research, 15*(5), 26697. https://doi.org/10.48084/etasr.11987

Andey, A., Uyama, H., & Lim, S. (2024). Physicochemical characterization and optimization of organic food waste compost: Practical application for sustainable regenerative agriculture farming. *Malaysian Journal of Sustainable Agricultural, 8*(1), 66–71. https://doi.org/10.26480/mjsa.01.2024.66.71

Bahri, S., Ambarwati, Y., Notiragayu, N., Marlina, L., & Setiawan, A. (2022). Training for the production of organic fertilizer from kitchen waste in Rukti Endah Village, Central Lampung Regency. *Community Empowerment, 7*(12), 2039–2044. https://doi.org/10.31603/ce.6985

Boutasknit, A., Anli, M., Lahlali, R., & Meddich, A. (2024). Effect of organic waste and inorganic additives on organic matter transformation and mineral availability in composting green waste. *Phyton, 93*(9), 2227–2243. https://doi.org/10.32604/phyton.2024.055629

Bünemann, E. K., Reimer, M., Smolders, E., Smith, S. R., Bigalke, M., Palmqvist, A., Brandt, K. K., Möller, K., Harder, R., Hermann, L., Speiser, B., Oudshoorn, F. W., Løes, A.-K., & Magid, J. (2023). Do contaminants compromise the use of recycled nutrients in organic agriculture? *Science of the Total Environment, 912*, 168901. https://doi.org/10.1016/j.scitotenv.2023.168901

Chorolque, A. A., Pellejero, G., Sosa, M. C., Palacios, J. R., Aschkar, G., García-Delgado, C., & Ballesta, R. J. (2021). Biological control of soil-borne phytopathogenic fungi through onion waste composting: Implications for circular economy perspective. *International Journal of Environmental Science and Technology, 19*(7), 6411–6422. https://doi.org/10.1007/s13762-021-03561-2

Chuma, G. B., Mondo, J. M., Ndeko, A. B., Akuzibwe, E. M., Bagula, E. M., & Mushagalusa, G. N. (2024). Quantification and valorization of compost derived from urban households' waste in Bukavu City, Eastern D.R. Congo. *Discover Sustainability, 5*(1). https://doi.org/10.1007/s43621-024-00283-6

Doda, H., Sharma, A., & Thakur, N. (2025). A systematic review on sustainable practices transforming global agribusiness. *Frontiers in Sustainable Food Systems, 9*. https://doi.org/10.3389/fsufs.2025.1566708

Faisal, F., Diningrat, D. S., Siregar, B., & Budiarta, K. (2019). Utilization of organic waste to organic fertilizer in the elementary schools of Sijunjung District. *Journal of Community Research and Service, 3*(2), 98–102. https://doi.org/10.24114/jcrs.v3i2.16060

Farouk, A. S., Abdelghany, A. M., Shehab, A. A., Alwakel, S. E., Makled, K. M., Naif, E., Ren, H., & Lamlom, S. F. (2024). Optimizing wheat productivity through integrated management of irrigation, nutrition, and organic amendments. *BMC Plant Biology, 24*(1). https://doi.org/10.1186/s12870-024-05213-2

Garg, K. K., Dhar, S., Sharma, V. K., Azman, E. A., Meena, R. P., Hashim, M., Kumar, D., Ali, G., Karunakaran, V., Kumar, Y., Athnere, S., Kumar, S., Om, H., Tuti, M. D., Meena, B. L., Kumar, B., Meena, V. K., & Kumar, S. (2024). Optimizing agricultural sustainability: Enriched organic formulations for growth, yield, and soil quality in a multi-crop system. *Frontiers in Plant Science, 15*. https://doi.org/10.3389/fpls.2024.1398083

Gastaldi, E., Buendia-Kandia, F., Greuet, P., Bouchou, Z. B., Benihya, A., César, G., & Domenek, S. (2024). Degradation and environmental assessment of compostable packaging mixed with biowaste in full-scale industrial composting conditions. *Bioresource Technology, 400*, 130670. https://doi.org/10.1016/j.biortech.2024.130670

Gillespie, A., & Halog, A. (2022). Community-scale composting initiatives in South-East Queensland and beyond: A review of successes, challenges and lessons for a pilot project on Karragarra Island, southern Moreton Bay. *Circular Economy and Sustainability, 3*(1), 305–327. https://doi.org/10.1007/s43615-022-00169-7

Girón-Rojas, C., Moya, E. G., García-Ruiz, A., Iglesias, N., & López, M. (2020). Assessment of biowaste composting process for industrial support tool development through macro data approach. *Waste Management, 105*, 364–372. https://doi.org/10.1016/j.wasman.2020.02.019

Hashim, A. A., Kadir, A. A., Ibrahim, M. H., Halim, S., Sarani, N. A., Hassan, M. I. H., Hamid, N. J. A., Hashar, N. N. H., & Hissham, N. F. N. (2021). Overview on food waste management and composting practice in Malaysia. *AIP Conference Proceedings*. https://doi.org/10.1063/5.0044206

Hettiarachchi, H., Caucci, S., & Schwärzel, K. (2020). Organic waste composting through nexus thinking. https://doi.org/10.1007/978-3-030-36283-6

Hidalgo, D., Martín-Marroquín, J. M., Corona, F., & Verdugo, F. (2025). Waste-derived fertilizers: Conversion technologies, circular bioeconomy perspectives and agronomic value. *Preprints*. https://doi.org/10.20944/preprints202507.2391.v1

Hissham, N. F. N., Kadir, A. A., Sarani, N. A., Hassan, I. H., Fadeli, M. F. A., & Mazlan, S. N. (2024). The evaluation of composted food waste effects in conserving and enhancing growth performance of *Azolla pinnata*. *International Journal of Conservation Science, 15*(1), 685–698. https://doi.org/10.36868/ijcs.2024.01.21

Iamsomboon, N., Jotaworn, S., Lamprom, W., Bhumkittipich, P., & Siramaneerat, I. (2023). Wastewater management and application to compost for urban farming. *Water Conservation and Management, 8*(2), 164–170. https://doi.org/10.26480/wcm.02.2024.164.170

Idawati, I., Sasongko, N. A., Santoso, A. D., Sani, A. W., Apriyanto, H., & Boceng, A. (2024). Life cycle assessment of cocoa farming sustainability by implementing compound fertilizer. *Global Journal of Environmental Science and Management*. https://doi.org/10.22034/gjesm.2024.02.26

Kansoriya, N. (2023). Synergizing sustainability: Recycling food waste for plant fertilizer production and unveiling ecological dynamics. *International Journal for Research in Applied Science and Engineering Technology, 11*(12), 2154–2161. https://doi.org/10.22214/ijraset.2023.57791

Khoirunnisak, A., Prijono, S., Nopriani, L. S., Prasetya, B., & Hanuf, A. A. (2025). Improving coffee soil health using compost made from sugarcane leaves, coffee pulp, and *Gliricidia* sp. *Sains Tanah - Journal of Soil Science and Agroclimatology, 22*(2), 271–280. https://doi.org/10.20961/stjssa.v22i2.103549

Kurniawati, A., Tóth, G., Ylivainio, K., & Tóth, Z. (2023). Opportunities and challenges of bio-based fertilizers utilization for improving soil health. *Organic Agriculture, 13*(3), 335–350. https://doi.org/10.1007/s13165-023-00432-7

Kvakkestad, V., Brod, E., Flø, B. E., Hanserud, O. S., & Helgesen, H. (2023). Circulation of nutrients through bio-based fertilizer products: Perspectives from farmers, suppliers, and civil society. *Frontiers in Sustainable Food Systems, 7*. https://doi.org/10.3389/fsufs.2023.1239353

Lhaj, M. O., Moussadek, R., Zouahri, A., Sanad, H., Saafadi, L., Alaoui, M. M., & Mouhir, L. (2024). Sustainable agriculture through agricultural waste management: A comprehensive review of composting's impact on soil health in Moroccan agricultural ecosystems. *Agriculture, 14*(12), 2356. https://doi.org/10.3390/agriculture14122356

Lida, S., Doruk, K., Mibang, A., & Basar, K. (2024). Harnessing the potential of enriched compost: Sustainable agricultural practices and environmental conservation. *Journal of*

Pharmacognosy and Phytochemistry, 13(1), 375–381. https://doi.org/10.22271/phyto.2024.v13.i1e.14852

Lin, L., Xu, F., Ge, X., & Li, Y. (2018). Improving the sustainability of organic waste management practices in the food-energy-water nexus: A comparative review of anaerobic digestion and composting. *Renewable and Sustainable Energy Reviews, 89*, 151–167. https://doi.org/10.1016/j.rser.2018.03.025

Liu, Q., Wu, P., Guo, X., Qu, Y., Zheng, J., Xing, Y., Dong, Z., Yu, W., Zhang, G., & Zhang, X. (2025). Impact of particle size on the aerobic decomposition and fertilizer efficiency of corn cobs: A sustainable waste-to-resource approach. *Biology, 14*(11), 1610. https://doi.org/10.3390/biology14111610

Manea, E. E., Bumbac, C., Dinu, L., Bumbac, M., & Nicolescu, C. M. (2024). Composting as a sustainable solution for organic solid waste management: Current practices and potential improvements. *Sustainability, 16*(15), 6329. https://doi.org/10.3390/su16156329

Meisam, T., & Hossein, G. (2018). Biogas. In *Biofuel and biorefinery technologies*. Springer International Publishing. https://doi.org/10.1007/978-3-319-77335-3

Mia, M. S., & Zzaman, W. (2025). Food waste–derived organic fertilizers: Critical insights, agronomic impacts, and pathways for sustainable adoption. *International Journal of Food Science, 2025*, 1551054. https://doi.org/10.1155/ijfo/1551054

Mpuangnan, K. N., Mhlongo, H. R., & Govender, S. (2023). Managing solid waste in school environment through composting approach. *Journal of Integrated Elementary Education, 3*(1), 34–42. https://doi.org/10.21580/jieed.v3i1.16003

Muhammad, A., Naidu, B. M., Sundram, V. P. K., Hussain, M. Z. S. M., Chew, L. L., & Amirrudin, F. A. (2023). Sustainable waste management in Malaysia: Leveraging supply chain solutions for a greener future. *Information Management and Business Review, 15*, 147–158. https://doi.org/10.22610/imbr.v15i3(si).3469

Murugesan, V., & Amarnath, D. J. (2020). Bio-process performance, evaluation of enzyme and non-enzyme mediated composting of vegetable market complex waste. *Scientific Reports, 10*(1). https://doi.org/10.1038/s41598-020-75766-3

Novra, A., Fatati, F., Devitriano, D., & Syarif, S. R. (2023). Compost fertilizer business supply chain management strategy for stability of potential added value of waste raw materials in Jambi province, Indonesia. *African Journal of Food, Agriculture, Nutrition and Development, 23*(3), 22670–22690. https://doi.org/10.18697/ajfand.118.21625

Pezzolla, D., Cucina, M., Proietti, P., Calisti, R., Regni, L., & Gigliotti, G. (2021). The use of new parameters to optimize the composting process of different organic wastes. *Agronomy, 11*(10), 2090. https://doi.org/10.3390/agronomy11102090

Policastro, G., & Cesaro, A. (2022). Composting of organic solid waste of municipal origin: The role of research in enhancing its sustainability. *International Journal of Environmental Research and Public Health, 20*(1), 312. https://doi.org/10.3390/ijerph20010312

Roy, E. D., Esham, M., Jayathilake, N., Otoo, M., Koliba, C., Wijethunga, I., & Fein-Cole, M. J. (2021). Compost quality and markets are pivotal for sustainability in circular food-nutrient systems: A case study of Sri Lanka. *Frontiers in Sustainable Food Systems, 5*. https://doi.org/10.3389/fsufs.2021.748391

Salas, M. Á., Sica, P., Rydgård, M., Sitzmann, T. J., Nyangáu, J. O., Mahdi, J. E., Moshkin, E., Silva, H. L. de C. e, Chrysanthopoulos, S., Kopp, C., Wali, K. C., Zireeni, Y., Ural-Janssen, A., Hassan, S. E. H., Kebalo, L. F., Chadwick, D. R., & Jensen, L. S. (2024). Current challenges on the widespread adoption of new bio-based fertilizers: Insights to move forward toward more circular food systems. *Frontiers in Sustainable Food Systems, 8*. https://doi.org/10.3389/fsufs.2024.1386680

Sharma, A., Soni, R., & Soni, S. K. (2023). From waste to wealth: Exploring modern composting innovations and compost valorization. *Journal of Material Cycles and Waste Management, 26*(1), 20–38. https://doi.org/10.1007/s10163-023-01839-w

Simon, W., van Zanten, H. H. E., & Hijbeek, R. (2024). Diets influence dependency on synthetic nitrogen fertilizers. *Research Square*. https://doi.org/10.21203/rs.3.rs-5101296/v1

Taylor, J. (2020). Modeling the potential productivity of urban agriculture and its impacts on soil quality through experimental research on scale-appropriate systems. *Frontiers in Sustainable Food Systems, 4*. https://doi.org/10.3389/fsufs.2020.00089

Tiong, Y. W., Sharma, P., Xu, S., Bu, J., An, S., Foo, J. B. L., Wee, B. K., Wang, Y., Lee, J. T. E., Zhang, J., He, Y., & Tong, Y. W. (2023). Enhancing sustainable crop cultivation: The impact of renewable soil amendments and digestate fertilizer on crop growth and nutrient composition. *Environmental Pollution, 342*, 123132. https://doi.org/10.1016/j.envpol.2023.123132

Triệu, T. Q. (2023). Circular economy models in agriculture in Vietnam. *Vietnam Social Sciences Review, 217*(5), 30–45. https://doi.org/10.56794/vssr.5(217).30-45

Waqas, M., Hashim, S., Humphries, U. W., Ahmad, S., Noor, R., Shoaib, M., Naseem, A., Hlaing, P. T., & Lin, H. A. (2023). Composting processes for agricultural waste management: A comprehensive review. *Processes, 11*(3), 731. https://doi.org/10.3390/pr11030731

Weidner, T., Graça, J., Machado, T., & Yang, A. (2020). Comparison of local and centralized biowaste management strategies: A spatially sensitive approach for the region of Porto. *Waste Management, 118*, 552–562. https://doi.org/10.1016/j.wasman.2020.09.013

Wichern, F., García-González, M. C., Moral, R., Papangelou, A., & Spiller, M. (2024). Editorial on special issues: Regional nutrient management in the circular economy & nitrogen and carbon recycling: Benefits from the stakeholders' perspective. *Nutrient Cycling in Agroecosystems*. https://doi.org/10.1007/s10705-024-10389-y

Widyatmika, M. A., & Bolia, N. B. (2024). Unveiling segregation and composting behavior in urban communities: A study case of Sarbagita Municipality, Indonesia. *Evergreen, 11*(2), 612–623. https://doi.org/10.5109/7183318

Wonyanya, M., & Uzorka, A. (2024). Comparative analysis of biogas yields from different organic waste sources in rural communities. *Research Square*. https://doi.org/10.21203/rs.3.rs-5206514/v1

Xu, M., Sun, H., Chen, E., Yang, M., Wu, C., Sun, X., & Wang, Q. (2023). From waste to wealth: Innovations in organic solid waste composting. *Environmental Research, 229*, 115977. https://doi.org/10.1016/j.envres.2023.115977

Xu, Q., Zhang, T., Niu, Y., Mukherjee, S., Abou-Elwafa, S. F., Nguyen, N. S. H., Aboud, N. M. A., Wang, Y., Pu, M., Zhang, Y., Tran, H.-T., Almazroui, M., Hooda, P. S., Bolan, N., Rinklebe, J., & Shaheen, S. M. (2024). A comprehensive review on agricultural waste utilization through sustainable conversion techniques, with a focus on the additives effect on the fate of phosphorus and toxic elements during composting process. *Science of the Total Environment, 942*, 173567. https://doi.org/10.1016/j.scitotenv.2024.173567

Yesaya, M., Mpanang'ombe, W., & Tilley, E. (2021). The cost of plastics in compost. *Frontiers in Sustainability, 2*. https://doi.org/10.3389/frsus.2021.753413

Zgallai, H., Zoghlami, R. I., Annabi, M., Zarrouk, O., Jellali, S., & Hamdi, H. (2023). Mitigating soil water deficit using organic waste compost and commercial water retainer: A comparative study under semiarid conditions. *Euro-Mediterranean Journal for Environmental Integration, 9*(1), 377. https://doi.org/10.1007/s41207-023-00437-4

Biographies of Authors

Sahdan Mustari, Public Health Study Program, Sekolah Tinggi Ilmu Kesehatan Amanah, Makassar, South Sulawesi 90234, Indonesia.

- Email: sahdankaraengrate@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: 59416617400
- Homepage: https://scholar.google.com/citations?user=EsON-M8AAAAJ&hl=th

Yusriyanto, Bachelor of Nutrition Program, Tri Tunas Nasional Institute of Technology and Health, Makassar, South Sulawesi 90234, Indonesia.

- Email: anto.yusriyanto@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: https://scholar.google.com/citations?user=aM16i4MAAAAJ&hl=id