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Research Paper

Vermicomposting as an adopted sustainability practice in a selected hotel in Metro Manila

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Abstract

Solid waste management remains a persistent challenge in the hospitality sector, with implications for environmental sustainability, operational efficiency, and corporate reputation. Although vermicomposting has been applied in agricultural contexts, its adoption within hotel operations remains underexplored. This study addresses this gap by examining how vermicomposting is adopted in hotel settings, how it shapes ecological outcomes and organizational practices. Using a case study of a luxury hotel in Manila, data were collected through immersion, semi-structured interviews, on-site observations, and document analysis. A nuanced understanding is needed to study how hotels implement vermicomposting because researchers need to examine both the challenges hotels face during its implementation and the positive aspects that come from this process, which in tun affects both ecological results and organizational procedures. Theoretically, the WORM Model extends sustainability and waste management frameworks by linking waste-to-value practices with organizational dynamics and brand-driven profitability in hospitality contexts. Practically, the study offers step-by-step guidance for hotels seeking to integrate vermicomposting into their operations and advance circular economy principles. Policy-wise, the findings suggest opportunities for tourism and environmental agencies in Asia to incorporate vermicomposting into sustainability standards and provide targeted support for hotels and MSMEs.

Keywords: Vermicomposting, Hotel, Solid Waste Management, Sustainability, Profitability.

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Introduction

Solid waste management has emerged as one of the most urgent concerns in the hospitality industry. Hotels, by the nature of their operations, generate significant volumes of organic and inorganic waste, and when this is inadequately managed, the consequences extend far beyond environmental pollution. Inefficient practices undermine public health, compromise safety, and weaken the industry's reputation for quality and responsibility (Das et al., 2019). At the same time, sustainability has shifted from being a voluntary add-on to a strategic necessity. Guests now show a stronger preference for eco-conscious brands, and hotels that position themselves as environmentally responsible increasingly enjoy reputational and financial benefits (Bashir et al., 2020; Kazmi et al., 2021). In this sense, sustainability is not only a moral responsibility but also a determinant of long-term profitability and competitiveness (Bodhanwala and Bodhanwala, 2018).

One of the more promising innovations in sustainable waste management is vermicomposting, a bioconversion process that uses earthworms to transform organic matter into nutrient-rich fertilizer. The approach is cost-efficient, environmentally sound, and adaptable to both small and large-scale operations (Thakur et al., 2021; Alshehrei and Ameen, 2021). In the Philippines, vermiculture was first introduced in 1978 with the use of Perionyx excavatus and later expanded with the African Nightcrawler (Eudrilus eugeniae) in 1987, which has since become the dominant species for composting (Guerrero, 2005, as cited in Aspe and Obusan, 2023). Despite this history, the practice has remained largely confined to the agricultural sector, with very little scholarly attention to its potential within the hospitality industry.

This neglect is notable because research on sustainability in hospitality has tended to focus on three main areas: energy efficiency (e.g., solar power, water conservation), eco-certifications and green marketing, and guest perceptions of environmental practices (Mensah, 2020; Elshaer et al., 2022; Han et al., 2019). Waste recovery innovations, particularly those that transform organic waste into valuable inputs, are rarely examined. When they are discussed, they are usually treated in municipal or agricultural contexts rather than in hotels (Singh and Jain, 2018; Kim et al., 2019). As a result, there is limited understanding of how vermicomposting could contribute to hotel sustainability strategies, including waste diversion, landscaping, plant propagation, and even brand positioning.

The gap is especially evident in Asian hospitality research, where case studies of waste recovery initiatives are limited and often overshadowed by broader discussions of green certifications or energy-focused innovations. A more nuanced understanding is needed of how hotels adopt vermicomposting in practice, what challenges and opportunities arise, and how this shape both ecological outcomes and organizational practices.

Guided by this gap, the present study explores the experience of a hotel in Metro Manila that has adopted vermicomposting as part of its sustainability program. Specifically, it seeks to answer the following research questions: 1) What factors motivated the hotel to implement vermicomposting, and how was the practice operationalized within its operations? 2) What outcomes, both ecological and organizational, emerged from the adoption of this initiative?

This research examines these questions to establish new knowledge about sustainable waste management practices within the hospitality industry. The research provides hotel operators in Asia with information to support their transition from conventional resource management to sustainable resource management.

A more nuanced understanding is therefore needed of how hotels adopt vermicomposting in practice, the challenges and opportunities that arise during its implementation, and how this adoption shapes both ecological outcomes and organizational practices. In hospitality settings, sustainability initiatives are embedded within daily operations, staff routines, and managerial decision-making, making it essential to examine not only environmental impacts but also institutional processes and organizational responses.

Literature Review

Solid waste has consistently been identified as one of the most significant environmental challenges in the hospitality industry. Scholars emphasize that hotels, as commercial establishments, generate large amounts of biodegradable and non-biodegradable waste, and that sustainable management of this waste is essential for the sector's long-term viability (Zrnić et al., 2022). Despite this recognition, academic discussions often remain centered on agricultural or municipal applications of waste management technologies, leaving the hospitality sector relatively underexplored. Hotels have implemented many sustainability practices, but they have paid less attention to vermicomposting as a sustainable practice which hotels should adopt. Existing studies tend to focus on agricultural or municipal applications, leaving their operational relevance, constraints and potential value in hotel settings underexplored.

Waste Reduction

Waste reduction is central to sustainability frameworks such as Lansink's Waste Hierarchy (1975), which prioritizes reduction, reuse, and recycling over disposal. Vermicomposting aligns with this hierarchy as a recycling method that converts organic waste into valuable byproducts (Gubernatorov and Aleksandrova, 2021). Prior studies affirm that systematic solid waste management significantly reduces environmental footprints (Budihardjo et al., 2019). However, much of the literature remains anchored in agriculture and municipal programs (Singh and Jain, 2018; Kim et al., 2019). Hospitality-focused research often highlights food waste prevention strategies, such as portion control or redistribution (Okumus et al., 2020), while recovery strategies like composting are less frequently examined. This imbalance suggests that the hospitality sector lags behind agriculture in experimenting with closed-loop approaches, despite being a major generator of organic waste. Recent scholarship also highlights the role of the circular economy in moving industries beyond waste minimization toward resource regeneration (Velenturf & Purnell, 2021; Barreiro-Gen and Lozano, 2020). Integrating vermicomposting into hotel operations would thus contribute to circularity, yet studies applying this paradigm to hospitality remain scarce (Legrand et al., 2022).

Sustainable Landscape

The use of organic fertilizers in landscaping is a well-established practice in agriculture

and horticulture (Kiesling and Manning, 2010; Zhou et al., 2019). Within hospitality, green spaces are increasingly tied to branding and guest experience, as sustainable landscape design communicates environmental responsibility (Elshaer et al., 2022). Nonetheless, the specific use of waste-derived fertilizers such as vermicast in hotel landscaping has received little scholarly attention. Hospitality studies tend to focus on energy efficiency or green certification schemes, overlooking how landscaping choices can integrate with waste management strategies. A recent trend in urban hospitality emphasizes multi-functional landscapes that combine aesthetic, ecological, and educational roles (Waman and Bohra, 2020; Chen and Chen, 2012). Vermicomposting can reinforce such landscapes by producing inputs for hotel gardens while reducing chemical fertilizer use, but systematic studies linking these practices remain absent.

Plant Propagation

Research on vermicompost confirms its effectiveness in improving plant yield, rooting mass, and resilience (Aderounmu and Musa, 2019; Rajan and Singh, 2021; Blouin et al., 2019). However, these findings remain largely situated in agricultural sciences. Hospitality research has seldom explored how organic fertilizers can support self-sufficiency through hotel-based plant propagation, such as cultivating ornamental plants or herbs for in-house use. Some recent hospitality studies on urban farming and hotel kitchens suggest opportunities for hyper-local sourcing (Modica et al., 2020; McDougall et al., 2022), yet the explicit integration of vermicomposting as a foundation for such practices has not been studied. This omission is important because plant propagation supported by organic waste recovery could both reduce costs and strengthen the environmental narrative of hotels.

Positive Brand Image

From a consumer perspective, sustainability initiatives positively influence loyalty, satisfaction, and willingness to pay premium prices (Modica et al., 2018; Silva et al., 2021). Green consumerism has become a significant driver of brand differentiation in hospitality, with visible ecological practices reinforcing brand equity (Han and Yoon, 2015; Moise et al., 2019). However, existing literature tends to emphasize more familiar initiatives, such as energy conservation or green certification logos, over less visible practices like vermicomposting. Studies suggest that when communicated effectively, even “back-of-house” practices can influence guest perceptions (Rahman and Reynolds, 2019; Jani and Han, 2013). Yet little is known about how waste to value initiatives directed contribute to a hotel’s reputation particularly in Asia where consumer awareness of circular economy practices is still emerging (Ali et al., 2023). The existing research gap requires investigation to determine whether vermicomposting can generate not only ecological benefits but also reputational capital that strengthens brand positioning.

Low Operational Cost

The hospitality industry uses economic efficiency as a fundamental reason to promote environmental sustainability. Research shows that business can decrease their utility expenses and operational costs through the implementation of sustainable practices (Alshehrei and Ameen, 2021; Dani et al., 2021). The practice of vermicomposting theoretically enables organizations to decrease waste hauling charges and eliminates

the need for chemical fertilizers which result in decreased total operational expenses. The existing research about hotel operations shows limited findings because most expense assessments come from studies of agricultural waste and municipal waste programs which do not apply to service-based industries (Sharma and Gag, 2019). Practices Hospitality research typically discusses cost savings from energy efficiency or water management (Rahman et al., 2012; Ahmad et al., 2019), while cost implications of waste recovery remain overlooked. More recent debates on circular economy accounting emphasize the need for tools that capture both ecological and financial returns (Velenturf and Purnell, 2021). Hotels adopting vermicomposting thus offer an opportunity to test whether these economic claims hold true in service-based contexts.

Responsible Sourcing

Responsible sourcing emphasizes local, organic, and ethically produced inputs (Mendoza, 2016; Patel, 2021; Ali et al., 2023). For hotels, sourcing decisions are increasingly part of their sustainability branding, as guests value transparency and local linkages. Yet the intersection of sourcing and waste recovery remains underexplored. The possibility of aligning local procurement with on-site waste transformation (for example, using vermicompost to grow herbs or ornamental plants internally) is rarely addressed in hospitality research. Studies on sustainable supply chains in hotels often highlight food procurement and certification (Modica et al., 2020; Wijethilake and Lama, 2019), but not how sourcing can close the loop with internal waste management. This oversight suggests that vermicomposting could play a bridging role between waste diversion and responsible sourcing, contributing both to ecological sustainability and to local economic linkages.

Synthesis

Across these six themes, the literature points to important yet underdeveloped intersections between waste management and hospitality sustainability. While frameworks such as the Waste Hierarchy (Lansink, 1975), the Triple Bottom Line (Elkington, 1998), and circular economy models (Velenturf and Purnell, 2021) provide overarching principles, they have not been applied in depth to examine vermicomposting within hotels. The gap is not simply the absence of vermicomposting studies in hospitality, but the lack of analysis on how waste recovery practices connect with landscaping, plant propagation, branding, cost efficiency, and responsible sourcing. By addressing these intersections, this study aims to provide both theoretical and practical contributions to sustainability research in hospitality.

Methodology

This study employed a qualitative case study design, an approach suitable for exploring contemporary practices within real-world contexts where the boundaries between the phenomenon and its setting are not clearly defined (Yin, 2018). Since vermicomposting remains underexplored in the hospitality industry, the case study method allowed an in-depth examination of the motivations, processes, and outcomes associated with its adoption. The chosen case, a luxury hotel in Metro Manila, was purposively selected as one of the first establishments in the Philippines to integrate vermicomposting into its

sustainability agenda. This made it a critical case with implications for both domestic and regional contexts (Stake, 1995; Merriam and Tisdell, 2016).

Data collection was conducted from June to December 2023 using multiple methods to ensure richness and triangulation. Immersion and site visits provided contextual familiarity with the hotel's operations. Semi-structured interviews were conducted with ten key informants occupying various roles in the vermicomposting initiative, including managers, sustainability officers, engineering personnel, landscaping staff, and food and beverage employees. The researchers conducted multiple interviews which included multiples visiting sessions and immersion periods to observe how participants change their operational practices and their way of thinking. The researchers protected participant identity through anonymization which assigned them identification codes of P1,P2 and so forth. The research team conducted document analysis of internal reports, promotional materials and documents related to sustainability (Bowen, 2009). The study used multiple research methods to obtain operational data and strategic details about how hotels use vermicomposting for their operations.

Thematic analysis was employed to interpret the data (Braun and Clarke, 2006). Coding was both deductive - guided by existing literature on sustainability and waste management - and inductive, allowing themes to emerge directly from the data. To enhance reliability, all authors participated in intercoder checks, independently reviewing a subset of transcripts and collaboratively resolving discrepancies in coding. Reflexive memo-writing was also maintained to document analytical decisions throughout the process (Corbin and Strauss, 2015). Triangulation across interviews, observations, and documents further strengthened the study's credibility, while member checking with selected participants validated the interpretations. Peer debriefing with academic colleagues provided additional external input and minimized researcher bias (Lincoln and Guba, 1985).

Ethical clearance was secured from the University Research Ethics Committee (UREC) prior to data collection. The study adhered to the National Ethical Guidelines for Health and Health-Related Research (NEGHHRR) and the National Ethical Guidelines for Health-Related Information Privacy (NEGHRIP). Informed consent was obtained from all participants, who were assured of confidentiality and voluntary participation. Personal identifiers were removed during reporting, and participants were informed of their right to withdraw from the study at any stage.

Through these methodological safeguards, the study ensured rigor, credibility, and ethical integrity while acknowledging the inherent limitations of a single-case design.

Results

The research team used qualitative research methods to collect study data through semi-structured interviews which included on-site observations and demonstration activities. The research team organized all collected data into tables which they used to assess how participants understood their experiences through an active process that led to them developing personal theories based on their cultural life experiences which Kelly described as personal constructs that can be changed through time (Chang and Mak, 2018).

Willpower

The interview responses revealed how vermicomposting as a sustainable practice began in the company. Participants emphasized that the implementation of waste reduction initiatives must start with management's long-term commitment, recognizing that "*sustainability is a commitment rather than a goal*" (P1). This commitment to the economic dimensions of sustainability addresses the environmental issues to which the hotel industry contributes (Abdou et al., 2020). The property is the first in the hotel industry to initiate vermiculture, pioneering sustainable practices that not only reduce environmental impact but also yield long-term financial benefits. The incorporation of programs such as waste reduction initiatives, elimination of single-use plastics (SUPs), promotion of sustainable employee activities, and the use of renewable energy sources contributed to lowering operational costs. As one participant shared, "*we have saved 5,000 kWh of energy because of the solar panels, and we are planning to have additional investments in buying 30 million pesos worth of solar panels*" (P1).

The existence of these environmental and financial benefits has emerged as a key driving factor behind the widespread adoption of sustainable measures in the hospitality sector. This commitment started with the company's management and extended to its employees, highlighting sustainability as a core part of their Corporate Social Responsibility (CSR). Over time, CSR began to be perceived as an integral part of the company's operations and business model (Aslaksen et al., 2021). The researchers also discovered that the property promotes sustainable employee practices through an active commuting campaign encouraging the use of stairs and through weekly CSR activities that all employees must participate in. Consequently, the property has established itself as a pioneer in implementing sustainable practices within the hotel industry, particularly through vermicomposting. The first stage of the WORM Model, Willpower, was established based on these findings, emphasizing management's leadership and discipline in consistently implementing sustainable practices. Their willpower extends beyond environmental efforts, as they actively prioritize sustainability as part of their corporate social responsibility, positioning the property as an exemplary model of responsible hospitality.

Optimization

The selected hotel adopted waste management technology through the Winnow System, an Artificial Intelligence (AI) product that monitors food waste in the employees' cafeteria. The system analyzes discarded food, enabling chefs to make informed purchasing decisions, which resulted in a 60% reduction in food waste. However, food waste from kitchen preparation remains unavoidable. As one participant explained, "*food wastes from the cafeteria area and the restaurants' kitchens, such as vegetable and fruit peelings, coffee grounds, eggshells, and leftover food like meat, bones, and shells are collected. The collected kitchen waste and the garden waste, such as plant trimmings, dried leaves, dried twigs, and wilted flowers are brought to the composting area on the rooftop of the parking building*" (P2). Larger organic waste materials are shredded because smaller organic matter decomposes faster due to greater surface area for microbial activity. Conversely, when the compost's pH level is higher, meaning the waste is more acidic due to citrus-based kitchen waste, decomposition slows since it may kill off pH-sensitive microbes (Rastogi, 2020). The researchers also noted that

meat and similar products are processed separately, as "*it takes longer to decompose*" (P2). However, Ho and Chu (2019) argued that food wastes with higher protein content decompose faster, while those with higher fat content slow the process. These findings are crucial to understanding the composting rate and efficiency of the vermicomposting process.

On-site observations revealed that the vermicomposting area provides an environment where both worms and plants can thrive. The vermichambers are kept away from direct sunlight by a steel roof, and a shade cloth provides protection in the greenhouse nursery and herb garden. These conditions are essential since worms require a maintained moisture level and temperature (Gustus, 2023), both of which are necessary for their survival. The covered area also protects plants from harmful UV radiation (Lyu, 2021) and controls soil moisture (Rich, 2023), while preventing birds from feeding on plants and worms. The rooftop location of the vermichambers and greenhouse nursery - on top of an eight-story parking building - also reduces exposure to local birds. Furthermore, vermitea, a byproduct of vermicomposting along with vermicast, possesses pesticidal properties as it contains beneficial microbes that suppress pests such as mites, aphids, and bugs (Yatoo et al., 2021). Combined with the covered structure, this forms an integrated pest management system that supports the growth of both worms and plants.

Figure 1: Comparison of African Nightcrawler Vermicast (on the top-left) Ordinary Earthworm (bottom-right)

"*We started our herb garden in 2018 by buying initial seedlings from local suppliers, the same suppliers that deliver the materials and ingredients needed in our kitchen operations. Some plants, like calamansi, were grown from the seeds that we collected as kitchen waste. The initial set of ornamental plants was also supplied by local suppliers. Seasonal decorations, such as Poinsettias during the holiday season, are from local flower shops*" (P2). From there, the plants and herbs were reproduced through marcotting, a method that involves encircling a branch, applying a rooting medium, and covering it with an impermeable material (Young, 2020) in the greenhouse nursery area. The ornamental plants and herbs are planted in soil with

vermicast and are periodically sprayed with diluted vermitea and lactic acid, which serve as organic pest control. These sustainable fertilization methods are both environmentally sound and economical. Although the researchers were unable to verify Blouin's (2019) claim of greater yield in plant products, the hotel recorded a reduction of ₱150,000–₱170,000 in fertilizer costs, consistent with Alshehrei and Ameen's (2021) findings on operational cost savings from vermicomposting. Garden waste is also returned to the vermichambers for composting, while other waste is shredded and mixed with ground eggshells to create mulch that prevents weed growth and retains soil moisture. Ground eggshells are likewise used to enhance the growth of flowering plants. These practices exemplify a functioning circular economy. However, during observation, the researchers noted a lack of natural pollinators, which are essential for plant reproduction and development (Pardo and Borges, 2020). Since pollination increases yield (McDougall et al., 2022), the researchers suggest that this aspect be given more attention.

The property's vermicomposting process begins with the collection of kitchen and garden waste. These wastes are shredded, while leftover meat products are placed in composting machines. The waste in the vermichambers is left for four to five weeks to decompose and cool before the African Nightcrawler worms are introduced. The worms then break down the waste, producing vermicast, while an outlet at the bottom of the vermichambers collects the vermitea. The chambers are occasionally sprinkled with water to maintain adequate moisture. Once decomposition is complete, the vermicast is sieved to separate the worms and then applied directly to ornamental and herb plants. Vermitea is diluted with water at a 1:10 or 1:20 ratio, depending on the waste's initial pH level, and sprayed on the plants every two weeks.

From these findings, the researchers established the second stage of the WORM Model, Optimization, which refers to the process of maximizing efficiency and functionality to achieve the best possible outcome. This stage encompasses the factors, methods, and processes involved in vermicomposting, including the ideal environmental conditions for sustaining worms and plants in the greenhouse nursery and herb garden, as well as the plant propagation processes that generate the garden waste essential for vermicomposting.

Renewability

The vermicomposting process has proven to be cost-effective, as one participant stated that, "*It did not result in a significant increase in renewable energy expenses because only the composting machine and shredder require electricity from our solar panels*" (P2), thereby aligning sustainability with financial prudence. The process was also highlighted as resource-efficient since it is a low-cost, eco-biotechnological method of waste management in which worms cooperate with microorganisms to convert biodegradable wastes into organic fertilizer (Kaur, 2020). Being entirely natural and organic, it does not require expensive inputs, while reducing waste and promoting a circular economy. Another notable component of the establishment's self-sustaining approach is the incorporation of plant propagation. By producing plants on-site, the property significantly lowered operational costs. This self-sufficiency not only ensured a consistent supply of plants for landscaping but also eliminated the need to purchase herbs externally, further reducing expenses. These implementations were categorized as indicators of low operational costs, as they resulted in decreased expenditure for the

establishment's operational needs.

In another aspect of their sustainability efforts, participants emphasized the hotel's use of locally sourced products. "*We make use of deboned chicken, cage-free eggs, hydroponically sourced seafood and vegetables, high quality coffee beans from local regions such as Benguet and South Cotabato, and local farm sourced seasonal ornamental plants and flowers*" (P1). This demonstrates a conscious effort to support local communities and create a more sustainable supply chain. Moreover, the establishment has successfully integrated sustainable sourcing into its operations through farm-to-table practices. They take pride in showcasing the origins of their ingredients, and guests have expressed appreciation for this transparency, which allows them to make informed and responsible food choices.

The selected hotel's sustainability initiatives extend beyond maximizing resources. Its vermicomposting program exclusively uses waste generated within the property, and the worms are reproduced on-site, avoiding the costs of external sourcing. This approach is both environmentally and economically advantageous, reducing reliance on chemical fertilizers and external herb suppliers. Furthermore, the installation of a glass bottling and water filtration system (NORDAQ) for the property's water supply reflects its ongoing commitment to reducing single-use plastics (SUPs) and promoting sustainable practices. Upcycling, defined as converting waste or used materials into new applications (Mendoza and Carpio, 2016; Moshtaghian et al., 2021), is another integral part of the hotel's circular initiative. Examples include converting kitchen and garden waste through vermicomposting and repurposing casino-generated shredded cards and chipboards into cake boards for partner restaurants. These actions reinforce the hotel's broader self-supply and waste-to-value strategy.

The property's herb garden products, which are used directly in the hotel's kitchen operations, are shown in Figure 2.

Figure 2: Herbs and ornamental plants produced from the hotel's rooftop herb garden

Delving deeper into the establishment's sustainability practices, the researchers also found a commitment to implementing eco-friendly alternatives, particularly through the use of bioplastics. Bioplastics possess excellent biodegradability and can help alleviate environmental issues (Ibrahim et al., 2021). By adopting bioplastics, the hotel reduces costs associated with disposable plastic items in its food and beverage outlets and utilizes bioplastic packaging for toiletries in guest rooms. Packaging made from corn starch, bamboo fiber, and paper provides an environmentally friendly alternative to traditional plastics, thereby reducing the carbon footprint. In communicating their sustainability initiatives, the hotel informs guests about the shift to bioplastics, encouraging them to participate in the property's environmental efforts.

The hotel has also made significant progress in advancing renewable energy through a ₱76 million investment in solar panels installed on the rooftop. By harnessing solar power, the establishment meets its energy needs while contributing to environmental protection by reducing greenhouse gas emissions without impeding economic growth (Obaideen et al., 2021). Another essential element is the contingency plan for potential equipment failures in renewable energy production. The participants stated that a hybrid energy system is in place as a backup, combining multiple energy sources to maximize efficiency (Babatunde et al., 2020). This system includes generators capable of providing sufficient power for continuous operations. By maintaining these generators, the property minimizes the risk of energy interruptions, demonstrating a proactive approach to ensuring reliable and efficient power supply.

As one participant explained, "*renewable energy generated by the solar panels is not limited to specific sustainable facilities within the establishment, as we still source some of our electrical needs from MERALCO*" (P2). Energy from both solar panels and MERALCO is distributed through strategically located substations, ensuring a consistent and stable energy flow throughout the facility. This synchronization minimizes potential disruptions caused by equipment malfunctions or unforeseen issues.

The third stage of the WORM Model, Renewability, encapsulates the hotel's ability to replenish and regenerate resources over time rather than depleting them permanently. The interrelated aspects of low operational cost, self-supply, sustainable alternatives, and renewable energy form a cohesive strategy that demonstrates how resource regeneration and cost-efficiency can coexist. The hotel's commitment to reducing expenses, maximizing renewable energy, and utilizing environmentally friendly alternatives represents a comprehensive sustainability approach. In this stage, the cumulative effects of these initiatives emerge, reinforcing the establishment's dedication to a sustainable and regenerative future.

Merit

According to the participants, "*as a result of all the efforts of our establishment, we got a 232% revenue increase in corporate and travel accounts and a 205% revenue increase in event accounts*" (P1). With the growing influence of consumer preference, green consumerism became an advantage for the property, attracting guests who intentionally support products and services that are environmentally friendly and sustainable (Rahman et al., 2023). Some guests have become repeat visitors and even business partners after learning about the hotel's sustainability commitments. As one participant shared, "*we actually have a patron who became our partner where we*

donate our composting machines." This partnership demonstrates how the property's positive brand image, built on sustainability, can influence consumer behavior and business collaboration, supporting Silva et al. (2021) who found that green consumerism positively affects hotel profitability. Furthermore, the establishment's collaboration with local farmers exemplifies eco-conscious consumerism by promoting a circular economy through sustainable partnerships.

The hotel's strong brand image also influences customers' buying behavior, primarily through repeat visits and positive guest experiences. Brand image shapes customer perceptions through the combined impact of marketing campaigns, public relations efforts, word-of-mouth, and direct guest interactions (Moise et al., 2019). Through personal recommendations and positive reviews, the property successfully cultivated customer loyalty, which not only supported its sustainability initiatives but also led to increased revenue. In addition to financial success, the participants emphasized the recognition their company has received for its environmental efforts. "*We were recognized by the Forbes Travel Guide and became one of the three global finalists for the Responsible Hospitality Award in 2023, and all of our three hotels (Nuwa, Nobu, and Hyatt Regency) received the 2022-2024 ASEAN Green Hotel Award*" (P1).

These recognitions not only validate the hotel's environmental initiatives but also boost employee morale and organizational pride. Working in a globally acknowledged establishment enhances staff motivation and performance, which in turn contributes to better service quality and profitability. The sense of pride and purpose derived from these achievements reinforces the property's culture of sustainability and excellence.

From these findings, the final stage of the WORM Model, Merit, was developed. This stage explains how consumer preference, shaped by a hotel's sustainable brand image, translates into tangible benefits such as customer loyalty, revenue growth, and industry recognition. The property's experience demonstrates that sustainability initiatives yield both ecological and economic rewards. As more travelers and guests prioritize environmental responsibility, hotels that integrate sustainability into their brand identity gain a competitive edge. This shift in consumer preference underscores the merit of aligning business success with environmental stewardship. In today's hospitality landscape, guests seek not only comfort and luxury but also the assurance that their choices support responsible and sustainable operations. Thus, the integration of sustainability into brand image and corporate practice becomes essential for attracting and retaining environmentally conscious guests, solidifying long-term profitability and reputation.

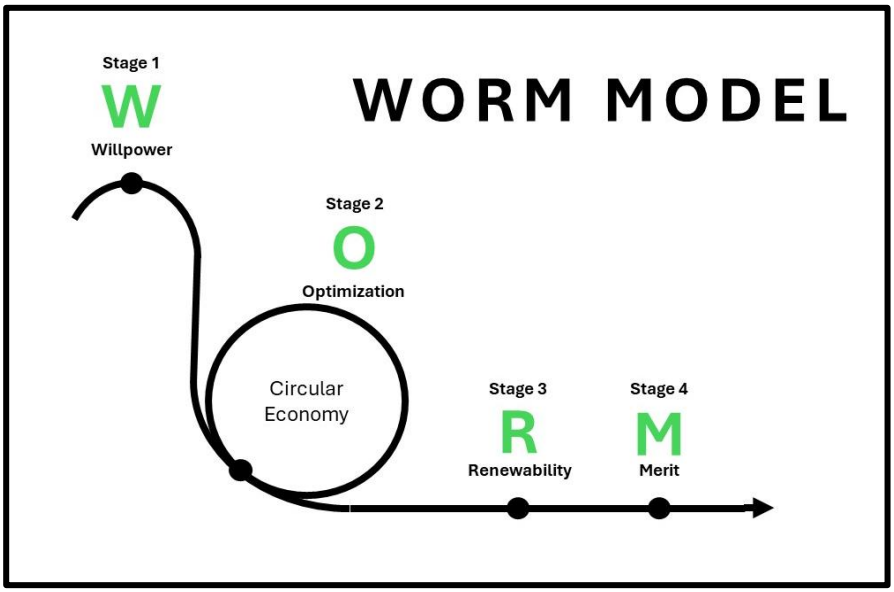
Discussion

The findings of this study suggest that vermicomposting, when embedded into hotel operations, goes beyond a waste reduction initiative and becomes a multidimensional sustainability strategy. Through repeated visits, multiple rounds of interviews, and extended immersion in the property, the research reached data saturation, as similar patterns and perspectives emerged consistently across participants and observations. Themes such as management commitment, waste segregation, ecological renewal, and reputational outcomes appeared repeatedly, suggesting that the WORM framework derived from this study reflects stable and well-grounded categories rather than isolated

insights. Prolonged engagement with participants further allowed the researchers to confirm and refine the themes, strengthening the credibility of the findings.

When positioned against existing frameworks, the WORM Model both aligns with and extends prior approaches in sustainability and waste management. For example, the dimension of Willpower resonates with the waste hierarchy and circular economy literature that emphasizes leadership and systemic commitment (Lansink, 1975; Velenturf and Purnell, 2021). Yet the results also demonstrate that managerial willpower in hotels is not static but fluctuates with operational pressures, staff morale, and guest demand. This introduces an important nuance often overlooked in more static models: sustaining ecological practices in hospitality requires not only managerial endorsement but also mechanisms for maintaining enthusiasm over time.

Figure 3: WORM model



Similarly, the dimension of Optimization corresponds to the efficiency principles embedded in the triple bottom line and waste recovery frameworks, but the case study reveals how optimization in hotels is uniquely challenged by seasonal surges, fluctuating guest volumes, and the unpredictable nature of food waste streams. Unlike agriculture, where inputs can be standardized, hotel waste varies daily, requiring adaptive management. By integrating these operational contingencies, WORM contributes contextual specificity that broad sustainability models often lack.

The dimension of Renewability reflects the regenerative logic of the circular economy, in which waste is reintegrated into productive cycles. In this case, vermicomposting was used not only for waste diversion but also for plant propagation, fertilizer substitution, and resource self-sufficiency. However, the volume of vermicast produced remained limited and could not fully replace commercial fertilizers, highlighting the boundary conditions of renewability in service-based industries. This constraint signals that vermicomposting should be considered as a complementary rather than a stand-alone solution, particularly in large-scale hospitality operations.

Finally, Merit highlights the reputational and consumer preference benefits of adopting ecological practices. Prior literature confirms that sustainability initiatives enhance guest loyalty and brand equity (Han and Yoon, 2015; Silva et al., 2021). The present study extends this understanding by demonstrating that even less visible practices such as vermicomposting can translate into reputational value when communicated effectively to stakeholders. Yet it also shows that without deliberate communication strategies, such initiatives remain under-recognized compared to more conventional sustainability measures like energy conservation. This underscores the importance of aligning operational sustainability with branding and marketing strategies to maximize impact.

Taken together, the WORM Model advances theory by situating vermicomposting as more than a technical waste-to-value process. It demonstrates how leadership dynamics, operational contingencies, ecological regeneration, and reputational outcomes interact in hospitality contexts. While the waste hierarchy, triple bottom line, and circular economy provide broad guidance, they do not fully capture the organizational, cultural, and branding dimensions that emerged in this study. WORM therefore adds a sector-specific framework tailored to hotels, emphasizing how waste recovery practices intersect with both ecological and business imperatives.

Nevertheless, limitations must be acknowledged. The study draws on a single luxury hotel that has access to resources, staff, and infrastructure not always available to smaller establishments or MSMEs. The findings therefore represent a best-case scenario rather than a typical baseline. Transferability to smaller hotels will require adaptation, especially in contexts where space, staff training, and capital investments are limited. Furthermore, the reliance on self-reported data, while triangulated with observations and documents, may have introduced a positive bias in highlighting successes over failures. Future research should therefore extend the WORM framework by testing it across multiple hotel categories, geographic contexts, and levels of resource availability.

By addressing these nuances, this study positions vermicomposting as an innovative yet bounded strategy within hospitality sustainability. Its contribution lies not only in documenting a pioneering case but also in extending existing sustainability frameworks through the articulation of WORM as a multidimensional, context-sensitive model.

Practical Implications for Asian Business

The findings of this study provide actionable lessons for hotels and policymakers in Asia seeking to move toward circular economy practices. Vermicomposting, while relatively simple in principle, requires strategic planning and integration into broader sustainability programs. The following implications highlight concrete steps that can guide adoption.

First, hotels should begin with leadership commitment. Managerial willpower proved decisive in this case. Senior leaders must institutionalize vermicomposting through formal policies, budget allocations, and clear communication of its importance to staff. Leadership endorsement not only sets priorities but also signals accountability, making

it more likely that sustainability programs will survive beyond individual champions.

Second, waste segregation protocols must be optimized from the outset. Hotels need clearly labeled bins, continuous staff training, and routine monitoring to avoid contamination. This is particularly important in Asian contexts, where high food waste volumes can overwhelm systems if segregation is poorly managed. Staff incentives or recognition programs can encourage consistent participation.

Third, hotels should ensure that ecological outputs are visibly reintegrated into operations. Vermicompost can be applied to landscaping, rooftop gardens, or small herb plantations that supply kitchens. Even if outputs are modest, using them internally reinforces a sense of closed-loop practice. Where possible, hotels may also partner with local farms to distribute surplus compost, strengthening community linkages.

Fourth, communication strategies are essential. Guests are unlikely to notice vermicomposting unless it is made visible through signage in gardens, short features in in-room materials, or guided sustainability tours. Training front-line staff to explain the initiative in simple terms can also convert an operational practice into a branding asset.

To translate these recommendations into practice, hotels can follow a phased implementation roadmap:

- Short-term (0–6 months): Conduct waste audits, secure leadership commitment, allocate space for composting, train staff on segregation, and pilot small-scale bins or vermichambers.
- Medium-term (6–18 months): Expand vermicomposting facilities, integrate outputs into landscaping or herb gardens, develop partnerships with local suppliers or farms, and initiate guest-facing communication strategies.
- Long-term (18 months and beyond): Institutionalize vermicomposting into sustainability policies, scale up outputs for broader sourcing programs, integrate with other initiatives (solar energy, water conservation, plastic reduction), and pursue recognition through green certifications or awards.

Beyond individual hotels, the study also has policy implications. In the Philippines, agencies such as the Department of Tourism (DOT) and the Department of Environment and Natural Resources (DENR) can play a stronger role by providing guidelines, incentives, and training modules for waste-to-value practices. At the regional level, integration of vermicomposting into frameworks like the ASEAN Green Hotel Standards would encourage broader adoption and recognition of circular practices across the industry. Industry associations and chambers of commerce could also facilitate knowledge-sharing platforms where best practices are exchanged between large hotels and MSMEs.

In summary, the practical significance of this study lies in demonstrating that vermicomposting can be operationalized as a phased, scalable process that integrates ecological and economic goals. For hotels in Asia, adopting vermicomposting is not only a matter of environmental responsibility but also an opportunity to enhance competitiveness, strengthen community linkages, and contribute to regional sustainability targets.

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