Social Determinants and Success Factors in Cultivating a 3R Culture through Malaysian Household Composting Awareness and Adoption

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Abstract
Household composting is an essential yet underutilised strategy for advancing Malaysia's Reduce, Reuse, Recycle (3R) culture and achieving Sustainable Development Goal 12 on responsible consumption and production. Despite policy frameworks such as the National Strategic Plan for Solid Waste Management, participation in composting remains uneven across Malaysian households. This study synthesises findings from peer-reviewed studies published between 2019 and 2025 to identify the primary social success factors influencing household composting awareness and adoption. Using a qualitative systematic literature synthesis approach, studies were selected based on their empirical focus, relevance to Malaysian households, and examination of behavioural determinants. Thematic analysis revealed four interrelated factors that drive adoption: education and knowledge, community engagement and social norms, policy and institutional support, and socioeconomic and demographic influences. These factors interact in a reinforcing cycle, where knowledge builds competence, community norms encourage participation, policy provides enabling structures, and demographic tailoring ensures inclusivity. The findings underscore that composting in Malaysia is not solely a technical process but a socially embedded practice that thrives when aligned with local cultural norms, community structures, and supportive policy environments. Recommendations include integrating composting education into school curricula, establishing community composting hubs, expanding policy enforcement and infrastructural support, and tailoring interventions to specific demographic segments. The study concludes that coordinated, multi-level strategies, combining education, social mobilisation, and institutional frameworks, are essential for embedding composting within Malaysia's 3R culture and achieving long-term environmental sustainability.

Introduction

The accelerating growth of municipal solid waste (MSW) has emerged as a pressing global sustainability challenge, with significant implications for environmental quality, public health, and resource efficiency. The United Nations' Sustainable Development Goal (SDG) 12 calls for responsible consumption and production, urging nations to adopt integrated waste management strategies that minimise landfill dependency while maximising resource recovery. In this context, composting—particularly at the household level—has gained recognition as a low-cost, decentralised method for diverting organic waste from disposal sites and transforming it into a valuable soil amendment (Zulkifli & Abd Manaf, 2024). In Malaysia, solid waste management is governed under the Solid Waste and Public Cleansing Management Act 2007 (Act 672) and guided by the National Strategic Plan for Solid Waste Management, which integrates the Reduce, Reuse, Recycle (3R) framework as a central policy instrument. This framework not only addresses the technical aspects of waste handling but also requires sustained behavioural change across diverse communities as mentioned in Al Mamun et al. (2023). However, despite Malaysia's target to achieve a 40% national recycling rate by 2025, organic waste, primarily are food and garden waste, continues to make up more than 40% of the total MSW stream.

Household composting, as the organic component of the recycling process, offers an effective means to reduce landfill loads, recover nutrients, and support localised circular economy practices (Amiruddin, Rozamri, Baharudin & Mohamad, 2023). Yet, adoption among Malaysian households remains uneven, shaped by factors such as education level, environmental awareness, access to facilities, and socio-cultural norms. Rural communities may retain traditional organic waste reuse practices but often lack formal composting systems, whereas urban households face spatial constraints and lifestyle barriers that hinder participation. Given the mixed levels of awareness and adoption, understanding the social success factors that drive household composting in Malaysia is critical. This study synthesises recent empirical research to identify four key interrelated factors which are education and knowledge, community engagement and social norms, policy and institutional support, and socioeconomic and demographic influences. Next, the study evaluates how these can be harnessed to strengthen Malaysia's 3R culture and meet national recycling goals.

Literature Review

Solid Waste Management in Malaysia

Malaysia's municipal solid waste (MSW) management system has undergone significant changes over the past two decades in response to rising waste generation and increasing environmental concerns. Rapid urbanisation, industrialisation, and population growth have driven an upward trend in MSW generation, with estimates indicating that Malaysians produce between 0.8 to 1.2 kilograms of waste per person daily (Phooi, Azman, Ismail, Arif Shah & Koay, 2022). Urban centres such as Kuala Lumpur, Penang, and Johor Bahru experience particularly high per capita waste generation rates, exacerbated by consumer culture and inadequate waste segregation practices. Historically, the country has relied heavily on landfills, many of which are non-sanitary and nearing capacity, leading to pressing environmental and public health challenges (Phang & Ilham, 2023). Overall, while Malaysia

has made measurable progress in 3R implementation, the predominance of organic waste in MSW and the country's reliance on landfills underscore the need for intensified composting initiatives. Embedding composting into household routines offers a direct pathway to achieving national recycling targets, advancing the circular economy agenda, and meeting Sustainable Development Goal 12 on responsible consumption and production.

The governance of solid waste management in Malaysia is centralised under the Solid Waste and Public Cleansing Management Act 2007 (Act 672), which provides the legal framework for waste collection, treatment, and disposal in participating states and federal territories. The Ministry of Housing and Local Government (*Kementerian Perumahan dan Kerajaan Tempatan, KPKT*) serves as the lead ministry responsible for policy formulation, coordination, and enforcement under this Act. Since its implementation, KPKT has sought to modernise Malaysia's waste management system, shifting from a predominantly landfill-dependent model toward a more sustainable, resource-oriented approach (Nazibudin, Sabri & Abd Manaf, 2025). One of KPKT's key policy instruments is the National Strategic Plan for Solid Waste Management, which sets national recycling and recovery targets while outlining strategies for waste reduction, segregation at source, and the promotion of environmentally sound technologies. The plan explicitly incorporates the 3R framework i.e. Reduce, Reuse, Recycle, as the guiding principle for transitioning toward a more circular waste economy. This policy direction was further reinforced through the Circular Economy Roadmap For Solid Waste in Malaysia 2025–2030, which aims to extend the lifespan of materials, promote closed-loop production systems, and reduce the environmental footprint of consumption and production activities (Yeow & Loo, 2018).

In operational terms, KPKT has introduced mandatory waste separation at source in several states, expanded kerbside collection schemes, and supported the establishment of recycling and composting infrastructure. Awareness campaigns such as *Kempen Kitar Semula* have been deployed nationally to encourage citizen participation in the 3R movement. Nevertheless, composting, despite being a key component of organic waste diversion, has not yet received the same level of systematic promotion as other recycling activities. Current initiatives tend to be localised, often driven by non-governmental organisations (NGOs), community groups, or educational institutions, with limited nationwide policy integration (Yu, Ab Ghafar, Adam & Goh, 2022). Given that organic waste remains the largest component of Malaysia's municipal waste stream, KPKT's circular economy agenda presents a timely opportunity to position household composting as a mainstream 3R strategy. By embedding composting in national waste reduction policies, providing targeted subsidies or incentives for household composting systems, and integrating composting education into school curricula, KPKT could significantly advance both national recycling rates and environmental sustainability outcomes.

Household Composting in the 3R Framework

The Malaysian government has adopted the 3R framework as a cornerstone of its waste management strategy, supported by national policies such as the Solid Waste and Public Cleansing Management Act 2007 (Act 672) and the National Strategic Plan for Solid Waste Management. From a social science perspective, the 3R framework is not only a technical or logistical matter but also a behavioural system embedded in daily life (Samsuri, Shah & Zulkifli, 2025). The success of 3R depends on public willingness to separate waste,

participate in recycling schemes, and adopt sustainable consumption habits. Composting, as the "organic" component of recycling, requires a similar combination of behavioural commitment and enabling infrastructure.

Within Malaysia's waste management hierarchy, household composting represents a critical yet underdeveloped strategy. By converting organic kitchen and garden waste into nutrient-rich compost, households can significantly reduce the volume of waste sent to landfills, contributing to national recycling targets while producing a valuable soil amendment for domestic gardening and small-scale agriculture. Composting aligns closely with the principles of a circular economy by retaining organic matter within local nutrient cycles, minimising environmental harm, and reducing the demand for synthetic fertilisers (The Star, 2024). Awareness and practice of composting vary significantly across Malaysian households, often correlating with education levels, prior environmental exposure, and the accessibility of composting facilities (Phang & Ilham, 2023). . Rural communities may retain traditional knowledge of organic waste reuse but often lack formalised systems or infrastructure for composting. In contrast, urban households frequently encounter space limitations, odour concerns, and competing lifestyle priorities that inhibit adoption (Tsan & Norisam, 2025). Moreover, studies indicate that knowledge dissemination alone is insufficient; practical demonstrations, peer influence, and visible community benefits are more effective in sustaining participation over time (Salleh et. al., 2020). Existing composting promotion efforts in Malaysia are often decentralised, led by local governments, NGOs, or educational institutions, rather than coordinated under a unified national strategy. Community composting hubs integrated with urban farming projects have shown that visible, collective action can normalise composting behaviour and encourage wider participation through social influence. However, without systematic policy mechanisms to scale these initiatives, their impact remains geographically and demographically uneven. Given that organic waste remains the largest component of Malaysia's MSW stream, embedding household composting within the broader 3R culture is essential to achieving the 40% national recycling rate target for 2025. This requires a multi-faceted approach that combines education, infrastructure, community mobilisation, and policy incentives to ensure composting becomes a mainstream, socially embedded practice.

Past Studies

Malaysia's waste management policy has progressively evolved to embed sustainability principles, particularly through the adoption of the 3R framework and, more recently, the integration of circular economy concepts under the stewardship of KPKT. The Solid Waste and Public Cleansing Management Act 2007 (Act 672) provides the legislative backbone for these efforts, mandating waste segregation and encouraging resource recovery. While the technical and infrastructural dimensions of this policy shift are well documented, the social and behavioural dimensions, especially at the household level, remain less explored, despite their critical role in successful implementation [4]. The shift from linear "take–make–dispose" models toward circular economy principles represents a strategic evolution in Malaysia's environmental policy. The circular economy approach, as highlighted by the Malaysian Green Technology and Climate Change Corporation, seeks to retain materials in productive use for as long as possible, thereby reducing dependency on landfills and lowering environmental impact (Mohan, Mohanty, Cross & Khajuria, 2024). Reference to Nazli, Hapiz, & Ghazali (2024) note that this transition aligns closely with the 3R framework

but requires deeper integration of social participation and behavioural change to be sustainable in the Malaysian context.

Behavioural theories offer important insights into why households adopt or resist composting. The Theory of Planned Behavior (TPB) is particularly relevant, positing that attitudes toward a behaviour, subjective norms, and perceived behavioural control jointly influence behavioural intentions. In Malaysia, Nazli et al (2024) found that positive environmental attitudes alone were insufficient without reinforcement from strong community norms and enabling infrastructure. Similarly, Alam (2020) demonstrated that sustainable food consumption behaviours could be predicted through TPB, with perceived behavioural control strongly influenced by access to facilities and awareness campaigns. Phang (2023) confirmed this pattern among Malaysian university students, noting that peer norms significantly strengthened pro-environmental intentions.

The Norm Activation Model (NAM) extends this perspective by emphasising moral obligation. Rastegari Kopaei et al. (2021) integrated TPB and NAM to study composting intentions, finding that awareness of environmental consequences, coupled with feelings of personal responsibility, enhanced the likelihood of adoption. In Malaysia's culturally diverse and religiously conscious society, such moral framing, particularly when embedded within community or faith-based values, can significantly strengthen composting engagement. The Social Practice Theory (SPT) offers yet another lens, focusing on the interaction between meanings, competences, and materials. Yu (2022) observed that when composting is culturally valued, supported by practical skills training, and facilitated by accessible tools, it transitions from a novel behaviour to an embedded household routine. Zulkifli & Abd Manaf (2024) reported that urban composting initiatives combining training, visible role models, and subsidised bins produced sustained adoption rates, while Amiruddin et al. highlighted the effectiveness of hands-on, locally tailored workshops in rural communities (Yu, Ab Ghafar, Adam & Goh, 2022). Overall, the literature demonstrates that household composting in Malaysia is most effective when embedded in a supportive ecosystem that integrates policy frameworks, infrastructure, education, and cultural norms. As KPKT advances its circular economy agenda, these social science insights are essential for designing interventions that go beyond technical fixes to address the underlying behavioural and social dynamics shaping the 3R culture.

Study Approach
This study adopts a qualitative systematic literature synthesis approach to identify and analyse the social determinants and success factors influencing household composting awareness and adoption within the context of Malaysia's 3R culture. Given the aim of this research, to consolidate empirical knowledge and propose contextually grounded recommendations, the methodology is designed to ensure both breadth in coverage and depth in interpretative analysis. The study is anchored in a qualitative research paradigm, underpinned by constructivist epistemology, which recognises that knowledge about social phenomena is contextually situated and socially constructed. A systematic literature synthesis method was employed to collate and interpret findings from existing peer-reviewed studies published between 2019 and 2025. This temporal boundary was selected to ensure the inclusion of contemporary data reflecting current policy frameworks, public attitudes, and behavioural trends related to household composting and the broader 3R

agenda in Malaysia. The primary data source comprised a number of peer-reviewed journal articles and conference proceedings that explicitly examined aspects of household composting awareness, adoption, and integration within the 3R framework in Malaysia. These studies were identified through targeted searches in Scopus, Web of Science, and Google Scholar, supplemented by citation chaining to ensure coverage of influential works.

To ensure both relevance and methodological consistency, explicit inclusion and exclusion criteria were applied in the selection of studies. Articles were considered eligible for inclusion if they were empirical in nature, employing quantitative, qualitative, or mixed-methods approaches, and focused specifically on Malaysian households or community contexts. Eligible studies were also required to explicitly examine composting awareness, adoption, or behavioural determinants within the broader waste management and 3R framework, and to have been published between 2019 and 2025 to maintain currency and policy relevance. Limiting to publications from 2019 to 2025 ensures currency and policy relevance, reflecting Malaysia's evolving waste management context and initiatives like Budget 2025 tax relief for household composting (Shakil, Azhar & Othman, 2023). Conversely, studies were excluded if they were purely technical in orientation, such as engineering-based composting experiments lacking social or behavioural dimensions, or if they comprised non-peer-reviewed opinion pieces, editorials, or policy commentaries without primary empirical evidence. This selective approach ensured that the synthesis drew exclusively on empirically grounded, socially oriented research capable of informing both behavioural understanding and practical policy interventions relevant to the Malaysian context. Excluding purely technical or engineering composting experiments without social aspects and non-peer-reviewed opinion pieces or editorials is consistent with standards for evidence-based synthesis to focus on socially oriented and empirically grounded research that can inform practical policy interventions. This approach supports extracting actionable insights from social-behavioral studies that also emphasize challenges such as the knowledge-practice gap in household waste management behavior and the need for targeted education and infrastructure.

The analysis was conducted in two stages. First, a descriptive synthesis was used to summarise the methodological approaches and contextual details of the included studies, allowing the research to map coverage across Malaysia's geographic areas and socio-demographic groups. Second, a thematic synthesis identified and combined the main social success factors influencing household composting awareness and adoption. This process involved repeatedly comparing coded data to find similarities and differences in the findings, then integrating them into coherent themes. The reliability of these themes was strengthened by continually cross-checking them against the context and details of the original studies. The selection criteria appropriately prioritize socially relevant empirical research on composting in Malaysian households, framing a rigorous and policy-relevant evidence base for analyzing awareness and adoption behavior within the broader waste management context. This selective focus enables clear understanding of behavioral drivers and barriers that matter for designing community and policy interventions in Malaysia.

Results and Discussion

Findings

The synthesis of the publications identified four primary social success factors that consistently influence household composting awareness and adoption in the Malaysian context: (1) education and knowledge, (2) community engagement and social norms, (3) policy and institutional support, and (4) socioeconomic and demographic influences. These factors were derived through thematic analysis of coded data extracted from both quantitative and qualitative studies, enabling a comprehensive integration of findings across rural and urban settings.

1) Education and Knowledge: Education is often the first step in fostering household composting awareness because it provides the foundational understanding of why and how composting should be practiced. In the Malaysian context, formal education campaigns, whether through schools, community workshops, or online platforms, equip individuals with technical know-how, such as proper waste segregation, moisture control, and compost maturity indicators (Alam, Ahmad, Ho, Omar & Lin, 2020). When people understand the environmental and economic benefits, such as reduced landfill waste and free organic fertilizer, they are more likely to internalize composting as a desirable behavior rather than a chore. This aligns with the Theory of Planned Behavior (TPB), where increased knowledge enhances perceived behavioral control, making the practice seem achievable. Beyond general awareness, targeted and localized education increases relevance and engagement. Rural households, for example, may benefit from demonstrations on using locally available materials for compost bins, while urban participants may need guidance on small-space or indoor composting systems. Tailoring content to specific audiences ensures that the knowledge imparted is practical and directly applicable to their living conditions, reducing the perceived barriers to adoption (Jia Xi, 2025). Sustained knowledge transfer is also critical. Short-term awareness campaigns often fail to produce lasting behavior change if not reinforced. Regular reminders through social media, school activities involving children, and visible success stories within the community can keep composting at the forefront of household practices. This continuous educational engagement not only supports initial adoption but also nurtures long-term integration of composting into the household's waste management habits.

2) Community Engagement and Social Norms: Household composting thrives when it becomes embedded in community culture. Community engagement leverages social norms (i.e. shared expectations about behavior) to normalize composting as a standard household activity (Rastegari Kopaei et al., 2021). When neighbors, friends, and local leaders actively compost, their visible participation creates a form of social proof that influences others to follow suit. This is especially powerful in tightly knit Malaysian rural communities, where collective action is part of the cultural fabric. Structured community activities, such as neighborhood composting hubs, "green village" competitions, or shared garden projects, can transform composting from an individual task into a communal goal. These initiatives not only provide opportunities for skill-sharing but also generate a sense of belonging and mutual accountability. Households are more likely to adopt composting when they see tangible benefits, such as shared vegetable harvests from compost-enriched community gardens, reinforcing the value of their contribution. Social norms also act as a behavioral safeguard. Once composting becomes a common practice, households may experience

social pressure to maintain their participation to avoid being seen as environmentally irresponsible. In this way, community engagement does more than just encourage adoption. It sustains it over time by embedding composting within the identity and values of the group.

3) *Policy and Institutional Support:* While education and community engagement address the "why" and "how" of composting, policy and institutional support ensure that households have the means to act on their intentions. Local governments in Malaysia can facilitate adoption by providing starter kits, subsidized compost bins, or access to collection points for compostable waste [20]. Policies that integrate composting into broader waste management frameworks, such as mandatory waste segregation laws, create structural incentives for households to participate. Institutional support also extends to consistent messaging and coordinated campaigns. When local councils, NGOs, and schools deliver aligned communication about composting benefits and procedures, households receive a unified message that reinforces behavior change. This reduces confusion and builds trust in the process, making households more willing to commit to composting as part of their daily routine (Zainal, & Abas, 2018). Moreover, policy interventions can remove structural barriers that might otherwise deter adoption. For urban residents, lack of space is a major obstacle; municipal authorities can address this by establishing shared composting facilities or promoting indoor composting technologies. By integrating these infrastructural solutions with public education and community programs, institutions play a central role in moving composting from a voluntary environmental act to a normalized civic duty.

4) *Socioeconomic and Demographic Factors:* Socioeconomic and demographic variables influence both the capacity and the motivation to adopt household composting. Factors such as income, education level, household size, and gender roles shape access to resources, time availability, and perceived relevance of composting (Salleh et al., 2022). For example, higher-income households may have more access to composting equipment but less motivation if they do not perceive immediate financial benefits, while lower-income households may be more receptive if composting is framed as a cost-saving measure for home gardening. Demographic factors also affect outreach strategies. Younger individuals may respond better to digital campaigns and gamified challenges, while older adults may prefer face-to-face workshops and hands-on demonstrations. Gender dynamics play a role too, as studies have shown women in Malaysia are often more engaged in household waste segregation and composting activities, potentially due to their central role in food preparation and household management (Hashim et al., 2021). Understanding these variables enables the design of targeted interventions. For instance, tailoring awareness campaigns for large households could emphasize composting as a way to manage substantial food waste efficiently, while programs for urban singles might highlight convenience and minimal space requirements. By aligning composting promotion with the realities of different socioeconomic and demographic groups, policymakers and educators can increase both the reach and the retention of composting practices.

Discussions

The findings of this synthesis reveal that household composting awareness and adoption in Malaysia are shaped by a multifaceted interplay of individual, community, institutional, and socio-demographic factors. This aligns closely with the Theory of Planned

Behavior (TPB), which posits that attitudes, perceived behavioural control, and subjective norms collectively influence behavioural intention (Ajzen, 1991). Education and knowledge emerge as critical drivers, enhancing perceived behavioural control by equipping individuals with the practical skills and confidence to engage in composting practices (Malaysian Green Technology and Climate Change Corporation, 2024). Community engagement reinforces subjective norms by embedding composting within the social fabric, creating peer pressure and shared responsibility that normalise the behaviour (Halim, Sa'at & Abu, 2025).

The importance of policy and institutional support is equally significant, resonating with Structuration Theory, which emphasises the duality of agency and structure. While households may express willingness to compost, their capacity to act is constrained without enabling structures such as accessible infrastructure, financial incentives, and regulatory frameworks. In dense urban settings, space limitations can be addressed through structural solutions such as shared composting hubs and vertical composting units (Masdek, Wong, Nawi, Sharifuddin & Wong, 2023). Conversely, rural communities, often possessing greater land access, benefit from policies that facilitate collective initiatives, resource-sharing, and integration of composting into agricultural practices (Fadhullah, Imran, Ismail, Jaafar & Abdullah, 2022).

Socioeconomic and demographic variables further shape behavioural adoption patterns. Evidence suggests that income, age, education level, and gender influence both motivations and barriers to composting. For instance, lower-income households may respond more positively to messages emphasising cost savings, while urban professionals prioritise convenience and time efficiency (Babaei et al., 2015). Women, as primary household waste managers in many Malaysian contexts, represent a key demographic for targeted empowerment initiatives.

This segmentation underscores that a "one-size-fits-all" approach is unlikely to be effective, and that interventions should be tailored to address the unique needs of different population segments.
These four success factors i.e. education, community engagement, policy support, and demographic tailoring, do not operate in isolation but rather reinforce one another in a cyclical manner. Education builds competence and awareness, community engagement strengthens social norms, institutional support removes structural barriers, and demographic tailoring ensures inclusivity. This interdependence reflects Social Practice Theory, which argues that sustainable practices are maintained through the integration of meaning (awareness and values), competence (skills and knowledge), and material provision (infrastructure and tools) (Izham, Shaari & Zaman, 2023).

From a policy perspective, cultivating a robust 3R culture through household composting requires an integrated, multi-level strategy. Awareness campaigns must be embedded within long-term institutional frameworks that provide infrastructure, consistent funding, and community facilitation (Nguyen, Malek, Umberger & O'Connor, 2022). The Ministry of Housing and Local Government (KPKT)'s shift towards a circular economy provides a timely policy window for embedding composting into both municipal waste management systems and grassroots-level initiatives (Pariatamby & Fauziah, 2013). Future research should explore longitudinal behavioural studies to track changes in composting

practices over time, as well as experimental trials of mixed-mode interventions that combine education, engagement, and structural support. Such approaches will not only validate the success factors identified here but also inform scalable, evidence-based strategies for embedding composting within Malaysia's waste management framework.

Conclusion and Recommendations

This study synthesised findings from recent Malaysian studies to identify the social success factors that drive household composting awareness and adoption in the context of cultivating a 3R culture. The analysis revealed that four interrelated factors i.e. education and knowledge, community engagement and social norms, policy and institutional support, and socioeconomic and demographic influences, consistently shape the extent to which households participate in composting. These factors function in a reinforcing cycle, with education building competence, community engagement fostering collective responsibility, policy providing enabling structures, and demographic tailoring ensuring inclusivity.

From a social science perspective, the Malaysian case highlights that household composting is not merely an environmental or technical practice, but a socially embedded behaviour that thrives when it aligns with local values, cultural norms, and policy incentives. Efforts to promote composting must therefore be designed with an appreciation of these social dimensions, recognising that knowledge alone is insufficient without supportive environments and accessible infrastructure. Furthermore, the country's policy landscape anchored in the National Strategic Plan for Solid Waste Management and aligned with Sustainable Development Goal 12 offers both the framework and the legitimacy for coordinated action.

Based on the findings, several recommendations are proposed to enhance household composting awareness and adoption in Malaysia:

Institutionalise Composting Education
Integrate composting modules into school curricula under the Ministry of Education's environmental education initiatives, ensuring early exposure to the 3R concept. For adults, provide regular, localised workshops tailored to different housing types and community contexts, supported by demonstration sites in both urban and rural areas.

Leverage Community-Based Models
Establish and fund community composting hubs, ideally linked to community gardens, mosques, or cooperative farming projects. Encourage local leadership through "Green Neighbourhood" awards, fostering healthy competition between communities and recognising exemplary environmental practices.

Strengthen Policy Enforcement and Support
Expand the scope of existing waste segregation at source regulations to explicitly include organic waste composting. Provide subsidised composting kits and technical support, particularly in urban high-density housing where space limitations are a challenge. Ensure multilingual outreach materials to cater to Malaysia's diverse population.

Tailor Interventions to Demographic Segments
For lower-income households, frame composting as a cost-saving measure that can enhance food security. For urban and higher-income groups, emphasise convenience, modern composting technologies, and environmental responsibility. Engage women as key household waste managers through targeted training, and use digital platforms to gamify composting for younger Malaysians.

Integrate Composting into Broader 3R Campaigns
Position composting not as an isolated activity but as a central component of the 3R strategy, ensuring consistent messaging across public agencies, NGOs, and private sector partners. Link composting outcomes to visible local benefits, such as reduced waste collection fees, improved public green spaces, or community produce markets.

In conclusion, advancing household composting in Malaysia requires a coordinated, multi-layered strategy that simultaneously builds individual capacity, mobilises community support, and embeds the practice within enabling policy frameworks. By aligning interventions with Malaysia's socio-cultural realities and policy ambitions, household composting can serve as a practical entry point for strengthening the nation's 3R culture and contributing meaningfully to its sustainable development agenda.

Theoretical and Contextual Contributions
This research extends the existing body of knowledge by integrating behavioural theories—such as the Theory of Planned Behavior (TPB), Norm Activation Model (NAM), and Social Practice Theory (SPT)—with the contextual realities of Malaysia's household composting practices. Theoretically, it demonstrates how attitudes, social norms, moral obligations, and enabling structures interact in shaping pro-environmental behaviours, moving beyond individual-level determinants to a multi-level understanding of behavioural adoption. Contextually, the study contributes by situating these insights within Malaysia's socio-cultural and policy frameworks, highlighting the critical role of demographic diversity, community structures, and institutional support in shaping composting practices. This dual contribution not only enriches the conceptual discourse on sustainable household behaviours in developing economies but also provides actionable evidence for policymakers seeking to embed household composting within the national 3R culture and the broader circular economy agenda.

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