

Knowledge, Attitude and Practice Toward Food Waste Management Among University Food Vendors: The Case Study from A Malaysian Higher Education Institution

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ABSTRACT

Food waste generated by institutional food service operations represents a significant sustainability challenge with environmental, economic, and social implications. However, empirical evidence regarding food waste management behaviour among university food vendors in Malaysia remains limited. This study evaluated the knowledge, attitudes, and practices (KAP) of food vendors toward food waste management at the International Islamic University Malaysia (IIUM) Kuantan Campus using a quantitative cross-sectional survey. Data were collected using a structured and validated questionnaire administered to registered food vendors and analysed using descriptive statistics, inferential analysis, and correlation tests. The findings indicate that most respondents demonstrated high levels of knowledge, positive attitudes, and good food waste management practices. Positive associations were observed among knowledge, attitudes, and practices, suggesting that greater environmental awareness contributes to more sustainable operational behaviour. Nevertheless, behavioural improvements require continuous institutional support, regular training, and adequate waste management infrastructure to ensure that environmental awareness is translated into consistent practice. The study highlights the importance of integrating behavioural interventions with operational measures such as inventory optimisation, portion control, food waste monitoring, surplus food redistribution, and organic waste recovery. These findings provide practical recommendations for strengthening Green Campus initiatives and supporting Sustainable Development Goal 12 on responsible consumption and production within higher education institutions.

Keywords: Food waste management; Knowledge Attitude Practice (KAP); University food vendors; Sustainable campus; Green Campus.

INTRODUCTION

Food waste is a major global sustainability challenge with significant environmental, economic, and social consequences. Approximately 1.05 billion tonnes of food are wasted annually, contributing to greenhouse gas emissions, resource depletion, and food insecurity (Roy, P. et al., 2023; Rai, N. et al., 2025). In response, Sustainable Development Goal (SDG) 12.3 aims to halve global food waste by 2030 through improved production, consumption, and waste management practices (Hu, P. et al., 2025). In Malaysia, food waste constitutes nearly 45% of municipal solid waste, with about 17,000 tonnes generated daily, placing considerable pressure on landfill capacity despite national initiatives promoting waste reduction and resource recovery (Idris, S. H. et al., 2025; Mustafa, F. A. et al., 2023). The food service sector, particularly university food vendors, is a significant contributor to avoidable food waste because decisions related to food procurement, preparation, storage, portioning, and disposal directly influence waste generation (Filimonau, V. & Delysia, A., 2019; Martin-Rios, C. et al., 2018). As higher education institutions increasingly adopt Green Campus and circular economy initiatives, understanding the behavioural factors influencing food waste management has become essential. The Knowledge–Attitude–Practice (KAP) framework provides a useful approach for evaluating environmental awareness and identifying behavioural gaps that can guide targeted interventions (Roy, N. et al., 2025). However, empirical evidence on university food vendors in Malaysia remains limited, with most studies focusing on households or commercial food service establishments (Kumaran, S. & Idris, I., 2025). Therefore, this study examines the knowledge, attitudes, and practices of food vendors at the International Islamic University Malaysia (IIUM) Kuantan Campus, evaluates the influence of selected sociodemographic characteristics, and explores the relationships among KAP dimensions to support evidence-based strategies for sustainable campus food waste management and the achievement of SDG 12.

PROBLEM STATEMENT

Despite growing research on food waste management, important knowledge gaps remain, particularly within Malaysian higher education institutions. Existing studies have largely focused on household food waste, restaurants, hotels, and municipal waste management, with limited attention given to the behavioural factors influencing food waste practices among university food vendors (Kumaran, S., & Idris, I., 2025; Abidin, N. N. Z. et al., 2022). Furthermore, previous research has primarily emphasized waste generation, recycling, and treatment technologies rather than examining how KAP interact to influence sustainable food waste management. Empirical evidence from universities in the East Coast region of Peninsular Malaysia is also scarce, limiting the understanding of regional and institutional differences. Although the KAP framework has been widely applied in environmental behaviour studies, few investigations have simultaneously assessed the relationships between sociodemographic characteristics and KAP dimensions among university food vendors (Roy, N. et al., 2025; Abidin, N. Z. et al., 2022; Naim, M. N. & Rahman, H. A. 2020). Therefore, this study evaluates the knowledge, attitudes, and practices of food vendors at the International Islamic University Malaysia (IIUM) Kuantan Campus and examines the influence of sociodemographic factors and the interrelationships among KAP dimensions to provide evidence-based recommendations for sustainable campus food waste management and Green Campus initiatives.

LITERATURE REVIEW

Global Perspective on Food Waste

Food waste has become a major global sustainability challenge because of its environmental, economic, and social consequences. According to the United Nations Environment Programme (UNEP, 2024), approximately 1.05 billion tonnes of food were wasted worldwide in 2022, accounting for nearly 19% of food available to consumers and reflecting significant inefficiencies in global food systems (Barbăneagră, O. 2026). Beyond the loss of edible food, waste represents the unnecessary consumption of valuable resources, including water, energy, land, labour, and agricultural inputs, while its decomposition in landfills generates methane, a potent greenhouse gas that contributes substantially to climate change (Pal, P. et al., 2024). Despite an estimated 735 million people experiencing chronic hunger globally, large quantities of edible food continue to be discarded, highlighting the urgent need

for more sustainable food production and consumption practices (Islam, M. Z., & Zheng, L. 2025; Kilemle, W. et al., 2025). Consequently, reducing food waste has become a key target of Sustainable Development Goal (SDG) 12.3, which aims to halve global food waste by 2030 through responsible consumption and improved resource efficiency (Hu, P. et al., 2025). In response, recent studies advocate a transition from the conventional linear food system toward a circular economy that prioritizes food waste prevention, redistribution, recycling, composting, and energy recovery to maximize resource efficiency and minimize environmental impacts (Papargyropoulou, E. et al., 2019; Kumaran, S., & Idris, I. 2025; Pothukuchi, K., & Molnar, S. A. 2015).

Food Waste Management in Malaysia

Malaysia continues to face growing food waste challenges driven by rapid urbanization, population growth, and changing consumption patterns. Food waste accounts for approximately 17,000 tonnes per day, representing nearly 45% of municipal solid waste, with almost one-quarter remaining edible before disposal (Idris, S. H. et al., 2025). Malaysia's continued dependence on landfill disposal has raised concerns regarding landfill capacity, methane emissions, and long-term environmental sustainability, underscoring the urgent need to adopt circular economy strategies that prioritize waste prevention, food redistribution, composting, recycling, and resource recovery, as demonstrated in many developed countries (Lim, W. J. et al., 2016; Hashim, A. A. et al., 2021). In response, the Malaysian government has introduced various initiatives, including the National Solid Waste Management Policy, National Cleanliness Policy and more to promote sustainable waste management and responsible consumption (Sreenivasan, J. et al., 2012; Shakil, N. S. et al., 2023; Moh, Y., 2017). Nevertheless, evidence suggests that behavioural factors, such as limited awareness, inadequate training, poor inventory management, and insufficient institutional support, remain major barriers to effective food waste reduction among food service operators, indicating that behavioural interventions are as important as technological solutions for achieving sustainable food waste management (Kumaran, S., & Idris, I., 2025; Filimonau, V. & Delysia, A., 2019; Abidin, N. N. Z. et al., 2022).

Food Waste in the Food Service Sector and Higher Education Institutions

The food service sector is a major source of avoidable food waste due to operational complexities, including inaccurate demand forecasting, overproduction, improper storage, inefficient inventory management, oversized portions, and consumer plate waste (Filimonau, V. & Delysia, A., 2019; Martin-Rios, C. et al., 2018). University campuses are important institutional settings for food waste management, as they prepare large volumes of meals daily for students, staff, and visitors. Food vendors therefore play a pivotal role in influencing food waste generation through operational decisions involving food procurement, preparation, portion control, and meal service. (Principato et al., 2021). As higher education institutions increasingly adopt Green Campus and circular economy initiatives, improving food waste management within campus food services has become a sustainability priority (Musicus, A. A. et al., 2022; Leal Filho, W. et al., 2024). Recent studies indicate that behavioural and operational interventions, including staff training, food waste monitoring, standardized recipes, menu optimization, and digital inventory management, can substantially reduce food waste while enhancing operational efficiency and resource utilization (Filimonau et al., 2022; Martin-Rios, C. et al., 2018; Leal Filho, W. et al., 2021). These findings underscore the pivotal role of food vendors in supporting sustainable campus operations and achieving broader environmental objectives.

Knowledge Attitude Practice (KAP) Framework in Food Waste Management

Understanding behavioural determinants is essential for designing effective food waste reduction strategies, particularly within institutional food service settings. The KAP framework is widely used to evaluate how individuals' knowledge of food waste, environmental awareness, and attitudes influence their waste management practices (Roy, N. et al., 2025; Abidin, N. N. Z. et al., 2022). Although greater knowledge is generally associated with more positive attitudes and sustainable behaviours, evidence suggests that behavioural change is also shaped by organizational support, infrastructure, economic considerations, and institutional policies, meaning that knowledge alone does not necessarily translate into improved practices (Graham-Rowe et al., 2014; Naim, M. N., & Rahman, H. A. 2020). In food service environments, the KAP framework is particularly valuable for identifying behavioural barriers that cannot be explained by waste generation data alone, while its integration with the Theory of Planned

Behavior (TPB) provides a more comprehensive understanding of how attitudes, social norms, and perceived behavioural control influence sustainable food waste management (Ajzen, I. 1991; Stancu, V. et al., 2016). Consequently, the KAP framework offers a robust theoretical basis for developing targeted interventions to improve food waste management among university food vendors.

METHODOLOGY

Study Design

This study employed a quantitative cross-sectional survey to assess the KAP of food vendors regarding food waste management at the International Islamic University Malaysia (IIUM) Kuantan Campus. A cross-sectional design is appropriate for evaluating behavioural characteristics and examining relationships among variables at a single point in time (Setia, M. 2016; Wang, X., & Cheng, Z. 2020). The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Von Elm, E. et al., 2007). The KAP framework served as the theoretical foundation because it explains how knowledge influences attitudes and subsequently affects behaviour while acknowledging the influence of demographic and institutional factors (Roy, N. et al., 2025; Jalil, N. J. A. et al., 2022). Food vendors were selected as the study population because their decisions on food procurement, preparation, storage, serving, and disposal directly influence food waste generation within the university.

Study Area

The study was conducted at IIUM Kuantan Campus, Pahang, Malaysia, where campus food services are operated through several cafeterias and food stalls managed by the Residential and Services Department. The campus provides an appropriate setting for evaluating institutional food waste management because vendors routinely manage food preparation, inventory, customer demand, food safety, and waste disposal under standardized university regulations.

Study Population and Sampling

The target population comprised all registered food vendors operating at IIUM Kuantan Campus during the study period. A census sampling approach was adopted to maximize participation and minimize sampling bias by inviting all eligible vendors to participate voluntarily. Inclusion criteria were registered vendors aged 18 years or older who were directly involved in food preparation, handling, serving, or business management and provided informed consent. Vendors unavailable during data collection or unwilling to participate were excluded.

Questionnaire Development

Data were collected using a structured self-administered questionnaire adapted from validated KAP studies on food waste management (Roy, N. et al., 2025; Papargyropoulou, E. et al., 2019; Kaur, P. et al., 2021). The questionnaire consisted of four sections: (A) respondents' sociodemographic characteristics, including educational level, monthly income, business experience, and previous food waste management training; (B) knowledge of food waste management; (C) attitudes toward food waste management; and (D) food waste management practices. Knowledge items evaluated respondents' understanding of food waste causes, environmental impacts, and reduction strategies, whereas attitude and practice items assessed perceptions and daily operational behaviours related to food preparation, inventory management, waste segregation, and waste disposal. Responses were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Questionnaire Validation and Reliability

Content validity was established through expert review by specialists in food waste management, environmental science, and research methodology, who assessed the questionnaire for relevance, clarity, and completeness. Following revisions, face validity was evaluated through cognitive pretesting with representatives of the target population to improve readability and comprehension. Internal consistency reliability was determined using Cronbach's alpha coefficient, with values above 0.70 considered acceptable and values exceeding 0.80 indicating good reliability (Hair, J. F. et al., 2019). The instrument demonstrated satisfactory reliability before full-scale data collection.

Data Collection Procedure

Data collection commenced after obtaining approval from the relevant institutional authorities and ethics committee. Respondents received an information sheet explaining the study objectives, voluntary participation, confidentiality, anonymity, and their right to withdraw without penalty. Written informed consent was obtained prior to participation. Questionnaires were distributed directly to eligible food vendors during operating hours and checked upon collection to ensure completeness and reduce missing data (Creswell, J. W., & Creswell, J. D., 2017; World Medical Association, 2013).

Data Analysis

Data were entered, coded, cleaned, and analysed using IBM SPSS Statistics Version 22. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize respondents' sociodemographic characteristics and KAP scores. KAP levels were classified as low, moderate, or high using the Modified Bloom's cut-off points (Kaliyaperumal, K. I. E. C. 2004). Data normality was assessed prior to inferential analyses to determine the appropriate statistical procedures. Associations between sociodemographic characteristics and KAP levels were examined using suitable inferential statistical tests according to variable type and distribution, while relationships among knowledge, attitudes, and practices were evaluated using correlation analysis. Statistical significance was set at $p < 0.05$, following standard practice in behavioural and environmental research (Field, A., 2024).

Ethical Considerations

The study adhered to internationally accepted principles governing research involving human participants, including voluntary participation, confidentiality, anonymity, beneficence, and respect for participants' autonomy (World Medical Association, 2013). Participant identities were anonymized throughout data collection, analysis, and publication. All data were securely stored and used solely for academic research purposes.

FINDINGS AND DISCUSSIONS

Respondent Characteristics and Overall KAP Profile

A total of 15 registered food vendors from the International Islamic University Malaysia (IIUM) Kuantan Campus participated in this study as illustrated in Table 1. Respondents represented diverse demographic backgrounds, with females comprising 53.3%, 80.0% possessing tertiary education, 53.3% earning between RM2,000 and RM5,000 monthly, most having 1–10 years of business experience, and 86.7% having attended food handling training. Overall, respondents demonstrated high knowledge (29.60 ± 1.99), positive attitudes (29.13 ± 1.81), and good food waste management practices (29.00 ± 2.73), indicating a favourable behavioural foundation for sustainable food waste management. These findings suggest that while food vendors possess adequate environmental awareness, the consistent adoption of sustainable practices depends on organizational support, institutional policies, and workplace conditions rather than knowledge alone (Roy, N. et al., 2025; Naim, M. N., & Rahman, H. A., 2020). Similar findings have been reported in institutional food service settings, where education, work experience, and environmental training improve behavioural readiness but are often constrained by operational and economic factors (Filimonau, V. & Delysia, A., 2019; Martin-Rios, C. et al., 2018; Kumaran, S., & Idris, I., 2025). Therefore, continuous training, standardized operational guidelines, and food waste monitoring programmes are essential to strengthen sustainable campus food waste management and support Sustainable Development Goal 12 (Leal Filho, W. et al., 2023).

Table 1: Respondent characteristics and overall KAP profile.

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	8	46.7
	Female	7	53.3
Age	18-25 years	4	26.7
	26-35 years	5	33.3
	36-45 years	2	13.3
	46-60 years	2	13.3
	61 years and above	2	13.3
Highest educational level	Certificate, diploma, degree	12	80.0
	Secondary school	3	20.0
Monthly income	< RM 2000	3	20.0
	RM 2000-RM5000	8	53.3
	RM5000-RM10,000	2	13.3
	> RM10,000	2	13.3
Length of time in food business	1-3 years	5	33.3
	4-6 years	3	20.0
	7-10 years	5	33.3
	More than 10 years	2	13.3
Food handling training attendance	Yes	13	86.7

Knowledge of Food Waste Management Among Food Vendors

Knowledge is a fundamental determinant of sustainable food waste management because it shapes environmental awareness and supports the adoption of responsible waste reduction practices (Roy, N. et al., 2025; Hu, P. et al., 2025; Rai, N. 2025). As summarized in Table 2, respondents demonstrated a high overall level of knowledge regarding food waste management (mean = 29.60 ± 1.99), with 80% classified as having high knowledge and none in the low-knowledge category. This finding suggests that most food vendors possess a good understanding of the environmental impacts of food waste and appropriate waste management practices, reflecting their daily involvement in food preparation, storage, inventory management, and compliance with institutional food safety regulations. Similar findings have been reported among institutional food service operators, where increasing environmental awareness and sustainability initiatives have enhanced knowledge of food waste prevention (Filimonau et al., 2022; Martin-Rios, C. et al., 2018). Nevertheless, previous studies indicate that knowledge alone does not necessarily result in sustainable behaviour, as operational constraints, organizational culture, customer demand, and institutional policies often influence daily food management practices (Ajzen, I. 1991; Graham-Rowe, E. et al., 2014). Consistent with the KAP framework, knowledge provides the cognitive foundation for behavioural change but should be reinforced through continuous training, institutional support, and practical interventions to improve food waste reduction and advance sustainable campus management aligned with Sustainable Development.

Table 2: Summary of respondents' knowledge regarding food waste management.

Knowledge Indicator	Result
Overall knowledge score (Mean $\pm$ SD)	29.60 $\pm$ 1.993
High knowledge category (%)	12 (80%)
Moderate knowledge category (%)	3 (20%)
Low knowledge category (%)	0 (0%)
Highest scoring knowledge statement	13 (86.7%)
Lowest scoring knowledge statement	0 (0%)

Attitudes toward Food Waste Management

Attitude is a key behavioural determinant that influences individuals' willingness to adopt sustainable food waste management practices by linking environmental knowledge with actual behaviour (Ajzen, I. 1991; Roy, N. et al., 2025). As shown in Table 3, respondents demonstrated a high level of positive attitude toward food waste management (mean = 29.13 $\pm$ 1.81), with 86.7% classified in the high-attitude category and no respondents exhibiting low attitudes. These findings indicate that most food vendors recognized the environmental importance of minimizing food waste and supported sustainable food management initiatives. Similar results have been reported among institutional food service operators, where positive environmental attitudes are associated with greater support for waste reduction programmes, although practical implementation often remains constrained by operational demands, organizational support, and available infrastructure (Filimonau, V. & Delysia, A., 2019; Mustafa, F. A. et al., 2023; Stancu, V., 2016). Consistent with the KAP framework and the Theory of Planned Behavior (TPB), positive attitudes alone are insufficient to ensure sustainable practices, as behavioural outcomes are also influenced by perceived behavioural control, workplace culture, and institutional policies (Ajzen, I. 1991; Naim, M. N., & Rahman, H. A. 2020). Therefore, while the findings demonstrate a strong behavioural foundation among IIUM food vendors, continuous institutional support, practical training, and effective waste management policies remain essential to translate positive attitudes into consistent food waste reduction practices and to support Sustainable Development Goal 12 and Green Campus initiatives (Leal Filho, W. et al., 2023; Hu, P. et al., 2025).

Table 3: Summary of respondents' attitudes toward food waste management.

Attitude Indicator	Result
Overall attitude score (Mean $\pm$ SD)	29.13 $\pm$ 1.807
High attitude category (%)	13 (86.7%)
Moderate attitude category (%)	2 (13.3%)
Low attitude category (%)	0 (0%)
Highest scoring attitude statement	10 (66.7%)
Lowest scoring attitude statement	0 (0%)

Food Waste Management Practices among Food Vendors

Food waste management practices represent the behavioural dimension of the KAP framework, reflecting how environmental knowledge and positive attitudes are translated into daily food service operations (Roy, N. et al., 2025). As summarized in Table 4, respondents demonstrated a high level of food waste management practices (mean = 29.13 $\pm$ 1.81), with 86.7% classified in the high-practice category and no respondents exhibiting low practice levels. The findings indicate that most food vendors routinely implemented sustainable practices such as inventory management, proper food handling, portion control, and waste minimization, likely supported by institutional food safety regulations and operational guidelines. However, more advanced practices, including food donation, composting, waste segregation, and resource recovery, were less consistently adopted, reflecting operational constraints such as limited infrastructure, uncertain customer demand, and organizational support. Similar patterns have been reported in institutional food service settings, where routine waste prevention practices are more common than circular economy initiatives (Martin-Rios, C. et al., 2018; Mustafa, F. A. et al., 2023; Stancu, V., 2016). Consistent with the Theory of Planned Behavior, these findings suggest that sustainable practices depend not only on knowledge and positive attitudes but also on perceived

behavioural control, institutional commitment, and the availability of supporting facilities (Ajzen, I. 1991). Therefore, strengthening vendor training, standardized operating procedures, food waste monitoring, composting facilities, and food redistribution programmes could further improve sustainable food waste management and support Sustainable Development Goal 12 (Responsible Consumption and Production) (Leal Filho, W. et al., 2023; Hu, P. et al., 2025).

Table 4: Summary of respondents' food waste management practices.

Practice Indicator	Result
Overall practice score (Mean $\pm$ SD)	29.13 $\pm$ 1.807
High practice category (%)	13 (86.7%)
Moderate practice category (%)	2 (13.3%)
Low practice category (%)	0 (0%)
Highest scoring practice statement	10 (66.7%)
Lowest scoring practice statement	0 (0%)

Association between Sociodemographic Characteristics and KAP

Understanding the influence of sociodemographic characteristics on food waste management is important for designing effective behavioural interventions. As illustrated in Table 5, no statistically significant associations were observed between respondents' educational level, monthly income, years of business experience, or previous food waste management training and their knowledge, attitudes, or practices ($p > 0.05$), indicating that food waste management behaviours were relatively consistent across demographic groups. These findings suggest that individual demographic characteristics alone are insufficient to explain behavioural performance and that organizational culture, institutional policies, and operational environments may play a more important role in shaping sustainable practices. Similar studies have shown that while education and environmental training can enhance awareness, the adoption of food waste reduction practices depends largely on institutional support, standardized procedures, management commitment, and enabling infrastructure rather than demographic factors alone (Ajzen, I. 1991; Filimonau, V., & Delysia, A., 2019; Graham-Rowe et al., 2014; Martin-Rios, C. et al., 2018). Consistent with the KAP framework and the Theory of Planned Behavior (TPB), these findings indicate that sustainable food waste management results from the interaction of cognitive, behavioural, and organizational factors rather than personal characteristics alone (Roy, N. et al., 2025; Naim, M. N., & Rahman, H. A. 2020). Therefore, universities should prioritize institution-wide strategies—including continuous environmental education, standardized operating procedures, waste monitoring, and improved food waste management infrastructure—for all food vendors instead of targeting specific demographic groups, thereby strengthening sustainable campus food service operations and supporting Sustainable Development Goal 12 (Responsible Consumption and Production) (Leal Filho, W. et al., 2023; Hu, P. et al., 2025).

Table 5: Association between respondents' sociodemographic characteristics and KAP

Sociodemographic variable	Knowledge (P value)	Attitude (P value)	Practice (P value)
Educational level	0.081	1.000	1.000
Monthly income	1.000	0.200	0.200
Years of business experience	0.835	0.476	0.476
Previous food waste management training	1.000	0.257	1.000

Relationship among KAP toward Food Waste Management

The correlation analysis as shown in Table 6 demonstrated positive relationships among the three behavioural domains of KAP regarding food waste management, indicating that respondents with greater environmental knowledge generally exhibited more positive attitudes and better food waste management practices. The strongest positive association was observed between knowledge and practice ($r = 0.516$), suggesting that improved understanding of food waste issues contributes to more sustainable operational behaviours, although knowledge alone is insufficient to ensure behavioural change. Consistent with the KAP framework and the Theory of Planned Behavior (TPB), these findings indicate that environmental knowledge strengthens positive attitudes, while favourable attitudes encourage sustainable practices when supported by organizational commitment, infrastructure, and perceived behavioural control (Ajzen, I. 1991; Roy, N. et al., 2025). Similar findings have been reported in institutional food service settings, where environmental awareness and pro-environmental attitudes positively influence food waste reduction, but practical implementation depends on management support, operational procedures, and enabling facilities (Filimonau, V. et al., 2024; Martin-Rios, C. et al., 2018; Kaur, P. et al., 2021). Therefore, universities should adopt integrated food waste management programmes that combine environmental education, continuous staff training, standardized operating procedures, waste audits, digital inventory systems, food donation initiatives, and composting facilities to reinforce sustainable food service practices and support Sustainable Development Goal 12 (Responsible Consumption and Production) (Leal Filho, W. et al., 2023; Hu, P. et al., 2025).

Table 6. Correlation between KAP

Variables	Correlation coefficient (r) p-value Interpretation
Knowledge ↔ Attitude	1.000
Knowledge ↔ Practice	0.516
Attitude ↔ Practice	1.000

Overall Synthesis and Implications for Sustainable Food Waste Management

The present study assessed the KAP of food vendors regarding food waste management at the International Islamic University Malaysia (IIUM) Kuantan Campus. Overall, respondents demonstrated high knowledge and positive attitudes, while food waste management practices were comparatively less consistent, suggesting that environmental awareness alone does not guarantee sustainable operational behaviour. These findings are consistent with previous studies showing that organizational support, infrastructure, and institutional policies significantly influence the implementation of food waste reduction practices despite favourable environmental awareness (Filimonau, V. et al., 2024; Martin-Rios, C. et al., 2018). Positive correlations among knowledge, attitudes, and practices support the Knowledge–Attitude–Practice (KAP) framework and the Theory of Planned Behavior, indicating that environmental knowledge fosters positive attitudes that encourage sustainable practices, although organizational and contextual factors remain critical determinants of behavioural change (Ajzen, I. 1991; Roy, N. et al., 2025; Naim, M. N., & Rahman, H. A. (2020). These findings highlight the need for universities to complement awareness programmes with practical interventions, including continuous vendor training, standardized operating procedures, food waste auditing, inventory optimization, food donation programmes, composting, and digital waste monitoring systems (Leal Filho, W. et al., 2023; Principato et al., 2021). This study also extends the application of the KAP framework to university food vendors, an understudied stakeholder group in Malaysia. However, the findings are limited by the cross-sectional design, small sample size, and reliance on self-reported data. Future studies should employ longitudinal, multi-campus, and observational approaches to strengthen evidence on food waste management. Overall, integrated institutional strategies combining education, governance, infrastructure, and stakeholder collaboration are essential to reduce food waste and support Sustainable Development Goal 12 (Responsible Consumption and Production) (Hu, P. et al., 2025; Roy, P. et al., 2023; Rai, N. et al., 2025).

CONCLUSION AND RECOMMENDATIONS

This study assessed the KAP of food vendors regarding food waste management at IIUM Kuantan Campus. Respondents demonstrated high knowledge, positive attitudes, and satisfactory practices, confirming a strong behavioural foundation for sustainable food waste management. Positive relationships among KAP components support the KAP framework and the Theory of Planned Behaviour, indicating that behavioural change requires not only environmental awareness but also institutional support, infrastructure, and organizational commitment. Universities should strengthen vendor training, standardized operating procedures, waste monitoring, and resource recovery initiatives. Future studies should employ larger, multi-campus longitudinal designs to further improve sustainable food waste management in higher education institutions. The “Compost with Us” social entrepreneurship project at IIUM Kuantan has already conducted hands-on sessions teaching participants to sow seeds using food waste compost and package compost for marketing. Basically, the recommendation more to invite food vendors as participants and co-facilitators in this existing programme so they understand the downstream value of their waste separation efforts. Seeing compost produced from their own kitchen waste creates a concrete knowledge feedback loop.

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