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Food Waste Generation and Economic Implications during Ramadan in Student Rented Houses: A Pilot Study

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Abstract: *Food waste during Ramadan is a growing concern in Malaysia, with limited research on university students in rented accommodations. This pilot study examined their food waste generation using a mixed-methods approach: daily quantitative measurements and qualitative interviews on food practices. Findings showed students produced 0.25 kg/person/day, lower than urban households, yet about 40% of food prepared or purchased was discarded, with some households food waste discarded reaching up to 65%. Waste levels varied by household size, purchasing behavior, and eating habits, influenced by the dual-meal Ramadan pattern. Minimal sustainable practices were observed, highlighting the need for awareness and behavioral interventions.*

Keywords: *Food waste, Ramadan, University Students*

Introduction

The United Nations Sustainable Development Goal (SDG) 12 on responsible consumption and production is increasingly relevant in the face of rapid urbanization and population growth, which continue to drive a sharp rise in global waste generation (Kasavan et al., 2019; Syazwan & Syed-Hassan, 2024), including food waste. Food waste has emerged as a global crisis, with the Food and Agriculture Organization (FAO) estimating that nearly one-third of all food produced for human consumption is lost or wasted annually (Pandey, 2021). This equates to about 1.3 billion tonnes of food worldwide, representing not only a humanitarian and ethical challenge but also an economic and environmental one (Bond et al., 2013). Food waste contributes significantly to greenhouse gas emissions, places unnecessary pressure on natural resources, and results in billions of dollars in economic losses each year (Nordin et al., 2020). It also causes serious environmental impacts, including landfill leachate that contaminates groundwater and endangers human health (Jereme, 2017; Keegan & Breadsell, 2021).

In Malaysia, the situation reflects this global concern. Food waste constitutes a substantial portion of municipal solid waste, straining existing waste management systems. The country generates over 39,000 tonnes of municipal waste daily, of which more than 30% is food waste (International Trade Administration, 2024). Alarmingly, food waste tends to increase during the month of Ramadan—the Islamic month of fasting—where Alam Flora

(2024) reported a 20–30% surge compared to other months. Estimates suggest that the 20,087.5 tonnes of food discarded daily during Ramadan could feed nearly half of Malaysia's population three times a day. In 2018, food waste across the country during Ramadan reached an estimated 615,000 tonnes, with the Solid Waste and Public Cleansing Management Corporation (SWCorp) further highlighting that 270,000 tonnes of untouched, edible food were thrown away each year in this period (T'ing et al., 2021). In addition, they can be fully or partially edible if consumed in time, as long as they are uncontaminated and properly stored (Gonçalves et al., 2023; Hennchen, 2019).

Economically, Ramadan also presents a paradox. On one hand, it drives tremendous business opportunities, particularly through Ramadan bazaars and small traders. For instance, many vendors report nearly doubling their turnover during this month without any increase in operating capital. The heightened demand for *takjil* (pre-dinner snacks) and festive meals supports vibrant micro-economies, creates temporary employment, and sustains local food industries (Choiriyah, 2024).This surge in supply and consumption contributes directly to higher volumes of food waste, particularly from households, night markets, and bazaars, making Ramadan a critical period for both economic gains and sustainability challenges.

Several factors contribute to the increase in waste during Ramadan. Over-purchasing, driven by attractive food displays and cultural norms of abundance, often leads to uneaten food. In hospitality settings, mismatches between guest turnout and food preparation levels also play a role, as highlighted by a study in the UAE, which revealed that guest show-up ratios strongly influenced buffet waste levels (Pirani & Arafat, 2015). At the household level, studies have shown that while some families strive to repurpose leftovers, a considerable portion of food still ends up discarded, despite Islamic teachings that discourage wastefulness (Ridwan & Andriyanto, 2019). Furthermore, visual appeal, taste expectations, and the festive atmosphere of Ramadan bazaars have been found to heavily influence consumer purchasing decisions, which in turn can drive over-consumption and subsequent waste (Azman et al., 2024).

Most studies focus on households or food establishments and Ramadan bazaars, while university students (over 687,000 enrolled in 2022 in Malaysia) remain overlooked despite their significant contribution to food waste (Ghazali et al., 2025). In rental houses, leftovers are the main type of waste, forming a core component of household food waste as they represent surplus food remaining from prepared meals (Aloysius et al., 2023; Kaur et al., 2020). This group represents a unique demographic with distinct eating and cooking habits shaped by communal living, shared budgets, limited cooking facilities, and irregular meal schedules. These characteristics may influence food waste patterns in ways that differ markedly from households or hospitality sectors. To date, few investigations has investigated food waste among university students during Ramadan especially in rented households.

This pilot study seeks to address that gap by examining food waste generation in student-rented houses during Ramadan. The study focuses on quantifying daily food waste at the household level, normalized per capita, while also capturing students' perceptions of waste through brief interviews. By doing so, it provides preliminary insights into the environmental and economic implications of Ramadan food waste among students, offering a foundation for more extensive future research.

Methodology

Study Area and Participants

This pilot study was conducted over a five-day period involving nine student-rented households (35 students) from Universiti Kuala Lumpur Malaysian Institute of Chemical and Bioengineering Technology in Alor Gajah, Melaka. The purpose was to obtain preliminary insights into food waste generation patterns during Ramadan and to assess the feasibility of data collection methods for potential future studies.

Study Design

This pilot study adopted a mixed-methods approach, combining (i) quantitative measurement of daily food waste generation and (ii) short qualitative interviews to gather insights on cooking, purchasing and consumption practices.

Data Collection

Food Waste Measurement

1. **Segregation:** Participating households were provided with designated containers for food waste collection. Non-food materials such as packaging and plastics were excluded.
2. **Weighing procedure:** At the end of each day, food waste was weighed using a digital kitchen scale (accuracy ±0.01 kg). Students were instructed to record the total daily weight in a log sheet prepared for the study.
3. **Normalization:** To allow comparison across households, daily waste was normalized by the number of household occupants, producing per-capita values in kg/person/day.

Qualitative Interviews

A short semi-structured interview was conducted with one student representative from each participating household. The questions focused on frequency of food consumption and preparation patterns (cooked at home or purchased from Ramadan bazaars), as well as perceptions of food waste and the main reasons for discarding food.

Economic Impact and Food Waste Proportion

To estimate the proportion of food wasted in each household, a benchmark of average daily food intake per person was established. This value was derived from typical food purchasing and consumption patterns during Ramadan.

Based on field observation and local pricing surveys at Ramadan bazaars, a standard meal was assumed to consist of:

1. **Main dish** (e.g., nasi ayam, roti john, or murtabak), weighing approximately **400–500 g** and costing RM 6–8.
2. **Side dish/snack** (e.g., kuih-muih, karipap, or satay), weighing approximately **150–200 g** and costing RM 3–5.

This yielded a total average portion size of 550–700 g per person per meal. For calculation consistency, the midpoint value of 0.65 kg/person/day was adopted as the representative average daily intake.

Using this benchmark, the percentage of food waste per household was calculated as:

$$Food\ waste\ percentage\ (\%) = \frac{Food\ waster\ per\ capita\ (\frac{kg}{day})}{0.65\ kg/day}\ x\ 100\ \%$$

Result and Discussion

Food Waste Generation

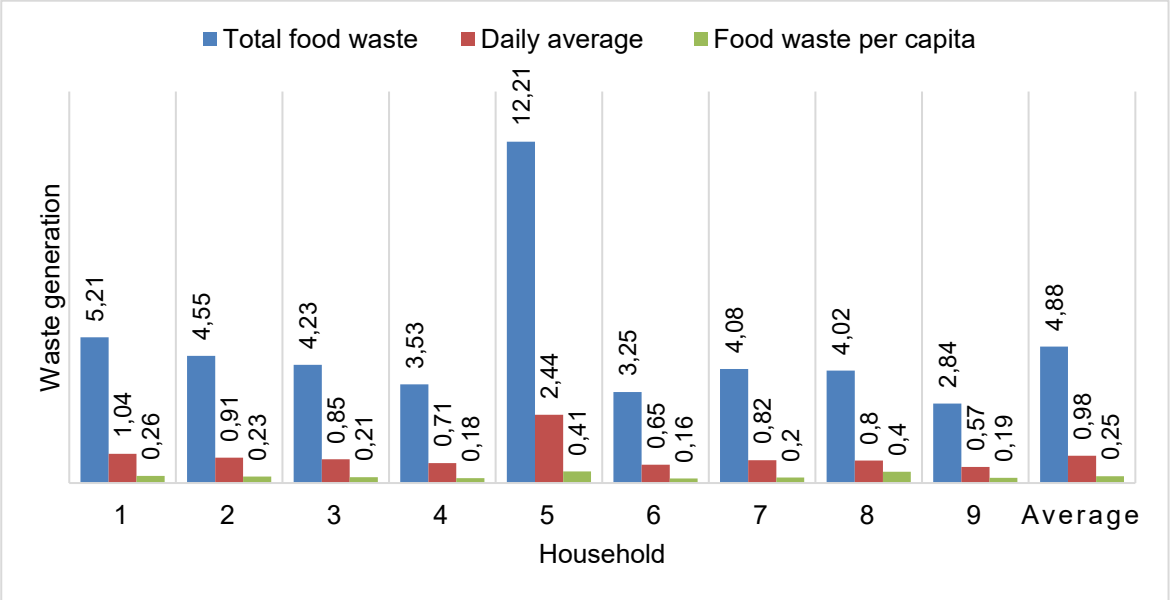

***Figure 1**. Food waste generation in rented student houses.*

Figure 1 shows the findings on food waste generation in rented student houses during Ramadan. This pilot study focuses specifically on plate waste, since most students typically purchase prepared food for *iftar* or for pre-dawn meal *sahoor*. In this pilot study, interviews revealed that plate waste primarily consisted of leftover rice, chicken and fish bones, expired bread, vegetable peels, uneaten snacks, spoiled rice, and food remnants from bazaar purchases.

Across the nine participating student-rented houses (a total of 35 students), the average food waste generation recorded during the study period was 4.88 kg/day in total, or 0.98 kg/household/day. When adjusted for household size, this equates to approximately 0.25 kg/person/day. This per capita value is substantially lower than reported by Ghafar (2017) averages in other contexts (for example, urban households in Malaysia often record between 0.5 and 0.8 kg/person/day of food waste).

This finding indicates that food waste generation in single-student households is relatively low, despite the common perception of excessive waste during Ramadan. Several factors also contribute to this outcome: students generally have limited financial resources, and most of them tend to buy ready-prepared food (from Bazar Ramdahan) in controlled portions rather than cooking in large quantities. Accoding to Mganga et al., (2021), awareness of the economic impact encouraged them to act, highlighting the role of financial factors in shaping behavior (Mganga et al., 2021). As a result, the potential for excessive leftovers is reduced.

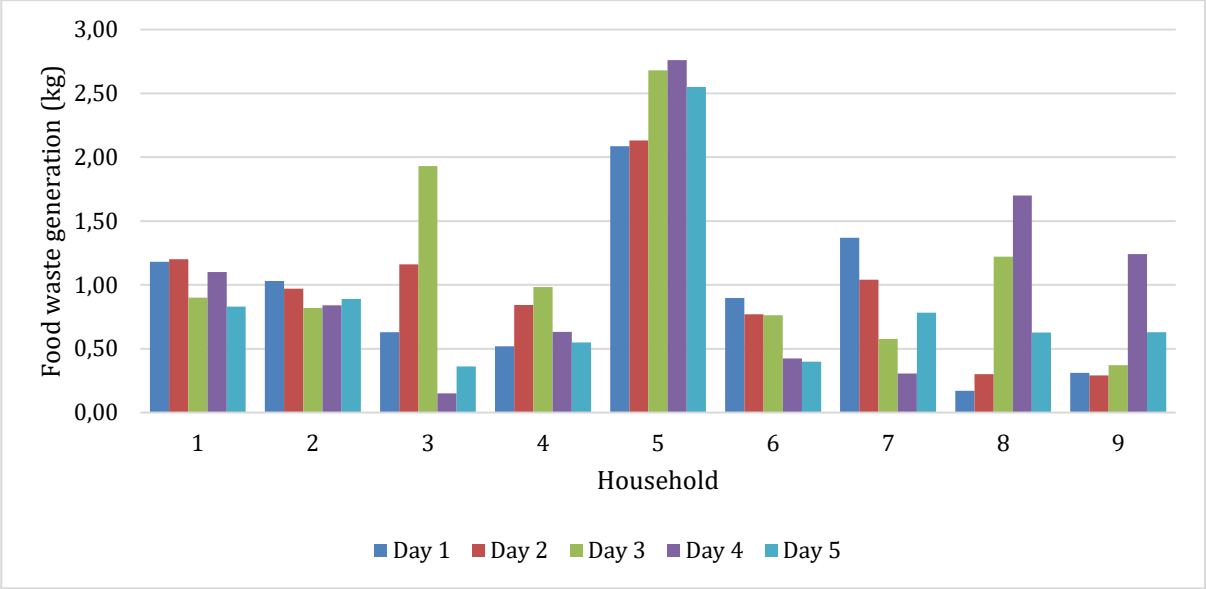

Figure 2 *Breakdown of food waste generation across households.*

Figure 2 illustrates the breakdown of food waste generation across households. Household 5 consistently produced the highest amounts, averaging more than to 2 kg per day, which can be explained by the larger household size of six members. In contrast, Household 8, despite having only two members, generated more waste on certain days compared to Households 6 and 7, each with four members. This variation may be attributed to factors such as over-preparation or excessive purchasing of food for *iftar*. Previous studies show that impulsive shopping, especially off-list or promotion-driven, increases food waste (Zainal & Hassan, 2019).

Conversely, lower values could indicate that some household members frequently break their fast outside the home, thereby reducing the amount of food waste generated domestically. Overall, no uniform trend in food waste generation was observed across households, highlighting the strong influence of behavioral and situational factors—a matter which will be further elaborated in the following subtopic.

Temporal Variation

Figure 3 illustrates that House 5 consistently recorded the highest daily food waste across the five-day period, ranging between 2.1 and 2.7 kg/day, as discussed earlier. In contrast, House 8 exhibited sharp fluctuations on Days 3 and 4, while the remaining households displayed irregular patterns without a consistent daily trend. Such variations highlight that food waste generation is highly dependent on human behavior and cultural practices (Galli et al., 2019). In the context of Ramadan, distinctive eating patterns (*iftar* and *sahoor*) have a major influence on determining these waste levels. Overall, the results underscore the erratic nature of food waste.

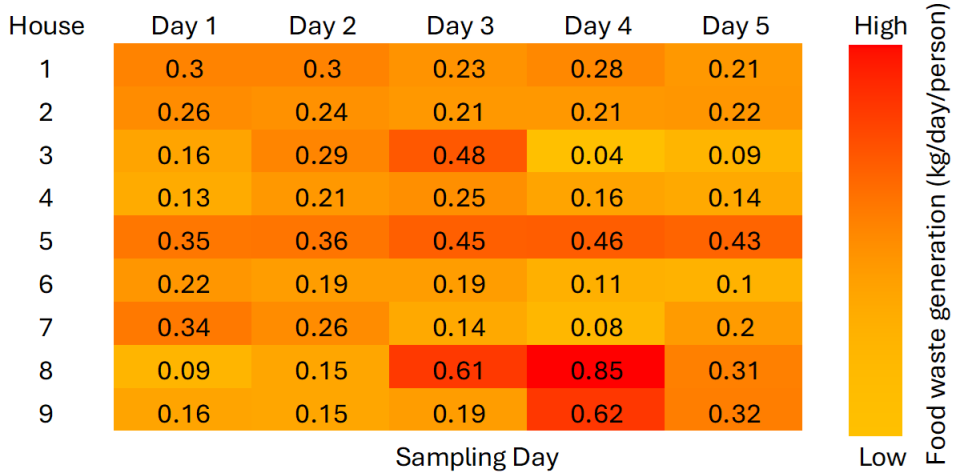

Figure 3 *Heatmap of daily food waste generation (per capita) across households.*

Economic and Behavioral Implications

Table 1 *Estimation food portion and prices*

Category	Example items	Avg. portion (g)	Price (RM)
Main dish	Nasi ayam / roti john / murtabak	400–500 g	6–8
Side/snack	Kuih-muih / karipap	150–200 g	3–5
Total	—	**550–700 g**	**9–13**

The average daily food intake per person in this study was estimated at 0.65 kg/day, derived from typical food purchasing and consumption patterns during Ramadan. Based on Table 1, a single meal usually consists of a main dish such as *nasi ayam*, *roti john*, or *murtabak* (≈ 400–500 g), accompanied by side items like *kuih-muih*, *karipap*, or satay (≈ 150–200 g). This results in an average portion size of 550–700 g per person per meal, equivalent to 0.55–0.70 kg. For simplicity and consistency in calculation, the mid-value of 0.65 kg was adopted as the representative average food portion consumed daily by each individual.

This benchmark value was then used to estimate the proportion of food wasted relative to the amount of food prepared or purchased, providing a standardized basis for comparison across households.

Table 2 *Per capita food waste (kg/day) and percentage of food waste**

Household	Food waste per capita (kg/day)	Percentage food waste (%)
1	0.26	41.60%
2	0.23	36.80%
3	0.21	33.60%
4	0.18	28.80%
5	0.41	65.60%
6	0.16	25.60%
7	0.2	32.00%

8	0.4	64.00%
9	0.19	30.40%
Average	**0.25**	**40.00%**

** Calculation based on an estimated average meal intake of 0.65 kg/person/day*

The analysis revealed that, on average, 40% of the food prepared in households was discarded. This result aligns with previous findings by Goodwin and Lipinski, 2004, which reported that 30–40% of prepared food typically ends up as waste. In this pilot study, individual household waste levels ranged from 25.6% to as high as 65.6%. For instance, Households 5 and 8 generated the highest per capita food waste, discarding more than 0.40 kg/day—equivalent to nearly two-thirds of the food prepared. These findings indicate that, while the overall conversion rate of prepared food into waste falls within a common range, certain households reflect ongoing economic inefficiencies, such as over-purchasing or excessive preparation.

From a management perspective, no evidence of sustainable practices was observed. Students mainly managed their food waste through disposal bins, reflecting the common practice in Malaysia where food waste is generally treated as part of municipal solid waste (Kamaruddin et al., 2020; Tumiran, 2022). It is consistent with (Hashim et al., 2021), who reported that in Malaysia about 80% of food waste ends up in landfills. There was no indication that sustainable approaches like composting and donation were utilized for waste reduction. However, some students reported using refrigerators to temporarily store excess food as a means of minimizing immediate waste.

Conclusion

This pilot study found that students in rented houses generated 0.25 kg/person/day of food waste during Ramadan, lower than typical urban household averages. Despite the small volume, about 40% of purchased or prepared food was discarded, with some households wasting up to 65%. Waste levels varied widely, influenced by household size, eating habits, and purchasing behavior, with no clear daily trend. The dual-meal pattern of Ramadan (iftar and sahoor) further shaped waste fluctuations. Sustainable practices were minimal, as students mainly relied on disposal bins, with only limited short-term storage in refrigerators. Overall, while total waste was modest, the high share of edible food discarded points to the need for better awareness and behavior change to reduce waste and financial loss.

Future research should focus on food waste at Ramadan bazaars, where overproduction and overbuying are common. Practical steps include portion control, pre-order systems, and better packaging or storage. Awareness campaigns and pilot waste segregation initiatives can also help reduce edible food loss and its economic impact.

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