

## Navigating Towards Sustainable Development: Determinant and Prevention Strategies for Household Food Waste in Malaysia

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### ABSTRACT

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The amount of food discarded by Malaysian households is substantial, to a great extent, avoidable. Minimizing food waste at the household level, therefore, plays a crucial part in the food chain responsibility. The little review has considered the effectiveness of interventions aimed at preventing food waste on itinerary stages of the food system. This significant gap, if filled, could help support those looking at reducing food waste in the developing world, providing knowledge of what interventions are specifically effective at preventing food waste. By using an extensive literature review, this paper clarified factors influencing food waste generation based on itinerary stages. This paper outlines five antecedents and recommendations for food waste reduction at the household level by using four strategies including sharing extra food and cooking, planned purchase schedule, skills on storing fresh food, and understanding family preferences which eventually can contribute to sustainable development goals. The integrated strategies are fruitful in improving household food waste management and preventing food waste generation as well as remedying existing policy gaps in Malaysia.

**Contribution/Originality:** This study adds to the body of knowledge and helps us to identify the antecedents of food waste as well as address specific intervention strategies for behaviors requiring change among the households. Besides, this study opens up opportunities for further exploration and research growth in the area, especially for developing nations like Malaysia.

## 1. Introduction

The food industry is not only one of the largest industries around the world, but the sector often provides a major contribution to the national economy. An Increased in the world population is leading to a shrill increase in the food production demand in the future. According to [Boliko \(2019\)](#) approximately one-third of food produced for human consumption is lost or wasted globally. Recent statistics from the [Food and Agricultural Organisation \(2020\)](#) suggest that more than 820m people are left without food worldwide. Hence growing political and public consensus around the insistence on these challenges has provided the impetus for governments, regions, cities, businesses, organizations, and citizens to react.

Generally, food that is produced for human consumption, but never consumed, comes with significant environmental, social, and economic impacts. Thus, food waste sources can be sorted into three groups which are food losses, i.e., food materials lost during preparation, processing, and production phases in the food supply chain, unavoidable food waste, i.e., the inedible parts of food materials lost during consumption phase (pineapple peel, fruit core, etc.) and avoidable food waste, i.e., the edible food materials that were lost during consumption phase (surplus and wastage) ([Thi et al., 2015](#)). In addition to its socio-economic implications, food waste also constitutes a significant environmental threat ([Redlingshofer et al., 2020](#)). Surprisingly in developed countries, the major contribution to food waste originates from households ([Quested et al., 2013](#)). Malaysia with an approximate population of 31 million has been undergoing rapid economic development over the past few decades. Even though the level of food security in Malaysia is still at an acceptable level, the habit of wasting food among its citizens has become an important issue to be addressed in the country. Based on the Food Aid Foundation (Food Aid) it is reported that in 2016, approximately 3,000 tonnes out of 15,000 tonnes of wasted food in Malaysia are edible and should not be dumped. The quantity usually increases by 15% to 20% during festive seasons. It is also found that Malaysians have generated 16,688 tonnes of food waste per day which is enough to feed 2.2 million people for three-time meals per day ([Saalah et al., 2020](#)).

There are few studies on the topic of food waste, and it is associated with consumer behavior but remains neglected and failed to present a broader view of the problem ([Evans, 2012](#)). Human behaviors influence food waste in various aspects of food's journey into and through the home. For example, planning, shopping, storage, preparation, and consumption of food. This paper, therefore, identifies major antecedents and outlines a few prevention strategies to reduce food waste generation at the household level.

## 2. Defining Food waste

Food waste is not only considered the trash that is produced or accumulated by individuals during or after meals. There are many more things that can be considered food waste, namely leftovers or rejected food items. As reiterated by [Lusk and Ellison \(2017\)](#), food waste refers to suitable food that is thrown away or uneaten, whether or not kept beyond its expiry date or left to ruin. Food waste is also defined as surplus food, foods left to go rotten along with edible portions, and foods that are for various reasons for discarded ([Bernstad, 2014](#); [Stenmarck et al., 2011](#); [Hanssen et al., 2016](#)).

Food waste is considered a never-ending story since this issue had received increasing public attention over the last decade. This problem was discussed at both local and global levels due to its associated economic and environmental burden. [Morone et al. \(2019\)](#) mentioned that extreme waste production may result in over-dumping in landfills bringing a negative impact on global climate change and causing environmental challenges. Food waste that ends up in landfill causes a big problem as it increases greenhouse gas emissions and contributes to global warming ([Papargyropoulou et al., 2014](#); [FAO, 2014](#)). At the same time, it also puts stress on the environment because it uses valuable resources like land, water, fertilizers, labor, and transportation ([Liu et al., 2007](#); [Ng et al., 2017](#); [Chen et al., 2021](#)). As claimed by various scholars, excessive food production leads to the over-utilization of natural resources, including land, water, and fossil fuels. The research done by Solid Waste Management and Public Cleansing Corporation (SWCorp) made available to The Star dated 6 June 2022 reported that there are 38,219 tonnes of solid waste generated in Malaysia every day in the year 2021. Every day, Malaysians dumped 4,081 tonnes of edible food which is enough to fill one-and-a-half Olympic-sized swimming pools. The findings figures are terrifying and proactive actions should be taken to curb the problems.

Significantly food waste can occur before the food even reaches the retail and consumer levels from weather issues, processing problems, storage issues, transportation difficulties, and overproduction. [Mirabella et al. \(2014\)](#) highlighted that food waste occurs at all stages of the food supply chain activities from farming, manufacturing, processing, and retail as well to household consumption. Existing literature on the main motivations that affect food waste is narrow and uneven. Therefore, it seems to focus on single or few variables, sometimes assuming behavioral and socio-demographic perspectives contribute to food waste. Factors that influence food behaviors include social patterns, manners, cultural background, skills, practice, knowledge, and tolerance of food ([Ganglbauer et.al., 2013](#)). Other reasons for discarding food were also due to the food product being spoiled, burnt, dropped on the floor, or dumped for some other reason such as past its expiration date and no longer using it ([Ilakovac et al., 2020](#)). However, our empirical study found the behavior of food waste comes from overpreparing, overbuying, improper storage, health concern, and avoidance of leftovers.

### 3. Antecedents of Food Waste

[Audet and Brisebois \(2019\)](#) assert that food waste can be reduced when all stages from production to consumption equally accept their responsibility. This paper analyses the major antecedents and consequences of food loss and waste among the household sectors. Five broad categories are developed by compiling all antecedents namely overpreparing, overbuying, improper storage, health concern, and avoidance of leftover.

#### 3.1. Overpreparing

Household food-related routines may influence the amount of food waste. Frequently, if one prepares too much food than is needed, then it's obviously excess food on the plate that may result in throwing it into the rubbish bin. [Apolonio \(2020\)](#) studies found that households cook in large quantities so that their family is able to have enough food even for the next meal and the food is sufficient enough for their kids to eat more. Most of the time, this scenario does happen in Malaysian culture because the mother does prefer to cook a lot at one time and then just reheat the food for the next meal especially when

they have a large crowd at home. They also believe this is one way of minimizing costs but end up it is more waste as compared to preparing in a small quantity (Porpino et.al., 2016). According to Wang et al. (2017), Chinese culture believed that if there is no excess food meal prepared means that the host did not enough entertain the guest that ending up will cause food leftover. The food prepared in large quantities will normally go through a process of reheating especially when served for the next meal.

It is a normal practice that once one prepares excess food, they may use a bigger plate and bowl for serving. As supported by Wansink et al. (2014) the tendency for food waste is higher when using large over-serving to serve the food. We often perceived that overpreparing may result in overcooking and cause waste, however, studies were done by Graham-Howe et al. (2014) found that it is acceptable of the importance of richness and good provider identity. We usually see that a caring and good mother's identity is to cook as much desired food. It also applies to those who cook for special events such as wedding receptions, etc. They want the guest to be fully served with sufficient food and the host to be proud as a provider identity to the food served. One could accidentally spoil the food at a high temperature while cooking. As quoted by Parizeau et al. (2015) and Parfitt et al. (2010) food damage during cooking such as burning is also related to over-preparation.

### 3.2. Overbuying

According to Ankiel and Samotyja (2021), the results of consumer opinions on the reasons for throwing out food are showed that food in households is wasted mainly due to poorly planned purchases, which means that consumers buy products that are unnecessary. Given the fact that during the purchasing process, consumers have the impression that their needs are much greater than they truly are, which also leads to buying excessive amounts of products. Another reason for wasting food is buying food products "just in case" (often for fear of a price increase in an era of inflation or a shortage of products, which was observable in the initial period of the Covid-19 pandemic). In addition, consumers indicated that the cause of food wastage is the purchase of large-packaged products (which seems to be more profitable) and considered that food is wasted because it is normal for consumers not to consume all the products purchased.

Irresponsible shopping behavior and the lack of shopping lists create the optimal conditions for the food waste phenomenon within households by over-provisioning and high sensitivity to marketing offers and campaigns (Pearson et al., 2013). Household food waste prevention begins with shopping behaviour (Bravi, 2019; Ostergaard et al., 2018), whereby consumers tend to be influenced by many incentives such as special offers and several psychological traps. Stefan et al. (2013) and Stancu et al. (2016) found that shopping and planning routines directly affect the degree of household food waste. Previous studies have identified the stages of food management strategies as food procurement, storage, preparation, supply, consumption, and waste disposal. Overprovisioning of food seems to be one of the most prominent reasons leading to superfluous food (Evans, 2012; Mallinson et al., 2016; Radzyminska et al., 2016). Identified reasons for overprovisioning include (i) the good provider identity, (ii) differences in taste, (iii) the compensation effect, (iv) time constraints, (v) bulk purchases, and (vi) oversized packaging. Overprovisioning of food is also connected to the perceived availability of time. Stockpiling food for unexpected occasions is seen to reduce stress and save time but could lead to buying more products than one can

consume in a timely manner (Ganglbauer et al., 2013; Graham-Rowe et al., 2014). Additionally, a perceived lack of time may prevent one from cooking planned meals for which ingredients have already been bought (Ganglbauer et al., 2013; Watson and Meah, 2012).

### 3.3. Improper Storage

Common food management errors that cause food waste include wrong (or too long) storage, lack of planning food provisioning, overstock of meals and food, misplanning of meals, improper cooking, and cooking too much (Khalid et al., 2019; Herzberg et al., 2020). All of these errors are related to household food storing and cooking routines. Proper household food storing not only maintains the quality of food items, but it also helps family members find places for their desired food items, prevent overpurchasing of food, and understand expiration dates of stored food (Farr-Wharton et al., 2014). Therefore, systematically categorizing and storing food products can prevent food waste (Parizeau et al., 2015). Other causes of household food waste reported in another study by Ponis et al. (2017) include errors in food management (e.g., improper storage, poor cooking skills, bad expiration date monitoring) and food portioning (food not served but discarded, food was scraped from plate).

Parizeau et al. (2015) noted that moral norms could affect food storage and cooking behaviors. People with low moral norms are less concerned about social and environmental impacts from food waste when they practice food storage and cooking and are less likely to make efforts to prevent food waste (Parizeau et al., 2015). Individuals have more motivation to perform a certain behavior when they have better control of the specific behavior (Ajzen, I., 1991). Therefore, when people have high confidence that they can control the quality of their food and healthy cooking, they make efforts on proper food storage and cooking, resulting in the decrease of household food waste. Third, health-conscious consumers may make efforts to reduce food waste due to their high pro-environmental awareness (Parizeau et al., 2015). Besides, health-conscious consumers may be highly concerned about household food storage and cooking routines because they want to ensure food safety and prevent the risk of foodborne disease (Byrd-Bredbenner, 2007).

Roodhuyzen et al. (2017) recently reviewed drivers of household food waste and categorised these as behavioural factors, personal skills, psychological factors, product factors, and societal factors. Concerning behavioural factors, a range of storage practices has an important impact on food waste generation and prevention (Stancu et al., 2022). Studies focusing on consumer household storage behavior highlight that many consumers keep a stock of potentially never used items that were bought for a special recipe or for a special occasion that has never occurred. Consumers have at least some knowledge on how to manage food in their households, but they often do not act in line with their knowledge in terms of the way consumers handle foods often differs between food categories, not necessarily according to what would be the right handling for the best preservation of the food (Terpstra et al., 2005). Consumer practices are also mediated, enabled, and constrained by material infrastructures (Shove et al., 2012). Within the physical structure of the home, the space available for storing food may determine how much food is wasted (Van Holsteijn & Kemna, 2018). Farr-Wharton et al. (2014) argue that storage is the most critical practice to address when aiming for food waste reduction, and that consumers should be enabled to organize food storage better to allow for easier location of food items. Refrigerators and freezers play an important

part in the modern household, enabling convenience, freshness, and food safety (care) (Waite & Phillips, 2016). Changing practices related to incorrect storage and wasting food after an arbitrary time-period, as well as correct use of fridges/freezers and packaging will prolong the lifespan of food (Brown & Evans, 2013).

### 3.4. Health Concern

Healthy food consumption is another expression of healthy lifestyle which lead to the food waste. Visschers et al. (2016) asserts that health concern is responsible for waste of perishable foods such as meat, fish, or dairy products. They also claim that adults who prefer to eat protein and dairy products, are aware that production of animal protein requires higher amounts of resources. The psychological concern about eating leftovers (for health reasons) can also generate food waste (Graham-Rowe et al., 2014). In fact, according to Conrad et al. (2018), following a healthy diet full of fresh produce can lead to more food waste. In the same vein, the consequences of protecting the health of oneself and others are crucial by avoiding potentially risky foods (e.g., Graham-Rowe et al., 2014; Visschers et al., 2016; Watson & Meah, 2012). Precisely, such conflicting goals take the form of concerns over possible health risks, in the sense that despite being troubled by the idea of wasting food individuals consider the avoidance of the perceived health risks associated with consuming leftovers, or products past their expiry dates (Aschemann-Witzel et al., 2015; Graham-Rowe et al., 2014; Hebrok & Boks, 2017; Schanes et al., 2018; Visschers et al., 2016; Watson & Meah, 2012). This preference towards avoiding health risks can reach the point where individuals are even disgusted by the idea of consuming such foods (Aschemann-Witzel et al., 2015). Farr-Wharton et al. (2014) stated that edibility of ingredients and the goal of avoiding the potential inconveniences associated with foodborne illness (Watson & Meah, 2012) conflict with individuals' negative attitudes toward food waste (e.g., Aschemann-Witzel et al., 2015; Farr-Wharton et al., 2014; Visschers et al., 2016; Watson & Meah, 2012) and habitually lead to the premature disposal of food (Aschemann-Witzel et al., 2015; Farr-Wharton et al., 2014; Graham-Rowe et al., 2014). Evidence from prior research also suggest this goal to be particularly relevant for consumers who had negative experiences with food in the past (FarrWharton et al., 2014), while in certain circumstances can even avert individuals to share food or to accept leftovers from other people (Lazell, 2016).

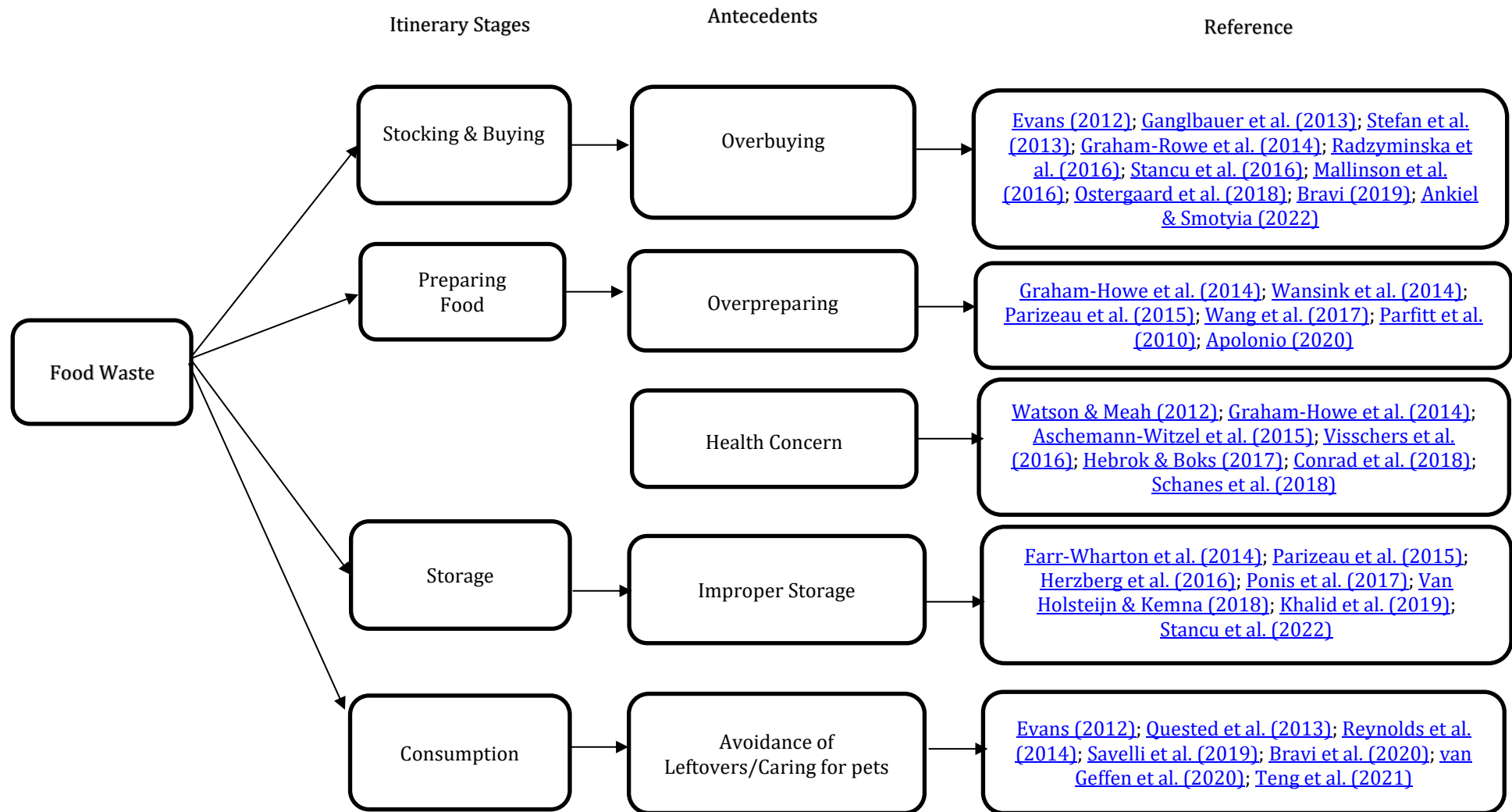
### 3.5. Avoidance of Leftovers/Caring for Pets

Many young consumers are having a difficulty on how to keep and recycle uneaten foods such as ingredients and meals due to their lack of experience in cooking (Bravi et al., 2020; Evans, 2012; Quested et al., 2013). Leftover foods were being disposed because of the food safety reasons such as being unconvinced either foods are still good or bad to eat (Nikolaus et al., 2018). Consumers who are keep an eye on the healthy lifestyles, tend to throw away of the leftover food due to several reasons such as leftover foods to be less nutritious, maybe will lead to weight gain, and might have negative impacts on health (Savelli et al., 2019; van Geffen et al., 2020). As reiterated by Evans (2012), not all families are willing to reheat food that was prepared for a previous meal due to its tastes, looks, bad smells, and even passed the expiration dates even the food stored in the fridge. Finally, all the excess ends up in the bin slowly. Furthermore, Reynolds et al. (2014) discovered which are home composting, feeding to pets, sewer disposal, donating to charity and throwing away as the foremost food waste dumping routes among Australian households. It is supported by Teng et al. (2021), which according to the study in Taiwan, the majority of respondents consider that kitchen waste can be

reprocessed as feed for pigs or organic fertilizer for crops while not aware of the consequent treatment of kitchen waste stances threat to the environment and human health.

**Figure 1** represents an integrated framework to have better understanding on the food waste phenomenon by formulating two major sets of dimensions such as different stages where the food waste took place and the major antecedents of that waste. This framework can serve as a reference for future research to establish more specific relationship between dependent variables waste and its antecedents. A small change of a behavior in this segment has a considerable impact on society especially among the lower-middle income families to save money at the initial phase from shopping, preparing food and consumption.

Figure 1: An Integrated Framework of Household Food Waste: Itinerary Stages and Antecedents Identified in Literature



#### 4. Prevention Strategies to Reduce Food Waste

This paper offers prevention strategies based on five dominant antecedents behind food waste to inform and educate households. Given the fact that the households unable to change the consequences unless they change antecedents, the proposed strategies, therefore, address the antecedents behind clean food consumption from research and practical perspectives.

##### 4.1. Sharing Additional Food and Co-procurement and Cooking

One of the ways to reduce food waste is by sharing the food with others. It is supported by [do Carmo and De Barcellos \(2018\)](#) as they claimed that food exchange between households and rearrangement of additional food are also substitutions to reduce food waste. In Malaysian culture, especially among Muslims, they really emphasize the activities of sharing and exchanging food, especially during Ramadan. The mother will cook extra, and they will share food with their neighbor so that both parties will get *barakah* and *pahala* during the holy month. In fact, in Muslim culture, this activity of food sharing has become part of their current practice and built up a great relationship among them. To Muslims, another way of sharing food is using a tray as it is the Sunnah of Prophet Muhammad PBUH.

Food sharing has recently caused great interest among analysts, scholars, and organizations, as there were increasing numbers, showing up across Europe and the US ([Morone et al., 2018](#)). Rationally, food sharing is a good way that leads to food waste reduction and benefits the environment, household savings, and important bodies. However, as mentioned by [Schanes and Stagl \(2019\)](#) although food sharing is often discussed as a possibly transformative method for a less wasteful food system, empirical studies are still rare and only a few researchers have yet examined the motivations of food sharing practitioners. The co-procurement means the activities of buying bulk quantities of groceries together and being shared by relatives, friends, or regional group shopping groups. This method not only shares purchasing quantity but also allows households to enjoy special prices for large quantities of stuff. While co-cooking means the activities of cooking and sharing meals together with someone who lives nearby and is mainly practiced by small-size households within the range of four members or less ([Teng et al., 2021](#)). This plan may benefit the households by not only reducing food expenses but also the time pressure in preparing the food and solving the food waste problem. The communities will enjoy their meal together and tighten their harmonious relationship as well. Studies by [Teng et al. \(2021\)](#) found that families in Taipei will cook and share dinner meals since some parents cannot prepare dinner on time after work hours.

##### 4.2. Purchase Plan Schedule & Proper Storage Technique

Systematically storing and categorizing food products (e.g., systematic stacking of newer and older foods, or according to frequency of use) in combination with periodic re-ordering can lower food waste generation ([Farr-Wharton et al., 2014](#), [Waitt & Phillips, 2016](#)). During processes of ordering and disposal, food items can be re-examined, re-

experienced, and re-valued, for example, to be used for a meal, replaced within the place of storage, or moved out of it (Waite & Phillips, 2016). Thus, ordering practices can enhance visibility and prevent forgetting food that is hidden in the back of the refrigerator or cupboard. Space constraints in the fridge in combination with a lack of knowledge about where to best locate certain types of foods often hinder systematic storage. Indeed, a majority of consumers fail to use storing strategies to increase food longevity in their households (Farr-Wharton et al., 2014) and have their fridges set to a higher temperature than recommended which can accelerate the decay of food products (Marklinder & Eriksson, 2015; Terpstra et al., 2005).

Another strategy to prevent food going to waste is the freezing of food, thereby extending the shelf-life of food and leftovers (Martindale, 2014; Quested et al., 2013; Secondi et al., 2015). The strategy's actual potential is not fully realised by households yet (Leray et al., 2016). Visschers et al. (2016) have not found a direct relation between knowledge about storage and amount of food wasted. Knowledge about proper storage may, however, have indirect effects on intention and food waste behaviour through other variables, such as personal attitudes and perceived behavioural control.

### 4.3. Skills to Keep Food Fresh and Longer

One dimension is packaging's potential to reduce household food waste (Williams et al., 2020; Williams et al., 2012; Wikström et al., 2019) thus understanding its effects are necessary for appropriate packaging solutions to be implemented. An exploratory study by Williams et al. (2012) suggested packaging components relative to food waste: (1) large sized and difficult-to-empty packages; (2) passed "best before date." Findings of their study reveal that around 25% of food waste was brought by big-sized packaging and best-before date label such. Some participants, however, were more conscious of food packaging and these are individuals with high environmental consciousness. They waste less food and recognize its role in food waste reduction (Williams et al., 2012). Hannon (2020) stated that primary packaging typically has the greatest impact on reduction food waste occurring along the value chain and in households. This primary packaging summarizes the food consumers encounter when shopping for groceries, to then take home and interact with as part of their regular food routines (Plumb et al., 2013; Quested et al., 2013). This means that opportunities to engage with packaging align to the contexts of food shopping, storage, preparation and eating during which consumer decisions and behaviours can influence household food waste (Dobernig et al., 2019; Ghinea et al., 2019; Hebrok et al., 2019; Quested et al., 2013). This shows that primary packaging is therefore crucial as an integrated intervention to help households minimize food waste. Verghese et al. (2015) and Lindh et al. (2016) agreed that many functions of packaging can be sorted into the categories of containment, protection, communication, and convenience. Lindh et al. (2016) identified 19 packaging features that indirectly contribute to sustainable development, of which 13 can help reduce product waste. This demonstrates the value of packaging as a tool to help fight food waste.

In a Norwegian study, 15% of the consumers said that packaging is an important cause for food waste, and 30% of the consumers stated that the too large packages are one important cause for food waste (Fredriksen et al., 2010). Some studies focusing on consumer household storage behavior highlight that many consumers keep a stock of potentially never used items that were bought for a special recipe or for a special occasion that has never occurred. These items are at some point thrown out (Wansink et

al., 2000). Consumers have at least some knowledge on how to manage food in their households, but they often do not act in line with their knowledge. For instance, they maintain the refrigerator temperature usually too high, store vegetables incorrectly, keep leftovers for too long and use date labelling to assess disposal even if it no longer applies after opening. Moreover, the way consumers handle foods often differs between food categories, not necessarily according to what would be the right handling for the best preservation of the food (Terpstra et al., 2005).

#### 4.4. Understanding Family Preferences and Leftovers Management

Romani et al. (2018) stated that, food preparation skills have a huge influence on potential food waste produced through leftovers. Food management skills that livelihood in reducing food subsequently being wasted such as need to know the right portion sizes to cook, think about on how to recycle leftover ingredients and leftover components of prepared meals, also the precise serving amount which will be eaten onto plates (Nabi et al., 2021; Van Dooren, 2019; Van Dooren et al., 2020). There are some potential reasons why by cooking at home leads to lower food waste is because through cooking at home, it can evolve cooking skills, be more efficient cook, know how to use of leftover, have a better estimation of how much food to cook and raise the awareness regarding of expiration dates of food stocks (Kubíčková et al., 2021; Pires et al., 2021). Aside from cooking skills, other skills which is related to dispose of leftover food such as the aptitude to use the senses to distinguish whether foods are safe to eat or not, and do not have any knowledge regarding of food date labels such as the 'best before' and 'use by' system operating in many countries including Australia (Nabi et al., 2021; van Dooren, 2019; van Geffen et al., 2020). Based on study by Pires et al. (2021), discovered that by using leftover foods was the most significant reason of food waste lessening and 25% of the respondents recycled leftover foods during the pandemic by developing creative recipes. People are improving their usage of leftover foods by cooking a new recipe and also to feed their poultry in the countryside and pets in cities (Vidal-Mones et al., 2021). By having a great awareness and time to reuse leftover might be cause of the higher usage of leftovers (Filimonau et al., 2022; Laila et al., 2022).

In order to reduce of having leftovers, household food providers would buy, prepare and cooked food properly based on their family member's food preferences (Teng et al., 2021). Laila et al. (2022) said, many parents talk about that their children frequently brought back some of the food that they took to school for lunch. However, during lockdown due to pandemic, the awareness of children food likings was boosted, and it leads to a decreasing in food waste. With the aim of reducing food waste, a plan such as recycle leftover foods are acceptable to family members and skills to manage the leftover management have become a vital for household food providers (Cappellini et al., 2012).

Table 1 represents the methods applied based on the five dominant antecedents behind food waste as well as the sources.

Table 1: Major Antecedents and Prevention Strategies

Reference	Strategy	Antecedents
Morone et al. (2018); do Carmo & Da Barcellos (2018); Schanes & Stagl (2019); Teng et al. (2021)	Sharing additional food and co-procurement and cooking	Overpreparing

Terpstra et al. (2005); Quested et al. (2013); Martindale (2014); Farr-Wharton et al. (2014); Secondi et al. (2015); Marklinder & Eriksson (2015); Waitt & Phillips (2016)	Planned purchase schedule & proper storage technique	Overbuying & Improper storage
Williams et al. (2012); Dobernig et al. (2019); Ghinea et al. (2019); Hebrok et al. (2019); Wikström et al. (2019); Williams et al. (2020)	Skills to keep food fresh and longer	Health concern
Cappellini et al. (2012); Romani et al. (2018); Filimonau et al. (2021); Laila et al. (2022); Pires et al. (2021); Vidal-Mones et al. (2021)	Understanding family preferences and leftovers management	Avoidance of leftovers/Caring for pets

## 5. Conclusion

By meeting the Sustainable Development Goals (SDGs) Target 12.3, reducing food waste is becoming a global concern. Not only boosting food security but meeting the ambitious target will improve livelihoods and address more global problems such as climate change, pollution, and biodiversity loss. In fact, curbing food waste is both a target in itself and a means of achieving other SDGs. There are several methods that have been widely applied in developing countries to fix food waste issues at the household level. Therefore, this paper offers four recommendations based on the major antecedents identified in the literature. Carrying out this study represents a vital step in the development of successful interventions on food waste among households.

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