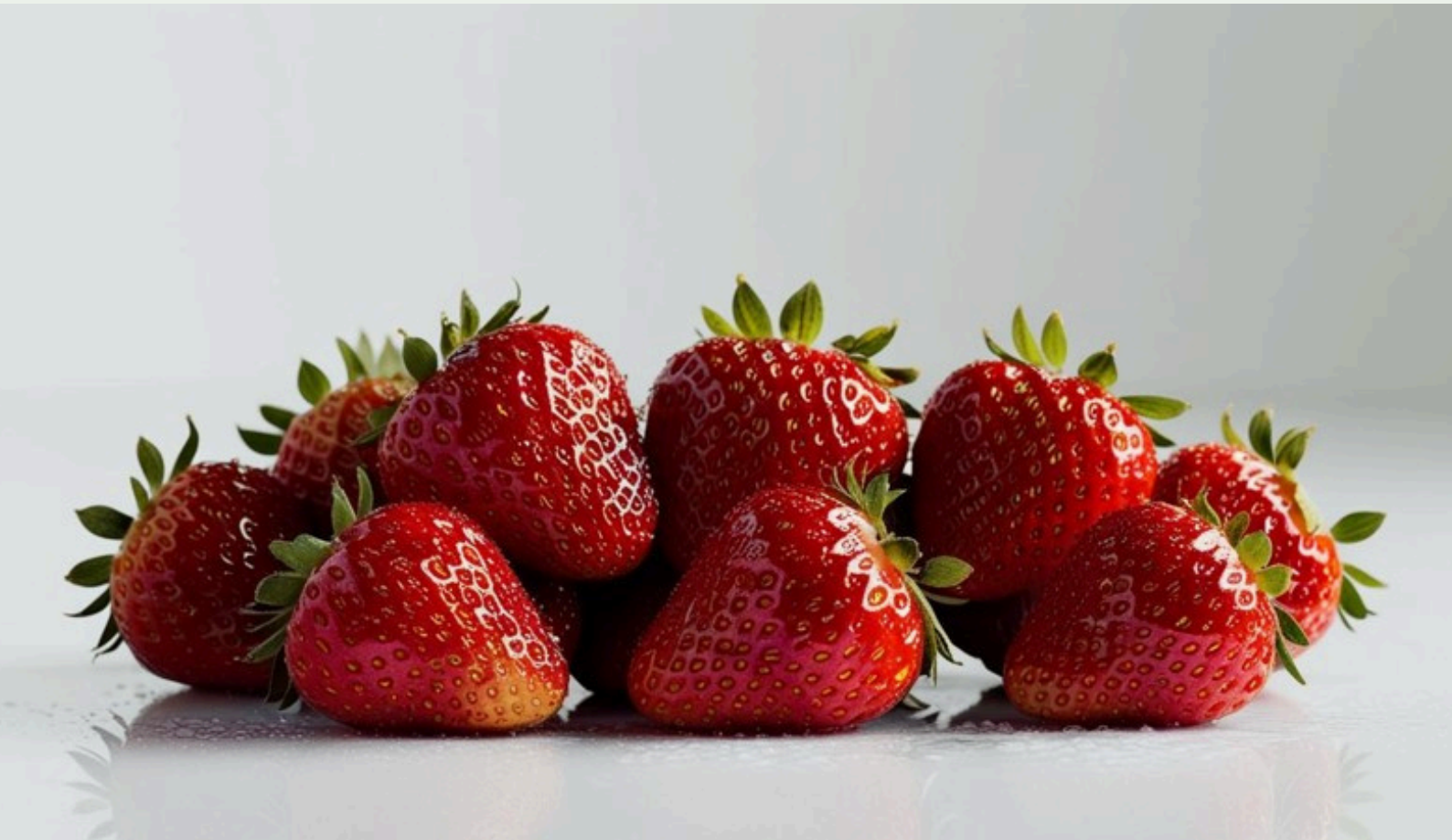
Zero WASTE

AWARENESS FOR THE REDUCTION OF FOOD WASTE

MODULE 2B: KNOWLEDGE

Sales and consumption aspects and their relationship to food waste



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General information. Module 2B KNOWLEDGE

Title:
Sales and consumption aspects and their relationship to food waste

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Duration:
6 hours – The duration of this module is four hours of the lesson and two hours the practice of the exercises.

Introduction:
This module describes different factors related to consumer behaviour that influence food waste. First, it is established that the concept of food waste is related to the latest stages of the Food Supply Chain (FSC) and it is generally associated to retailers and consumer's behavioural issues. The main sections of the chapter address consumer behaviours that influence food waste at household level, factors that determine food waste away from home, and finally the types of waste that occur in the distribution and sale of food.

Understanding consumers' attitudes, values and behaviours towards food would contribute to find the underlying motivations and behaviours of food wastage. That knowledge can help policymakers or social marketers in finding effective solutions and initiatives against it.

Learning outcomes
On successful completion of Module 2B participants should be able to…

Knowledge
- Understand consumer motivations and behaviours that lead to food waste in the household.
- Know the factors that influence food waste in extra-domestic consumption.
- Recognize the types of waste that occur at distribution level and business strategies that can cause the most waste.

Technical skills
- To recognize all those psychological factors, lifestyles, habits and socio-demographic variables that determine food wasting behaviour both at household level and away from home.
- To adopt a more critical attitude towards commercial distribution practices that lead to greater food waste.

Soft skills
- Increasing consumer awareness of the serious problem of food waste
- To reflect on how our individual behaviour can be part of the solution.

Main contents

1.| Waste or loss, where consumer can make a difference?

Food losses and waste represent a severe issue that is compromising our planet's sustainability. Every year over one-third (around 1,300 million tons per year) of global food production get lost or wasted along the food supply chain (FSC) causing economic, environmental and social impacts (Gustavsson et al., 2011, p.56 cited by UNEP, 2021). Reducing these losses could bring important benefits for all:

- it could save money for farmers, companies and people
- it could alleviate hunger, save water and land
- it could reduce the global greenhouse gases emissions and consequently climate change impacts.

Europe generate around 14% of these losses, what means almost 90 million tons of food that have an approximate value of 143.000 million euros. Looking at the absolute numbers, the countries with a larger wastage compared to those around them are United Kingdom, Germany, The Netherlands, France, Poland, Spain and Italy (Lorenzo, 2020).

Due to the importance and magnitude of the phenomenon, the reduction of food losses and waste has been included within the 17 Sustainable Development Goals (SDGs) promoted by the UN for the Agenda 2030 with the aims of ending poverty, protecting the planet and to ensure wealth for all. In particular, the SDG 12-Ensure sustainable consumption and production patterns, includes the food waste issue in its third target: "by 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" (SDG 12.3, UN, 2015).

Figure 1. The 17 Sustainable Development Goals (SDGs).

European citizens throw away an average of 20% of the food they purchased (Lorenzo, 2020). Before explaining how consumers' behaviours influence food waste, it is necessary to distinguish between food losses and food waste

and stablish in which of them consumers can play a role. Up to this point, we have spoken of them indistinctly; however, they are not synonyms, although there is no unanimity in their definitions.

The FAO has proposed that food losses occurs during the first stages of the FSC, usually referring to the decrease in the food quantity or quality (pests and diseases, limited harvesting techniques, price volatility), which makes it unfit for human consumption. Food waste is related to the latest stages of the FSC and it is generally associated to retailers and consumer's behavioural issues (Griffin et al., 2009; Parfitt et al., 2010; Gustavsson et al., 2011). Some authors include the intentionality dimension to these definitions and refer to food loss as the accidental reduction in the quantity and quality of food before consumption whilst food waste is defined as the intentional discard of food suitable for human consumption (Santeramo, 2021). See Figure 2.

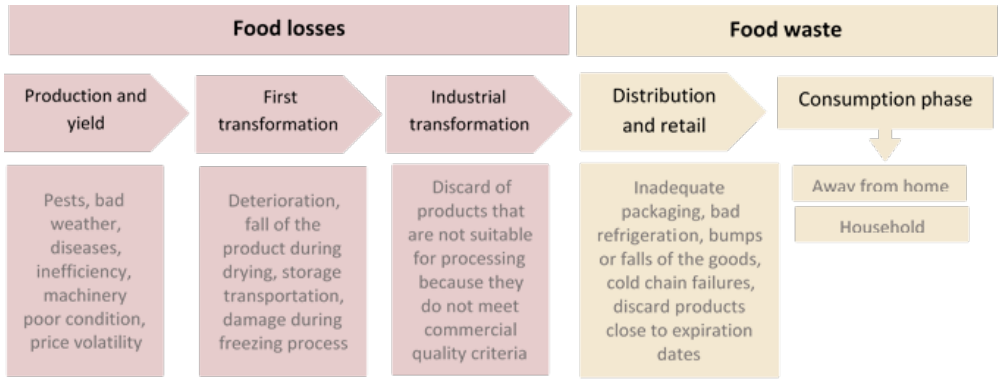

Figure 2. Stages of food losses and food waste and causes.
Source: own elaboration from Principato (2018); Cleva and Casares (2017).

Another FAO definition links food waste only to consumer level and food losses to any stage before the consumer level, regardless of the real underlying explanatory cause. This definition does not consider food waste as the losses that occur at retail and distribution level, but only focus on the food purchased by the consumer's within any type of store, restaurant, or catering service, and was not eaten.

The most recent classification by the United Nations in their report Food Waste Index (UNEP, 2021), make a distinction in their definition of "food waste" between food and the inedible parts removed from the human food supply chain at retail, food service and household levels. These inedible parts are supposed to end in the following destinations: landfill; controlled combustion; sewer; litter / discards / refuse; co / anaerobic digestion; compost / aerobic digestion; or land application. See definitions in Figure 3.

Definitions

- **Food waste**: appropriate food for human consumption discarded or left to spoil at retailer or consumer level -regardless of the cause.
- **Food losses**: a decrease of food, originally intended for human consumption, at all stages of the food chain prior to retailer and consumer level, regardless of the cause.
- **Food**: any substance –whether processed, semi-processed or raw – that is intended for human consumption. It includes drink, and any substance that has been used in the manufacture, preparation or treatment of food.
- Food waste includes:
    - Edible parts: parts of food that are intended for human consumption.
    - Inedible parts: components associated with food that are not intended to be consumed by humans. For example, bones, rinds and pits/stones.

We will focus on the food waste issue as defined by UNEP (2021) that consider food waste occurring at retail and consumption level, and is divided into household and away from home consumption (see Fig. 4).

The avoidable and possibly avoidable food waste, represent the largest amount in volume of food waste generated by household (WRAP, 2009b; WRAP, 2013a) and it is mainly caused by consumer's attitudes and behaviours (Parfitt et al., 2010; Principato et al., 2015).

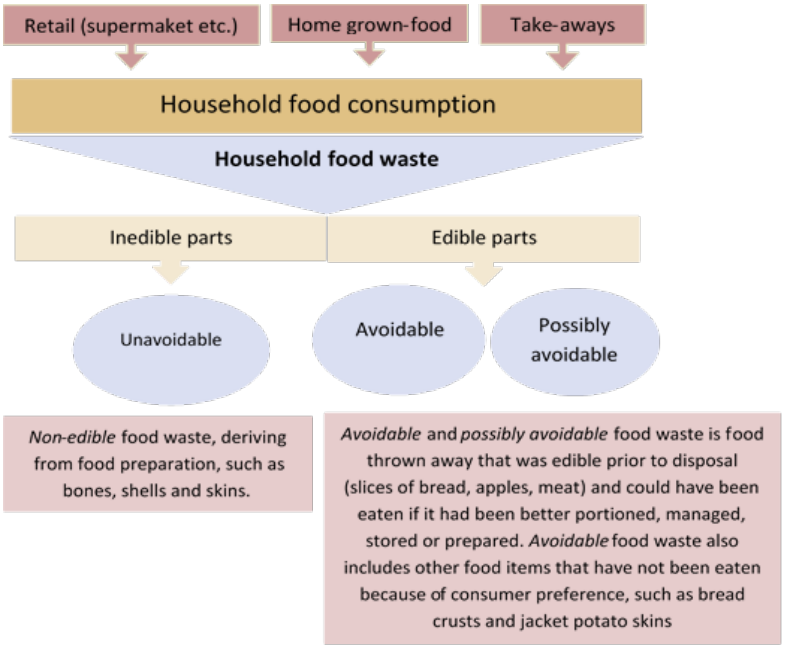

Figure 4. Origin of food consumption and distinguishable parts of food waste.
Source: Own elaboration from Waste Resources Action Programme-WRAP, 2013b, p. 4; WRAP, 2009a; Parfitt et al., 2010.

Considering the away from home definitions we will focus on avoidable and possibly avoidable food waste that occurs in:

(i) The restaurant industry, which includes restaurant, bars and cafeterias that offer table service.

(ii) Catering services, that is food served within private or public canteens, catering and hotels.

(iii) Counter service and fast food.

In particular, food waste in the away from home phase occurs at two levels: preparation and service (or consumption phase) (Risku-Norja et al., 2010; Papargyropoulou et al., 2016). Therefore we consider food waste as the avoidable and possibly avoidable food discarded during the preparation/processing of the meals as well as spoilage and expiration, and also food wasted from the client's plate (food scraps or leftovers) (Marthinsen et al., 2012; Pirani and Arafat, 2015).

2.| Consumer behaviours that influence food waste at household level:

The UNEP's first Food Waste Index report estimates that around 931 million tonnes of food waste was generated in 2019, 61% of which came from households, 26% from food service and 13 % from retail (Figure 5). This suggest that 17% of global food production may be wasted (11% in households, 5% in food service and 2% in retail).

Figure 5. Percentages of food waste generate in household, food service and retail.

Household per capita food waste generation is broadly similar across country income groups, suggesting that action on food waste is equally relevant in high, upper-middle and lower middle-income countries. This diverges from earlier narratives concentrating consumer food waste in developed countries, and food production, storage and transportation losses in developing countries (UNEP, 2021).

Understanding consumers' attitudes, values and behaviours towards food, contribute to find the underlying motivations and behaviours of food wastage. That knowledge can help policymakers or social marketers in finding effective solutions and initiatives against it.

Several researchers have started to study food waste from a behavioural perspective using the Theory of Planned Behaviour proposed by Azjen in 1991 (Graham-Rowe et al., 2014; Block et al., 2016; Mondejar-Jiménez et al., 2016; Stancu et al., 2016; Visschers et al., 2016). According to this theory, intentions are good predictors of human behaviour, and can be influenced by three important factors: subjective norms, perceived behavioural control and attitudes.

Food waste is considered under individual control when consumers are conscious of why they waste food (they have the intention to reduce food waste) and on the other hand, it is considered unintentional when there is

underlying factors like habits or emotions that make consumer unaware of food waste (Block et al., 2016; Russell et al., 2017).

Principato (2018) took into consideration the consumer decision making process and modified it according to food waste peculiarities. Indeed, some individual's factors like psychological, social, situational, demographic and socio-economic can drive wasteful behaviour. These factors influence both wasteful behaviours and food management process: planning, pre-acquisition, acquisition, preparation, consumption and disposition. Principato (2018) called this process the household food waste journey (see Figure 7). Every phase of the household food waste journey could contribute to some extent to wasteful behaviour.

2.1 | Psychological Factors

Among these factors, we can cite some non-cognitive determinants of food waste behaviour like emotions and habits, but also food waste knowledge and food waste involvement, intended as the level of concern regarding its impacts.

a) Emotions

The emotional experience is determined by the meaning and value that the subject attributes to an event and it is not the event itself that activates the emotion (Amato, 2019). Emotions can be primary or secondary. Primary emotions are innate, all individuals, regardless of their culture, have the same primary emotions, which determine the same facial expressions (fear, anger, surprise, sadness, and disgust). Secondary emotions (resignation, forgiveness, envy, shame, jealousy, nostalgia) are more complex, they are built through social learning and interaction, and they are strongly influenced by culture and contexts (Amato, 2019). Emotions play an important role in driving food waste behaviour. Some authors have hypothesised that emotions can have an indirect and direct effect on behaviour because they provide a motivational impetus (Rusell, 2017). Researchers have found that, commonly, individuals associated negative emotions to food waste (anger, shame, disgust, sadness, anxiety). However, when consumers associate emotions like joy and gaiety to food waste that could be explained by the feeling of wealth that often is coupled to food abundance and it is seen as a necessary consequence of the abundance feeling. Some studies suggested that using guilt emotion as a motivational tool could promote pro-environmental behaviour (Amato, 2019). Social marketing has studied emotions as a mean to increase the intention to reduce food waste using messages framed with "gratitude for having" (Septianto, 2020).

b) Attitudes

Thoughts and feelings (e.g. guilt) towards food waste reflect how problematic a person finds to do or avoid it (van Geffen, 2016). In order to analyse attitude, it seems interesting to have a look into the study conducted by Aecoc (2019) in Spain. On it, they were analysed 32 attitudes toward food waste and planning. Sample consist of 2000 consumers that were classified

into five groups (see Figure 6): “food taster”, “food-waste generators”, “eco-friendly”, “price-driven”, and “re-users”. Each group showed different attitudes towards food waste. Food-waste generators had a higher perception of being throwing food away (50% vs. 30% sample mean). Re-users showed a higher positive attitude towards saving leftovers to cook other dishes compared to sample mean. Groups also presented differences in their habits. Re-users throw away less food (22% of them did not produce any food waste and 54% generated few food waste), while food-waste generators seems to be the highest food wasters. Food-waste generators did not consider safe the best before date (18% vs. 9% the rest of groups), so they throw food away once the recommended date was expired.

Another attitude explaining food waste is the idea of «throwing away is cheaper than reusing». When people think that food is not worth enough to be reuse or store beyond expiration date, food waste increase. Usually this group of food are fruit, vegetables, bread and precooked dishes (Cleva and Casares, 2017).

Figure 6. Consumer segments and food waste.

Taster

When they go grocery shopping, they buy more than they planned.
They think food is becoming more expensive
They don't like to cook
They don’t like to prepare recipes with leftovers
They like looking at new products in grocery stores
They try to indulge themselves every day

Food waste generators

They don't feel bad when they throw food away
They often have to throw out products from the pantry because they are out of date
They keep leftovers in the fridge but usually become spoiled and they have to throw them away
At home we throw out more food than they wish
At home they don't have time to cook
We usually cook more quantity than needed and if there are leftovers we throw them away
We buy food online more frequent

Eco-friendly

I prefer local products that have grown close to where I live
I am committed to collaborating with the problems of my community
I would be prepared to live with less
Promotions make me waste food
I follow a Mediterranean and traditional diet
I prefer to make small and more frequent purchases

Price driven

They have reduced the amount spent on food
When they go on excursions they take food from home
They don't like to cook
They don't like trying new flavors and products
They think that food is becoming more expensive

Reusers

Before throwing food away I think about it a lot
I prefer to make large and less frequent purchases
I like to try new recipes with the leftovers I have in the fridge
I try to save the leftovers to cook other dishes
More a more I look for offers in food

c) Perceived behavioural control

Perceived behavioural control is defined as the degree to which people perceive their ability, and the possibility to perform a particular behaviour. For example, “I am able to reduce my food waste”. Some recent work acknowledged attitudes and perceived behavioural control as predictor for consumer food waste behaviour (Principato et al., 2015; Visschers et al., 2016).

d) Food waste concern-awareness

Drawing on marketing field, two important psychological factors influencing the consumer purchase decision are product knowledge and product involvement.

- Product knowledge: people knowledgeable about food waste issues are more likely to avoid the phenomenon (Barr, 2007). Other research has shown that the more aware youths are about food waste the more likely it is that they can reduce their wasteful behaviour (Principato et al., 2015).

- Food waste involvement: individuals with high environmental and civic sense, waste less food (Barr, 2007; Parfitt et al., 2010; Williams et al., 2012).

Since food waste behaviour is also driven by more automatic and less-conscious routines, we should definitely take into account habits (Verplanken and Holland, 2002; Steg and Vlek, 2009;), as well as emotions (Triandis, 1977; Bamberg and Möser, 2007; Quested et al., 2013).

e) Social norms

According to the food waste literature (Graham-Rowe et al., 2014; Mondejar-Jiménez et al., 2016; Stancu et al., 2016; Visschers et al., 2016), social norms play an important role in influencing wasteful behaviour and the household food waste journey. For social norms we intend the social pressure to engage in a particular behaviour, or in other words, they represent the extent to which individuals perceive wasting food as a behaviour disapproved by people important for them (Lapinski and Rimal, 2005). For instance, “my family does not like to throw away food”.

These psychological factors not only influence wasteful behaviour directly, but also indirectly through their effect on some phases of the household food waste journey. To make an example, a greater awareness on the consequences of food waste phenomenon increases the likelihood that youths will draw a shopping list (Principato, 2018).

When individuals believe, throwing away food is wrong and does not match with their self-image, the amount of food they waste decreases. In addition, individuals who shop responsibly, and buy as much as they need, report less food waste (Aydin and Yildirim, 2021).

2.2 | Lifestyle and Habits

People often lack time to perform food waste preventing behaviours due to demanding lifestyles. They feel pressure to balance life goals such as raising children, work, social activities and housework. Researchers have found that experiencing time pressure is linked to higher waste levels (van Geffen, 2016). Food-related habits and practices play key roles in food provisioning and food waste generation (Aschemann-Witzel et al., 2021); here some of these habits and practices are listed:

- Meal as a social event: going out for lunch or dinner regularly and getting easy-to-cook or casual dinner with friends.
- Security and familiarity: only buy and eat foods that are familiar and dislike anything that might change eating habits.
- Self-fulfilment from cooking: the feeling of being an excellent cook and enjoying to create meals from scratch.

- Social relations via meals: for some people the most important thing when eating dinner is being together or having a lovely chat.
- Price-quality relation: comparing prices between product variants in order to get the best value for money.
- Convenience food: when ready-to-eat and frozen foods are a large part of the food products consumed at home.
- Ways for shopping behaviour and price criterion: some people appreciate packaging that keeps products hygienic and safe, or compare product appearance to decide which fruit and vegetables to buy or look for ads looking for store specials discounts.

In the Household Food Waste Journey presented by Principato (2018) and described below (Figure 7), they examined how food related habits could generate wasteful behaviour during the food management processes and pre-consumption routines at home.

Household Food Waste Journey

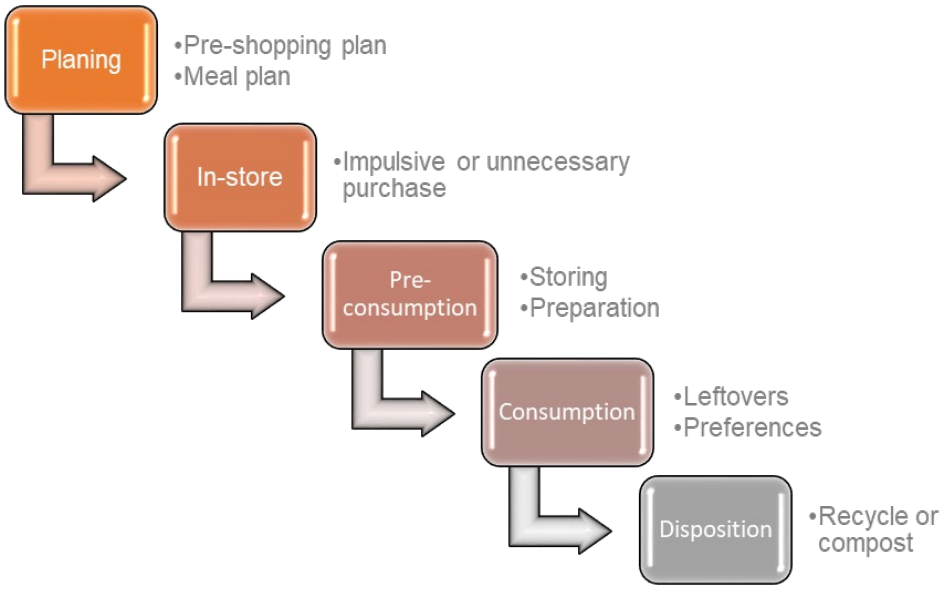

Figure 7. Stages of Household Food Journey.

Planning

The first phase of the household food waste journey is **pre-shopping planning**. The lack of it has demonstrated to influence wasteful behaviours (Exodus, 2006; Lyndhurst, 2007; Gustavsson et al., 2011), since it could result in buying more food than needed and therefore increasing the likelihood of spoilage (Chandon and Wansink, 2006; Quested et al., 2013). **Meal planning** is to decide what food to eat in a determined period (e.g. a week) and could be effective in reducing wasteful behaviour (Van Geffen et al., 2016). Checking storage spaces and doing a shopping list have demonstrated to be effective practice in reducing food waste (Stefan et al., 2013; Principato et al., 2015). Aecoc report (2019), which analysed motives

for conducting household food waste, indicate that the majority of respondents (70%) generated food waste due to the carelessness or laziness of checking the pantry or the fridge regularly.

In-store

This phase takes into account all the behaviours and influences at the point of purchase that drive consumer to waste food. In particular, impulsive purchases, which are often stimulated by marketing strategies result in an increase in food waste levels –like the 3 for 2 promotions that push the consumer to buy more than needed – (Exodus, 2006; Lyndhurst, 2007; Mondejar-Jiménez et al., 2016). The presence of children demanding unnecessary items, or the layout and positioning of foods in stores (visual merchandising strategies) may also influence wasteful behaviours (Exodus, 2006).

Pre-consumption

Principato (2018) divide this phase into two sub-phases: **storing** and **preparation**.

- Storing: correct storing prevents wasteful behaviours. Some people store products sub-optimally for healthy purposes, for example, certain parents use a bowl of fruit instead of putting it in the fridge in order to instil children healthy eating (Evans et al., 2012). The majority of people have a lack of knowledge on how to better store food to prolong its shelf life. Another example is that consumers are not aware of the different fridge shelves that they can effectively use in order to avoid food damage (Cox and Downing, 2007; Graham-Rowe et al., 2014; Aschemann-Witzel et al., 2015). The use by and best before dates has created confusion among consumers driving them to misinterpret date expiration labels (FSA, 2008; Cleva and Casares, 2017). Food safety fear is a top reason of wasteful behaviours (Neff et al., 2015). Therefore, food close to the expiration date is erroneously perceived as less acceptable for consumption (Wansink and Wright, 2006; Sen and Block, 2009). Another important aspect of food storage refers to the sensory skills, understood as the ability of people to understand the freshness of food using their taste, smell and touch. Elderly people tend to use more their senses in order to understand the edibility of a food, while youths rely more on date labels or the period of time the food has been stored for (Terpstra et al., 2005). The use of sensory skills to evaluate freshness is related to less waste. Aecoc report (2019) also confirm that most of respondents take decisions of wasting food based on physical and organoleptic evaluation of food products. The use by and best before dates were just an indicator, but they were not a decisive factor to throw food away. Depending on food's category, consumers give more importance to ones senses than other. In fruits and vegetables, the physical aspect was the most relevant characteristic, in meat and fish, it was the odour and in chilled food, the used by date and the physical aspect were the most reliable factors. Pasta, rice, legume and

dairy products were the most consumed after the use by and best before dates were expired. As Principato et al. (2015) showed the fear of food freshness and food-borne illness increases food waste. Therefore, it is fundamental to educate people, and in particular youths, about the reliability of their senses in assessing the edibility of a food.

- Preparation**:** food cooking and preparation are driven by culinary skills, which has been seen as important in reducing food waste behaviours (Cox and Downing, 2007; Principato et al., 2015; Van Geffen et al., 2016). Among these skills, we can mention (Exodus, 2006; Lyndhurst, 2007; Evans, 2011; Williams et al., 2012):
    - Avoiding some preparation mistakes due to suboptimal culinary skills that could end up in wasting food (as food burned during preparation).
    - Cooking too much food than needed.
    - The ability to prepare leftovers into new meals.

Consumption

During this stage, food waste occurs if individuals leave food scraps on the plate, or if they do not correctly store or reuse their leftovers later (Porpino et al., 2016). Sometimes consumers forget there are leftovers in the fridge and throw them away (Evans et al., 2012). Another aspect refers to food preferences that vary within the household (Block et al., 2016). For instance, families with kids struggle to make them eat some type of food like fruit and vegetables, which could result in higher wasteful behaviour. In order to avoid this, Evans (2011), suggests the routine of deciding a preferred dish to make sure that every day the food is consumed as well by the picky-eaters that some kids are.

Disposition

This stage refers to food waste management. That means how to reuse or not disposed food: giving it to animals, recycling (like home composting), etc.). Individuals who separate kitchen waste tend to throw away less food than those who do not recycle or compost any part of their kitchen waste (Secondi et al., 2015).

2.3 | Situational Factors

Situational factors are external variables that influence in some way an individual's behaviour towards food waste. In particular, contextual variables are associated with food waste, taking into account the geographical environment and the perceptions of the place where individuals reside. The first situational factor considered, is the level of urbanization where individuals live, since people living in urban areas tend to waste more than people living in rural areas (Secondi et al., 2015). Aecoc report (2019) showed that food-taster segment is frequent in capital and big cities. Another interesting situational factor is the perception of the amount of litter where people reside. The perception of living in a clean area is associated with a

virtuous behaviour of the residents. This has relevant implications for policy makers.

2.4 | Demographic and Socio-Economic Factors

From a demographic perspective, **youths** tend to waste more than elders (Osner, 1982; Hamilton et al., 2005; Lyndhurst, 2007; European Commission, 2014a, b; Aecoc, 2019). Concerning the socio-economic variables, the more the **level of education** individuals have, the more the quantities of wasted food (Secondi et al., 2015; Visschers et al., 2016). Aecoc report (2019) found that the price-driven consumers' group tend to present a higher unemployment rate and a lower education level. **Household composition** also play a role: bigger household tend to waste more than smaller household (Quested et al., 2013), although the number of food waste per capita decreases as the members of a family grow (Parizeau et al., 2015). Aecoc report (2019) found that in the group of food-waste generators, single-person households were frequent. Families with children tend to waste more that all-adult households of equal size due to picky-eating and food safety reasons (Quested and Luzecka, 2014). Regarding **gender and income**, there is not consensus. Some studies revealed that females waste more than males (Cox and Downing, 2007; Stancu et al., 2016; Visschers et al., 2016). However, a number of researches stated that men waste more than women (Gallo, 1980; Osner, 1982; Van Garde and Woodburn, 1987; Buzby and Guthrie, 2002; Koivupuro et al., 2012; Stefan et al., 2013; Aecoc, 2019). Aecoc report (2019) showed that the eco-friendly group had a higher income level while price-driven group had a lower income level.

3.| Nutrition. Food composition

Understanding food waste phenomenon away from home is a new research topic. Indeed, research in the field has focused more on household behaviour since the largest amount of spoilage happens in this stage although food waste away from home still represents 21% of the total wastage. According to a study made in the UK (Giorgi, 2013), food waste in restaurants happens during the preparation phase (45%), or food deterioration (21%), or due to client's leftovers (34%). See Figure 8.

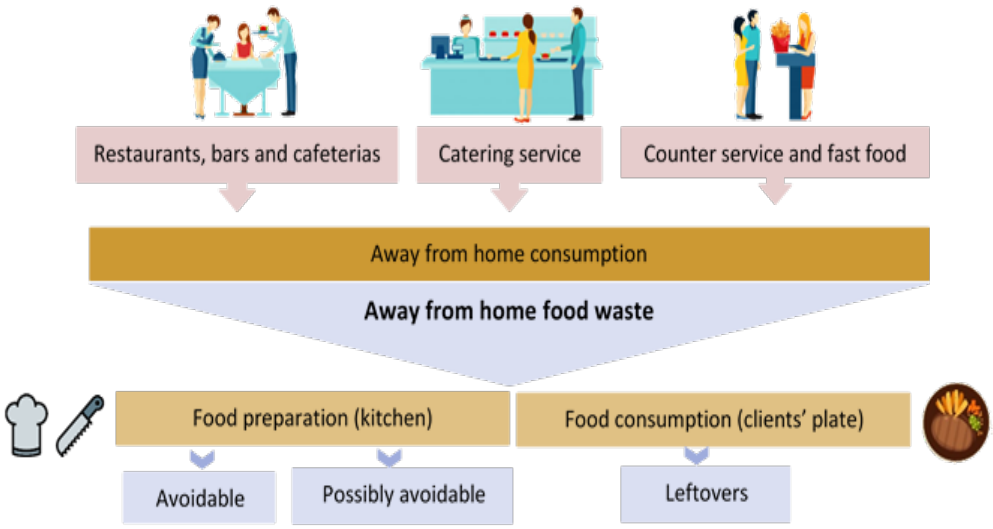

Figure 8. Sources of away from home food waste.

The theoretical framework used to explain food waste at restaurant level focus on two levels where the phenomenon occurs: food preparation and food consumption (Risku-Norja et al., 2010; Sustainable Restaurant Association, 2010; Marthinsen et al., 2012; Betz et al., 2014; Pirani and Arafat, 2015; Heikkilä et al., 2016; Papargyropoulou et al., 2016).

Kitchen food waste happens during the preparation phase for reasons related to "overproduction, peeling, cutting, expiration, spoilage, overcooking, etc."; while client food waste represents customer plate leftovers leave by the customer in the plate, it is the food wasted by customer after the dish has been served (Papargyropoulou et al., 2016, p. 4).

This section analyses the factors and incorrect behaviours that are associated to food waste away from home by focusing on food waste generated in the kitchen (KFW) and those generated by clients (CFW).

Kitchen Food Waste

Considering the managers and chefs' perspective, according to the literature, these behaviours significantly reduce food waste:

- Careful ordering and menu planning (Sustainable Restaurant Association, 2010).
- Avoiding spoilage waste by monitoring used-by-dates and storage conditions (WRAP, 2013a).
- Offering different portion sizes according to client's needs and educating the client to avoid leftovers (Sustainable Restaurant Association, 2010; WRAP, 2013a).

Concerning food waste reuse and redistribution, the best behaviours rest on:

- The possibility of reusing edible food items for making other recipes (Sustainable Restaurant Association, 2010; WRAP, 2013a);
- The donation of kitchen surplus food;
- Offering the customer the chance to take the leftovers home through the adoption of a doggie bag (WRAP, 2013a).

Client Food Waste

From clients' perspective, several factors influence the generation of leftovers in the plate: restaurant configuration, size of food portion, consumers' preferences and the possibility to look and smell the food before serving (Sustainable Restaurant Association, 2010; WRAP 2013a; Matzembacher et al., 2020).

Based on restaurant configuration, Matzembacher et al. (2020) make the following classification:

Variable price buffet: customer selects the type and amount of food that wants to eat, with the possibility of looking and smelling the food during the selection process. Consumers serve themselves and have full control of what and how much is served on the plate. The payment is according to the weight of the plate, the higher the weight the higher the amount paid (Matzembacher et al., 2020).

Fixed price buffet (all you can eat buffets): customers will pay the same price regardless of how much food they choose to put on their plate and the number of times they refill the plate. Customers can choose the amount of food served and they can look the appearance and smell the food during their choice (Matzembacher et al., 2020).

Fixed price table service: includes a la carte restaurants, where consumers choose between some foods options from a menu without looking or smelling the food in the moment of their choice. Based on that, the restaurant's staff prepares and brings food to the consumer's table. The price is fixed, the food quantity is predetermined, and generally, it is not possible to be changed,

although the customer may request to withdraw some component of the meal. It is also possible to order and pay for additional vegetable servings, deserts, rice, fries, among others (Matzembacher et al., 2020).

Similar to fixed price table service configuration, we found fast food or counter service. The main difference is that table service does not exist. In the first case the customer place an order on the counter, takes the food tray, and goes to a dining area, where tables and chairs are available. In the second case, the customer place an order on the counter and either remains seated at the counter to consume the food or takes a food tray and goes to a dining area. The price is fixed and the food quantity is predetermined.

Variable price buffet service presents the lowest level of food waste per plate compared to other restaurants categories, where the main difference is that customer pays for the amount of food served and can look and smell the food before serving it, being saving money a key motivator to reduce food waste (Matzembacher et al., 2020).

The **unavoidable food waste** per plate is almost the same across restaurants configuration. The unavoidable food waste is mostly related to meat bones and fruit peels.

Avoidable food waste: In all restaurants categories, the main wasted product is cheap food (e.d. rice or potatoes). Generally, cheap food is served in large quantities. The second most wasted product is from the meat category. Finally, other carbohydrates, its wastage could be due to preferences for types of food, or even consumer's preferences for diets.

Matzembacher et al. (2020) found in their study that most of consumers perceived that leaving leftovers in the plate was an exception for them, even when most of them had leftovers in the moment of the interview. The most common reason to leave leftovers were:

- Serving too much food on the plate
- They don't like the taste of some food
- The food was cold
- The meat was tough

Concerning how clients could reuse leftovers, the doggie bag seems to be the main option as long as it is available (Sustainable Restaurant Association, 2010; WRAP, 2013a). In Anglo-Saxon countries (like in the US and UK) and in the Northern European countries this practice is widely embraced at any social level, while in the Mediterranean countries the majority of the people still don't ask for it, especially for cultural reasons. For example, although 90% of Italians believe that restaurants waste a large amount of food, 41% of Italians are embarrassed to ask for a doggie bag (Last Minute Market, SWG 2016). Indeed, only one out of three Italians brought leftovers home from restaurants at least once (36%), and 22% believe that asking for a doggie bag represent a rude behaviour and they feel ashamed to do so (Coldiretti, 2017; Sirieix et al., 2017). Other possible

reasons could be that it would not be convenient to carry food in that moment or consumers have no interest to take home that type of food (staples food) (Matzembacher et al., 2020).

Conclusion

The combination of monetary incentives (only pay for the food they are serving), serving incentives (the possibility to influence the serving and choose smaller portions) and sensory incentives (the possibility to look and smell the food before serving it), would be what may avoid food losses when consuming food away from home (Matzembacher et al., 2020).

4.| Food Waste during the distribution and sale phases – retail level

Although we focus on consumer food waste, it is important to see briefly, why food gets lost in the distribution and sale phases and how food marketing and retailing contribute to consumer-related food waste via decisions on date labelling, packaging sizes, design elements, and pricing strategies, encouraging over-purchase, as well as shifting consumer priorities (Aschemann-Witzel et al., 2015).

In general, some global trends have accelerated the possibilities of food losses and waste. The distance between the place of production and final consumption, along with the shift in dietary patterns, especially in the economies in transition, where consumers are increasingly eating meat, fish and other perishable products (Escaler and Teng, 2011).

In the retail industry, food waste refers to unsalable products that need to be discarded or recycled (Teller et al., 2018). During the distribution and sale phases, food waste usually arises from distortions in the demand forecasting, leading to enormous quantities of foodstuffs not sold before the expiration date, or being damaged by natural deterioration. Additional causes at retail level can be:

- Limitation on the technology used to preserve products;
- The possible damage of food during transportation;
- The inadequate professional training of sales staff, not applying stock rotation procedures;
- The recalls of certain products from the market, as they do not meet qualitative and safety standards.

The commitment of internal company guidelines on quality, shelf availability and strategies related to product range, pricing, and (in-store) promotions are important aspects. (Teller et al., 2018). Now, we explain three particular causes related with consume behaviour.

Retailers' quality and safety standards

Wholesalers and retailers operate as powerful gatekeepers between production and consumption, thereby either hindering or encouraging the commercialization and consumption of higher or lower quality standards (Hartmann et al., 2021).

There are differences among different store formats in terms of causes of food waste. That depends on certain characteristics, such as store size, product range, pricing strategy, and the intensity of promotional activities. For example, hypermarkets have high-quality standards imposed by the parent organization (Teller et al., 2018).

The fact that retailers have enhanced more and more their standards for product quality and service provisions, particularly on-shelf availability and product choice alternatives, have led to the increase of customer expectations for quality, permanent availability and frequent in-store promotions. The categories containing a high share of products with limited shelf life, sensitive logistical characteristics, and slow or erratic demand patterns, such as fruits and vegetables, dairy, and bakery products, are the most severely affected (Teller et al., 2018).

The range of product category, the different logistics and marketing strategies leads to different impacts depending on shelf life, product sensitivity, imposed quality standards, and product-specific demand patterns. Higher product allocations during promotional periods and creation of fluctuating demand through marketing and visual merchandising are important causes of food waste at retailers (Teller et al., 2018). See Figure 9.

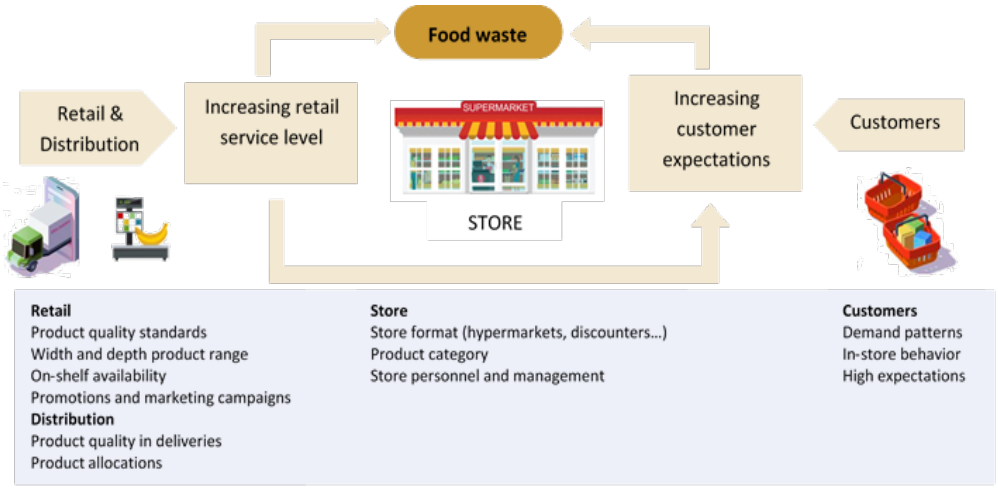

Figure 9: Causes of food waste in retail stores from Teller et al. (2018).

Marketing strategies

From retailers' point of view, the main cause related to customers is **the limited predictability of their demand** and their undesirable behaviour when selecting and handling products in store (e.g., damaging products, choosing "newest" products with a latest expiration date) (Barilla Center for Food and Nutrition, 2012; Teller et al., 2018).

From customer side, several aggressive marketing strategies in retail establishments significantly favour waste. This is the case of promotions "2x1" or "3x2" or extra-large packages. Although at first glance these discounts are beneficial for customers, they encourage consumers to buy large quantities of the same product without having planned for what they will be used for (Mondéjar Jiménez et al., 2016; Cleva and Casares, 2017). Consumers are tempted to impulsive buying or spontaneous decisions in the store (Aschemann-Witzel et al., 2015).

Consumers claim that packages are too large in general. Pricing strategies, such as decreasing price with larger units and price promotions encourage the purchase of large units and greater numbers of units (Dusoruth et al., 2020). Product and package design in terms of portioning or storage suitability, impact food management at home (Aschemann-Witzel et al., 2015).

Aesthetics standards

The retail demanding aesthetic standards have been criticized for potentially exaggerating consumers' wish for homogeneous and appealing offers and accustoming consumers' perceptions of normality to a much narrower range than needed (Aschemann-Witzel et al., 2015).

Appearance is a universal attribute to all products and establishes the first sensory impression of the item, majorly influencing its acceptability by confirming or disconfirming consumers' sensory and hedonic expectations. Industry practices have established consumer expectations for prototypical appearances of fresh produce, where consumers associate quality food with visual appeal. Damages and blemishes that occur post-harvest and appear at the point of purchase affect consumer perception of quality and reduce purchase intention (Dusoruth et al., 2020).

In Europe, 20% and 40% of the fruits and vegetables are thrown away before reaching the stores for aesthetic reasons. The established aesthetic standards make that part of the collected products never reach the supermarkets. Cooperatives or companies make a selection of products and discard foods that do not present a perfect image or size, shape or color, despite preserving their nutritional properties. The most affected food are fruits and vegetables (Cleva and Casares, 2017).

Suboptimal food have been defined as food products with an abnormal appearance and/or other deviating product attributes (e.g. feel, smell) as well as products that are close to or have passed their expiration date but which are still unreservedly consumable (Aschemann-Witzel et al., 2015).

Some studies have demonstrated that even respondents with different behavioral profiles respond in a similar way rejecting food that had deteriorated in appearance but are fully edible (Dusoruth et al., 2020). Due

to the dominating effect of abnormal appearance, many consumers remained reluctant to choose *suboptimal food* after tasting fruits with blemished appearance that were objectively optimal in taste (Hartmann et al., 2021).

Consumers expect some form of compensation for suboptimal food, such as price discounts. However, discounts can also reinforce consumers' negative perception thereby lowering their appreciation of suboptimal food since consumers tend to use prices as indicators of quality (Hartmann et al., 2021).

Household composition also affects consumer behavior towards food waste. Small households tend to feel that they would not being able to consume expiring products quickly enough. Households with children (implying bigger households) are found to be less open to buying suboptimal food due to the wish to give children "only the best" (Hartmann et al., 2021).

Increasing the availability of food with heterogeneous appearance would increase consumer familiarity and tolerance to suboptimal products. Some authors indicate that changing contextual factors is more effective in changing consumer behavior than influencing knowledge or attitudes (Hartmann et al., 2021).

Conclusion

Food waste is created due to spillage and degradation, improper storage and transportation between farm and consumer. Food waste occurrence leads to negative impacts on store performance in terms of costs, reduced profit margins and loss of sales and profits. (Teller et al., 2018

Food waste causes at retail level:

(1) Difficulties to properly matching demand. It is necessary an accurate forecasting, ordering, and replenishment;

(2) Trading with fast-turning, perishable products in sensitive packaging;

(3) Customers are increasingly demanding in terms of quality and services. (Teller et al., 2018).

- Excess of stocks and oversupply: consumers expect the shelves to be filled with a wide range of food products available.
- Lack of tolerance of the appearance and quality of products. (Teller et al., 2018

Key concepts and vocabulary

Key concepts and vocabulary

Avoidable and possibly avoidable: edible food waste that have been eaten if it had been better portioned, managed, stored or prepared. Avoidable food waste also includes other food items that have not been eaten because of consumer preference, such as bread crusts and jacket potato skins.

Behaviour: An individual, group, organization or system's external reactions to both internal factors and external stimuli in its environment (National Academies of Sciences, engineering, and Medicine, 2020).

Client food waste: food wasted away from home by customer after the dish has been served.

Edible parts: the parts of food that are intended for human consumption.

Food losses: a decrease, at all stages of the food chain prior to retailer and consumer level, of food that was originally intended for human consumption, regardless of the cause.

Food waste in the away from home phase: the avoidable and possibly avoidable food discarded during the preparation/processing of the meals as well as spoilage and expiration, and also food wasted from the client's plate (food scraps or leftovers).

Food waste: appropriate food for human consumption discarded or left to spoil at retailer or consumer level -regardless of the cause.

Food: any substance –whether processed, semi-processed or raw – that is intended for human consumption. It includes drink, and any substance that has been used in the manufacture, preparation or treatment of food.

Habits: context-behaviour associations in memory that develop as people repeatedly experience rewards for a given action in a given context. Habitual behaviour is cued directly by context and does not require supporting goals and conscious intentions (Mazar and Wood, 2018 cited by National Academies of Sciences, engineering, and Medicine, 2020).

Inedible parts: components associated with a food that are not intended to be consumed by humans. For example, bones, rinds and pits/stones.
Kitchen Food Waste: food waste away from home that happens during the preparation phase for reasons related to "overproduction, peeling, cutting, expiration, spoilage, overcooking, etc."

Motivation (to prevent food waste): A person's willingness to perform actions that reduce the likelihood or amount of food waste being generated.

Relevant aspects of motivation are attitude, awareness, and social norms (Van Geffen et al., 2016).

Norms: Informal rules that govern behaviour in groups and societies. Norms in this context refers to moral norms (i.e., when people feel that doing something aligns with an abstract right or wrong), injunctive social norms (i.e., feelings about what one ought to do), and descriptive social norms (i.e., perceptions of what most people are doing) that are strongly correlated with behaviour (National Academies of Sciences, engineering, and Medicine, 2020).

Retail food waste: unsalable products that need to be discarded or recycled in retail industry.

Sustainable Development Goals: are a collection of 17 interlinked global goals adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. They recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability (United Nations Environment Programme, 2021).

Unavoidable: Non-edible food waste, deriving from food preparation, such as bones, shells and skins.

Evaluation section

1. | Multiple choice questions

1. **Food losses and food waste have a significant:**
a) Economic impact
b) Environmental impact
c) Social impact
d) All the above are true

2. **In which Sustainable Development Goals has food waste included?**
a) In SDG 3
b) In SDG 12
c) In SDG 10
d) In SDG 14

3. **In what stages does food losses occur?**
a) Production and yield
b) First transformation
c) Industrial transformation
d) All the above are true

4. **In which of the following stages does food waste occur?**
a) First transformation
b) Industrial transformation
c) Consumption phase
d) Production and yield

5. **The inedible parts of household food waste refers to:**
a) Avoidable food waste
b) Possibly avoidable food waste
c) Non-edible food waste
d) Home grown-food

6. **Food waste away from home occur in:**
a) Restaurant
b) Catering services
c) Counter service
d) All above are true

7. **Where the highest percentage of food waste was generated in 2019 according to the first Food Waste Index Report?**
a) In household
b) In fast food
c) In restaurant industry
d) In retail

8. **Psychological factors influencing food waste include:**
a) Perceived behavioural control
b) Lifestyles
c) Situational Factors
d) Demographic Factors

9. **What food related habits could generate wasteful behavior during the food management processes and pre-consumption routines at home:**
a) Pre-shopping plan
b) Meal plan
c) Impulsive or unnecessary purchase
d) Recycle or compost

10. **Related to Kitchen Food Waste (KFW), what behaviours reduce it?**
a) Careful menu planning
b) Monitoring used-by-dates and storage conditions
c) Educating the client to avoid leftovers
d) All the above are true

11. **In your opinion, what is the most common reason to leave leftovers in away from home consumption**
a) Serving too much food on the plate
b) They don't like the taste of some food
c) The food was cold
d) The meat was tough

12. **In your opinion, what is the best incentive to avoid food waste in away from home consumption?**
a) Monetary incentives
b) Serving incentives
c) Sensory incentives
d) Others

13. **In food waste at retail level, what is the reason depending on the format store?**
a) Damage of food during transportation
b) Not applying stock rotation procedures
c) High quality standards imposed
d) Recall of certain products (lack of quality)

14. **At the retail level, food waste is related with consumer behavior through:**
a) Retailers' quality
b) Marketing strategies
c) Aesthetics standards
d) All the above are true

15. What marketing strategies are most related to food waste at the retail level?

a) Product quality standards
b) Width and depth product range
c) On-shelf availability
d) Promoting and marketing campaigns

2. | Activities (optional) / Exercises

What kind of consumer am I?

To find it out, we propose you to answer the following questions:

(*You should give each one a score between 1 and 5, where 1 = strongly disagree and 5 = strongly agree. Then you must add up the points achieved in each block*)

QUESTION BLOCK 1	1	2	3	4	5
❖ When I go grocery shopping, I buy more than I planned	☐	☐	☐	☐	☐
❖ I think food is becoming more expensive	☐	☐	☐	☐	☐
❖ I don't like to cook	☐	☐	☐	☐	☐
❖ I don't like to prepare recipes with leftovers	☐	☐	☐	☐	☐
❖ I like looking at new products in grocery stores	☐	☐	☐	☐	☐
❖ I try to indulge myself every day	☐	☐	☐	☐	☐

TOTAL POINTS: _____

QUESTION BLOCK 2	1	2	3	4	5
❖ I don't feel bad when I throw food away	☐	☐	☐	☐	☐
❖ I often have to throw out products from pantry because they are out of date	☐	☐	☐	☐	☐
❖ I keep leftovers in the fridge but usually become spoiled and I have to throw them away	☐	☐	☐	☐	☐
❖ At home, I throw out more food than I wish	☐	☐	☐	☐	☐
❖ At home, I don't have time to cook	☐	☐	☐	☐	☐
❖ I usually cook more quantity than needed and if there are leftovers, I throw them away	☐	☐	☐	☐	☐
❖ I buy food online more frequent	☐	☐	☐	☐	☐

TOTAL POINTS: _____

QUESTION BLOCK 3

	1	2	3	4	5
❖ I prefer local products that have grown close to where I live	☐	☐	☐	☐	☐
❖ I am committed to collaborating with the problems of my community	☐	☐	☐	☐	☐
❖ I would be prepared to live with less	☐	☐	☐	☐	☐
❖ Promotions make me waste food	☐	☐	☐	☐	☐
❖ I follow a Mediterranean and traditional diet	☐	☐	☐	☐	☐
❖ I prefer to make small and more frequent purchases	☐	☐	☐	☐	☐

TOTAL POINTS: _____

QUESTION BLOCK 4

	1	2	3	4	5
❖ I have reduced the amount spent on food	☐	☐	☐	☐	☐
❖ When I go on excursions, I take food from home	☐	☐	☐	☐	☐
❖ I don't like to cook	☐	☐	☐	☐	☐
❖ I don't like trying new flavours and products	☐	☐	☐	☐	☐
❖ I think that food is becoming more expensive	☐	☐	☐	☐	☐

TOTAL POINTS: _____

QUESTION BLOCK 5

	1	2	3	4	5
❖ Before throwing food away, I think about it a lot	☐	☐	☐	☐	☐
❖ I prefer to make large and less frequent purchases	☐	☐	☐	☐	☐
❖ I like to try new recipes with the leftovers I have in the fridge	☐	☐	☐	☐	☐
❖ I try to save the leftovers to cook other dishes	☐	☐	☐	☐	☐
❖ More a more I look for offers in food	☐	☐	☐	☐	☐

TOTAL POINTS: _____

If the score achieved is higher than…	You can be considered
18 points in block 1	Taster consumer
21 points in block 2	Food waste generator consumer
18 points in block 3	Eco-friendly consumer
15 points in block 4	Price driven consumer
15 points in block 5	Reuser consumer

In which block did you achieve the highest score? _____

3. | Multiple choice answers

1	d	**6**	d	**11**	all
2	b	**7**	a	**12**	all
3	d	**8**	a	**13**	c
4	c	**9**	c	**14**	d
5	c	**10**	d	**15**	d

Useful resources

Useful resources

Zero Waste Europe. Library: https://zerowasteeurope.eu/library/

The Big Waste: Why Do We Throw Away So Much Food? Yale School of the Environment. 360 video. https://e360.yale.edu/features/the_big_waste_why_do_we_throw_away_so_much_food

14 Ways Consumers Can Reduce Food Waste. Institute of Agriculture and Natural Resources. University of Nebraska-Lincoln. https://food.unl.edu/14-ways-consumers-can-reduce-food-waste

Portion distortion page. U.S. Department of Health & Human Services. https://www.nhlbi.nih.gov/health/educational/wecan/eat-right/portion-distortion.htm

Portion distortion quiz. . U.S. Department of Health & Human Services https://www.nhlbi.nih.gov/health/educational/wecan/downloads/portion-quiz.pdf

Sustainable Management of Food Basics. United States Environmental Protection Agency. https://www.epa.gov/sustainable-management-food/sustainable-management-food-basics

Stop Food Waste. Tools and Resources. https://stopfoodwaste.org/resources

Free online courses related to food waste. Reading University. https://www.reading.ac.uk/apd/OnlineCourses/Free_Online_Courses.aspx?

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