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Drivers and barriers to food waste reduction

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Abstract

Purpose – The purpose of this paper is to analyse main drivers and barriers to food waste reduction in the consumption phase and analyse pathways to anti-wastage behaviours.
Design/methodology/approach – A systematic literature review was performed in order to understand the main variables affecting the behaviour and to identify pathways to move to an anti-waste behaviour. In the end, 84 articles were selected for the final analysis.
Findings – Drivers and barriers to reduce food waste were categorised in societal factors, personal factors and behavioural factors. Variables can increase the amount of waste (+) or reduce it (–). From them, efforts to move to an anti-wastage behaviour are classified in macro-environmental change, retailers' engagement, raise awareness of the issue and creating anti-wastage social norms.
Research limitations/implications – The systematic review did not capture all variables that can influence consumer food waste and it is necessary different approaches to study the issue.
Practical implications – From the drivers for food waste reduction it is possible to design efforts to help consumers change their pattern of behaviour.
Social implications – Reducing food waste has effects in changing economic inequality, relative poverty and environmental damages.
Originality/value – The great majority of studies that analyse consumer food waste focus on behaviours that increase food waste. This special paper identifies how to stimulate and proactively work with behaviours that help to food waste reduction.

Keywords Systematic review, Food waste, Food waste reduction, Consumer food waste

Paper type Research paper

1. Introduction

Moving from invisibility, the topic of food waste has become an extremely visible topic. Production systems and consumption patterns are accused of being incoherent. How is it possible that around one-third of food produced is lost or wasted (FAO, 2013) and at the same time millions of people around the world suffer from hunger and malnutrition? The gap between food production and consumption and the distance between food waste and its consequences only worsen the problem.

Food waste is considered a social issue (Salhofer *et al.*, 2008), affecting individuals' well-being. The food that is wasted could be used to combat hunger or malnutrition (Parfitt *et al.*, 2010). Moreover, food security issues increase with the losses, related to food access, such as purchasing power and prices of food (Beretta *et al.*, 2013; Papargyropoulou *et al.*, 2014). With the expected increase on global population (Godfray *et al.*, 2010), food availability is a crucial issue.

The major problem to deal with the issue is the fact that food losses and waste occur throughout the entire food supply chain. Differences between food loss and food waste relate to the position inside the supply chain. Food losses occur at the beginning to the middle of the supply chain, considered losses from agricultural produce, harvesting, transport, storage and processing activities (Gustavsson *et al.*, 2011). Food waste occurs at the end of the food supply chain, in the distribution, retail and consumption phases (Parfitt *et al.*, 2010). Food waste is associated with behavioural issues, in multiple moments of consumption and embedded in contextual and cultural factors (Porpino *et al.*, 2015). The major problem of food waste is that energy from agriculture, transportation, processing, food sales, storage and preparation are also wasted when food waste occurs (Abeliotis *et al.*, 2014).

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Thus far, different studies analysed consumer-related food waste. Analysis of factors causing consumer food waste in households and supply chains (Aschemann-Witzel *et al.*, 2015), behaviours resulting into waste at the pre-acquisition, acquisition, consumption and disposition stages (Block *et al.*, 2016) and an understanding of possible causal relationships of consumer food waste (Roodhuyzen *et al.*, 2017) are examples of studies that analysed consumer behaviour and food waste. However, the great majority focus on behaviours that increase the waste. It is not clear yet how to stimulate and proactively work with behaviours that help consumers to reduce their waste.

There is not only one solution to deal with consumer-related food waste. Strategies and actions require a combination of multiple actors (Aschemann-Witzel *et al.*, 2015). From the food waste hierarchy (Papargyropoulou *et al.*, 2014) the most advantageous action to deal with food waste is prevention. Avoiding food surplus from the entire supply chain, including the consumption phase, preventing avoidable food to be disposed, is the most favourable solution. To do so, it is necessary to comprehend behaviours that can indeed prevent the final wastage.

Thus, some questions emerge: What are the drivers and barriers of food waste reduction in the consumer level? How consumers can act in an "anti-wastage" behaviour? Under which conditions food waste is minimised? What variables are easier to change in order to have a food (anti) wastage behaviour? This special manuscript is designed to analyse the behaviours that reduce consumer food waste and how to proactively stimulate them. The study describes which variables affect consumer food waste, focusing on the drivers and barriers to food waste reduction. Instead of investigating isolated influences, the interactive nature of various factors affecting the behaviour will be explored.

2. Method

A systematic review was conducted to explore the factors that influence food waste at the consumer level. The aim was to identify the main variables and factors influencing consumer behaviour result in food waste. After, the nature of these factors, if they act as driver or barrier to food waste reduction, was explored. Systematic review is recommended when there is a need to summarise existed information about a topic, drawing a conclusion about a specific phenomenon (Kitchenham, 2004). Moreover, this method is suitable to answer questions that with a single study it may be incomplete (Petticrew and Roberts, 2006). Since food waste is considered a complex issue (Aschemann-Witzel *et al.*, 2015) and is a result of multiple behaviours of food's journey (Quested *et al.*, 2013), the systematic review seems to be appropriate for this study, which aims to identify the different factors and variables that affect the behaviour.

Systematic literature review adopts a particular methodology (Petticrew and Roberts, 2006), being in accordance with a predefined search strategy (Kitchenham, 2004). It needs a detailed protocol, which is a plan providing explicit descriptions of the steps to be taken (Tranfield *et al.*, 2003). In this study, the systematic review followed the protocols outlined by Sampaio and Mancini (2007), Petticrew and Roberts (2006), Kitchenham (2004), Tranfield *et al.* (2003) and Bossle *et al.* (2016). Figure 1 shows the design of the research protocol.

First, an exploratory phase was conducted to elaborate the inclusion and exclusion criteria, and to have an overview the topic consumer-related food waste. Since the beginning some criteria were already defined: to include only peer-reviewed articles and only articles that analyse the relationship with food waste in a consumer perspective, otherwise the results would not be in accordance with the main objective of this research. In addition, the search was not restricted by date, to capture studies from different periods. This decision was taken in order to deep analyse what has been published about consumer food waste, having no intention to restrict the results. "Consumer food waste" and "household food waste" were used as keywords in the topic field, applying the Boolean operator "OR" when possible, in five

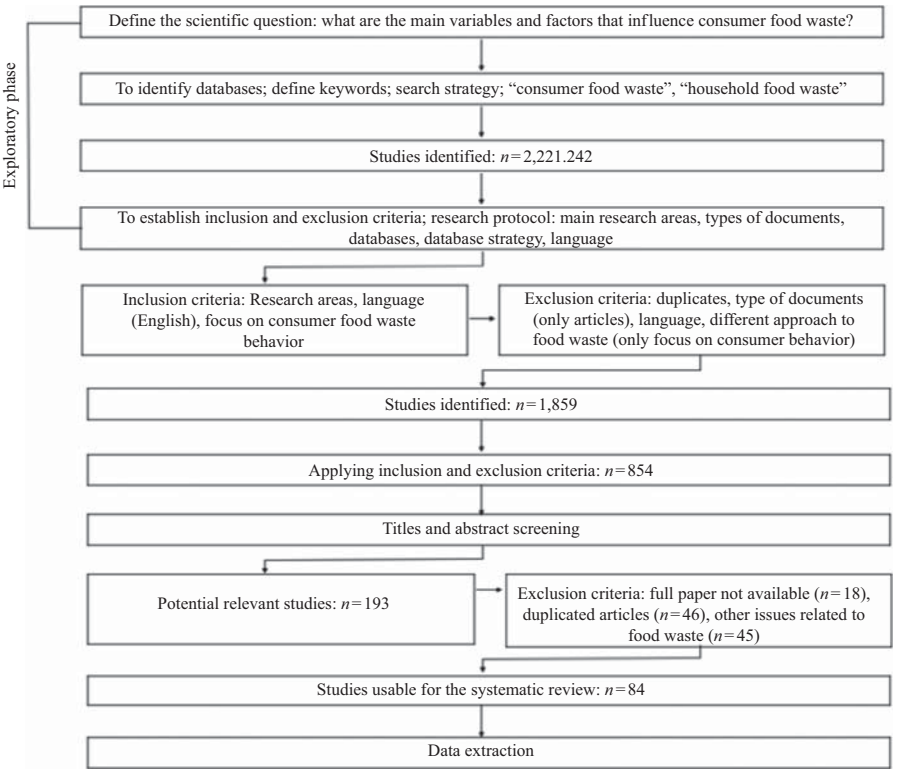

Figure 1.
Research protocol

Sources: Adapted from Sampaio and Mancini (2007), Petticrew and Roberts (2006), Kitchenham (2004), Tranfield *et al.* (2003) and Bossle *et al.* (2016)

databases (Web of Science – 1,220 results; Scopus – 1,896 results; Scielo – 8 results; Google Scholar – 2,218.000 results; Ebsco Host – 118 results). More than one database was used to compare results and to obtain a broad view about the topic in different research studies.

After an exploratory analysis, researchers decided to maintain the same keywords in the second phase ("consumer food waste" and "household food waste"), once they have captured different contexts and different variables of influence. Web of Science, Ebsco Host and Google Scholar databases were selected, due to the fact that they resulted in a great variation in the results. The research was taken in field "Topic", except for Google Scholar database, where the research was limited to "Title" field. This decision was due to the fact that the results in Google Scholar were greater than 2,212.000 files. In this way, we searched papers only in the "Title" field to limit the results to 293 studies.

As inclusion criteria, the choice was only for peer-reviewed articles, as aforementioned, only English as a language, no restriction by date. In Web of Science database, the areas of research were limited to: environmental sciences ecology; business economics; sociology; social sciences other topics; behavioural sciences; psychology; social issues; food science and technology; anthropology. These areas were selected in the exploratory phase, different areas did not explore the relation between consumer behaviour and food waste.

The final search comprised only peer-reviewed papers (in English) from the ISI Web of Knowledge (within the areas stated above), EBSCO and Google Scholar (for this one, only in the title field) databases. The keywords "consumer food waste" and "household food waste" were

searched, applying the Boolean operator "OR" for ISI Web of Knowledge and EBSCO databases and separately for Google Scholar database. The results were: ISI Web of Knowledge – 1,411 articles; EBSCO – 155 articles; Google Scholar – 293 articles. Applying the inclusion and exclusion criteria of selecting only articles in English language, only peer-reviewed articles, in the main areas, the results stay as it follows: ISI Web of Knowledge – 607 articles; EBSCO – 94 articles; Google Scholar – 153 articles (a total of 854 articles).

First, titles and abstracts were screened for relevance to assess which met the inclusion criteria – mainly focusing on consumer-related food waste. Full papers were consulted when the abstract did not clearly meet the inclusion. From 854 titles and abstracts analysed, 193 potentially relevant studies were selected for the review. From these, 18 articles were not available and 46 were duplicated. Finally, 84 articles were selected for full analyses, all focusing exclusively on factors that may influence the consumer behaviour regarding food waste.

To extract relevant information from each study, data extraction should be performed (Petticrew and Roberts, 2006), containing general information (title, author, publication details), study features and specific information and notes on emerging themes (Tranfield *et al.*, 2003). All papers were fully analysed within the qualitative software programme Nvivo. Analysis was organised around key concepts and definitions and coded at the most detailed level of information. When analysing main results of the studies, variables that affect consumer behaviour and food waste levels were also coded. The codes were compared to each other and organised as a driver or barrier to food waste reduction as well as into categories with similar meanings or representing similar phases of food consumption.

In the following, the main variables and factors that influence consumer food waste are described and discussed.

3. Results

3.1 Overview of food waste research

The results indicate that there is a growing interest in the analysis of food waste in the consumer perspective. The systematic review was not limited by date. Even though it only captured papers from 2010[1]. Since 2014, there has been an increase in the number of papers (Figure 2).

Figure 3 shows the countries of the papers selected. It is possible to observe a predominance of studies performed in the UK (16) and Italy (7).

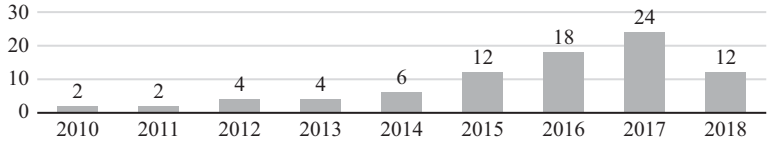

Figure 2.
Distribution of the papers per year

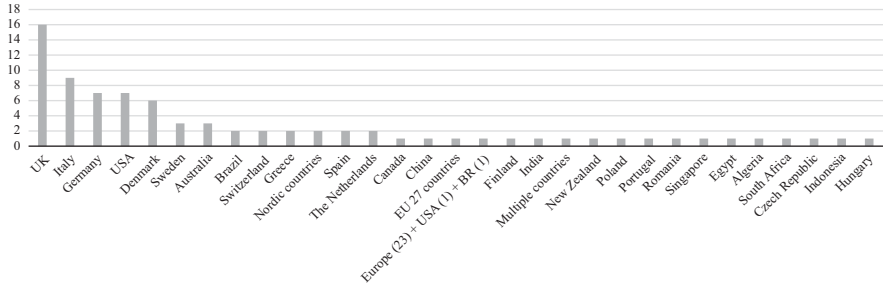

Figure 3.
Distribution of the papers per country

3.1.1 Food waste definition. In this section, we present an overview of food waste definition used in the selected studies. Some studies, though, do not define the term food waste. Instead, they start from the issues with wasting food. The ones that use a definition usually start with FAO's definition of food losses: "any change in the availability, edibility, wholesomeness or quality of the food that prevents it from being consumed by people"; or "the wholesome edible material intended for human consumption, arising at any point in the Food Supply Chain (FSC) that is instead discarded, lost, degraded or consumed by pests" (FAO, 1981). Additionally, McCarthy and Liu (2017a) and Richter and Bokelmann (2017) bring the Waste & Resources Action Programme definition, with food waste as "food and drink thrown away that was, at some point prior to disposal, edible". Abeliotis *et al.* (2014) use the European Community (2011) definition of food waste as "composed of raw or cooked food materials and includes food loss, before, during or after meal preparation in the household, as well as food discarded in the process of manufacturing, distribution, retail and food service activities". Aschemann-Witzel *et al.* (2015) use FUSIONS' definition "[…] any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)".

Most of the studies differentiate food losses from food waste, with the first occurring at the beginning to the middle of the supply chain, considered losses from agricultural produce, harvesting, transport, storage and processing activities, and the second represents losses in downstream stages, at the end of the food supply chain, in the distribution, retail and final consumption (Gustavsson *et al.*, 2011; Parfitt *et al.*, 2010). We discuss only the second term, food waste, due to the fact that this study analyses individuals' behaviours that result into waste.

From the selected studies, it is possible to affirm that there is not a consensus about the term and not a single definition. Some of them consider food suitable for consumption, while others consider food no longer proper to consume. Moreover, different terms and ideas complement the definition of food waste. Table I shows what the studies consider food waste and different terms associated with its definition.

3.1.2 Theoretical approach to study consumer food waste. To complement the analysis of how consumer food waste has been studied in the literature, we investigated the theories used to support the selected studies (Table II). The great majority of the studies use attitudes and behaviours towards food waste. These attitudes can be attributed to general behaviours that increase food waste or specific aspects associated with the issue, such as suboptimal food consumption (de Hooge *et al.*, 2017) or packaging issues (Williams *et al.*, 2012). We found studies that reviewed general aspects of food waste, contributing to the understating of consumer food waste (e.g. Parfitt *et al.*, 2010).

Some of the studies used a psychology-oriented approach, such as the theory of planned behaviour (TPB). It is important to highlight that other constructs were added to the TPB ones. For example, the analysis of attitudes, subjective norm and perceived behavioural control (Ajzen, 1991) was complemented with self-identity, anticipated regret, moral norm and descriptive norm, to predict intention to reduce household food waste (Graham-Rowe *et al.*, 2015). The similar occurred for food-related routines (Stancu *et al.*, 2016; Stefan *et al.*, 2013).

The systematic review also captured studies that used a sociological approach, with a focus on social practice theory (see Table II). These studies drew conclusions of the food waste phenomenon under the social, economic and cultural areas of everyday life and habits and routines.

Different theories and approaches were used in trying to explain consumer-related food waste (see Table II).

3.1.3 Methodological approaches to study food waste issues. When analysing the methodological procedures applied in the papers, surveys were commonly used, focusing

Different terms	Authors
Avoidable food waste consists of products that could have been eaten, such as leftovers, food left to go bad and food that past its sell-by date. Unavoidable food waste consists of non-edible waste such as peels, bones, shells and coffee grounds. Possibly avoidable food waste is food that some consumers eat but not others (e.g. bread crust), or food that can be eaten if prepared differently (e.g. raw potato peeling vs potato peel crisps)	Arous *et al.* (2017), Borrello *et al.* (2017), Janssen *et al.* (2017), Jellil *et al.* (2018), Gjerris and Gaiani (2013), Koivupuro *et al.* (2012), Leray *et al.* (2016), Mondéjar-Jiménez *et al.* (2016), Principato *et al.* (2015), Quested *et al.* (2011), Secondi *et al.* (2015), Tucker and Farrelly (2016), Stefan *et al.* (2013)
Over-nutrition: consuming more than needed is considered food waste	Aschemann-Witzel (2018), Aschemann-Witzel (2016), Parfitt *et al.* (2010)
Food that was purchased but not consumed and ends up in the bin	Calvo-Porral *et al.* (2017), Visschers *et al.* (2016)
"Food loss is defined as the decrease in food quantity or quality which makes it unfit for human consumption […] edible products that are directed to human consumption and are discarded when not consumed for various reasons"	Chakona and Shackleton (2017)
Edible food supplied for human consumption	Janssen *et al.* (2017), Melbye *et al.* (2017), Aschemann-Witzel *et al.* (2016), Chalak *et al.* (2016), Graham-Rowe *et al.* (2014)
"Food that can no longer be consumed by humans"	Lazell (2016)
"Food waste refers to the wastage of items fit for human consumption – for example, when foods are discarded in the retail trade, in food service, or in households because they are regarded as 'suboptimal' when close to the 'best-before' date or due to minor product awns"	Aschemann-Witzel (2016)
"In this paper both terms (food loss and food waste) are used synonymously and refer to all food losses, because a distinction between wasteful behaviour and other reasons for food losses was difficult to perform"	Beretta *et al.* (2013)
"The ambiguous nature of food leftovers requires competence in dealing with foodstuffs that are neither meal nor ingredients, neither fresh nor completely spoiled; as such, they do not belong on the plate but neither do they yet belong in the waste bin […] considered surplus, and not yet waste"	Cappellini and Parsons (2013)
"Surplus food is treated as synonymous with food waste"	Evans (2011)
"The food lost at the consumption stage is a direct consequence of the consumer purchasing and eating behaviour, while this is not the case for the other stages of the supply chain, where much food is discarded due to other reasons not linked to human action"	Falasconi *et al.* (2016)
Crops potentially for human consumption but grown for non-food purposes, edible food intentionally used to feed animals or is a by-product of food processing diverted away from the human food	Aschemann-Witzel (2016), Parfitt *et al.* (2010)
"We define food waste as unintended losses of food produced for human consumption occurred in the distribution and consumption stages of the food supply chain due to 'multiple moments of consumption dispersed in space and time across other integrated practices such as shopping and cooking', which are themselves embedded in contextual and cultural factors"	Porpino *et al.* (2015)
"Wasted food: to be any food produced for human consumption that is discarded, whether it was kept beyond its expiry date, left to spoil or thrown away for any reason. Thus, if a family, for instance, chooses to feed pets with leftovers an appropriate	Porpino (2016)

(*continued*)

Table I.
Terms and concepts associated with food waste definitions and the authors

Different terms	Authors
means to discard food might have been reached, but waste itself was not avoided"	
"Refers to the irrational economy management processes taking place in the hospitality and households sector"	Radzymińska *et al.* (2016)
"[…] to include that which is leftover from meal preparation or which remains uneaten at the end of a meal, and food that is left unused or only partially used and then disposed of, and is not diverted to pets, composting, or other useful ends"	Tucker and Farrelly (2016)
"Avoidable waste means food that at some point prior to disposal was edible. In addition to food being discarded for reasons related to perceived food safety, others have shown that consumers waste food for reasons related to food quality"	Williams *et al.* (2012)

Table I.

General aspects of food waste	Aschemann-Witzel (2016), Aschemann-Witzel *et al.* (2016), Calvo-Porral *et al.* (2017), Chalak *et al.* (2016), Gjerris and Gaiani (2013), Porpino (2016), Parfitt *et al.* (2010)
Attitudes and behaviours towards food waste	Abdelradi (2018), Abeliotis *et al.* (2014), Arous *et al.* (2017), Aschemann-Witzel *et al.* (2015), Aschemann-Witzel, Jensen, Jensen and Kulikovskaja (2017), Bernstad (2014), Chakona and Shackleton (2017), Clark and Manning (2018), de Hooge *et al.* (2017), Diaz-Ruiz *et al.* (2018), Falasconi *et al.* (2016), Filipová *et al.* (2017), Fonseca (2014), Gaiani *et al.* (2018), Graham-Rowe *et al.* (2014), Grandhi and Singh (2016), Helmert *et al.* (2017), Janssen *et al.* (2017), Jellil *et al.* (2018), Jörissen *et al.* (2015), Koivupuro *et al.* (2012), Lazell (2016), Mallinson *et al.* (2016), Marangon *et al.* (2014), Martindale and Schiebel (2017), Melbye *et al.* (2017), Parizeau *et al.* (2015), Ponis *et al.* (2017), Porpino *et al.* (2015), Principato *et al.* (2015), Quested *et al.* (2011, 2013), Qui and Roe (2016), Radzymińska *et al.* (2016), Richter and Bokelmann (2017), Richter (2017), Secondi *et al.* (2015), Setti *et al.* (2016), Symmank *et al.* (2018), Tucker and Farrelly (2016), Williams *et al.* (2012), Wilson *et al.* (2017)
Theory of planned behaviour	Graham-Rowe *et al.* (2015), Lorenz *et al.* (2017), Mondéjar-Jiménez *et al.* (2016), Stancu *et al.* (2016), Stefan *et al.* (2013), Visschers *et al.* (2016), Romani *et al.* (2018), Russell *et al.* (2017)
Social practice theory	Blichfeldt *et al.* (2015), Evans (2011, 2012a, b), Leray *et al.* (2016), Cappellini and Parsons (2013), Soma (2017)
Value-belief-norm	Faar-Wharton *et al.* (2014)
Cue utilisation theory	Bhatt *et al.* (2018), Loebnitz *et al.* (2015), Loebnitz and Grunert (2015)
Socio-technical perspective	Mylan *et al.* (2016)
Key success factors	Aschemann-Witzel, de Hooge, Rohm, Normann, Bossle, Grønhøj and Oostindjer (2017)
Household waste prevention intervention campaigns	Jagau and Vyrastekova (2017), Sharp *et al.* (2010)
Affection and abundance	Porpino *et al.* (2016)
Circular economy	Bhatt *et al.* (2018)
Social-psychological literature	Geislar (2017)
Social norms	Hamerman *et al.* (2018), Young *et al.* (2017)
Green consumption	McCarthy and Liu (2017a, b)
Pro-environmental behaviour	Young *et al.* (2018)
Information	Zepeda and Balaine (2017)
Price reduction	Aschemann-Witzel, Jensen, Jensen and Kulikovskaja (2017), Aschemann-Witzel (2018)

Table II.
Theories, approaches and authors used in the studies

mainly on food consumption and wastage behaviour among consumers. Food management behaviours and attitudes to shopping, cooking and food consumption were also explored through surveys. Experimental studies increased from 2017. Additionally, qualitative studies, with focus on in-depth interviews and ethnographic studies, were used to explore consumer perceptions about food waste behaviour. Mixed-method approach was also prevalent between the studies analysed, providing different insights to food waste issues. Table AI presents the methods applied in the papers of the sample as well as the sources. Studies mostly focus on consumers' perception, attitudes and food-related routines that lead to food waste.

In the following, the main results from the above-mentioned studies are described, focusing on the drivers and barriers to food waste reduction.

3.2 Variables affecting consumer food waste

Variables found in the literature were divided into three main categories: societal factors, personal factors and behavioural factors. These categories were adapted from Quested *et al.* (2013) framework, which included two routes for household food waste reduction in the analyses: influencing the behaviour and actions that result into waste or changing the way that food is sold. Our categories were adapted from this framework and encompass: external context of influence, with sociocultural and retail factors that influence the individual, having both direct and indirect effect – societal factors; households characteristics and psychological influences, particular from each individual – personal factors; and the behaviour, habits and routines related to food provisioning – behavioural factors. Culture directly influences all variables. That is, the variables described as influencing consumers' behaviour are influenced by the predominant culture. Therefore, culture is presented as an integrated variable affecting all dimensions analysed.

Figure 4 presents the framework with the factors found on the literature. The following variables can affect the waste in a positive way, increasing the amount of food waste (+), or in a negative way, reducing it (−).

3.2.1 Societal factors. There are three subgroups of societal factors that can influence consumers' waste: historical; regulatory; and supply chain factors.

In historical factors, when society faced specific moments, such as the Second World War, where food rationing was frequent, they suffer influences in a way to reduce food waste (Quested *et al.*, 2013). This group of people usually "over 65 years old" are the ones who waste less. Additionally, recession periods are reported as one of the main drivers to reduce food waste (Abeliotis *et al.*, 2014).

From supply chain factors, an important barrier to waste reduction is packages (Marangon *et al.*, 2014). Their characteristics (difficulty in emptying/large sizes) are responsible for 20–25 per cent of the food wasted in the household (Williams *et al.*, 2012). Moreover, food supply chain is accused to provide misleading expiration date labelling (Aschemann-Witzel *et al.*, 2016; Gjerris and Gaiani, 2013), affecting consumers' perceptions of whether the food is proper to eat.

Consumers accuse supermarkets for selling products in poor conditions, which ends up on the bin (Graham-Rowe *et al.*, 2014; Jörissen *et al.*, 2015), being an important barrier to food waste reduction. Additionally, quantity discounts were stated as a retailer practice that directly influences household food waste, encouraging consumers to buy more than they actually need (Gjerris and Gaiani, 2013). A different barrier to waste reduction is the aesthetic standards required by retailers, avoiding suboptimal food products (Aschemann-Witzel, de Hooge, Rohm, Normann, Bossle, Grønhøj and Oostindjer, 2017).

Some practices are drivers of waste reduction. Retailers can encourage consumers to buy the right amount and help with storage conditions (Hebrok and Boks, 2017; Quested *et al.*, 2011),

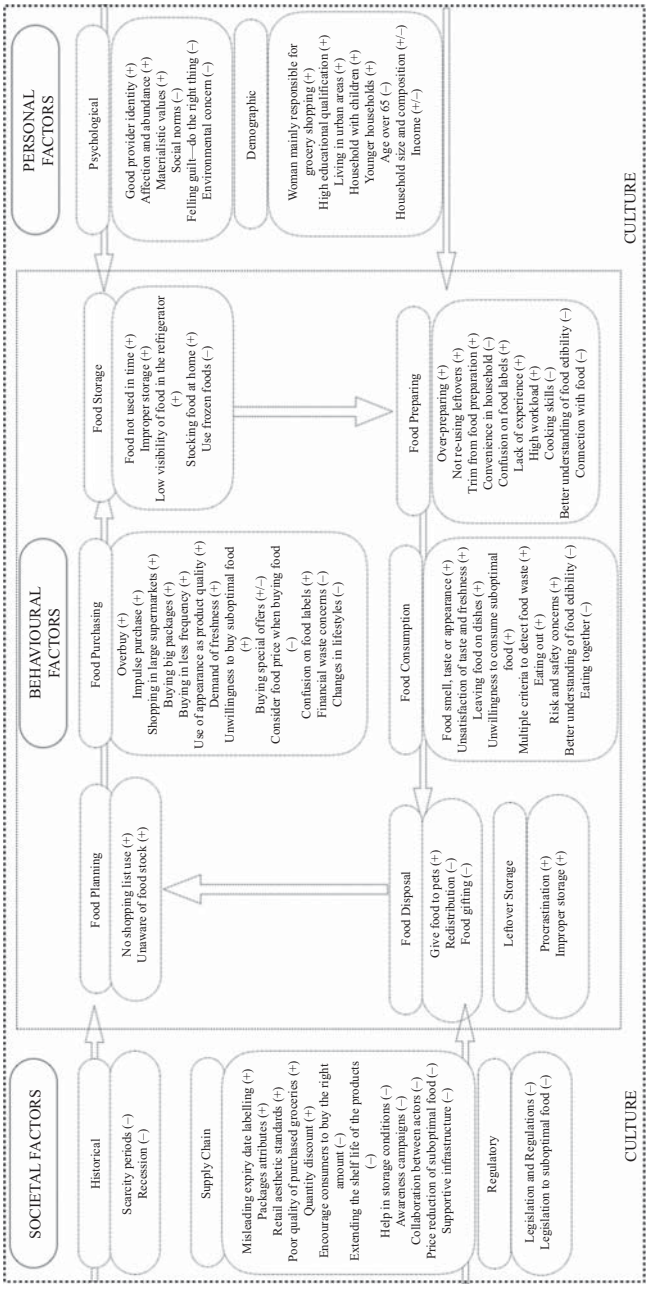

Figure 4.
Drivers and barriers to food waste reduction

informing about the right temperature of the food and how to improve their storage in households. Additionally, selling suboptimal food with a reduced price can be implemented in stores to help reduce food waste in the food supply chain (Symmank *et al.*, 2018).

Food industry can help by extending product shelf life (Aschemann-Witzel *et al.*, 2016; Hebrok and Boks, 2017; Quested *et al.*, 2011). All these changes with the creation of awareness campaigns and the importance of reducing the waste (Quested *et al.*, 2011; Sharp *et al.*, 2010; Arous *et al.*, 2017; Hebrok and Boks, 2017; Richter, 2017; Romani *et al.*, 2018; Young *et al.*, 2018) should be part of policy makers to increase awareness of food waste issues and how to avoid it. Therefore, supportive infrastructure (Geislar, 2017) and system-level collaboration between actors (Jellil *et al.*, 2018) are necessary in the food supply chain to facilitate food waste reduction.

To regulatory factors, regulations, policies and strategies can be a driver to food waste reduction. Compared to economic incentives, food waste related legislation and regulation are accused to be more effective (Arous *et al.*, 2017; Chalak *et al.*, 2016). Polices should act as facilitators, allowing, for example, the use of suboptimal food products (Aschemann-Witzel, 2016).

3.2.2 Personal factors. Personal factors are particular factors of each individual and are categorised as demographic factors and psychological factors.

Demographic factors are associated with family composition and household characteristics. The first factor of influence in food waste reduction is household size. Smaller households produce less waste than larger ones (Jörissen *et al.*, 2015; Koivupuro *et al.*, 2012; Silvennoinen *et al.*, 2014; Tucker and Farrelly, 2016). However, on a per capita basis, when analysing the amount of food waste per person, single households waste more (Jörissen *et al.*, 2015; Koivupuro *et al.*, 2012; Silvennoinen *et al.*, 2014). Therefore, larger households produce less waste.

In relation to gender, women tend to produce more waste than men. When women are responsible for grocery shopping, the amount of waste generated is higher (Koivupuro *et al.*, 2012; Silvennoinen *et al.*, 2014). When analysing household composition, the ones with children have higher levels of waste (Cappellini and Parsons, 2013; Evans, 2012a, b; Marangon *et al.*, 2014; Parizeau *et al.*, 2015; Tucker and Farrelly, 2016; Visschers *et al.*, 2016; Parfitt *et al.*, 2010; McCarthy and Liu, 2017b). This problem occurs specially with "younger households" (Marangon *et al.*, 2014; Visschers *et al.*, 2016; Blichfeldt *et al.*, 2015; Radzymińska *et al.*, 2016; Parfitt *et al.*, 2010; Leray *et al.*, 2016). A possible explanation for this phenomenon is that mothers tend to avoid the use leftovers to feed their children and prefer to serve a "new" food (Evans, 2012b). Additionally, high workload from young parents reduces the time of food care (Jörissen *et al.*, 2015).

Households with individuals with higher education tend to produce more waste (Marangon *et al.*, 2014; Secondi *et al.*, 2015). The authors also found that households in rural areas produce less waste than the ones in urban areas. When analysing income results diverge, but generally individuals with lower incomes tend to waste less. However, this relationship changes depending on the product category (Setti *et al.*, 2016; Stancu *et al.*, 2016; Stefan *et al.*, 2013; Filipová *et al.*, 2017; McCarthy and Liu, 2017a; Szabó-Bódi *et al.*, 2018).

Psychological factors are intrinsic factors of each individual. The good provider identity appears as one of the major barriers to food waste reduction. There is a desire to be a good parent, partner or host, associated with affection and abundance, leading individuals to buy and prepare more food than necessary, and to hold a high stock of food at home (Porpino *et al.*, 2016; Graham-Rowe *et al.*, 2014; Visschers *et al.*, 2016). The good provider identity results in a compensation effect (Porpino *et al.*, 2016). When mothers prepare unhealthy meals, they tend to compensate them preparing also healthy food. Additionally, they tend to over-buy healthy foods, even if they will not eat them (Graham-Rowe *et al.*, 2014).

Cooking from scratch is also linked with the good provider identity (Porpino *et al.*, 2015). Notwithstanding, even if consumers have the perception that cooking too much results in

food waste (Koivupuro *et al.*, 2012), this over-preparation is justified by the importance of abundance and the desire to be a good provider (Graham-Rowe *et al.*, 2014; Porpino *et al.*, 2015, 2016; Visschers *et al.*, 2016). Additionally, when individuals pursue materialitic values, they tend to waste more food than individuals who do not have this characteristic (Abdelradi, 2018; Diaz-Ruiz *et al.*, 2018).

An essential psychological factor that is a driver of food waste reduction is the feeling of guilt when throwing food away (Graham-Rowe *et al.*, 2014; Quested *et al.*, 2011; Jagau and Vyrastekova, 2017; Richter, 2017). The great majority of individuals report guilt when food waste occurs. Therefore, creating social norms to waste management can influence individuals to behave in a manner to reduce their waste (Bernstad, 2014; Geislar, 2017; Hamerman *et al.*, 2018). Moreover, individuals who express high environmental concern produce lower levels of waste and tend to behave in a more responsible way (Diaz-Ruiz *et al.*, 2018; Hamerman *et al.* 2018; Melbye *et al.*, 2017).

3.2.3 Behavioural factors. Behavioural factors are directly associated with the food purchase and consumption cycle, and are divided into: planning, purchasing, storage, preparing, consumption, leftover storage and disposal.

When analysing food planning, the majority of behaviours are considered barriers to food waste reduction. Not using shopping list (Jörissen *et al.*, 2015; Stefan *et al.*, 2013; Fonseca, 2014; Clark and Manning, 2018; Diaz-Ruiz *et al.*, 2018; Ponis *et al.*, 2017) and lack of information on food already stocked at home (Farr-Wharton *et al.*, 2014; Gaiani *et al.*, 2018) are variables related to inefficiencies in food planning routines that increase the amount of waste.

Food purchasing behaviours have the greatest number of variables influencing the final waste. Overbuy food is the most mentioned barrier to food waste reduction (Falasconi *et al.*, 2016; Evans, 2011; Leray *et al.*, 2016; Gaiani *et al.*, 2018). This is related to bulk buying, large packages and stocking food at home (Porpino *et al.*, 2015; Koivupuro *et al.*, 2012; Radzymińska *et al.*, 2016; Graham-Rowe *et al.*, 2014). In buying more food than needed, it can spoil, get out-of-date, be forgotten in the fridge or can have bad smell or taste along time (Koivupuro *et al.*, 2012). The overbuying barrier to waste reduction is related to impulse buying (Porpino *et al.*, 2015; Fonseca, 2014).

When analysing in-store behaviours, consumers use appearance to infer product quality, choosing the more attractive product (Aschemann-Witzel *et al.*, 2015). Consequently, retailers reject suboptimal food and consumers do not perceive them as valuable. The unwillingness to buy suboptimal foods is a barrier to food waste reduction, affecting the whole supply chain (de Hooge *et al.*, 2017; Loebnitz and Grunert, 2015; Loebnitz *et al.*, 2015; Helmert *et al.*, 2017; Symmank *et al.*, 2018). In the same direction, consumers' high demand of freshness increases the waste (Aschemann-Witzel *et al.*, 2015; Gjerris and Gaiani, 2013; Principato *et al.*, 2015; Evans, 2011).

Buying at large supermarkets is a different barrier to food waste reduction (Jörissen *et al.*, 2015; Marangon *et al.*, 2014). This may be associated with low value to food when buying in convenient large supermarkets and the high availability of different products. The frequency of shopping also impacts the final waste. When shopping once-a-week, the food wasted is higher than when shopping occurs more frequently (Marangon *et al.*, 2014; Williams *et al.*, 2012; Fonseca, 2014). This effect is due to the fact that people who buy in a less frequency tend to buy more food avoiding going to shopping stores.

The effect of special offers, such as "Buy One, Get One Free" or products with discounts, is not clear. Usually, who buys special offers waste less (Jörissen *et al.*, 2015; Silvennoinen *et al.*, 2014; Koivupuro *et al.*, 2012; Clark and Manning, 2018; Ponis *et al.*, 2017). Even if this marketing strategies encourage consumers to buy more than needed, buying promotional products may be associated with money restrictions (Jörissen *et al.*, 2015; Koivupuro *et al.*, 2012). However, at the same time, there is an association with buying special offers and food waste increase (Fonseca, 2014; Radzymińska *et al.*, 2016).

As drivers to food waste reduction, the economic problems of food waste are usually considered more relevant than the environmental ones (Principato *et al.*, 2015; Stancu *et al.*, 2016). Saving money was considered an important driver to reduce the waste (Lazell, 2016; Quested *et al.*, 2011). Therefore, financial concerns play a key role, especially for those who change lifestyles and need to save money (Graham-Rowe *et al.*, 2014).

To food storage, improper habits to store food are barriers to waste reduction (Gjerris and Gaiani, 2013; Romani *et al.*, 2018). Long storage (Jörissen *et al.*, 2015; Porpino *et al.*, 2015; Mallinson *et al.*, 2016; Leray *et al.*, 2016) and low visibility (Farr-Wharton *et al.*, 2014) lead household members to forget food in the fridge and throw it away after a long period. Improper storage conditions lead to quality loss, through spoilage, drying, bad smell or taste (Koivupuro *et al.*, 2012). These factors are closely related to lack of knowledge about storage conditions (Porpino *et al.*, 2015).

A similar barrier to waste reduction is food not used in time. Individuals tend to reject food when it passed the "use by"/"best before" dates (Evans, 2012a; Parfitt *et al.*, 2010; Parizeau *et al.*, 2015; Falasconi *et al.*, 2016; Blichfeldt *et al.*, 2015; Leray *et al.*, 2016; Jörissen *et al.*, 2015; Clark and Manning, 2018; McCarthy and Liu, 2017a, b). This is maximised for consumers who misinterpret date labels (Farr-Wharton *et al.*, 2014).

A driver of food waste reduction in the food storage phase is to freeze the food before storing it. Research studies show that household food waste is minimised when they use frozen foods (Janssen *et al.*, 2017; Martindale and Schiebel, 2017).

In food preparing, the worst barrier to food waste reduction is over-preparing. In preparing too much, food can be stored on the fridge as a leftover, not going to the bin immediately (Evans, 2012b). However, the unwillingness to consume leftovers, prejudice against them or freshness preference are barriers to waste reduction (Farr-Wharton *et al.*, 2014; Koivupuro *et al.*, 2012; Porpino *et al.*, 2015; Mallinson *et al.*, 2016; Stancu *et al.*, 2016; Tucker and Farrelly, 2016; Blichfeldt *et al.*, 2015; Mylan *et al.*, 2016; Cappellini and Parsons, 2013; Evans, 2012b; Fonseca, 2014; Leray *et al.*, 2016; Chakona and Shackleton, 2017; Gaiani *et al.*, 2018; Ponis *et al.*, 2017; Clark and Manning, 2018; Richter, 2017).

Even if consumers perceive that overcooking results in waste, it is justified by the importance of abundance and the good provider identity (as aforementioned). Food damages during cooking (e.g. burning) are also associated with over-preparation (Parizeau *et al.*, 2015; Parfitt *et al.*, 2010). Convenience (Bernstad, 2014; Porpino *et al.*, 2015) and lack of experience are basic variables related to preparing more food than needed (Jörissen *et al.*, 2015; Radzymińska *et al.*, 2016). Aligned with this, high workload results in higher amounts of waste due to lack of time to deal with household issues (Jörissen *et al.*, 2015; Leray *et al.*, 2016; Clark and Manning, 2018).

Moreover, confusions in interpreting labels, such as "use by" and "best before", lead consumers to throw away perfectly edible food (Abeliotis *et al.*, 2014; Falasconi *et al.*, 2016; Principato *et al.*, 2015; Wilson *et al.*, 2017; Arous *et al.*, 2017; Richter, 2017). Trim from food preparation is the only food waste considered unavoidable (Parizeau *et al.*, 2015; Tucker and Farrelly, 2016).

To work with drivers to food waste reduction in this phase of food consumption, developed cooking skills (Gjerris and Gaiani, 2013; Mylan *et al.*, 2016; Graham-Rowe *et al.*, 2014; Ponis *et al.*, 2017) and better understanding of foods edibility reduce the amount of waste (Farr-Wharton *et al.*, 2014). Additionally, connection with food is a key driver to reduce food waste (Blichfeldt *et al.*, 2015). Individuals who are more aware of the importance of food and different ways to prepare it seem to be more proactive to reduce their waste.

In food consumption, different variables can act as drivers and barriers to food waste reduction. Food smell, taste, appearance (Jörissen *et al.*, 2015; Lazell, 2016; Chakona and Shackleton, 2017; Gaiani *et al.*, 2018) and dissatisfaction with food freshness (Koivupuro *et al.*, 2012; Principato *et al.*, 2015) are barriers to the reduction whereas

consumers demand the perfect condition of the food. Individuals tend to rely on food appearance, smell or taste to judge its edibility when there is a lack knowledge necessary to draw inferences about them (Graham-Rowe *et al.*, 2015; Lazell, 2016). Consequently, the use of multiple methods to detect food waste (e.g. smelling with appearance) is an important barrier to waste reduction (Parizeau *et al.*, 2015).

In addition, rejecting suboptimal foods increases the amount of waste (Aschemann-Witzel *et al.*, 2015; de Hooge *et al.*, 2017). Individuals justify this behaviour with safety and risk concerns (Graham-Rowe *et al.*, 2014; Evans, 2011; Lazell, 2016; Abdelradi, 2018). Therefore, a better understanding of the food edibility is a driver to waste reduction (Farr-Wharton *et al.*, 2014; Blichfeldt *et al.*, 2015).

Serving too much food also affects waste. Consumers leave food on the dishes that go straight into the bin (Parfitt *et al.*, 2010; Porpino *et al.*, 2015; Mallinson *et al.*, 2016). As well as special occasions, like eating out, tend to increase waste, especially from the leftovers from previous meals (Evans, 2012a; Parizeau *et al.*, 2015; McCarthy and Liu, 2017b; Ponis *et al.*, 2017).

A driver to food waste reduction is eating together. Food waste is reduced when household members eat together at home (Chakona and Shackleton, 2017).

To leftover storage, food can be stored in the refrigerator, not going to the bin immediately. However, the "procrastination" of the consumption of these leftovers makes food loses value and ends up to the bin (Porpino *et al.*, 2016; Blichfeldt *et al.*, 2015). The unwillingness to consume leftovers is usually associated with safety conditions (individuals believe it can cause some harm) or simply because different meal options occur (eating out). Therefore, with improper storage of the leftovers, the food can be forgotten in the refrigerator or loses its qualities, and is considered a barrier to waste reduction (Gjerris and Gaiani, 2013; Koivupuro *et al.*, 2012; Porpino *et al.*, 2015; Farr-Wharton *et al.*, 2014; Mallinson *et al.*, 2016; Leray *et al.*, 2016).

The final phase of the food cycle is food disposal. Consumers have habits related to food disposal that are different routes to avoid waste. The act of giving food excess to pets is a solution that consumers find to deal with over-preparation (Porpino, 2016) However, it is still a form of waste (Stuart, 2009). Some practices, on the other hand, can be considered drivers to food waste reduction. Redistribution initiatives, such as food banks, are alternative ways of reducing waste at the consumer and food supply chain levels, by redistributing food that will not be consumed in time (Aschemann-Witzel, de Hooge, Rohm, Normann, Bossle, Grønhøj and Oostindjer, 2017). The same occurs to food gifting between households (Soma, 2017).

4. How to move to an anti-wastage behaviour

After a deep analysis in the data collected in the systematic review, aiming at assessing drivers and barriers to food waste reduction, it is possible to affirm that consumers have many opportunities to waste food. In general terms, Figure 4 proposes that external and personal factors impact behavioural factors, and both on the adoption of anti-wastage behaviours. Some of these factors are considered fixed, such as household size and composition and historical period, some influences are more difficult to change, such as regulatory and psychological factors. However, a deep analysis of the drivers and barriers allows the integration of efforts to waste reduction. The efforts found to move to an anti-wastage behaviour are classified in macro-environmental change, retailers' engagement, raise awareness of the issue and creating anti-wastage social norms.

Macro-environmental changes can be drivers of food waste reduction. First, well-defined regulations and policies are more effective than fiscal measures (Chalak *et al.*, 2016). Therefore, clear regulations in the way that date labels are used to help consumers' understanding (Aschemann-Witzel *et al.*, 2016) can move to a less wasteful behaviour.

The same applies to suboptimal food consumption, with regulations to extinguish aesthetical standards (Aschemann-Witzel *et al.*, 2016).

Institutional changes in food waste collection systems (Parizeau *et al.*, 2015) and creation of necessary infrastructure (Bernstad, 2014; Geislar, 2017) to push household members to participate in recycling activities can also be a food waste reduction effort. Laws encouraging the development of close-loop supply chains (Parfitt *et al.*, 2010) can push business behaviour to have more sustainable operations and engage their customers in their activities to waste reduction.

Retailers' engagement in helping consumers to avoid food waste is created with actions in the way that the food is sold and with alternative solutions. Retailers should start to sell suboptimal food, with price reduction or create different categories of products (Aschemann-Witzel *et al.*, 2015; Symmank *et al.*, 2018). This can also have an effect of suboptimal food consumption in households. Consumers can perceive value in these products, avoiding to discard.

It is possible to observe a movement going towards change. The French retailer Intermaché created a campaign, called "inglorious" fruits and vegetables, Albert Heijn from Netherlands used baskets of suboptimal fruits and vegetables to sell on their store and Imperfect redistribution from the USA sells boxes with suboptimal food (Aschemann-Witzel *et al.*, 2016). About marketing and sales strategies, retailers can use innovative solutions to sell products with special offers. For example, TESCO supermarkets in the UK started to sell "buy one, get one free later" (Mondéjar-Jiménez *et al.*, 2016). This initiative avoids products to expire when buying more than needed.

However, the major effort of retailers in trying consumers to avoid food waste is related to packaging improvement, such as adapting sizes, increase the shelf life of foods and improving storability (Aschemann-Witzel *et al.*, 2015). Packaging improvement can use innovative solutions (e.g. nanotechnology) (Parfitt *et al.*, 2010), and smart packaging, where colour-changing indicates when the food is no longer proper to eat (Jörissen *et al.*, 2015). Changes in packages are also related to improve food labelling. Retailers can change their environment to promote sustainable strategies, including: providing information about the freshness and durability of a product, how to storage a product, give recipes on how to use leftovers, design special offers to reduce the waste and so on. Likewise, practical interventions, such as sensory skills (Principato *et al.*, 2015), could help with proper freshness and expiration date awareness. Finally, food that would be discarded can be transferred to other parts (e.g. food banks) (Aschemann-Witzel *et al.*, 2016).

An additional effort to move to anti-waste behaviour is raising awareness of food waste issues. There is a focus in educating consumers in food management skills, which are related to behavioural factors (Figure 4). Starting by a systematic approach to food storage, mainly to inform about food items they already have, can reduce stockpiling and over-purchasing. Planning meals in advance, reuse of leftovers, understanding of date labelling, reduce consumption of perishable foods and adequate storage need to be integrated in food management skills to reduce food waste as part of effective food management strategies. Information should be repeatedly provided and using different sources to reach different consumers segments (Aschemann-Witzel *et al.*, 2015).

Finally, creating anti-wastage social norms can stimulate negative attitudes towards wasteful behaviours (Gjerris and Gaiani, 2013; Radzymińska *et al.*, 2016). The awareness of food waste production potentially reduces the amount of waste (Parizeau *et al.*, 2015; Principato *et al.*, 2015) and intention to not waste food is determined by social norms and attitudes towards food waste (Stancu *et al.*, 2016). This is reinforced for individuals who have a strong concern to the environment (Diaz-Ruiz *et al.*, 2018; Hamerman *et al.* 2018; Melbye *et al.*, 2017). Informing about the issues associated with food waste, focusing on the environmental problems of it, can induce individuals to act in an anti-wastage behaviour. Therefore, an environment where individuals know the consequences and the importance of

reducing their waste is a potential driver to food waste reduction. The behaviours and actions against waste reduction need to become visible (Sharp *et al.*, 2010) as part of the prevalent social norms.

5. Conclusion

A great contributor to food waste is consumer's behaviour, which suffers influences by a range of factors. It is important to discuss the variables that affect individuals and to find different ways to move to an anti-wastage pattern of behaviour. This systematic review captured the main drivers and barriers to waste reduction. Some influences are fixed and difficult to change, such as household and historical factors. However, from the main analysis, behavioural factors, which encompass shopping routines and food handling and provision (Figure 4), are more flexible and easier to change. Efforts to move to an anti-wastage behaviour require macro-environmental change, retailers' engagement, raising awareness of the issue and creating anti-wastage social norms. Different actors of the food supply chain have to collaborate to move into an anti-waste pattern of behaviour.

Consumer food waste can just be minimised, not totally abolish, requiring actions upstream (Aschemann-Witzel *et al.*, 2015). Policy makers, food marketers and retailers have an important role in enhancing sustainability when helping consumers to behave in a less wasteful way. The recommendation is to first raise awareness of food waste issues in trying to create an environment where the prevalent norm is not to waste food. Food industry and retailers have an essential role in preventing the waste by developing packages that help consumers to reduce their waste. In the same way, communication about food management skills helps individuals to pursue different habits and routines in the household environment. Combining different efforts, anti-waste behaviours can be stimulated by different actors of the food supply chain and consumers can suffer their influence when buying and consuming food products.

Our framework (Figure 4) contributes to the understanding of the factors in a theoretical way, where a range of variables observed can reduce food waste levels when analysed by the relation between attitudes and behaviour theory. Guilt feeling, for example, is one of the major motivators to food waste reduction. With the same importance, concern for the environment is a personal characteristic that pushes individuals to purse less wasteful behaviours. Theoretically speaking, psychological theories, when analysed with attitudes and behaviour theories, can help in understating mechanisms to consumers reduce their waste. Additionally, the framework also helps in a practical way the waste reduction efforts by the understanding of attitudes that help to change behaviours. Strategies to waste reduction should carefully analyse the combination of factors explored in this study in order to deal with the variables that are easier to change.

However, research is needed to understand how different interventions could actually reduce consumer food waste. Experimental studies exploring the effect of price reductions (de Hooge *et al.*, 2017; Loebnitz *et al.*, 2015) or intervention techniques such as providing information about social norms (Schmidt, 2016) could explore incentives for food waste reduction.

In terms of limitations, the systematic review did not capture all variables that can influence consumer food waste. Future studies could use different inclusion and exclusion criteria to have different results. Overall, the present paper makes valuable effort by presenting with an integrative way the different factors that influence consumer food waste. It furthers the discussion on how different actors of the food supply chain could act in order to help consumers and to have benefits with it.

Note

1. This review ended in the first month of 2018 and only captured articles until January 2018. Therefore, 12 papers were published in just the first month of the year.

References

Abdelradi, F. (2018), "Food waste behaviour at the household level: a conceptual framework", *Waste Management*, Vol. 71, pp. 485-493.

Abeliotis, K., Lasaridi, K. and Chroni, C. (2014), "Attitudes and behaviour of Greek households regarding food waste prevention", *Waste Management & Research*, Vol. 32 No. 3, pp. 237-240.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.

Arous, S.A., Capone, R., Debs, P., Haddadi, Y., El Bilali, H., Bottalico, F. and Hamidouche, M. (2017), "Exploring household food waste issue in Algeria", *AGROFOR International Journal*, Vol. 2 No. 1, pp. 55-67.

Aschemann-Witzel, J. (2016), "Waste not, want not, emit less", *Science*, Vol. 352 No. 6284, pp. 408-409.

Aschemann-Witzel, J. (2018), "Consumer perception and preference for suboptimal food under the emerging practice of expiration date based pricing in supermarkets", *Food Quality and Preference*, Vol. 63, pp. 119-128.

Aschemann-Witzel, J., de Hooge, I. and Normann, A. (2016), "Consumer-related food waste: role of food marketing and retailers and potential for action", *Journal of International Food & Agribusiness Marketing*, Vol. 28 No. 3, pp. 271-285.

Aschemann-Witzel, J., Jensen, J.H., Jensen, M.H. and Kulikovskaja, V. (2017), "Consumer behaviour towards price-reduced suboptimal foods in the supermarket and the relation to food waste in households", *Appetite*, Vol. 116, pp. 246-258.

Aschemann-Witzel, J., de Hooge, I., Amani, P., Bech-Larsen, T. and Oostindjer, M. (2015), "Consumer-related food waste: causes and potential for action", *Sustainability*, Vol. 7 No. 6, pp. 6457-6477.

Aschemann-Witzel, J., de Hooge, I.E., Rohm, H., Normann, A., Bossle, M.B., Grønhøj, A. and Oostindjer, M. (2017), "Key characteristics and success factors of supply chain initiatives tackling consumer-related food waste – a multiple case study", *Journal of Cleaner Production*, Vol. 155, pp. 33-45.

Beretta, C., Stoessel, F., Baier, U. and Hellweg, S. (2013), "Quantifying food losses and the potential for reduction in Switzerland", *Waste Management*, Vol. 33 No. 3, pp. 764-773.

Bernstad, A. (2014), "Household food waste separation behavior and the importance of convenience", *Waste Management*, Vol. 34 No. 7, pp. 1317-1323.

Bhatt, S., Lee, J., Deutsch, J., Ayaz, H., Fulton, B. and Suri, R. (2018), "From food waste to value-added surplus products (VASP): consumer acceptance of a novel food product category", *Journal of Consumer Behaviour*, Vol. 17 No. 1, pp. 57-63.

Blichfeldt, B.S., Mikkelsen, M. and Gram, M. (2015), "When it stops being food", *Food, Culture & Society: An International Journal of Multidisciplinary Research*, Vol. 18 No. 1, pp. 89-105.

Block, L.G., Keller, P.A., Vallen, B., Williamson, S., Birau, M.M., Grinstein, A., Haws, K.L., LaBarge, M.C., Lamberton, C., Moore, E.S., Moscato, E.M., Reczek, R.W. and Tangari, A.H. (2016), "The squander sequence: understanding food waste at each stage of the consumer decision-making process", *Journal of Public Policy & Marketing*, Vol. 35 No. 2, pp. 292-304.

Borrello, M., Caracciolo, F., Lombardi, A., Pascucci, S. and Cembalo, L. (2017), "Consumers' perspective on circular economy strategy for reducing food waste", *Sustainability*, Vol. 9 No. 1, p. 141.

Bossle, M.B., de Barcellos, M.D., Vieira, L.M. and Sauvée, L. (2016), "The drivers for adoption of eco-innovation", *Journal of Cleaner Production*, Vol. 113, pp. 861-872.

Calvo-Porral, C., Medín, A.F. and Losada-López, C. (2017), "Can marketing help in tackling food waste?: proposals in developed countries", *Journal of Food Products Marketing*, Vol. 23 No. 1, pp. 42-60.

Cappellini, B. and Parsons, E. (2013), "Practising thrift at dinnertime: mealtime leftovers, sacrifice and family membership", *The Sociological Review*, Vol. 60 No. S2, pp. 121-134.

Chakona, G. and Shackleton, C.M. (2017), "Local setting influences the quantity of household food waste in mid-sized South African towns", *PLoS One*, Vol. 12 No. 12, p. e0189407.

Chalak, A., Abou-Daher, C., Chaaban, J. and Abiad, M.G. (2016), "The global economic and regulatory determinants of household food waste generation: a cross-country analysis", *Waste Management*, Vol. 48, pp. 418-422.

Clark, J. and Manning, L. (2018), "What are the factors that an opportunity sample of UK students insinuate as being associated with their wastage of food in the home setting?", *Resources, Conservation and Recycling*, Vol. 130, pp. 20-30.

de Hooge, I.E., Oostindjer, M., Aschemann-Witzel, J., Normann, A., Loose, S.M. and Almli, V.L. (2017), "This apple is too ugly for me!: consumer preferences for suboptimal food products in the supermarket and at home", *Food Quality and Preference*, Vol. 56, pp. 80-92.

Diaz-Ruiz, R., Costa-Font, M. and Gil, J.M. (2018), "Moving ahead from food-related behaviours: an alternative approach to understand household food waste generation", *Journal of Cleaner Production*, Vol. 172, pp. 1140-1151.

European Community (2011), "Preparatory study on food waste across EU-27, technical report 2010-054", European Communities.

Evans, D. (2011), "Blaming the consumer – once again: the social and material contexts of everyday food waste practices in some English households", *Critical Public Health*, Vol. 21 No. 4, pp. 429-440.

Evans, D. (2012a), "Beyond the throwaway society: ordinary domestic practice and a sociological approach to household food waste", *Sociology*, Vol. 46 No. 1, pp. 41-56.

Evans, D. (2012b), "Binning, gifting and recovery: the conduits of disposal in household food consumption", *Environment and Planning D: Society and Space*, Vol. 30 No. 6, pp. 1123-1137.

Falasconi, L., Cicatiello, C., Franco, S., Segré, A., Setti, M., Vittuari, M. and Cusano, I. (2016), "Consumer approach to food waste: evidences from a large scale survey in Italy", *Rivista di Economia Agraria*, Vol. 71 No. 1, pp. 266-277.

FAO (1981), *Food Loss Prevention in Perishable Crops*, Food and Agriculture Organization of the United Nations, available at: www.fao.org/docrep/s8620e/s8620e00.html (accessed 20 February 2017).

FAO (2013), "Urgent collaboration required on food wastage", Food and Agriculture Organization of the United Nations, available at: www.fao.org/news/story/en/item/202914/icode/ (accessed 12 March 2017).

Farr-Wharton, G., Foth, M. and Choi, J.H.J. (2014), "Identifying factors that promote consumer behaviours causing expired domestic food waste", *Journal of Consumer Behaviour*, Vol. 13 No. 6, pp. 393-402.

Filipová, A., Mokrejšová, V., Šulc, Z. and Zeman, J. (2017), "Characteristics of food-wasting consumers in the Czech Republic", *International Journal of Consumer Studies*, Vol. 41 No. 6, pp. 714-722.

Fonseca, J.R. (2014), "A latent class model to discover household food waste patterns in Lisbon City in support of food security, public health and environmental protection", *International Journal on Food System Dynamics*, Vol. 4 No. 3, pp. 184-197.

Gaiani, S., Caldeira, S., Adorno, V., Segrè, A. and Vittuari, M. (2018), "Food wasters: profiling consumers' attitude to waste food in Italy", *Waste Management*, Vol. 72, pp. 17-24.

Geislar, S. (2017), "The new norms of food waste at the curb: evidence-based policy tools to address benefits and barriers", *Waste Management*, Vol. 68, pp. 571-580.

Gjerris, M. and Gaiani, S. (2013), "Household food waste in Nordic countries: estimations and ethical implications", *Etikk i praksis – Nordic Journal of Applied Ethics*, Vol. 7 No. 1, pp. 6-23.

Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F. and Toulmin, C. (2010), "Food security: the challenge of feeding 9 billion people", *Science*, Vol. 327 No. 5967, pp. 812-818.

Graham-Rowe, E., Jessop, D.C. and Sparks, P. (2014), "Identifying motivations and barriers to minimising household food waste", *Resources, Conservation and Recycling*, Vol. 84, pp. 15-23.

Graham-Rowe, E., Jessop, D.C. and Sparks, P. (2015), "Predicting household food waste reduction using an extended theory of planned behaviour", *Resources, Conservation and Recycling*, Vol. 101, pp. 194-202.

Grandhi, B. and Singh, A.J. (2016), "What a waste! A study of food wastage behavior in Singapore", *Journal of Food Products Marketing*, Vol. 22 No. 4, pp. 471-485.

Gustavsson, J., Cederberg, C., Sonesson, U., van Otterdijk, R. and Meybeck, A. (2011), *Global Food Losses and Food Waste: Extent, Causes and Prevention*, FAO, Rome.

Hamerman, E.J., Rudell, F. and Martins, C.M. (2018), "Factors that predict taking restaurant leftovers: strategies for reducing food waste", *Journal of Consumer Behaviour*, Vol. 17 No. 1, pp. 94-104.

Hebrok, M. and Boks, C. (2017), "Household food waste: drivers and potential intervention points for design – an extensive review", *Journal of Cleaner Production*, Vol. 151, pp. 380-392.

Helmert, J.R., Symmank, C., Pannasch, S. and Rohm, H. (2017), "Have an eye on the buckled cucumber: an eye tracking study on visually suboptimal foods", *Food Quality and Preference*, Vol. 60, pp. 40-47.

Jagau, H.L. and Vyrastekova, J. (2017), "Behavioral approach to food waste: an experiment", *British Food Journal*, Vol. 119 No. 4, pp. 882-894.

Janssen, A.M., Nijenhuis-de Vries, M.A., Boer, E.P. and Kremer, S. (2017), "Fresh, frozen, or ambient food equivalents and their impact on food waste generation in Dutch households", *Waste Management*, Vol. 67, pp. 298-307.

Jellil, A., Woolley, E. and Rahimifard, S. (2018), "Towards integrating production and consumption to reduce consumer food waste in developed countries", *International Journal of Sustainable Engineering*, pp. 1-13.

Jörissen, J., Priefer, C. and Bräutigam, K.R. (2015), "Food waste generation at household level: results of a survey among employees of two European research centers in Italy and Germany", *Sustainability*, Vol. 7 No. 3, pp. 2695-2715.

Kitchenham, B. (2004), "Procedures for performing systematic reviews", Keele University, Keele, 33, pp. 1-26.

Koivupuro, H.K., Hartikainen, H., Silvennoinen, K., Katajajuuri, J.M., Heikintalo, N., Reinikainen, A. and Jalkanen, L. (2012), "Influence of socio-demographical, behavioural and attitudinal factors on the amount of avoidable food waste generated in Finnish households", *International Journal of Consumer Studies*, Vol. 36 No. 2, pp. 183-191.

Lazell, J. (2016), "Consumer food waste behaviour in universities: sharing as a means of prevention", *Journal of Consumer Behaviour*, Vol. 15 No. 5, pp. 430-439.

Leray, L., Sahakian, M. and Erkman, S. (2016), "Understanding household food metabolism: relating micro-level material flow analysis to consumption practices", *Journal of Cleaner Production*, Vol. 125, pp. 44-55.

Loebnitz, N. and Grunert, K.G. (2015), "The effect of food shape abnormality on purchase intentions in China", *Food Quality and Preference*, Vol. 40, pp. 24-30.

Loebnitz, N., Schuitema, G. and Grunert, K.G. (2015), "Who buys oddly shaped food and why? Impacts of food shape abnormality and organic labeling on purchase intentions", *Psychology & Marketing*, Vol. 32 No. 4, pp. 408-421.

Lorenz, B.A.S., Hartmann, M. and Langen, N. (2017), "What makes people leave their food? The interaction of personal and situational factors leading to plate leftovers in canteens", *Appetite*, Vol. 116, pp. 45-56.

McCarthy, B. and Liu, H.B. (2017a), "Food waste and the 'green' consumer", *Australasian Marketing Journal*, Vol. 25 No. 2, pp. 126-132.

McCarthy, B. and Liu, H.B. (2017b), "'Waste not, want not' exploring green consumers' attitudes towards wasting edible food and actions to tackle food waste", *British Food Journal*, Vol. 119 No. 12, pp. 2519-2531.

Mallinson, L.J., Russell, J.M. and Barker, M.E. (2016), "Attitudes and behaviour towards convenience food and food waste in the United Kingdom", *Appetite*, Vol. 103, pp. 17-28.

Marangon, F., Tempesta, T., Troiano, S. and Vecchiato, D. (2014), "Food waste, consumer attitudes and behaviour. A study in the north-eastern part of Italy", *Rivista di Economia Agraria*, Vol. 69 Nos 2-3, pp. 201-209.

Martindale, W. and Schiebel, W. (2017), "The impact of food preservation on food waste", *British Food Journal*, Vol. 119 No. 12, pp. 2510-2518.

Melbye, E.L., Onozaka, Y. and Hansen, H. (2017), "Throwing it all away: exploring affluent consumers' attitudes toward wasting edible food", *Journal of Food Products Marketing*, Vol. 23 No. 4, pp. 416-429.

Mondéjar-Jiménez, J.A., Ferrari, G., Secondi, L. and Principato, L. (2016), "From the table to waste: an exploratory study on behaviour towards food waste of Spanish and Italian youths", *Journal of Cleaner Production*, Vol. 138, pp. 8-18.

Mylan, J., Holmes, H. and Paddock, J. (2016), "Re-introducing consumption to the 'circular economy': a sociotechnical analysis of domestic food provisioning", *Sustainability*, Vol. 8 No. 8, p. 794.

Papargyropoulou, E., Lozano, R., Steinberger, J.K., Wright, N. and bin Ujang, Z. (2014), "The food waste hierarchy as a framework for the management of food surplus and food waste", *Journal of Cleaner Production*, Vol. 76, pp. 106-115.

Parfitt, J., Barthel, M. and Macnaughton, S. (2010), "Food waste within food supply chains: quantification and potential for change to 2050", *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, Vol. 365 No. 1554, pp. 3065-3081.

Parizeau, K., von Massow, M. and Martin, R. (2015), "Household-level dynamics of food waste production and related beliefs, attitudes, and behaviours in Guelph, Ontario", *Waste Management*, Vol. 35, pp. 207-217.

Petticrew, M. and Roberts, H. (2006), *Systematic Reviews in the Social Sciences: A Practical Guide*, John Wiley & Sons, Blackwell Publishing, Oxford.

Ponis, S.T., Papanikolaou, P.A., Katimertzoglou, P., Ntalla, A.C. and Xenos, K.I. (2017), "Household food waste in Greece: a questionnaire survey", *Journal of Cleaner Production*, Vol. 149, pp. 1268-1277.

Porpino, G. (2016), "Household food waste behavior: avenues for future research", *Journal of the Association for Consumer Research*, Vol. 1 No. 1, pp. 41-51.

Porpino, G., Parente, J. and Wansink, B. (2015), "Food waste paradox: antecedents of food disposal in low income households", *International Journal of Consumer Studies*, Vol. 39 No. 6, pp. 619-629.

Porpino, G., Wansink, B. and Parente, J. (2016), "Wasted positive intentions: the role of affection and abundance on household food waste", *Journal of Food Products Marketing*, Vol. 22 No. 7, pp. 733-751.

Principato, L., Secondi, L. and Pratesi, C.A. (2015), "Reducing food waste: an investigation on the behaviour of Italian youths", *British Food Journal*, Vol. 117 No. 2, pp. 731-748.

Qi, D. and Roe, B.E. (2016), "Household food waste: multivariate regression and principal components analyses of awareness and attitudes among US consumers", *PloS One*, Vol. 11 No. 7.

Quested, T.E., Marsh, E., Stunell, D. and Parry, A.D. (2013), "Spaghetti soup: the complex world of food waste behaviours", *Resources, Conservation and Recycling*, Vol. 79, pp. 43-51.

Quested, T.E., Parry, A.D., Easteal, S. and Swannell, R. (2011), "Food and drink waste from households in the UK", *Nutrition Bulletin*, Vol. 36 No. 4, pp. 460-467.

Radzymińska, M., Jakubowska, D. and Staniewska, K. (2016), "Consumer attitude and behaviour towards food waste", *Journal of Agribusiness and Rural Development*, Vol. 1 No. 29, pp. 175-181.

Richter, B. (2017), "Knowledge and perception of food waste among German consumers", *Journal of Cleaner Production*, Vol. 166, pp. 641-648.

Richter, B. and Bokelmann, W. (2017), "Explorative study about the analysis of storing, purchasing and wasting food by using household diaries", *Resources, Conservation and Recycling*, Vol. 125, pp. 181-187.

Romani, S., Grappi, S., Bagozzi, R.P. and Barone, A.M. (2018), "Domestic food practices: a study of food management behaviors and the role of food preparation planning in reducing waste", *Appetite*, Vol. 121, pp. 215-227.

Roodhuyzen, D.M.A., Luning, P.A., Fogliano, V. and Steenbekkers, L.P.A. (2017), "Putting together the puzzle of consumer food waste: towards an integral perspective", *Trends in Food Science & Technology*, Vol. 68, pp. 37-50.

Russell, S.V., Young, C.W., Unsworth, K.L. and Robinson, C. (2017), "Bringing habits and emotions into food waste behaviour", *Resources, Conservation and Recycling*, Vol. 125, pp. 107-114.

Salhofer, S., Obersteiner, G., Schneider, F. and Lebersorger, S. (2008), "Potentials for the prevention of municipal solid waste", *Waste Management*, Vol. 28 No. 2, pp. 245-259.

Sampaio, R.F. and Mancini, M.C. (2007), "Estudos de revisão sistemática: um guia para síntese criteriosa da evidência científica", *Brazilian Journal of Physical Therapy*, Vol. 11 No. 1, pp. 83-89.

Schmidt, K. (2016), "Explaining and promoting household food waste-prevention by an environmental psychological based intervention study", *Resources, Conservation and Recycling*, Vol. 111, pp. 53-66.

Secondi, L., Principato, L. and Laureti, T. (2015), "Household food waste behaviour in EU-27 countries: a multilevel analysis", *Food Policy*, Vol. 56, pp. 25-40.

Setti, M., Falasconi, L., Segrè, A., Cusano, I. and Vittuari, M. (2016), "Italian consumers' income and food waste behavior", *British Food Journal*, Vol. 118 No. 7, pp. 1731-1746.

Silvennoinen, K., Katajajuuri, J.M., Hartikainen, H., Heikkilä, L. and Reinikainen, A. (2014), "Food waste volume and composition in Finnish households", *British Food Journal*, Vol. 116 No. 6, pp. 1058-1068.

Sharp, V., Giorgi, S. and Wilson, D.C. (2010), "Delivery and impact of household waste prevention intervention campaigns (at the local level)", *Waste Management & Research*, Vol. 28 No. 3, pp. 256-268.

Soma, T. (2017), "Gifting, ridding and the 'everyday mundane': the role of class and privilege in food waste generation in Indonesia", *Local Environment*, Vol. 22 No. 12, pp. 1444-1460.

Stancu, V., Haugaard, P. and Lähteenmäki, L. (2016), "Determinants of consumer food waste behaviour: two routes to food waste", *Appetite*, Vol. 96, pp. 7-17.

Stefan, V., van Herpen, E., Tudoran, A.A. and Lähteenmäki, L. (2013), "Avoiding food waste by Romanian consumers: the importance of planning and shopping routines", *Food Quality and Preference*, Vol. 28 No. 1, pp. 375-381.

Stuart, T. (2009), *Waste: Uncovering the Global Food Scandal*, Penguin Books, London.

Symmank, C., Zahn, S. and Rohm, H. (2018), "Visually suboptimal bananas: how ripeness affects consumer expectation and perception", *Appetite*, Vol. 120, pp. 472-481.

Szabó-Bódi, B., Kasza, G. and Szakos, D. (2018), "Assessment of household food waste in Hungary", *British Food Journal*, Vol. 120 No. 3, pp. 625-638.

Tranfield, D., Denyer, D. and Smart, P. (2003), "Towards a methodology for developing evidence-informed management knowledge by means of systematic review", *British Journal of Management*, Vol. 14 No. 3, pp. 207-222.

Tucker, C.A. and Farrelly, T. (2016), "Household food waste: the implications of consumer choice in food from purchase to disposal", *Local Environment*, Vol. 21 No. 6, pp. 682-706.

Visschers, V.H., Wickli, N. and Siegrist, M. (2016), "Sorting out food waste behaviour: a survey on the motivators and barriers of self-reported amounts of food waste in households", *Journal of Environmental Psychology*, Vol. 45, pp. 66-78.

Williams, H., Wikström, F., Otterbring, T., Löfgren, M. and Gustafsson, A. (2012), "Reasons for household food waste with special attention to packaging", *Journal of Cleaner Production*, Vol. 24, pp. 141-148.

Wilson, N.L., Rickard, B.J., Saputo, R. and Ho, S.T. (2017), "Food waste: the role of date labels, package size, and product category", *Food Quality and Preference*, Vol. 55, pp. 35-44.

Young, C.W., Russell, S.V., Robinson, C.A. and Chintakayala, P.K. (2018), "Sustainable retailing – influencing consumer behaviour on food waste", *Business Strategy and the Environment*, Vol. 27 No. 1, pp. 1-15.

Young, W., Russell, S.V., Robinson, C.A. and Barkemeyer, R. (2017), "Can social media be a tool for reducing consumers' food waste? A behaviour change experiment by a UK retailer", *Resources, Conservation and Recycling*, Vol. 117, pp. 195-203.

Zepeda, L. and Balaine, L. (2017), "Consumers' perceptions of food waste: a pilot study of US students", *International Journal of Consumer Studies*, Vol. 41 No. 6, pp. 627-637.

Further reading

Carlsson-Kanyama, A., Ekström, M.P. and Shanahan, H. (2003), "Food and life cycle energy inputs: consequences of diet and ways to increase efficiency", *Ecological Economics*, Vol. 44 No. 2, pp. 293-307.

Cuéllar, A.D. and Webber, M.E. (2010), "Wasted food, wasted energy: the embedded energy in food waste in the United States", *Environmental Science & Technology*, Vol. 44 No. 16, pp. 6464-6469.

Evans, D., Campbell, H. and Murcott, A. (2012), "A brief pre-history of food waste and the social sciences", *The Sociological Review*, Vol. 60 No. S2, pp. 5-26.

Fusions (2013), "Report on food waste drivers for reducing food waste and barriers and opportunities", available at: www.researchgate.net/publication/283730045_Report_on_food_waste_drivers_for_reducing_food_waste_and_barriers_and_opportunities (accessed 19 February 2018).

WRAP (2009), "Household food and drink waste in the UK", Waste & Resources Action Programme, available at: www.wrap.org.uk/search/gss/understanding%20food%20waste (accessed 12 February 2018).

Appendix

Authors	Method	Source
Quantitative approach		
Abeliotis *et al.* (2014)	Survey	*Waste Management & Research*
Abdelradi (2018)	Survey	*Waste Management*
Arous *et al.* (2017)	Survey	*AGROFOR International Journal*
Aschemann-Witzel (2018)	Survey	*Food Quality and Preference*
Chakona and Shackleton (2017)	Survey	*PLoS One*
Diaz-Ruiz *et al.* (2018)	Survey	*Journal of Cleaner Production*
Falasconi *et al.* (2016)	Survey	*Rivista di Economia Agraria*
Filipová *et al.* (2017)	Survey	*International Journal of Consumer Studies*
Gaiani *et al.* (2018)	Survey	*Waste Management*
Graham-Rowe *et al.* (2015)	Survey	*Resources, Conservation and Recycling*
Grandhi and Singh (2016)	Survey	*Journal of Food Products Marketing*
Janssen *et al.* (2017)	Survey	*Waste Management*
Jörissen *et al.* (2015)	Survey	*Sustainability*
Lorenz *et al.* (2017)	Survey	*Appetite*
Mallinson *et al.* (2016)	Survey	*Appetite*
Marangon *et al.* (2014)	Survey	*Rivista di Economia Agraria*
Martindale and Schiebel (2017)	Survey	*British Food Journal*
McCarthy and Liu (2017a)	Survey	*Australasian Marketing Journal*
McCarthy and Liu (2017b)	Survey	*British Food Journal*
Melbye *et al.* (2017)	Survey	*Journal of Food Products Marketing*
Mondéjar-Jiménez *et al.* (2016)	Survey	*Journal of Cleaner Production*
Ponis *et al.* (2017)	Survey	*Journal of Cleaner Production*
Principato *et al.* (2015)	Survey	*British Food Journal*
Qui and Roe (2016)	Survey	*PLoS One*
Richter (2017)	Survey	*Journal of Cleaner Production*
Russell *et al.* (2017)	Survey	*Resources, Conservation & Recycling*
Secondi *et al.* (2015)	Survey	*Food Policy*
Setti *et al.* (2016)	Survey	*British Food Journal*
Stancu *et al.* (2016)	Survey	*Appetite*
Stefan *et al.* (2013)	Survey	*Food Quality and Preference*
Szabó-Bódi *et al.* (2018)	Survey	*British Food Journal*
Tucker and Farrelly (2016)	Survey	*The International Journal of Justice and Sustainability*
Visschers *et al.* (2016)	Survey	*Journal of Environmental Psychology*
Young *et al.* (2018)	Survey	*Business Strategy and the Environment*
de Hooge *et al.* (2017)	Choice experiment	*Food Quality and Preference*
Bhatt *et al.* (2018)	Experiment	*Journal of Consumer Behaviour*
Geislar (2017)	Experiment	*Waste Management*
Hamerman *et al.* (2018)	Experiment	*Journal of Consumer Behaviour*
Helmert *et al.* (2017)	Experiment	*Food Quality and Preference*
Jagau and Vyrastekova (2017)	Experiment	*British Food Journal*

(*continued*)

Table AI.
Authors, methods and sources

Authors	Method	Source
Loebnitz and Grunert (2015)	Experiment	*Food Quality and Preference*
Loebnitz *et al.* (2015)	Experiment	*Psychology & Marketing*
Symmank *et al.* (2018)	Experiment	*Appetite*
Wilson *et al.* (2017)	Experiment	*Food Quality and Preference*
Young *et al.* (2017)	Experiment	*Resources, Conservation & Recycling*
Zepeda and Balaine (2017)	Experiment	*International Journal of Consumer Studies*
Chalak *et al.* (2016)	Panel data analysis	*Waste Management*
Qualitative approach		
Blichfeldt *et al.* (2015)	Interviews	*Food, Culture & Society: An International Journal of Multidisciplinary Research*
Clark and Manning (2018)	Interviews	*Resources, Conservation & Recycling*
Graham-Rowe *et al.* (2014)	Interviews	*Resources, Conservation and Recycling*
Mylan *et al.* (2016)	Interviews	*Sustainability*
Soma (2017)	Interviews	*Local Environment*
Cappellini and Parsons (2013)	Ethnography	*The Sociological Review*
Evans (2012b)	Ethnography	*Environmental and Planning D: Society and Space*
Evans (2011)	Ethnography	*Critical Public Health*
Evans (2012a)	Ethnography	*Sociology*
Aschemann-Witzel, de Hooge, Rohm, Normann, Bossle, Grønhøj and Oostindjer (2017a)	Case study	*Journal of Cleaner Production*
Bernstad (2014)	Case study	*Waste Management*
Quested *et al.* (2011)	Insights	*Nutrition Bulletin*
Quested *et al.* (2013)	Insights	*Resources, Conservation and Recycling*
Aschemann-Witzel (2016)	Insights	*Science*
Radzymińska *et al.* (2016)	Focus group	*Journal of Agribusiness and Rural Development*
Sharp *et al.* (2010)	Review	*Waste Management & Research*
Calvo-Porral *et al.* (2017)	Literature review	*Journal of Food Products Marketing*
Gjerris and Gaiani (2013)	Literature review	*Nordic Journal of Applied Ethics*
Hebrok and Boks (2017)	Literature review	*Journal of Cleaner Production*
Jellil *et al.* (2018)	Literature review	*International Journal of Sustainable Engineering*
Porpino (2016)	Literature review	*Journal of the Association of Consumer Research*
Mixed-method approach		
Aschemann-Witzel *et al.* (2015)	Literature review and experts interview	*Sustainability*
Aschemann-Witzel *et al.* (2016)	Literature review, experts interview and cases	*Journal of International Food & Agribusiness Marketing*
Aschemann-Witzel, Jensen, Jensen and Kulikovskaja (2017)	Qualitative accompanied shopping interviews and a quantitative online experimental survey	*Appetite*
Borrello *et al.* (2017)	Survey and choice experiment	*Sustainability*

Table AI. (*continued*)

Authors	Method	Source
Faar-Wharton *et al.* (2014)	Interviews and ethnographic observations	*Journal of Consumer Behaviour*
Fonseca (2014)	Survey and in-depth interviews	*International Journal of Food System Dynamics*
Koivupuro *et al.* (2012)	Food waste diary and questionnaire	*International Journal of Consumer Studies*
Lazell (2016)	Survey, ethnographic observations, semi-structured interviews and focus group	*Journal of Consumer Behaviour*
Leray *et al.* (2016)	Material flows analyses and survey	*Journal of Cleaner Production*
Parfitt *et al.* (2010)	Literature review and experts interview	*Philosophical Transactions of the Royal Society B*
Parizeau *et al.* (2015)	Households waste weights and survey	*Waste Management*
Porpino *et al.* (2015)	In-depth interviews, observations, photo analyses and focus group	*International Journal of Consumer Studies*
Porpino *et al.* (2016)	In-depth interviews, observations and photo analyses	*Journal of Food Products Marketing*
Richter and Bokelmann (2017)	Food waste diary and questionnaire	*Resources, Conservation & Recycling*
Romani *et al.* (2018)	Interviews, survey and field experiment	*Appetite*
Williams *et al.* (2012)	Food waste diary and questionnaire	*Journal of Cleaner Production*

Table AI.

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