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Drivers of Food Waste and Policy Responses to the Issue - The Role of Retailers in Food Supply Chains

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The Role of Retailers in Food Supply Chains

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Abstract: One third of the entire food produced for our consumption is either lost or wasted at some point of the food supply chain. The problem of food waste does not only intensify the elementary problem of food insecurity in wasting precious nourishment - originally intended to be consumed - connected with its economic value, but the processing and disposal of food also wastes scarce resources such as water, agricultural land and energy, as well as increasing CO_2 emissions. Recent studies identify consumers as the single largest drivers of food waste and praise education and raising awareness amongst them as most promising in limiting domestic food waste. Next to consumers, wasteful practices of the food industry are a predominant driver of food waste in developed countries so that the role of retailers in the generation of food waste across the food supply chain is investigated and policy recommendations with respect to its reduction assessed. Examining the influence of retailers on food date labels and quality standards, proves that food retailers endow immense power to drive food waste across the food supply chain. Keeping this retail power in mind, policy recommendations for reducing domestic food waste and cause-oriented policy recommendations aimed at reducing food waste due to date labelling and quality standards are assessed according to their efficiency.

Keywords: food waste, food date labelling, food quality standards, retail food waste, retail power on food supply chains, European Year against Food Waste, European food system, EU policy response to food waste

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1. Introduction

It is estimated by the Food and Agriculture Organization of the United Nations (FAO 2011: 4) that, on a global scale, one third of the entire food produced for our consumption is either lost or wasted at some point of the food supply chain. The problem of food waste does not only intensify the elementary problem of food insecurity in wasting precious nourishment - originally intended to be consumed (European Parliament 2011: 11) - connected with its economic value, but the processing and disposal of food also wastes scarce resources such as water, agricultural land and energy, as well as increasing CO_2 emissions. Producing and disposing of EU food waste, accumulating to approximately 89 million tons per year, causes additional CO_2 emissions of about 170 million tons and consumes a total of 261 million tons of natural resources (European Commission 2010: 87). Halving food wastage in Europe and North America would not only supply all 870 million chronically undernourished people with enough food and water one and a half times (Kreutzberger & Thurn 2012: 57) but would also liberate agricultural land, water and energy for other uses.[1] By designating 2014 as the *European Year against Food Waste*, the European Parliament appears to have finally realised the implications of food waste.

For reducing food waste and mitigating connected impacts, it is essential to know about the causes of wasting eatable food. These drivers are diverse and differentiated between different countries. While in developing countries food is predominantly lost as a consequence of inefficient harvesting, insufficient storage facilities and a lack of infrastructural conditions, wasteful practices of the food industry and consumers are the predominant drivers of food waste in developed countries. These range from overproduction due to subsidies or the pressure of delivering agreed quantities to strict aesthetic requirements, unplanned grocery shopping and misunderstanding of food date labels connected with the inability of consumers to determine whether aged food is still safe to be eaten.

The objective of this study is to investigate the role of retailers in the generation of food waste across the food supply chain and to assess policy recommendations with respect to its reduction. Amongst others, we will address questions on the role of food retailers in food supply chains and on their involvement in food waste caused by date labelling and quality standards. It will assess in how far the EU policy response to food waste is promising in terms of reducing food waste, possible policy recommendations for reducing the generation of food waste due to date labelling and quality standards and in how far they are sufficient.

[1] Amount of starving people between 2010 and 2012 (FAO 2012: 8).

Light will be shed on these questions by first introducing the current state of research on drivers of food waste, resulting in a first hypothesis stating that *consumers are the main drivers of food waste*. Building upon this hypothesis, the results of consumer focused studies will be assessed as unreliable, so that the focus will be shifted from consumers to the dominating actors of food supply chains, namely food retailers. Starting with a display of their power, it will be examined in how far it can be linked to the generation of food waste. On that account, food date labels and quality standards will serve as evidence for the influence of food retailers on generating food waste across the food supply chain. Both concepts will be introduced and food retailers' influence on them presented. This will be followed up by examining in how far the existence of date labels and quality standards can account for the generation of food waste across the food supply chain.

The closing part of the study is dedicated to examining policy recommendations on their efficiency with regard to the limitation of domestic food waste and food waste in general. In a first step the current policy response of the EU, stating that *raising awareness and educating consumers is most promising in limiting domestic food waste*, will be assessed. It is reasoned that this policy response is insufficient in reducing food waste caused by private households due to retailers strongly influencing consumers. Further, cause-oriented policy recommendations aiming at the reduction of food waste connected to food date labels and quality standards will be presented and each will be evaluated critically in order to find out in how far these can be assessed as promising in limiting the generation of food waste.

The study concludes that, although recent studies identify consumers as the single largest drivers of food waste, exclusively relying on behavioural change on the side of consumers can only be assessed as a possible starting point rather than as a sufficient measure when aiming at the reduction of food waste. Particular attention should be paid to food retailers' immense power to drive food waste across the entire food supply chain. Therefore, this power needs to be constrained. With respect to date labelling it will be illustrated that constraining power will only be possible by abolishing quality-related date labelling (best-before dates) and by applying an independent and reliable determination of use-by dates. As to quality standards, it will be reasoned that sorting out simply for aesthetical reasons needs to be abolished and the application of methods to make use of the entire crop, including fruits and vegetables with flaws, ensured.

2. Public Debate on Food Waste

According to FAO (2011: 4), approximately 1.3 billion tons of food waste is generated yearly accounting for about one third of the food produced globally for consumption.[2] The state of provided literature on food waste below has been grouped into central issues in order to offer a well-structured review of the debate.

2.1 Impact of Food Waste

Detrimental implications for the environment, society and the economy derive from the practice of wasting food. FAO (2013a) identified impacts on the environment due to food waste, starting from pressure on resources due to production and going all the way to the disposal of food. Producing food which is eventually thrown away has major impacts on the atmosphere by emitting greenhouse gases, on the availability of water and land reduced by being consumed or occupied, and on biodiversity through the intensification of agricultural production methods. Economically, food wastage increases global prices of food and natural resources connected to food production, resulting in direct social consequences for impecunious and starving people neither having access to scarce resources nor being able to afford the food required for healthy living (FAO 2013b: 15-16).

2.2 Drivers of Food Waste

Different countries have various reasons for food waste occurring within several stages of the supply chain[3] (FAO 2013b: 17). In developing countries food, especially fresh products such as fish, meat, fruit and vegetables, is predominantly lost as a consequence of insufficient storage facilities and a lack of infrastructural conditions often in combination with a hot and moist climate. In addition, food products lacking a minimum level of food safety standards can turn into unsafe food resulting in food waste. Manufacturers often do not have the capacity for processing and preserving fresh products necessary for meeting demands (FAO 2011: 11-13).

In developed countries, however, food is not treated in the light of the social or environmental implications of its production, but basically as an expendable commodity (Stuart 2009: 15-16). Hence, food waste is mainly driven by consumers and wasteful practices within the food industry (FAO 2013b: 17). Overproduction is a prominent driver of food waste,

[2] Existing studies distinguish between food loss and food waste. For the purpose of this study, food loss which is usually caused by problems within the supply chain, for instance due to poor weather conditions, bad infrastructure or logistics, insufficient technology or lacking access into markets, (FAO 2013a: 8-9) will be excluded from the scope.

[3] In order to analyse on which stages of the food supply chain food waste occurs, the food supply chain has been subdivided into the following four levels: agricultural production, processing, distribution and consumption. The levels of distribution and consumption will be analysed by exclusively focusing on food retailers and private households respectively.

resulting either from agrarian subsidies encouraging farmers to produce more food than actually needed (Kreutzberger & Thurn 2012: 51) or from contractual commitments between farmers and industrial customers on agreed quantities forcing farmers to overproduce in order to be prepared for possible crop losses (FAO 2011: 10), commonly referred to as *contingency planning* (Bond et al. 2013: 10). While some of the extra supply can be sold as fodder or be further processed (FAO 2011: 10), the majority of it has to be discarded due to a lack of market alternatives for the sale of these surpluses (Bond et al. 2013: 10).

Trimming during standardised production usually results in by-products which would be safe for human consumption but are rather squandered. Functional faults can result in products with undesired variance in weight, appearance and shape, or damaged packaging. Even though neither food safety nor nutritional value or taste would be expected to be affected, these products end up being wasted. On top of that, strict aesthetic requirements lead to agricultural products being refused by food retailers for not meeting high quality expectations in terms of their appearance (FAO 2011: 11-12). Supermarkets are continuously ordering security stocks in quantity and product range, which increases the likelihood of products expiring before being sold and hence ending up in the garbage bin (Kreutzberger & Thurn 2012: 36). Accordingly, retailers are alleged to be responsible for the generation of 4-8% of food waste (European Commission 2010: 13; WRAP in DEFRA 2010: 54).

Unplanned grocery shopping is a major factor of food waste created by consumers (Kreutzberger & Thurn 2012: 38). Due to the share of salary spent on food in advanced countries decreasing, people can simply afford to throw out more food (FAO 2013b: 39). Food date labelling is also supposed to be responsible for food being disposed of despite being edible, since most of the consumers simply rely on the printed food date labels rather than using their senses (seeing, smelling, tasting) to identify if a food product is still edible (Kreutzberger & Thurn 2012: 66-67). In comparison to other actors of the food supply chain in the EU, private households are alleged to be responsible for the largest share (42%) of food going to waste (European Commission 2010: 13; WRAP in DEFRA 2010: 54). Even though the European Commission (2010: 13) and the Waste and Resources Action Programme (WRAP) (WRAP in DEFRA 2010: 54) have identified consumers as the single largest contributor to food waste, many others also emphasise the role of the food industry in food waste generation. While Kreutzberger and Thurn (2012: 121-123) see multinational agribusiness as the initiators and profiteers of food waste, Patel (2013: xvi) focuses on supermarkets due to them being "*the newest and most powerful agribusiness*" which needs to assume its responsibility for the generation of food waste (FOE 2005: 4).

2.3 Policy Responses to Food Waste

Building on the results of its study, the European Commission (2010: 13) prioritises the reduction of domestic food waste. Educational campaigns and raising public awareness are demonstrated and adopted as promising policy responses in limiting the amount of food being wasted by private households (European Parliament 2011: 8). The decrease of food waste generated by other actors of the food supply chain, however, has not been addressed by the European Commission to date.

The UK House of Lords EU Sub-Committee on Agriculture, Fisheries, Environment and Energy (HOL) published a report on EU food waste prevention, recognising the important role food retailers play in cutting food waste by influencing consumers and producers (HOL 2014: 27). Retailers are urged to assume their responsibility with regard to the generation of food waste by creating promotions and incentives for consumers to limit the amount of wasted food (HOL 2014: 25). The majority of EU Member States feel that it is up to the private sector to take up the lead in the reduction of food waste (Council of the European Union 2014a: 3).

Recapitulating, among the various drivers of food waste across the food supply chain the European Commission (2010: 13) focuses on private households as the main contributors to food waste. HOL (2014: 25), however, also underlines the power food retailers exert over the whole food supply chain, directly resulting in an immense influence on the generation of food waste. With regard to the issue of how to reduce domestic food waste most efficiently, there is consensus between the European Commission and HOL that educating consumers and raising awareness amongst them is most promising.

3. The Study

Although public debate on the drivers of food waste is particularly focused on consumers while only some draw attention to the retail industry, we will focus on the precise role of retailers in the food supply chain.

The objective of this study is twofold: First, to investigate the influence of retailers across the food supply chain with regard to their involvement in the generation of food waste[4]. Second, to analyse policy responses with respect to their efficiency in reducing food waste. For that purpose, the used methodology[5] will help analysing the following two hypotheses[6] deriving from the preceding theoretical introduction:

I. *Consumers are the main drivers of food waste*
II. *Educating consumers and raising awareness amongst them is most promising in reducing domestic food waste*

As will be shown in section 4.1.1, reliable data on food waste is lacking to date. For the EU 27, there is only one existing study available which was assigned by the European Commission (2010). Best data collection is exhibited by WRAP conducting food waste research for the UK with a special focus on domestic food waste. Due to more than 100 existing definitions of 'food loss' and 'food waste' it is difficult to find comparable data (Themen 2014: 14). Therefore, for the purpose of this study the UK data from WRAP is considered to be representative for the EU 27. In addition, where data for the EU 27 is missing but available for Europe, the latter was used instead. Figures derived from WRAP and Europe should give an idea on the extent of food waste across the food supply chain, while we want to point out that they do not reflect accurate figures.

[4] In doing so, the focus will rather be on food waste, referring to food appropriate for human consumption that is being discarded for having gone beyond the expiry date or simply having been left to spoil (FAO 2013a: 9). Food waste generally results from retailers and consumers owing either to a conscious act or simply due to carelessness (Themen 2014: 14) and mainly occurs in countries with medium- to high-incomes (FAO 2011: 4).

[5] The secondary data was taken from official sources of the EU (regulations, statements, records focusing on food waste), EU marketing standards and food date labelling and from books, studies, articles from journals and newspapers, online articles and more, with regard to the drivers of food waste, power of retailers across the food supply chain with a special focus on their influence on the generation of food waste and policy recommendations to limit food waste generation.

[6] To investigate the first hypothesis, existing studies from the European Commission (2010) and WRAP (WRAP in DEFRA 2010) identifying consumers as the main driving force of food waste were analysed with a focus on the reliability of the results. The different methods of data collection used by the two studies quoted above played a central role in section 4.1.1 where they were presented in detail. To investigate the second hypothesis, the EU policy response to domestic food waste, which is mainly based on recommendations on the part of the European Parliament (2011) and HOL (2014), was introduced. Its effectiveness in limiting domestic food waste was primarily analysed with data from Evans (2009) who conducted a field study with private households attempting to detect their reasons for wasting food. Recommendations from FAO (2013b), Kreutzberger and Thurn (2012) and Stuart (2009) were used for building cause-oriented policy recommendations on limiting food waste due to date labelling and quality standards and were mainly assessed on the basis of the preceding analysis of the behaviour of retailers with regard to food waste

4. The Role of Retailers in Food Supply Chains

The following chapter is dedicated to analysing the first hypothesis: *consumers are the main drivers of food waste*. It will be demonstrated that food retailers play an important role in the food supply chain, so that they should be given particular attention. Evidence of their influence on the generation of food waste will be given in the examples of food date labelling and quality standards[7].

4.1 Shifting Focus from Consumers to Food Retailers

By presenting existing studies on the drivers of food waste and their shortcomings, focus will be shifted from consumers to food retailers which will be accorded special attention through the analysis of their power in food supply chains.

4.1.1 Shortcomings in Consumer Focused Studies

The European Commission (2010: 11) carried out a study on the extent of food waste throughout the EU and found that around 89 million tons of food were wasted in 2006, i.e. 179 kilograms per EU citizen. This number is expected to go up to 126 million tons per year by 2020, if nothing is done to stop this trend (European Commission 2014a). When looking at the considered actors across the food supply chain, *food retailers* are alleged to be responsible for 4.4 million tons (5%), the *food service* sector for 12.3 million tons (14%), *manufacturing* for 35 million tons (39%) and *private households* for 38 million tons (42%) of the aforementioned amount of EU food waste (European Commission 2010: 13). Comparable data from the UK provided by WRAP suggests a slightly higher share for *retailers* (8%), 21% for *manufacturing*, 15% for the *food service* sector, the same share for *private households* (42%) and a 15% contribution by *others*, including commercial food waste and such from agriculture and gardening (WRAP in DEFRA 2010: 54).

Following from this, both studies identify consumers as the single largest contributor to food waste, responsible for the generation of 42% of the total food being wasted. Based on the results from the European Commission (2010), the EU policy agenda exclusively focuses on domestic food waste.

However, concerns about the reliability of the studies' results do exist. The European Commission (2010: 9) excludes food waste generated by agricultural production. In section 4.2.2 it will be explained that a vast amount of food waste is generated during agricultural production, so excluding this stage distorts results immensely. Moreover, this study actually

[7] Food quality will exclusively be defined according to the aesthetic appearance, including the shape, colour, size and possible optical flaws, entirely disconnected from the nutritional value of food products.

mentions that results for the sectors of manufacturing and retail are to be regarded as fragile, due to them being derived from unreliable data (ibid.: 13). Even though WRAP has conducted the most extensive and most detailed research on food waste, anonymous interviews with WRAP researchers revealed that data for retail food waste has been obtained by self-reporting on the part of the retail industry. In most cases the information provided was not of adequate detail, nor was it useful for comparison. In all known cases the information was given on the basis of a secrecy agreement, making sure that no company name was made public. Furthermore, data was evaluated only from companies with an above-average efficiency regarding the avoidance of food waste, therefore entirely neglecting companies causing more waste. Merely referring to data from the most efficient ignores that, according to Stuart, US evidence shows that the most wasteful retailers cause up to thirty-five times as much waste as an efficient retailer does (Stuart 2009: 52-53).

Since, however, self-reporting is an extremely unsound source of information, the only way of measuring the amount of food waste caused is the examination of garbage bins. That was the case in UK and US households, where waste bins were inspected in immense detail in an effort to determine what had been thrown away and in what quantity. Food retailers, in contrast, were able to choose what data to publish, lacking any sort of official surveillance verifying the data (Stuart 2009: 53-54).

Despite merely identifying consumers as the largest single contributor to food waste (42%), results from WRAP (WRAP in DEFRA 2010: 54) and the European Commission (2010: 13) reveal, but do not deal with, the fact that the larger share of food waste (58%) can be attributed to the stages of pre-consumption. Research by FAO (2011: 5) also confirms that across different world regions pre-consumption food waste is consistently higher than food waste by consumers.

In addition, while retail data on food waste is presumably being underestimated, the share of domestic food waste in general is confirmed as being overestimated by HOL (2014: 55), stating that food waste tends to be more obvious and hence easier to spot at the very end of the food supply chain. All of these shortcomings are, however, either not recognised or simply ignored by EU policy makers, predominantly addressing consumers to limit the generation of food waste.

There are, however, opinions such as those presented by HOL (2014) and Friends of the Earth (FOE) shifting the focus towards retailers and pointing out that retailers are playing an extremely powerful part within the food chain (FOE 2005: 4). By influencing consumers,

manufacturers and producers and the way all of them behave (HOL 2014: 5), retailers obtain an immense responsibility (FOE 2005: 4) which they fail to assume especially with regard to the generation of food waste (HOL 2014: 5).

According to Kreutzberger and Thurn (2012: 121-123) the focus on consumers fades out multinational agribusinesses as initiators and profiteers of food waste. To narrow the scope, attention will be drawn to large food retailers and "*supermarket[s], the newest and now most powerful agribusiness[es]*" (Patel 2013: xvi).[8] As a consequence, this study is devoted to closer examine the role of retailers according to their power with regard to food waste.

4.1.2 Power of Food Retailers across Food Supply Chains

Against the backdrop of the aforementioned shortcomings of recent studies which assumed consumers as the main driving force of food waste, the interjection about the immense power of retailers will be pursued. The following section will therefore demonstrate the immense power of food retailers and how it can be connected to the generation of food waste.

Food System Hourglass

The European food system has been a key player in the transformation regarding food retail. Mergers and acquisitions have dominated the food retail sector in Europe over the past years, resulting in huge economies of scale for the large retailers while smaller, independent grocery shops have started disappearing from the market (Ethical Corporation 2006: 210, 215). Hence, Patel (2013: 11) likens the European food system to an hourglass through which the agricultural products of all farmers must flow and where only a few dozen distributors control the supply of food to the millions of households throughout Europe. This applies to the majority of first world national retail markets with powerful retailers dominating the distribution from producers to consumers (Consumers International 2012: 4). According to Ethical Corporation (2006: 210-211), the concentration level of the European market is one of the highest worldwide with the result that a market share of 63.5% was obtained by the top 30 retailers of groceries in 2004. Hence, the entire market share of groceries in many countries is possessed and controlled by only a very small and selected group of retailers. This especially applies to the UK, where only four retailers control 76% of the UK-wide food market (Consumers International 2012: 3-4).

This high level of concentration leads to a shift within the supply chain, with primary producers taking on only an inferior economic role, with power concentrating in the retail sector (European Commission 2014a). Resulting power imbalances are constantly growing. Such

[8] Due to their similar power along food supply chains, supermarkets and large food retailers will be summarised under the terms *retailers* or *supermarkets* in the following.

imbalances are particularly severe for agricultural products, where the dissipation on the supply side intensifies the strength of retailers (Consumers International 2012: 3-4). As a result, only a few food retailers exert a high degree of power over the whole food supply chain by representing the only link between agricultural producers and consumers (Patel 2013: 11). Thus, only a few companies, oligopolistically organised, in the processing, trading and retailing part of the value chain tend to distribute profits amongst them instead of profits being equitably shared with producers (Bargawi & Oya 2009: 1).

Shaping Market Conditions

It is due to this concentration that food retailers have also gained considerable power to shape processes along the supply chain according to their needs (Schuhler 2005: 40) by lobbying governments (Patel 2013: xiii). Thus, retailers' influence on the policy of the European Commission is immense. When defining new initiatives and guidelines, the European Commission is in direct coordination with the retail industry, which results in market conditions shaped to the needs of retailers. While the Global Food Safety Initiative, composed of around 40 large retailers, defines food safety standards, the Global Commerce Initiative, composed of leading retailers such as Metro, Carrefour and Tesco, aims at preparing common standards along the global food supply chain (Schuhler 2005: 18-19).

HOL (2014: 5) expects that this high level of power and influence over the whole food supply chain has implications for the generation of food waste, so that it urges retailers to assume their responsibility for food waste. In how far retailers' influence does not only drive food waste but also transfers it to other stages of the food supply chain will be demonstrated on the basis of food date labels and quality standards.

4.2 Food Retailers as Drivers of Food Waste

Even though consumers are alleged to cause food waste by misinterpreting date labelling and demanding fruits and vegetables to be of high visual quality, food waste within the retail chain is often also connected to the way stock is managed, especially the way perishable products close to their sell-by date are treated, or when quality standards keep products from being sold where aesthetic issues or defects in packaging arise (Bio Intelligence Service 2011: 10). In how far the power and influence of retailers drive food waste across the whole food supply chain will be explained by the examples of food date labelling and quality standards.

4.2.1 The Influence of Retailers on Food Date Labelling

In the following section the implementation of food date labelling will serve as a basis for analysing in how far it causes food waste across the food supply chain.

Definition and Implementation of Food Date Labels

Food date labelling began with the implementation of *sell-by dates* on behalf of the food industry in an attempt to regain trust in food provided by retailers. Sell-by dates were implemented to assist employees of food retailers in managing stock by telling them when to move older stockpiles from the back of the shelves up to the front. Goods which never used to have date-coding in the past were suddenly beginning to carry such dates, even though they were safe for eating for an indefinite period of time (Stuart 2009: 101-102). In 1979, the EU followed with its first Directive on food labelling, introducing best-before and use-by dates (Council of the European Union 1979).[9] From then on, the EU food labelling regulation demanded that the majority of pre-packed edible goods should carry either a date of minimum durability (best-before date) or an expiration date (use-by date) (European Parliament & Council of the European Union 2000: 34-35). Until today, other forms of date labelling, such as display-until and sell-by dates, are not legally demanded (Rowney 2014: 20).

According to recent regulations, the best-before date "*shall be the date until which the foodstuff retains its specific properties when properly stored"* (European Parliament & Council of the European Union 2000: 34). It applies to food products suitable to be stored at room temperature (e.g. bread) and chilled foodstuff not supporting any growth of organisms that could lead to possible food-poisoning, if stored properly (e.g. butter) (Stuart 2009: 96-97). Most importantly, best-before dates serve as indicators of until when a product's specific food quality, such as colour, taste and consistency, is guaranteed rather than as indicators of food safety (Kreutzberger & Thurn 2012: 32). On the contrary, use-by dates need to be applied to food products being highly perishable, where after only a short period of time food safety can no longer be guaranteed (European Parliament & Council of the European Union 2000: 34-35). They have to be applied especially to fish and meat products as well as eggs (Kreutzberger & Thurn 2012: 32). Due to the potential risk for human health it is forbidden to sell food products after their use-by date (ibid.: 67). Hence, according to EU regulations, use-by and best-before dates function for diverse purposes: whereas best-before dates are solely a quality guarantee, use-by dates, on the other hand, are meant to ensure food safety (European Parliament & Council of the European Union: 34-35).

Determination and Application of Food Date Labels

Although EU food labelling regulations state that it is mandatory for the majority of all pre-packed food products to possess one of the two food date labels, they do not determine the

[9] In 1979, Directive 79/ 112/EEC introduced the term 'use before' (Council of the European Union 1979: 7). Over the years, this term has been replaced by 'use-by', the expression being used today.

length of the shelf life that each product needs to have. This determination is rather done by manufacturers and food retailers on the basis of speedy stock turnover, product composition and chemical ingredients (Stuart 2009: 97-98; Kreutzberger & Thurn 2012: 67). In the process of calculating shelf lives, worst case scenarios including poor storage conditions and improper handling by consumers are assumed and result in major margins of error. Resulting from this, the set date as best-before or use-by date often happens to be days before the goods will spoil, if treated properly (Stuart 2009: 96-97). Moreover, under the pretext of food safety and consumer protection, deadlines are becoming increasingly shorter (Kreutzberger & Thurn 2012: 12) while date labelling even tends to become more and more inconsistent for different products as well as different retailers (WRAP 2010: 113). As per research by Stuart (2009: 98-100), it is also a routine practice for some products amongst the use-by category to be labelled incorrectly. Unlike its actual intention, the use-by date of some products does not reflect food safety but rather has the function of a best-before date indicating the food products' peak of quality.

Hence, today's date labelling system with its overstated standards on the one side, while providing high flexibility to manufacturers and retailers for determining and applying date labels on the other, is not shaped to protect human health or the environment but rather to keep corporations from having to go into litigation with customers (Stuart 2009: 104-105).

Food retailers did not only push the introduction of food date labels in the first place but in coordination with manufacturers are also responsible for the determination of date labels providing them with strong power with regards to the generation of food waste.

Food Date Labels as Drivers of Food Waste

Contrary to the EU, federal law in the US does not demand food date labelling except for selected food products for infants (USDA 2013). A demand from the United States Department of Agriculture (USDA) to make it mandatory for some food products to be labelled was rejected on the grounds that food date labels are an important contributor to EU food waste (Stuart 2009: 102-103). According to Stuart (ibid.: 103-104),

> "[the] *European law on food labelling, and its application by manufacturers and retailers, currently causes enormous quantities of waste. It may be that in their current form date labels do more harm than good, or at least more harm than is necessary*."

In how far food date labels can be linked to the generation of food waste will be explained in the following.

Retail Waste

Determining dates of food labels by calculating for the worst-case scenario leads to shelf lives that are too short to permit an adequate distribution, a proper sale and the consumption of the food, all in time. This in turn immensely increases the amount of food being wasted which would still be fine to eat for the majority of all people (Stuart 2009: 102-103).

A much used practice, responsible for a huge amount of retail food waste, is the '*rule of the one third*'. It implies that processed food needs to be in store within one third of its shelf life time, thus offering consumers the freshest possible products, far off from reaching their expiration date. Products which do not reach retail stores within one third of the shelf life time are rejected by many retailers and returned to the producers, hence causing an unnecessary amount of waste of good-to-eat quality food (FAO 2013b: 47).

Statistically, the majority of UK consumers (approximately 75%) check date labels in-store to ensure the buying of the freshest products with the finest quality so as to be certain to have the maximum amount of time to use up the bought goods (WRAP 2010: 112). Therefore, employees of food retailers are urged to permanently inspect food products not only for their sell-by but also for their best-before date labels and to remove from the shelves all food products being close to one of either. Especially dairy products are exposed to severe sorting by retailers already several days before expiring (Kreutzberger & Thurn 2012: 12). On average, food products are removed from shelves two days before their printed date label (ibid.: 35-36). The worst case example is put into daily practice by Aldi Süd, a German retailer, guaranteeing that food products will be good for eating for a minimum of one week after purchase. Hence, Aldi Süd's internally called '*seven-day-rule'* demands that all food products not meeting this requirement be removed from their shelves (WDR 2013). Contrary to the assumption that this daily practice would represent an economic problem for food retailers, the waste of food as well as its disposal are actually already priced in and distributed throughout all goods, so that the consumer is the one bearing these costs (Kreutzberger & Thurn 2012: 13).

The daily practice of food retailers sorting out food merely on the basis of food date labels is highly problematic when considering that this food is often neither sold for a reduced price nor donated to food charities or redistributed for the use of animal feeding but rather simply wasted (Bond et al. 2013: 10).

Consumer Waste

Even though EU food labelling regulations distinguish between best-before (quality) and use-by (safety) dates, there is a great deal of confusion on the side of consumers. The majority of UK consumers (more than 60%) is not aware of the difference between best-before and use-by dates (HOL 2014: 26). According to research by Stuart (2009: 101-102), retailers initiated confusion around date labels by advertising with slogans like "*you know it's fresh by the sell-by date*".[10] Instead of sell-by dates merely serving as support for stock managers, consumers got used to, and confused them, with dates concerning food safety (ibid.: 97, 101-102). In addition, about 80% of the British population falsely regard best-before dates as dates telling them by when a product needs to be consumed (use-by dates) (DEFRA 2007: 16). Contrary to best-before dates' actual function as a quality indicator, over a third of the British population views them as a food safety function. This belief results in food products being discarded because consumers assume that food products past their best-before date could be unsafe to eat (Stuart 2009: 98-100). In fact, consumer confusion connected to food date labelling is responsible for 20% of domestic food waste (European Parliament 2011: 13). For the EU this implies an annual amount of over 7.5 million tons of wasted food due to the misunderstanding of date labelling.[11]

In addition to food waste due to consumer confusion, too many consumers blindly rely on date labels. They are obviously not aware of the fact that the speed of a food product's deterioration is also dependant on many other factors such as storage and handling (Stuart 2009: 102-103). Instead of using their sensory judgment to identify whether a product is still edible (Kreutzberger & Thurn 2012: 66), 42% of the British discard food past its expiry date without examining it (HOL 2014: 26).

Even against the backdrop of the aforementioned exceptionally stringent date labelling system of manufacturers and retailers, leaving high margins before the actual day of deterioration, consumers not only rely on these date labels but are rather overcautious (Stuart 2009: 98-100). Consumer concerns over whether aged food is still safe for eating, tends to outweigh any anxiety of wasting food by throwing it out (Evans 2011: 437). Resulting from this, approximately a third of all food products carrying a date label in the UK is already discarded before a product reaches the printed date (EUFIC 2012).

[10] Advertising campaign by the British multinational retailer Marks & Spencer.
[11] Calculated on the basis of 38 million tons of domestic food waste (European Commission 2010: 13).

Considering that food date labels are neither subject to law nor to scientific evidence but rather determined on the basis of manufacturers' and retailers' assessments, the rightfulness of best-before dates, implemented by the retail industry, is therefore highly questionable (Stuart 2009: 97-98).

4.2.2 The Influence of Retailers on Food Quality Standards

In order to escape the criticism of date labelling, representatives of the food industry emphasise that the majority of food being wasted does not bear any date label at all (German Bundestag 2012: 12). They rather shift focus towards fruits and vegetables which make up the largest share of domestic food waste, e.g. about half of the wasted food in Germany (Cofresco 2011: 15). Before being sold in retail stores, these fruits and vegetables are, however, subject to quality standards being heavily influenced by food retailers. In how far these quality standards generate food waste will be examined in the following section.

Definition and Implementation of Quality Standards

From 1988 on, EU marketing standards had regulated the appearance, size and shape of 36 kinds of fruits and vegetables (Kreutzberger & Thurn 2012: 67). The curvature of cucumbers, for example, was strictly regulated, not allowing an arc larger than 10 millimetres per 10 centimetres length. Supposedly, these regulations were put into place not only to facilitate comparison among agricultural products but also to provide a minimum quality guarantee for EU consumers (CBI 2012: 1). According to Kreutzberger and Thurn (2012: 67), by introducing marketing standards, the European Commission followed demands from the side of the transport, as well as the manufacturing and retail industry, as standardising agricultural products not only facilitates trade, transport and manufacturing but also creates a common European market. Transferred to the example of cucumbers, cucumbers of the same length and shape are not only easier to pack into standardised boxes but are also easier to be processed automatically. Due to the fact that EU marketing standards are disconnected from taste and ingredients, they cannot be seen as indicators of nutritional value but rather reflect the commercial quality of agricultural products (ibid.).

However, EU marketing standards did not come along without costs. In 2008, EU regulations forced a British wholesaler to discard a total of 5,000 kiwi fruits because they were four grams too light for the standard required by EU regulations (Stuart 2009: 150-152). This was based on the allegation that fruits and vegetables not meeting the required EU standard were unsuited for human consumption (Kreutzberger & Thurn 2012: 47). Hence, qualitatively

fine food simply not meeting the requirements of EU regulations was rejected by the transport, manufacturing and retail industries on a regular basis (Stuart 2009: 150-152).

Resulting from these negative implications, the European Commission relaxed its marketing standards by abolishing the requirements for 26 types of fruit and vegetable in 2009. Mariann Fischer Boel, Commissioner for Agriculture and Rural Development, reasoned that it is not necessary to regulate quality standards at EU level but "*far better to leave it to market operators*" (European Commission 2009: 1). Even though the marketing standards were retained for ten agricultural product types,[12] the implementation and enforcement of these have been left to Member States from then on. Products not fulfilling the requirements must be labelled accordingly to be distinguishable from EU classification (ibid.).

Due to a majority of European states along with industry bodies opposing the decision by the European Commission (Stuart 2009: 152-153), the relaxation of the marketing standards was not successful in practice (Kreutzberger & Thurn 2012: 45-46). Firstly, it had no material effects because the marketing standards remained in place for the ten largest crop categories, accounting for 75% of EU trading value (European Commission 2009: 1; Kreutzberger & Thurn 2012: 68). But more importantly, food retailers used consumer preferences as a pretext not only for maintaining EU marketing standards but also for establishing additional retail specific quality standards (FAO 2011: 11; Kreutzberger & Thurn 2012: 67-69). According to FOE (2002: 1), quality standards are primarily a concern for the large retailers, demanding best possible transportability, storage ability and resilience. Resulting from this, European and North American retailers predominantly offer the same variety of fruits and vegetables. The most dominant apple varieties for example are easily harvested and respond very well to pesticides. Being tossed about does not tear or blemish their skin when being transported over longer distances. Moreover, these apples respond positively to the industrial production and the technologies of waxing. They withstand transportation as well as possible, hence ensuring they look pretty once they are put on display (Patel 2013: x).

Quality Standards as Drivers of Food Waste

The European Parliament has already recognised that quality requirements concerning the appearance of fruits and vegetables are the reason for unnecessary discards and hence lead to increased food waste (European Parliament 2011: 8). Resulting from this, 40-50% of total yields are not accepted at some point of the food supply chain due to quality standards

[12] Apples, citrus fruits, kiwi fruits, lettuces, peaches and nectarines, pears, strawberries, sweet peppers, table grapes, tomatoes (European Commission 2011a: 7).

(Henningsson et al. 2004: 508). Because there are no alternative markets which would permit sales for human consumption, some of the rejected produce can be redirected as feed for livestock while most of it is, however, ploughed back right into the soil (Bond et al. 2013: 10). According to European Commission spokesman Michael Mann, retail specific quality standards are even stricter than EU marketing standards, so that they are the main source of elimination (Stuart 2009: 152-153). This is confirmed by FOE (2002: 2) stating "*supermarkets go beyond the already strict standards for cosmetic appearance set out by the EU*". In how far quality standards drive the generation of food waste along the whole food supply chain will be presented in the following.

Agricultural Production

Implications of quality standards with regard to food waste are most apparent at the level of agricultural production. While modern farming techniques improved efficiency in agricultural production, the implementation of quality standards revoked everything by producing increasing amounts of food waste (Stuart 2009: 146).

Research by Kreutzberger and Thurn (ibid.) states that quality standards in general are responsible for up to almost 40% of crops which are not even harvested, directly ploughed back or left hanging on trees. According to Leake (2005), retail specific quality standards in the West result in agricultural food waste of up to one third of total yield. Data from the UK indicates that 20-40% of crops are not harvested because of not complying with retail specific quality standards (HOL 2014: 28).

Prior to being processed, agricultural produce meant to be sold by food retailers passes controls according to its size. This is already done during harvest when modern harvesters check the size of the specific produce. All produce not fulfilling the required standard stays behind on the field or is directly ploughed back into the soil (ibid.: 142-146). Hence, instead of being redirected to other purposes this share of food is wasted despite its nutritional value (Kreutzberger & Thurn 2012: 230-231).

In a second step, photographic sensor machines check all harvested produce which passed the size control (Stuart 2009: 147-149). In doing so, cameras examine agricultural products according to their colour, shape as well as possible irregularities. Again, all produce not meeting the programmed ideal is sorted out. The reasons for rejecting apples and pears, for example, are manifold. Apples with small skin blemishes, being either too red or not red enough or not having the proper shape, do not pass quality controls so that they are refused even before consumers would be able to buy them (FOE 2002: 1). Some of the sorted agricultural produce

can be sold to processors. In the case of carrots, this is about a third. The remainder can be sold as feed for livestock. However, it is not only inefficient to redirect food initially grown to nourish humans to animals but also reduces the producer's income, because he is only able to charge about 10% of the original value (Stuart 2009: 142-143, 149-150).

Processing

Quality controls are also responsible for food waste at the level of processing. Part of the fruits and vegetables being rejected at the level of agricultural production can be sold to processors – with a financial loss compared to its original value, of course. However, it happens on a regular basis that fruits and vegetables intended for further processing are also subject to strict quality controls (FOE 2002: 2-4). Resulting from this, 40-50% of highly perishable produce, especially salads and raw vegetables, are wasted at this level due only to optical flaws resulting from their high perishability (Henningsson et al. 2004: 508). In addition, processing errors can lead to products not having the correct weight or shape but having no further influence on food safety, taste or any other nutritional value of the product. These products often end up being thrown out in a common production line (FAO 2011: 12).

According to FOE (2005: 3), retail specific quality standards are responsible for 30-50% of British fruits and vegetables, grown for the retail sector, being refused even before they reach food retailers.

Retail and Consumer Waste

Compared to the prior stages, food waste for aesthetic reasons is relatively small at the stages of retail and consumption. This can be explained by the fact that retailers have already rejected all produce not meeting the required quality standards, so that a large amount does not even end up for sale.

Supermarkets generally say that they are only responding to the consumers' wants and needs and that, if they got those wrong, consumers would simply shop elsewhere. This can however be contradicted, due to supermarkets playing an important role in shaping the demand of consumers and in view of the power they possess in the market, for they can strongly influence what, how and where consumers buy. In addition, Stuart is convinced that consumer demands are secondary to retailers' who predominantly aim at meeting the demands of shareholders, i.e. increasing profits, which is attained by selling as much of the more expensive high quality produce as possible (Stuart 2009: 153-155). According to Consumers International (2012: 3), supermarkets have a gate-keeping function rather than being only a passive

transmitter of the consumers' wishes. Their role as a gatekeeper can be misused to the impairment of suppliers and consumers alike.

It is, however, true that consumers, having food safety and shelf life in mind, search for the best-looking products, resulting in food products with optical flaws being left over (Kreutzberger & Thurn 2012: 40). As a consequence, comparable to their daily practice of checking products for date labels, retail employees check and sort out fresh produce according to aesthetic quality standards to ensure best appearance to consumers. This is especially true for products that are highly perishable, such as lettuces, leeks and radishes, which are generally removed from shelves and discarded after one day (Kreutzberger & Thurn 2012: 35-36). Domestic food waste mainly occurs because consumers attribute food safety to the aesthetics of a food product. Apples, for example, getting wrinkly, are discarded despite being safe to eat (Evans 2011: 436-437).

5. Policy Responses to Food Waste

Based on the findings of the European Commission study (2010: 13) identifying consumers as the main drivers of food waste, the EU policy agenda is mainly focussed on reducing the amount of food waste on the level of private households. Hence, the following chapter is dedicated to analysing the second hypothesis: *educating consumers and raising awareness amongst them is most promising in limiting domestic food waste*. To address food waste due to food date labels and quality standards, further policy recommendations will be given and it will be critically evaluated in how far these can be assessed as promising in limiting the generation of food waste.

5.1 Education and Awareness Raising

EU policy responses aimed at reducing the generation of food waste seem to be bound to interventions targeting knowledge, behaviour and the attitude of people (Evans 2011: 431). Thus, the following section assesses in how far this effort can be considered as promising in reducing domestic food waste.

5.1.1 Consumer Focused Awareness Raising

Following from the vast amounts of food being wasted in combination with the resultant social, environmental and economic impacts, the European Commission reacted in its *Roadmap to a Resource Efficient Europe* by picking out the food sector as one in which it is necessary to take action, announcing that edible food waste will be cut in half by 2020 as well as assessing how food waste can be limited best throughout the entire food supply chain by a Communication on Sustainable Food (European Commission 2011b: 18). The European Parliament recognised the need for action with regard to increasing food waste by proclaiming 2014 the *European Year against Food Waste* especially to raise awareness of this topic among European citizens (European Parliament 2012: 8).

Public awareness and educational campaigns are demonstrated and adopted as promising policy responses in limiting the amount of food being wasted by private households (ibid.). The European Commission created a website, directed at EU citizens, providing basic information on the causes, impacts and amounts of wasted food, educating consumers on the actual meaning of food date labels as well as suggesting how to prevent food waste generation, e.g. by providing recipes for leftovers from the previous day to cook (European Commission n.d.). Moreover, the European Parliament calls on Member States to introduce programmes sensitising children from an early age onwards to the issue of food waste (European Parliament 2011: 8). The various actors of the food supply chain, but especially food retailers, are urged to support private households in limiting domestic food waste (ibid.; HOL 2014: 25).

Education on Food Date Labelling

With respect to food labelling, FAO (2013b: 47) considers it highly important to create clarity on the meaning of best-before and use-by dates, while the European Consumer Organisation demands that these dates are calculated with a greater transparency. This is considered to prevent confusion among consumers being overcautious with best-before labels and to result in a better understanding of food date labelling, so that related food waste could be reduced (BEUC 2014: 3). In order to take responsibility, HOL (2014: 26) urges the retail industry to not only clarify and revise the requirements for date labelling but also to explain them to consumers, for them to achieve a better understanding. Retailers also ought to teach their customers that it is more important to handle, transport and store food products correctly to maintain their food safety than it is to orient themselves exclusively on date labels. Finally, advice on food storage, which could be improved via standardised information on the storage of food products, should be accorded greater importance (ibid.: 26-27).

Education on Quality Standards

In order to reduce food waste for aesthetic reasons the European Parliament (2011: 8) wants stakeholders to educate consumers on the nutritional virtue of misshaped agricultural produce. FAO (2013b: 39) motivates consumers to buy misshaped fruits and vegetables because by buying cosmetically imperfect agricultural products, consumers can indicate their willingness to ignore aesthetic barriers that could save misshaped food products from being wasted in the future.

5.1.2 Shortcomings of Consumer Focused Policy Responses

Even though the European Parliament and HOL have recognised that food waste occurs along the entire supply chain and underline that all players need to assume their responsibility (European Parliament 2011: 4-5), policy responses to halve food waste by 2020 (European Commission 2011b: 18) are disproportionately focused on consumers. Even though FAO (2011: 14) agrees that educational campaigns are crucial to attain behavioural change on the side of consumers, it refers to it as a possible starting point rather than a sufficient policy agenda. Moreover, by exclusively focusing on domestic food waste, attention is diverted from supermarkets as the most powerful initiators and profiteers of food waste who are in this way discouraged from assuming their responsibility.

In fact, halving the total amount of food waste from 2011 to 2020 (European Commission 2011b: 18) merely by addressing domestic food waste by means of awareness raising and educational campaigns, representing the only policy response to date, is a more than

optimistic goal of the EU in the light of figures from Britain. In Britain, educational campaigns between 2006 and 2012 were able to reduce domestic food waste by no more than 13% (Waterfield 2014: 2).

In an effort to reach the above-mentioned goals, the European Commission has published various communication material online. However, there exists justified concern that the target group may not be reached (BEUC 2014: 3). The website will only be found by people specifically searching for information on food waste while uninformed people, whose awareness is intended to be raised, will not simply find their way to the website and hence not be reached.

Unlike the European Parliament and HOL, Evans (2011: 1) believes that food waste created in households cannot be regarded as an issue concerning individual behaviour of consumers, which is why he considers educational programmes addressing consumers as insufficient in limiting food waste on the level of private households. Even though this approach could reduce food being wasted by unaware consumers, the focus remains solely on consumers. The preceding analysis of how food retailers shift food waste within the food supply chain, especially to the stages of agricultural production and consumption, comes to the conclusion that consumers alone cannot be blamed for domestic food waste. Hence, exclusively trying to bring about behavioural change on the consumer side will only be sufficient in reducing domestic food waste to a limited extent. The remaining share of domestic food waste, as demonstrated above, is mainly driven by the influence of retailers.

Against the backdrop of current practice with regard to the determination and application of date labels (see section 4.2.1), educating consumers on date labelling, as demanded by HOL (2014: 26), would only have a sufficient effect if manufacturers and retailers stopped determining and applying date labels on the basis of marketing considerations, such as faster stock turnovers in supermarkets (BEUC 2014: 3). Urging retailers to educate consumers on the nutritional value of misshaped fruits and vegetables but neglecting the fact that the majority of retailers does not offer any imperfect produce results in educated consumers but fails to achieve its initial objective of reducing food waste since consumers are simply not offered such products in stores (Kreutzberger & Thurn 2012: 219).

Assistance from the side of food retailers, not only exerting power over but also driving food waste across the whole food supply chain, is an essential precondition for the EU approach of educating consumers to be successful. This is also recognised by the European Commission's

Retail Forum for Sustainability which held its annual event 2013 on food waste (European Retail Round Table 2013: 1) stating that

> "(...) *retailers in Europe are in an exceptional position to promote more sustainable consumption not only via their daily contact with millions of European consumers, but also through their own actions and their partnerships with suppliers.*" (European Commission 2014b)

There exists, however, no incentive for retailers to support consumers in limiting domestic food waste for they are actually profiting from food going to waste. The more food is wasted, the more food needs to be replaced which in turn results in increasing stock turnovers. Educated consumers who would possibly waste less food and hence not need to buy as much, would leave retailers with a decrease in sales and profits. For that reason, political authorities, continuously supporting the interests of business (see section 4.1.2), are technically not pushing retailers to accept their responsibility in this regard (Kreutzberger & Thurn 2012: 32).

Recapitulating, focusing on education and awareness raising cannot be regarded as a sufficient approach in tackling domestic food waste owing to a high influence from the side of retailers that have no interest in limiting the amount of wasted food, which is in fact highly profitable for them.

5.2 Cause-Oriented Policy Recommendations

Instead of exclusively addressing consumers, there is a need for cause-oriented approaches, including retailers as the most influential actors of the food supply chain. Such policy recommendations, especially aiming at the reduction of food waste connected to food date labels and quality standards, will be presented and each evaluated critically in order to find out in how far they can be assessed as promising in limiting the generation of food waste.[13]

5.2.1 Policy Recommendations on Food Date Labels

Section 4.2.1 revealed the influence of retailers on the generation of food waste related to date labels. In the following, the effectiveness of particular measures aiming at the reduction of food waste resulting from date labelling will be assessed.

Price Reduction

Reducing prices of food products close to or shortly after their best-before or sell-by date as done by some, predominantly smaller, supermarkets could serve as a promising option to reduce

[13] In order to keep the focus on limiting food waste related to date labelling and quality standards, universal policy recommendations, such as redistributing food to food charities or as feed for livestock have been left out of the scope (for details see FAO 2013b).

food waste resulting from food date labels (Stuart 2009: 64-66). Concerning food close to its date label, the European Parliament demands EU Member States to allow the retailing sector to decrease prices for fresh food to prices below the actual production cost. As a consequence, even consumers with a lower budget would be able to afford good quality food and pay a reasonable price, while the quantity of thrown out food could be reduced (European Parliament 2011: 8). According to Thurn (German Bundestag 2012: 34), reducing prices for products close to their best-before date could also lead to the inversion of customers' shopping behaviour, currently shopping for products with a maximum durability, to searching for products being close to their best-before date and therefore cheaper, which would reduce the amount of food that retailers need to sort out and discard due to their date labels. In fact, in the case of one of the largest British retail chains, Marks & Spencer, it has been estimated that this could actually decrease their amount of food waste by 10% (Stuart 2009: 65-66).

However, food retailers are not only reluctant to lower prices for products close to their best-before label, but also tend to be even more unwilling to do so when it comes to selling food past its best-before date. In Germany for example, even though there is no law prohibiting the selling of food past its best-before date, food retailers are extraordinarily reluctant to do so for liability reasons. Manufacturers guarantee that a food product is flawless up to its best-before date. When that date has passed, liability moves to the retailer who generally rather discards food past its best-before date than taking the risk of selling an unsafe food product and risking litigation (Kreutzberger & Thurn 2012: 39-40).

In addition, there is another economic incentive for retailers to discard food close to or past its best-before date. As already mentioned in section 4.2.1, reducing prices for food products close to their best-before date is not paying off the additional labour involved, i.e. re-labelling food products with reduced prices and placing them back in their according shelves (WDR 2013). Apart from that, it is also costly to keep such food products in shop, for they take up shelf space which would otherwise be used for regularly priced products (FAO 2013b: 35).

Furthermore, retail food waste as well as its disposal has already been priced in and distributed throughout all goods. The additional workload connected to a price reduction would not justify the additional revenues for the retailer. Naturally, the decision of wasting rather than selling these food products is made without taking into consideration any social or environmental impacts (FAO 2013b: 35).

Independent Reasonable Date Labelling

Against the backdrop of consumer food waste being generated due to the questionable methods with which retailers determine and apply date labels leading to consumer confusion about such date labelling, Stuart (2009: 97-98) states that "*the legitimacy of the retail industry's application of best-before dates is (...) highly questionable*". Consequently, he demands the establishment of an independent institution which should be in charge of a reasonable determination of date labels. This institution should be working responsibly in the interest of both, consumer health as well as waste reduction (ibid.: 104-105). While in theory, date labelling by an independent institution would have potential for reducing food waste related to such labels, there are some barriers to this working in practice.

Naturally, manufacturers have all insights into such factors as the composition and chemical ingredients of a product so that, compared to an external institution, a *reasonable* determination of the day of minimum durability or expiration could be easier for them. Following from this, an external institution would always be dependent on product information from the side of manufacturers. However, along with retailers, manufacturers profit from speedy stock turnovers being driven by increasing amounts of food waste (see section 5.1.2). As a consequence, neither manufacturers nor retailers have an incentive to support an external institution tasked to determine date labels reasonably, which would lead to an unreliable communication of information and hence an unreliable determination of date labels by an independent institution.

Abolishment of Best-Before Labels for Long-Lasting Products

There are ongoing discussions on changing EU food date labelling regulations with a view to preventing misinterpretation and related food waste. Just recently, the delegations of the Netherlands and Sweden, with the support of other EU Member States, initiated discussions among EU Ministers aimed at broadening the list of food products not required to indicate a best-before date, due to their practically endless durability. This should work as a measure to limit food waste generated by consumers who are confused by current date labelling practices (Council of the European Union 2014b: 8). Selected food products are already on such a list today and hence need not bear a best-before date (European Parliament & Council of the European Union 2000: 35). However, the Netherlands and Sweden have proposed that further products retaining quality over a long timeframe when stored appropriately, such as dry pasta,

rice, coffee and hard cheese, be exempted from the obligation of having to carry a best-before date label (Council of the European Union 2014a: 8).

According to the European Commission, extending the list of food products not being required to carry a date of minimum durability has potential for reducing food waste resulting from the perception of consumers that food past its best-before date is no longer suitable for human consumption by 15 million tons per year. For this reason, the European Commission will be tabling proposals allowing Member States to expand the catalogue of foods not requiring best-before dates.

If this recommendation is put into practice not only by the European Commission and its Member States but also by manufacturers and retailers, it would have a great potential for reducing the amount of food being thrown out. Even though EU regulations concerning food labelling already exempt salt, baked goods, wine, fresh vegetables and fruits from food date labelling requirements (European Parliament & Council of the European Union 2000: 35), supermarkets nonetheless apply food labels to some of the exempted products merely out of routine (Stuart 2009: 96-97). Likewise, the relaxation of EU marketing standards had no effect on retailers who continued to reject agricultural products only by virtue of aesthetic demands (see section 4.2.2). Therefore, even though a move from the side of the EU could have potential for limiting domestic food waste in theory, EU Member States, but most importantly the food industry, need to accept and adopt it before there can be a change in practice. It is, however, highly probable that the food industry will continue applying date labels on exempted products since it can lead to increased profits.

Abolishment of Quality-Related Date Labels

Instead of merely extending the list of products being exempted from the obligation to be labelled with a best-before date, food waste connected to date labels could be better prevented by *abolishing* date labelling exclusively based on food quality. Against the backdrop of 7.5 million tons of food being wasted every year by EU citizens not correctly understanding date labelling (see section 4.2.1), combined with the fact that there is no incentive for food retailers to support the prevention of food waste, the abolishment of quality related date labels is an absolute necessity. This approach is shared by Stuart (2009: 104-105) who demands that all date labels should solely clarify until when it is *safe* to consume a food product.

As a result of this abolishment, consumers currently attributing a safety function to best-before dates might no longer discard food products despite them being safe for eating. If, however, quality-related date labels were to really be abolished, it would be necessary to ensure

that use-by dates were determined exclusively on the grounds of food safety and solely applied to highly perishable food products that can be a potential health risk after going bad.

Reliable Date Labelling

As already explained, it is a highly complex task to determine the shelf life of food products due to it being dependent on various factors such as storage conditions and discontinuities in the cold storage chain. It is therefore nearly impossible to determine an exact day of expiration. To address this problem, research on new technologies providing reliable information on the actual state of food with regard to its safety is being increasingly pursued.

So-called *food label tags* are developed to replace current date labels on food products. In replacement of a printed date, the colour of the tag will indicate the current state of food safety. Consisting of metallic nanorods degrading according to the storage environment, these tags will change colour going from green through to red along with the spoiling product (HOL 2014: 24-25).

PERES, an electronic device currently in testing, supports consumers in determining the quality of fresh food, such as fish, poultry and meat. PERES has primarily been developed to protect consumers from food poisoning. However, at the same time, this electronic device will help to limit avoidable food waste originating from blind reliance on date labels and overcautious consumer concerns with regard to food safety. By measuring humidity, temperature and the concentration of chemical substances being formed during the process of spoilage it is more reliable than custom date labels (PERES).

Even though new technologies promise to provide reliable information on the safety status of perishable products, we are still some years away from the moment when any large scale implementation will be possible (HOL 2014: 24). Stuart (2009: 100-101) additionally criticises these new technologies for being too expensive to be applied on a major scale. Moreover, by shifting consumer reliance from conventional to innovative date labels, responsibility is completely being taken away from consumers who should also be encouraged to use their own senses to find out whether a food product is safe for consumption.

5.2.2 Policy Recommendations on Food Quality Standards

Retailers' influence on food wasted for aesthetic reasons has been demonstrated (see section 4.2.2). The following section is dedicated to assessing the effectiveness of recommendations which could be implemented to reduce the generation of food waste related to quality standards.

Implementation of Value Ranges

In view of the vast amounts of food being wasted exclusively on the grounds of aesthetic requirements, the existence of quality related food standards is highly critical. Therefore, it is suggested that retailers offer to their customers a greater variety of imperfect products in combination with a broader range of prices (FAO 2011: 11).

Instead of assuming their responsibility for food waste resulting from the application of quality standards, retail industry argues that customers are used to standardised appearance of agricultural produce and, hence, not willing to buy food of diverging aesthetical quality (Stuart 2009: 152-153). According to Tesco, a British retailer, a consumer will always choose the food looking best, cosmetically. Adding products not meeting the same cosmetic standards will actually drive waste, says Tesco (HOL 2014: 28). Following from this conviction, it is obvious that crop technologists as well as growers are focused on cultivating cosmetically high-quality produce instead of concentrating on producing the most nutritious, best tasting products (Stuart 2009: 149-150). The prevention of blemishes from pests and insects is accompanied by an increased application of pesticides aimed at meeting strict quality requirements (FOE 2002: 1).

While HOL (2014: 28) agrees that consumer views and their behaviour towards cosmetic food standards have been adapted to the standardised appearance of agricultural produce, it is convinced that it is also possible to reshape them. In addition, consumer surveys proved that 80% of the consumers surveyed in the UK are willing to buy agricultural produce not being perfect in colour and shape (HOL 2014: 29). Research by FOE (2002: 1) revealed that, instead of demanding highest appearance quality, consumers are rather concerned about food safety issues such as additional pesticide residues in fruits and vegetables. Therefore, FAO criticises that standards are based on appearance quality rather than safety issues and additionally demands that consumers should be able to choose their fruits and vegetables on the basis of nutritional values and hence be free to buy imperfect products at their own desire (FAO 2013b: 49).

A few retailers have already begun to relax their aesthetic requirements for agricultural produce, selling imperfect fruits and vegetables at a lower price and are thus helping consumers in realising that seemingly imperfect items are of equivalent nutritional quality (FAO 2013b:

49). In these stores, customers can choose between more expensive high quality produce and price-reduced sub-standards. These retailers, which introduced broader value ranges, were able to limit the share of wasted food. For example, the British retailer Waitrose which advertised misshaped bananas for a reduced price was allegedly able to reduce food waste on crop from as much as 40% in 2002 to as little as only 3% in 2008 (Stuart 2009: 66-67). A French retailer, Intermarché, just recently launched its new advertising campaign '*Inglorious fruits and vegetables*' promoting imperfect produce to be "*as good [as high quality food] but 30% cheaper*" (Intermarché 2014). According to Intermarché (2014), this campaign raised awareness in shops, social networks and the media.

Critical Assessment

FAO (2013b: 49) is convinced that if retailers and policy makers pull together on one string to eliminate existing quality standards, they have a great potential to dramatically limit the amount of wasted food, especially in the stage of agricultural production (FAO 2013b: 49). According to research conducted by Stuart, however, retailers cannot find any incentive to offer price-reduced sub-standards on a larger scale (Stuart 2009: 66-67). For one, selling sub-standard fruits and vegetables that were previously out-graded but now accepted by retailers, can only be sold at a lower price, and secondly, displaying reduced sub-standards next to the more expensive high quality products could encourage customers to buy less of the high quality products, both approaches leading to reduced profits for the retailers. This can also serve as an explanation why the relaxation of EU marketing standards had no sufficient effect on the practice of retailers who continue applying strict quality standards (ibid.: 152-155).

Stuart (2009: 66-67) claims that existing campaigns for sub-standards are generally restricted to particular crops that have been affected by severe weather conditions and not based on an overall reappraisal of waste, making the entire impact of such endeavours uncertain. This is exactly what gave the impulse for this year's Waitrose campaign promoting sub-standard apple varieties. Bad weather conditions in producing countries damaged up to 70% of total crops, which resulted in a shortage of high quality apples. It remains to be seen whether retailers will offer sub-standard produce permanently or simply offer market sub-standards for as long as there is a shortage in high quality fruits and vegetables. This concern is also expressed by members of the UK's National Farmers' Union who on the one side welcome higher flexibility in terms of quality from the side of the retail industry but on the other are sceptical that this flexibility will persist in years with sufficient amounts of high quality fruits and vegetables (Merrill 2014).

In addition, there is no data on how consumers respond to the implementation of price-reduced sub-standards in the long run. Even though willingness to buy misshaped fruits and vegetables does exist, it remains unclear if consumers would increasingly divert purchases from high quality produce to sub-standards or rather return to high quality fruits and vegetables after an initial phase of implementation. A possible barrier on the side of consumers could be the fact that while a work-life balance is becoming more important, food is losing its social function. As a consequence, food preparation becomes incidental and is rather done only because it is necessary, and preferably without wasting too much time (Kreutzberger & Thurn 2012: 103). In addition, imperfect food products such as forked carrots may not easily be peeled in full length by a single stroke, meaning their preparation compared to that of high quality produce being perfectly straight may require more time (Stuart 2009: 147-149).

Whole Crop Purchasing and the Integrated Supply Chain

HOL (2014: 29) proposes '*whole crop purchasing*' as an effective opportunity to reduce food waste between production and retail. Instead of refusing a share of the crop, retailers would commit themselves to purchasing the entire supply of crop and make use of it for a range of different purposes, depending on the condition of the produce (ibid.). An action plan has been established to offer support for retail organisations in regard to this topic. It provides information on how to identify opportunities for the implementation and it demonstrates the actual process of implementation as well as potential barriers and benefits of whole crop purchasing for different actors along the whole food supply chain in theory and via a case study (Spray 2012: 1-8).

In practice, retail organisations can utilise whole crop purchasing through a so-called *vertically integrated ownership model* (Spray 2012: 2) which is exercised by Morrisons, a UK retailer. By being in possession of its own supply chain (see Figure 1) Morrisons is able to directly purchase fruits and vegetables from farmers. In a next step, the produce is sorted, graded and washed by Morrisons processing facilities. In operating their own facilities for manufacturing and packaging, Morrisons may use various parts and classes of a crop simply by packaging crop themselves in different ways (HOL 2014: 32; Morrisons n.d.: 12). Highest quality produce can be directly sold to consumers to be prepared at home, while lower class produce, which may have blemishes on the skin, could be processed in store to be sold as pre-chopped fruits and vegetables. All produce left over can further be processed to be sold as ready meals in shop, e.g. soups and salads (HOL 2014: 29). In a next step, food products are either stored in a Morrisons distribution centre or directly distributed to different Morrisons stores (Morrisons food waste n.d.).

Figure 1: Morrisons Integrated Supply Chain Process

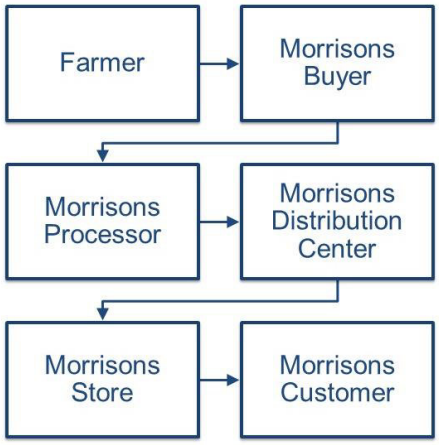

Figure 1 Morrisons Integrated Supply Chain Process (Morrisons: 6).

Critical Assessment

The model of whole crop purchasing in combination with an integrated supply chain of retailers has great potential to reduce the amount of food being wasted across all stages of the food supply chain. In the first place, whole crop purchasing immensely limits agricultural food waste originating from strict cosmetic requirements, and consequently raises income for producers as a positive side effect (Spray 2012: 2). Second, an integrated supply chain shortens time between producer and retail by bypassing storage facilities of the suppliers which results in an extended shelf life at both the retail and consumption stage and, hence, reduces the likelihood of food going to waste (HOL 2014: 29). According to Morrisons (n.d.: 12), during the harvest season the entire crop of carrots, swede, cauliflower and broccoli as well as 90% of mushrooms, potatoes and onions are harvested in Great Britain. This allegedly leads to their vegetables actually being as fresh as possible when arriving in store. As per Morrisons, possessing their own supply chain enables them to deliver food directly from field to fork within 12 hours, making Morrisons an industry leader in terms of turnaround time (ibid.). In addition, previously sorted produce is processed and sold, so that in fact, according to self-reporting, whole crop purchasing of potatoes enabled Morrisons to utilise over 20% more crop which reduces food waste at the same time (ibid.: 13).

However, not all retailers have processing and packaging facilities which would enable them to integrate their supply chain, so it remains questionable whether the model of whole crop purchasing could be implemented on a larger scale. An alternative for retailers without these capacities would be to cooperate with purchasing organisations. This could be done by making use of the potential offered by purchasing organisations by buying produce in volume

to then sell it to further suppliers. Such a cooperation of different actors of the food supply chain could be a significant contribution to a more efficient food chain which in turn could reduce the amount of food being wasted (Council of the European Union 2014a: 3) and should be welcomed by the European Commission's Retail Forum for Sustainability, suggesting retailers should not only support consumers in reducing food waste but should also take action themselves, e.g. through partnerships with suppliers (European Commission 2014b).

As demonstrated in section 4.1.2, retailers generally need to have a monetary incentive motivating them to support the reduction of food waste. The action plan for whole crop purchasing assumes the following benefits for retailers: "*cost control, reduced supply chain waste, improved relationships with producers, [and] improved/extended shelf lives of products*" (Spray 2012: 4). From the perspective of retailers, however, none of these can be regarded as actual benefits. As the most powerful actors of the food supply chain, retailers already control costs and are therefore not dependent on good relationships with producers. Due to the fact that retailers profit from speedy stock turnovers and food waste, they will neither regard improved product shelf lives nor the prevention of food waste as beneficial for themselves (see section 4.2).

6. Conclusion

In an effort to evaluate possible policy recommendations for limiting food waste, it was the aim to analyse the role of retailers in food supply chains with special regard to food waste. The analysis has refuted the two hypotheses of which one defined consumers as the main drivers of food waste, while the other declared educating and awareness raising campaigns as promising policy responses aimed at limiting domestic food waste. The obtained results do not deny that the present amount of domestic food waste, as well as food waste in general, is highly disturbing in social, environmental and economic respects, but rather they imply that it is not exclusively consumers that need to be blamed for the given problems (Evans 2011: 437).

Therefore, focus was shifted from consumers to retailers, the most powerful and influential actors in the food supply chain. Due to the European grocery market being highly concentrated, retailers are able to shape market conditions precisely to their needs. The demonstration of the retailers' power was followed by a closer examination on their influence on the generation of food waste across the food supply chain based on the chosen examples of food date labels and quality standards. The analysis did not only identify retailers as being complicit in the generation of food waste in various stages of the food supply chain but rather as being an initiator and profiteer of food waste. This has been reasoned by analysing decisions being made by retailers neither on the basis of food safety nor on that of consumer preferences, as it is professed by retailers, but rather with a view solely to the retailers' and their shareholders' advantage.

Following from this, it was concluded that individualising responsibilities for reducing the generation of domestic food waste through policy responses exclusively addressing behavioural changes on the side of consumers can merely be considered as a possible starting point rather than a sufficient approach as long as retailers continue to negatively influence consumers and drive food waste along the supply chain.

Cause-oriented policy recommendations aiming at the limitation of the influence of the retail industry on date labelling and quality standards were analysed and critically evaluated in order to find out in how far these could constitute a promising leverage point in an effort to reduce the generation of food waste. The importance of abolishing quality-related date labelling as well as the ensuring of a reliable determination of use-by dates by an independent institution were presented as useful preconditions to prevent food waste caused by misunderstanding of consumers. It was further shown that in addition to abolishing quality standards by introducing value ranges, the utilisation of the entire crop to the greatest possible extent may not lead to a

reduction in domestic food waste but rather to a reduction of food waste on the level of producers and processors.

It was, however, emphasised that retailers do not have an incentive for promoting policy recommendations aimed at the reduction of food waste, as long as there is an economic profit for them to be obtained from increasing amounts of food waste. Moreover, as long as retailers control the whole food supply chain while the demands of shareholders dominate their business practices, it will be impossible to limit food waste sufficiently.

As described, it was not possible to support the carried out theoretical analysis with reliable data. Still, the presented findings are presumably the best currently available indicating that it is possible to disprove that consumers should be the only focus in a search for limiting domestic food waste as well as food waste in general. Further research should, therefore, address the generation of food waste along the entire food supply chain, with special focus on agricultural production and distribution, which are currently the least explored stages. Therefore, businesses should be obliged to publish their food waste figures. This could not only support the investigation of food waste on the level of retail being currently based on voluntary self-reporting, but could also incentivise retailers to increase their efficiency in comparison to competitors with regard to food waste as well as improve their public image (Stuart 2009: 71-72).

As the EU announced to publish a Communication on Sustainable Food aimed at assessing how best to limit food waste throughout the supply chain, it remains to be seen whether actors other than consumers of the food supply chain will be addressed.

Bibliography

Bargawi, H., Oya, C. (2009). "*Agribusiness for Development: Who Really Gains? Perspectives from the Journal of Agrarian Change*". Centre for Development Policy and Research. Available from: https://www.soas.ac.uk/cdpr/publications/dv/file53490.pdf [Accessed 09.08.2014].

BEUC (2014). "*Date labelling and food waste. Letter sent to the European Commission (DG SANCO)*". Bureau Européen des Unions de Consommateurs. The Consumer Voice in Europe. Available from: http://www.beuc.org/publications/beuc-x-2014-040_cpe_date_labelling_and_food_waste.pdf [Accessed 04.07.2014].

Bio Intelligence Service (2011). "*Guidelines on the Preparation of Food*". Waste Prevention Programmes. Available from: http://ec.europa.eu/environment/waste/prevention/pdf/prevention_guidelines.pdf [Accessed 10.08.2014].

Bond, M., Meacham, T., Bhunnoo, R. and Benton, T.G. (2013). "*Food waste within global food systems. A Global Food Security report*". Available from: http://www.foodsecurity.ac.uk/assets/pdfs/food-waste-report.pdf [Accessed 09.08.2014].

CBI (2012). "*EU legislation: Marketing standards for fresh fruit and vegetables. Ministry of Foreign Affairs of the Netherlands*". Centre for the Promotion of Imports from developing countries. Available from: http://www.cbi.eu/system/files/marketintel/2012_EU_legislation_Marketing_standards_for_fresh_fruit_and_vegetables.pdf [Accessed 09.08.2014].

Cofresco (2011). "*Save Food Studie. Das Wegwerfen von Lebensmitteln – Einstellungen und Verhaltensmuster Quantitative Studie in deutschen Privathaushalten. Ergebnisse Deutschland*" Available from: http://www.cofresco.de/pdf/Results_Save_Food_Study_Germany.pdf [Accessed 10.08.2014].

Consumers International (2012). "*The relationship between supermarkets and suppliers: What are the implications for consumers?*" July 2012. Available from: http://www.europe-economics.com/publications/the_relationship_between_supermarkets_and_suppliers.pdf [Accessed 09.08.2014].

Council of the European Union (1979). "*Council Directive 79/112/EEC of 18 december 1978 on the approximation of the laws of the Member States relating to the labelling, presentation and advertising of foodstuffs for sale to the ultimate consumer*". Official Journal of the European Communities. Available from: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31979L0112 [Accessed 09.08.2014].

Council of the European Union (2014a). "*Food loss and food waste - Information from the Netherlands and Swedish delegations, supported by the Austrian, Danish, German and Luxembourg delegations*". 13 May 2014. Available from: http://register.consilium.europa.eu/doc/ srv?l=EN&f=ST%209755%202014%20INIT [Accessed 09.08.2014].

Council of the European Union (2014b). "*Press Release. 3314th Council meeting. Agriculture and Fisheries*". 19 May 2014. Available from: http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/agricult/142689.pdf [Accessed 09.08.2014].

DEFRA (2007). "*Report of the Food Industry Sustainability Strategy Champions' Group on Waste*." Department for Environment, Food and Rural Affairs. Group on Waste (CGW). London. Available from: http://archive.defra.gov.uk/foodfarm/policy/foodindustry/documents/report-waste-may2007.pdf [Accessed 01.06.2014].

DEFRA (2010). "*Food 2030*". Department for Environment, Food and Rural Affairs. London. Available from: http://archive.defra.gov.uk/foodfarm/food/pdf/food2030strategy.pdf [Accessed 09.08.2014].

Ethical Corporation (2006). "*The sustainability of European food supply chains*". Department for Environment, Food and Rural Affairs. London. Available from: http://goo.gl/Pc1cCS [Accessed 09.08.2014].

EUFIC (2012). "*Lebensmittelverschwendung reduzieren*". European Food Information Council. Available from: http://www.eufic.org/article/de/page/FTARCHIVE/artid/How-to-minimise-food-waste/ [Accessed 10.08.2014].

European Commission (2009). "*The return of the bendy cucumber: 'wonky' fruit and vegetables back on sale from 1st July*". Available from: http://europa.eu/rapid/press-release_IP-09-1059_en.htm [Accessed 09.08.2014].

European Commission (2010). "*Preparatory Study on Food Waste across EU 27*". Available from: http://ec.europa.eu/environment/eussd/pdf/bio_foodwaste_report.pdf [Accessed 09.08.2014].

European Commission (2011a). "*Commission implementing Regulation (EU) No 543/2011 of 7 June 2011 laying down detailed rules for the application of Council Regulation (EC) No 1234/2007 in respect of the fruit and vegetables and processed fruit and vegetables sectors*". Official Journal of the European Union. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:157:0001:0163:EN:PDF [Accessed 09.08.2014].

European Commission (2011b). "*Roadmap to a Resource Efficient Europe. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and The Committee of the Regions. COM(2011) 571 final*". 20 September 2011. Available from: http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf [Accessed 01.07.2014].

European Commission (2014a) "*Sustainable Food*". Available from: http://ec.europa.eu/environment/eussd/food.htm [Accessed 09.08.2014].

European Commission (2014b). "*Retail Forum for Sustainability*". Available from: http://ec.europa.eu/environment/industry/retail/index_en.htm [Accessed 09.08.2014].

European Commission (n.d.). "*Stop food waste*". Available from: http://ec.europa.eu/food/food/sustainability/index_en.htm [Accessed 01.07.2014].

European Parliament and Council of the European Union (2000). "*DIRECTIVE 2000/13/EC of the European Parliament and of the Council of 20 March 2000 on the approximation of the laws of the Member States relating to the labelling, presentation and advertising of foodstuffs*". Official Journal of the European Communities. Available from: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:109:0029:0042:EN:PDF [Accessed 09.08.2014].

European Parliament (2011). "*Report on how to avoid food wastage: strategies for a more efficient food chain in the EU (2011/2175(INI))*". Committee on Agriculture and Rural Development. 30 November 2011. Available from: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A7-2011-0430+0+DOC+XML+V0//EN [Accessed 09.08.2014].

European Parliament (2012). "*Avoiding food wastage - European Parliament resolution of 19 January 2012 on how to avoid food wastage: strategies for a more efficient food chain in the EU (2011/2175(INI))*". Available from: http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+TA+P7-TA-2012-0014+0+DOC+PDF+V0//EN [Accessed 01.07.2014].

European Retail Round Table (2013). "*European retailers lead the way towards a sustainable future in a resource-constrained world*". Retail Forum annual event 2013 on food waste. Press Release. Available from: http://www.eurocommerce.be/media/77774/EuroCommerce%20ERRT%20Joint%20Press%20Release%20-

%20European%20retailers%20lead%20the%20way%20towards%20a%20sustainable%20futu re%20in%20a%20resource-constrained%20world.pdf [Accessed 04.08.2014].

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, 21:4, 429-440. Available from: http://dx.doi.org/10.1080/09581596.2011.608797 [Accessed 09.08.2014].

FAO (2011). "*Global Food Losses and Waste. Extent, Causes and Prevention*". Food and Agriculture Organization of United Nations. Available from: http://www.fao.org/docrep/014/ mb060e/mb060e00.pdf [Accessed 09.08.2014].

FAO (2012). "*The State of Food Insecurity in the World. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition*". Food and Agriculture Organization of United Nations. Available from: http://www.fao.org/docrep/016/i3027e/ i3027e00.htm [Accessed 09.08.2014].

FAO (2013a). "*Food Wastage Footprint. Impacts on Natural Resources*". Food and Agriculture Organization of United Nations. Available from: http://www.fao.org/docrep/018/ i3347e/i3347e.pdf [Accessed 09.08.2014].

FAO (2013b). "*Toolkit. Reducing the Food Wastage Footprint*". Food and Agriculture Organization of United Nations. Available from: http://www.fao.org/docrep/018/i3342e/ i3342e.pdf [Accessed 09.08.2014].

FOE (2002). "*Supermarkets and Great British fruit*". Media Briefing. Friends of the Earth. October 2002. Available from: http://www.foe.co.uk/sites/default/files/downloads/ supermarket_british_fruit.pdf [Accessed 09.08.2014].

FOE (2005). "*Checking out the environment? Environmental impacts of supermarkets*". Briefing. Friends of the Earth. June 2005. Available from: http://foe.org.uk/sites/default/files/ downloads/checking_out_the_environme.pdf [Accessed 09.08.2014].

German Bundestag (2012). "Ö*ffentliche Anhörung zum Thema 'Lebensmittelverschwendung'. Ausschuss für Ernährung, Landwirtschaft und Verbraucherschutz*". 68. Sitzung. 23 April 2011. Available from: http:// webarchiv.bundestag.de/archive/2013/1212/bundestag/ausschuesse17/a10/ anhoerungen/2012_04_23_Lebensmittelverschwendung/Protokoll_17-68___A_Lebensmittelverschwendung.pdf [Accessed 09.05.2014].

Henningsson S., Hyde K., Smith, A. & Campbell, M. (2004). "*The value of resource efficiency in the food industry: a waste minimisation project in East Anglia, UK*". Journal of Cleaner

Production, 12, 505-512. Available from: http://www.sciencedirect.com/science/article/pii/S0959652603001045 [Accessed 09.08.2014].

HOL (2014). "*Counting the Cost of Food Waste: EU Food Waste Prevention*". European Union Committee 10th Report of Session 2013-4. 6 April 2014. House of Lords. London. Available from: http://www.publications.parliament.uk/pa/ld201314/ldselect/ldeucom/154/15402.htm [Accessed 09.08.2014].

Intermarché (2014). "*'Inglorious' fruits and vegetables*". Available from: http://www.youtube.com/watch?v=TJgx8QfoyLg [Accessed 09.08.2014].

Kreutzberger, S., Thurn, V. (2012). "*Die Essensvernichter. Warum die Hälfte unserer Lebensmittel im Müll landet und wer dafür verantwortlich ist*". Kiepenheuer & Witsch: Köln.

Kummu, M., de Moel, H., Porkka, M., Siebert, S., Varis, O. & Ward, P.J. (2012). "*Lost food, Wasted Resources: Global Food Supply Chain Losses and Their Impacts on Freshwater, Cropland, and Fertiliser Use*". Science of the Total Environment. 438. 477-489.

Leake, J. (2005). "*Picky stores force farmers to dump veg*". Sunday Times, 17 July 2005. Available from: http://www.thesundaytimes.co.uk/sto/news/uk_news/article141470.ece [Accessed 09.08.2014].

Merrill, J. (2014). "*Ugly fruit gets a makeover as store cuts waste. Waitrose sells produce disfigured by bad weather, and that's good for farmers and customers alike*". Independent. 01 June 2014. Available from: http://www.independent.co.uk/life-style/food-and-drink/news/ugly-fruit-gets-a-makeover-as-store-cuts-waste-9466943.html [Accessed 09.08.2014].

Morrisons food waste (n.d.). Available from: http://www.morrisons-corporate.com/policy/Food-Waste/ [Accessed 09.08.2014].

Morrisons (n.d.). "*Food Waste Factbook*". Available from: http://your.morrisons.com/Documents/Great_Taste_Less_Waste_Final_Draft.pdf [Accessed 27.07.2014].

Patel, R. (2013). "*Stuffed and Starved. From Farm to Fork. The Hidden Battle for the Food System*". Portobello Books. Available from: Google play [Accessed: 05.06.2014].

Rowney, M. (2014) "*The wasteline: Redefining 'waste' and improving resource management policy*". Institute for Public Policy Research. Available from: http://www.ippr.org/assets/media/publications/pdf/the-wasteline-waste+resource-management_Jul2014.pdf [Accessed 11.08.2014].

Schuhler, C. (2005). "*Metro Total Global. Die internationale Kapitalstrategie des größten deutschen Handelskonzerns*". isw-forschungshefte 2, Oktober 2005.

Spray, A. (2012). "*Action Plan. Securing crop supply through whole crop purchasing*". Best Food Forward. December 2012. Available from: http://www.wrap.org.uk/sites/files/wrap/WCP%20Action%20Plan%20-%20finalv1.pdf [Accessed 09.08.2014].

Stuart, T. (2009). "*Waste. Uncovering the Global Food Scandal*". Penguin Books: London. Available from: Google play [Accessed: 05.06.2014].

Themen, D. (2014). "*Reduction of Food Losses and Waste in Europe and Central Asia for Improved Food Security and Agrifood Chain Efficiency*". Regional Office for Europe and Central Asia. UN Food and Agriculture Organization of United Nations. Available from: http://www.fao.org/fileadmin/user_upload/Europe/documents/docs/ASI/FLW_draft_en.pdf [Accessed 09.08.2014].

USDA (2013). "*Food Product Dating*". United States Department of Agriculture, Food Safety and Inspection Service. Telegraph. 19 May 2014. Brussels. Available from: http://www.fsis.usda.gov/wps/portal/fsis/topics/food-safety-education/get-answers/food-safety-fact-sheets/food-labeling/food-product-dating/food-product-dating [Accessed 10.08.2014].

Waterfield, B. (2014). "*'Best-before' labels on rice, coffee and pasta reach their sell-by date. EU is to scrap 'best-before' dates on long life food packaging as a measure to stop millions of tons of edible produce being thrown away every year*". Brussels. Available from: http://www.telegraph.co.uk/news/worldnews/europe/eu/10841634/Best-before-labels-on-rice-coffee-and-pasta-reach-their-sell-by-date.html [Accessed 28.07.2014].

WDR (2013). "*Wegwerfwahn: Müll statt Essen. Handel vernichtet Lebensmittel vor Ablaufdatum*". Westdeutscher Rundfunk Köln. Available from: http://www1.wdr.de/fernsehen/ratgeber/markt/sendungen/lebensmittel222.html [Accessed 01.06.2014].

WRAP (2010). "*Consumer insight: date labels and storage guidance*". Waste and Resources Action Programme. Available from: http://www.wrap.org.uk/sites/files/wrap/Technical%20report%20dates.pdf [Accessed 09.08.2014].

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