UNIVERSITEIT UTRECHT

# Encourage Food Waste Reduction

## Policy options for the Dutch context to encourage retail's efforts for food waste reduction in the supply chain

**MASTER THESIS**

Faculty of Geoscience
MSc Sustainable Development: Environmental Governance

By Lili Hocke

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# Master Thesis (30 ECTS)

## Encouraging Food Waste Reduction

Policy options for the Dutch context to encourage retail's efforts for food waste reduction in the supply chain

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## ABSTRACT

Food waste is increasingly acknowledged as problem that needs to be solved on the way to achieve sustainable development as one third of the world's food is estimated to be wasted (FAO, 2013a). Food waste causes increased $CO_2$ emission through production, processing and its disposal; it contributes to world hunger as food is wasted instead of delivered to the ones in need; economically, food waste is wasted investment in production, processing, supply, and preparation of food. In Europe, food waste per capita is among the highest (280 kg/year/capita). In addition to the EU target of 50% food waste reduction by the year 2020, the Netherlands set an interim target of 20% food waste reduction by 2015. However, the implemented measures by the Dutch government could so far not reach any reduction in food waste. Retail is a powerful player within the food supply chain, with influence upstream the food supply chain (producers and suppliers) and downstream the food supply chain (consumers). Therefore, this research project aimed to develop policy recommendations for the Dutch government to encourage retail to engage in food waste reduction in the food supply chain. Against this background, the research 1) explored the leverage points of retail regarding the reduction of food waste along the food supply chain, 2) identified the obstacles and drivers for retail to engage in the food waste reduction efforts, and 3) identified suitable policies to encourage drivers and overcome obstacles. The research included a literature review on the leverage points, a multiple case study was conducted with retail organizations to identify obstacles and drivers for retail's efforts to reduce food waste, and interviews were conducted with experts on policy options to overcome obstacles and enhance drivers. Using a grounded theory approach, in total three retail organizations and the Centraal Bureau Levensmiddelenhandel (Branch organization of the big Dutch retail organizations) were included in the case study and interviews with six experts on policy options were conducted.

The findings of the research revealed that there are several leverage points of retail to reduce food waste in the food supply chain at the retail, upstream, and downstream. In total 12 variables were found to influence the retail's decision to engage in food waste reduction. The importance of the variables was found to differ between efforts to reduce food waste upstream, downstream or at the retail. Nevertheless, profitability was in total identified as the most frequently named variable that influenced the decision of retail to engage in food waste reduction. Moreover, the research revealed multiple options for the Dutch government to increase the identified drivers and overcome the identified obstacles. The research identified the following important recommendations: 1) Research on the quantities of food waste and its causes, in order to prioritize measures; 2) focus on efforts to reduce consumer food waste as consumer are responsible for 2/3 of the Dutch food waste; 3) include the entire supply chain in future policies to avoid shifts from one part of the supply chain to another.

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| | |
|---|---|
| **CBL** | Centraal Bureau Levensmiddelenhandel |
| **CS** | Corporate Sustainability |
| **CSR** | Corporate Social Responsibility |
| **EMS** | Environmental Management System |
| **FAO** | Food and Agriculture Organization of the United Nations |
| **IE** | Industrial Ecology |
| **KPI** | Key Performance Indicator |
| **LCA** | Life Cycle Assessment |
| **Ministry I&E** | Dutch Ministry for Infrastructure and Environment |
| **Mt** | Million tons |
| **NGO** | Non Governmental Organization |
| **PLUS R.** | PLUS Rozenburg |
| **WRAP** | Waste Resource Action Programme |

# 1. INTRODUCTION

## 1.1 BACKGROUND AND KNOWLEDGE GAP

In the context of decreasing resources and increasing population growth, sustainable development is given increasing attention in civil society, politics and science. Sustainable development is commonly referred to as development "that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). It embraces the economic, environmental and social aspect of development -or also referred to as planet, people, profit-.

Food waste is an important part of sustainable development because it addresses all three aspects of sustainable development: In total one-third of the globally produced food gets lost or wasted, 1.3 billion tons a year (FAO, 2013a), while currently still 842 million people in the world suffer from undernourishment (FAO, IFAD, & WFP, 2013). Rising food prices and food shortages with the World Bank's forecasts of a 50% increase in food demand between 2009 and 2030 (Evans, 2009) stress the **social** importance to reduce food waste and to make food available for those in need. **Economically**, wasted food is wasted investment paid for resources, for wages of production, processing, supply, and preparation of the food. The **environmental** impact arises from greenhouse-gas (GHG) emissions and water use from production, transport, disposal, land use, and eutrophication (BIOSIS, 2012; Espace Environnement, 2012; Hafner, Barabosz, & Schneider, 2012). In total 19%–29% of global anthropogenic GHG-emissions derive from the food systems, emitting 9,800–16,900 million tons (Mt) $CO_2$ equivalent in 2008 (Vermeulen, Campbell, & Ingram, 2012).

In Europe, food waste per capita is among the highest with approximately 280 kg/year (Gustavsson et al. , 2011), approximately 89 Mt annual food waste in the EU27 with an impact of 170 Mt $CO_2$ equivalent (Bio Intelligence Service, 2010). The topic of food loss and food waste has attracted the attention of governments, NGOs and major sectors involved in food supply (Mena, Adenso-Diaz, & Yurt, 2011). The European Commission put food waste in 2012 on the agenda, setting the goal of reducing needless food waste by 50% by 2020 (European Commission, 2011), stressing the **societal relevance** to make the food system more efficient and reduce avoidable wastage. The Netherlands set an interim target to reduce food waste by 20% in 2015 (Zero Waste Europe, 2013). To meet this target the Dutch government has to implement measures that effectively reduce food waste along the food supply chain. Measures have been implemented, but until now they did not result in decreasing numbers of food waste (Ministry of Economic

Affairs, 2014; Soethoudt & Timmermans, 2013). Therefore an important question is "What types of incentives and regulations might effectively shift consumption and waste behaviours?" (Vermeulen et al., 2012, p.216).

During the last decade numerous studies have been dedicated to the analysis of the reasons for food wastage in the food supply chain (e.g. FAO, 2013; Giorgi, 2013; Gustavsson et al., 2011; Hafner et al., 2012; Parfitt, Barthel, & Macnaughton, 2010; Soethoudt & Timmermans, 2013; Waarts et al., 2011). The reasons for food waste and loss occur along the entire supply chain and are manifold embracing production, processing, retail and consumers. Until now, in the EU and in the Netherlands, special attention has been dedicated to consumers because of their high share of food waste (almost 60%) (Braun, 2012; Hafner et al., 2012; Soethoudt & Timmermans, 2013). In the Netherlands the share of food waste by consumers is about 2/3 of the entire food waste, 1/3 derives from trade, services and government sector (Figure 1) (Soethoudt & Timmermans, 2013). Even though a much lower amount of food waste occurs at the retail than at the consumer, retailers have an enormous influence when it comes to food waste in the food supply chain. Many authors and institutions like Bio Intelligence Service (2010), Harvey (1989), Stuart (2009), Wrap (2007), and the European Commission (2014) acknowledged "a shift in power in the supply chain, with bargaining power more concentrated in the retail sector than before, with primary producers taking on a subordinate economic role." The influence of retail spreads upstream the food supply chain to the suppliers and producers and downstream to the consumer. Thus focusing on behavioural change by retail can have far reaching influence in the reduction of food wastage. Besides their large influence, in order to successfully reduce food waste, to target retailers makes strategic sense due to the high stakes involved (possible losses from bad publicity) and therefore a higher response rate (Kitzmueller & Shimshack, 2012) than e.g. directly approaching consumers. For the reasons mentioned, it is important to investigate the policy options to change retail behaviour in order to increase their efforts on food waste reduction in the food supply chain.

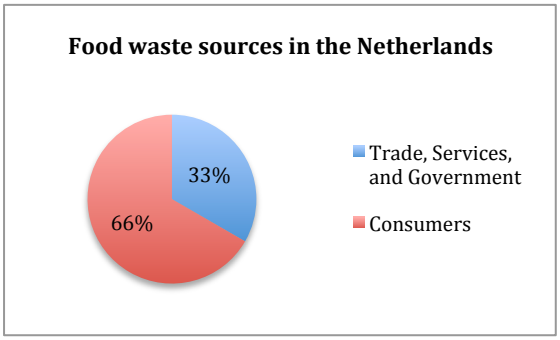


**Figure 1** Food waste sources in the Netherlands. Data taken from Soethoudt and Timmermans (2013).

There are already pilot projects, voluntary agreements (UK) and single initiatives within Europe that target supermarkets. The types of instruments used in this respect are:

Awareness campaigns, information tools, training programmes, logistic improvements, waste measure activities, research programs, regulatory measures, food redistribution activities, and industrial uses (Bio Intelligence Service, 2010). In the Netherlands policies have been implemented as well, however they did not have the intended effect as the Food Waste Monitor 2013 (Soethoudt & Timmermans, 2013) shows. Food waste has rather increased along the supply chain, with exception of the consumer (Ministry of Economic Affairs, 2014; Soethoudt & Timmermans, 2013). Therefore, policies are needed which give an incentive for retailers for more efforts against food waste. Governments can take an important role as "public policies have enormous potential for preventing food waste, but at present very few have been identified. […As an example] regulatory instruments, such as the requirements or incentives to disclose food waste data, can encourage competition among retailers for good performance in this area, offering both substantial environmental and social benefits" (Bio Intelligence Service et al., 2010, pp.93-95). Additionally, within the EU and in the Netherlands, attention for food waste is rising on the public and political level, and options for food waste reduction are discussed. Thus, the political and societal attention is given to introduce effective food waste policies. However to do so, the obstacles and drivers for retail to use their influence to reduce food waste along the supply chain must be known. Waarts et al. (2011) conducted a study about the legislative and regulatory barriers for food waste reduction in the Dutch context, but the study does not address potential other aspects such as communication, or knowledge gaps.

Thus further investigations are needed to explore the obstacles and drivers for behavioural change of retail towards food waste reduction in order to find suitable policy options to encourage behavioural change of retail. These investigations link to former research conducted on the governance of sustainable supply chains, governance modes for sustainable development and corporate social responsibility.

## 1.2 RESEARCH OBJECTIVE AND RESEARCH QUESTIONS

The objective of this research project is to contribute to food waste reduction in the Netherlands, by identifying policy recommendation for the Dutch government to encourage retail's efforts to reduce food waste in the supply chain. The policy recommendation will be given based on 1) *descriptive knowledge* on the leverage points of retail in regard to food waste reduction in the food supply chain gained using literature on food waste; 2) *explanatory knowledge* on the reasons for retail's efforts to reduce food waste, i.e. their encountered obstacles and drivers, generated using an in-depth-case study with the retailers Albert Heijn, Retailer 3, PLUS Rozenburg, and the

CBL; and 3) *prescriptive knowledge* on policy options to overcome the identified obstacles and enhance drivers gained using literature on food waste, literature on policy options for industrial ecology, and interviews with experts.
Therefore the following research question will be guiding this research project:

**Building on the leverage points of retail on food waste in the supply chain, the experienced obstacles and drivers for retail's food waste reduction efforts, and policy options to enhance drivers and recue obstacles, what are policy recommendations for the Dutch government to encourage retail's efforts to reduce food waste in the food supply chain?**

1. What are the leverage points of retail concerning food waste reduction in the food supply chain?
2. What are the important drivers and obstacles for retail experienced in the Dutch context to engage in food waste reduction in the supply chain?
3. What are policy options to overcome the identified obstacles and enhance the identified drivers currently experienced by the Dutch retail sector to reduce food waste along the supply chain?

## 1.3 OUTLINE OF THE REPORT

To answer the research questions, first, the methodological approach will be explained in chapter 2, justifying the methods used, the selection of the cases and how data was gathered. Chapter 3 includes the theoretical background of the topic of food waste and the concepts employed. Chapter 4, 5, and 6 present the analysis and findings of the individual research questions. In chapter 4 findings are presented on the options retail has to reduce food waste in the food supply chain, i.e. the role of retail in the food supply chain in the context of food waste reduction. Chapter 5 presents the obstacles and drivers for retail to use their options in the food supply chain to reduce food waste. As the research objective is to give policy recommendation, chapter 6 identifies the policy options that can be employed to overcome the identified obstacles and enhance the identified drivers, followed by the results of the research project, i.e. the recommendations for the Dutch government, in chapter 7. In chapter 8 the conclusions drawn from the research project are presented, followed by a critical reflection of the results in chapter 9.

# 2 METHODS

In order to reach the aim of this research project, i.e. to give recommendations for the Dutch governments on policy options to encourage retail's efforts to reduce food waste in the supply chain, the research needs to be tailored to answer the main research question. In the following the research strategy and methods used for data gathering are explained and their choice justified.

## 2.1 RESEARCH STRATEGY

The research is **practically oriented** because it aims to give concrete recommendations for the Dutch government; it is **exploratory** because the field of food waste has only recently emerged, especially the focus on retail and thus the obstacles and drivers for retail to reduce food waste along the supply chain are still under-explored. In total, the lack of knowledge and theory on the Dutch retail context concerning food waste justify the exploratory character of the research project. The lack of theory also implies that the research will be **inductive**, generating hypothesis on the ground of the empirical studies conducted. In contrast, deductive research is the empirical testing of hypotheses that have been developed on the basis of knowledge and theoretical considerations (Bryman, 2001). A deductive research is not useful due to the already mentioned lack of knowledge and lack of theory in the field of food waste caused by retail and of food waste policies targeted at retail.

The research is **qualitative** because 1) data on food waste, especially for individual food supply chain phases is often non existent or measured different among the sector, 2) due to the complexity of the food supply chain, it would be difficult to distinguish between the exact amounts of food waste caused by retail behaviour or by other factors, and 3) food waste is a sensitive topic and thus includes reluctance of retail to give quantitative data, making it unfeasible for the scope of this research project to obtain the needed data for quantitative analysis.

The aim of the research is thus to establish hypotheses about 1) the outcomes a policy should have to encourage retail's effort for food waste reduction in the Netherlands, i.e. enhancing drivers and overcoming obstacles and 2) the output of a policy to achieve this, i.e. the instruments that can be implemented. The methodological choice to reach this aim will be explained and justified in the following.

To create hypotheses about the desired outcome and output of future Dutch policies to encourage retail's efforts in food waste reduction a grounded theory approach is chosen

justified by the lack of theory and knowledge on food waste policies. The research will be conducted with selected cases to allow a more in depth inside in the obstacles and drivers at place.

### 2.1.1 GROUNDED THEORY

Grounded theory is a research approach "designed to develop a well integrated set of concepts that provide a thorough theoretical explanation of social phenomena under study" (Corbin & Strauss, 1990, p.5). The method is suitable to develop new theories based on empirical data. The approach was developed by Glaser and Strauss (1967) as an alternative to the prevalent deductive research approaches at that time, and as theory development grounded in systematic data gathering and analysis.

Grounded theory builds on two core concepts: 'Constant comparison' and 'theoretical sampling' (Suddaby, 2006). Constant comparison is the simultaneous collection and analysis of data, a combination of induction and deduction (Sauders, Lewis, & Thornhill, 2007), i.e. findings are tested in the field for confirmation; theoretical sampling means that the data collected is chosen in accordance with the theory constructed. Grounded theory has several steps: "[G]ather data, code, compare, categorize, theoretically sample, develop a core category, and generate a theory" (Walker & Myrick, 2006). The first step is the data gathering, followed by coding of the data. Corbin and Strauss (1990) distinguish between three steps of coding: Open coding, axial coding, and selective coding, which follow upon each other. Open coding entails the sorting of data into concepts, i.e. the comparison and unification of similar phenomena under a common name. Concepts are then aggregated into categories, which are more abstract than concepts. Axial coding is the establishment of relation of concepts and their sub-categories, and selective coding is the unification of all categories around a core category, representing the core phenomena under study.

Along with other qualitative data analysis, grounded theory seeks to organize the data gathered. Further similarities with other qualitative methods are the potential sources of data (incl. interviews, observations, government documents, video tapes, newspapers, letters, and books (Corbin & Strauss, 1990)) and the acceptance of the researcher's responsibility to interpret data (Strauss & Corbin, 1994). However, grounded theory differs to other qualitative methods in its focus to establish theory, its iterative process, and the well-defined process of data analysis from basic description to conceptual ordering and finally theorizing. It is a useful method for exploratory research, and for research setting where the researcher can exert little control over the phenomena studied (Lozano & Huisingh, 2011). Therefore, the exploratory character of the research,

due to lack of knowledge and theory in the field, and the lack of control on retailers' behaviour by the researcher, justify the choice for a grounded theory approach.
To apply the grounded theory approach for the research objective, the cases to which it will be applied have to be selected, therefore a case study was chosen, which will be explained in the following.

### 2.1.2 CASE STUDY

A case study is "a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence" (Robson, 2002, p.178). For Gerring (2004) "a case study is best defined as an in-depth study of a single unit [and it] is correctly understood as a particular way of defining cases, not a way of analysing cases or a way of modelling causal relations" (p.341). In general there is no single definition of what a case study is. For internal consistency Gerring's definition will be used for this research project. Case studies are suitable for research with qualitative character, low n (low number of cases studied), ethnographic work, and single cases. Furthermore, it is suitable to research contemporary events, in which the manipulation of the relevant behaviour is beyond the ability of the researcher (Jupp, 2006; Scholz & Tietje, 2002), and when the analysed behaviour is context dependent (Sauders et al., 2007). Case studies allow flexibility (Lozano & Huisingh, 2011) because data techniques can be combined (Sauders et al., 2007), which is needed to adjust the investigation techniques when exploring unknown fields. Thus, a case study research is suitable for this research project given the exploratory character, the contemporary character of retail behaviour that will be researched, and the lack of influence of the researcher on relevant behaviour of retail organizations.
Instead of making a clear cut distinction between case studies and non-case studies Gerring (2004) identified affinities of both types of research which show the trade-offs between case studies and non-case studies (Table 1). The choice of case study type is then dependent on the type of inference, the scope of proposition, unit homogeneity, causal insight, casual relationship, strategy of research, useful variance and ontology. Case studies in comparison to non-case studies (referred to as cross-unit studies) are more suitable for descriptive, in-depth research objectives for which the cases are internally comparable instead of representative, causal mechanism are researched, invariant relationships, an exploratory research strategy, and variance for a single unit is prevalent.

Before the choice for a case study is justified applying the above affinities to this research project, a few terms need to be explained first, namely unit, population, sample and cases. The unit is "a spatially bounded phenomenon—e.g., a nation-state, revolution, political party, election, or person" (Gerring, 2004, p.342), the population are the samples including studied and unstudied cases, and cases are several observations (Ibid.). From the studied cases an inference should be made for the unstudied cases.

**Table 1** Single-unit versus cross-unit research designs: Trade-offs and affinities. Comparison of trade-offs for case study and non-case studies (Cross-unit study) (Source: Gerring, 2004).

| | | **Affinity** | |
|---|---|---|---|
| | | Case study | Cross-Unit Study |
| 1. Type of inference | (a) Descriptive | + | |
| | (b) Causal | | + |
| 2. Scope of proposition | (a) Depth | + | |
| | (b) Breadth | | + |
| | (c) Boundedness | | + |
| 3. Unit homogeneity | (a) Case comparability (internal) | + | |
| | (b) Representativeness (external) | | + |
| 4. Causal insight | (a) Causal mechanisms | + | |
| | (b) Causal effect | | + |
| 5. Causal relationship | (a) Invariant | + | |
| | (b) Probabilistic | | + |
| 6. Strategy of research | (a) Exploratory (theory generation) | + | |
| | (b) Confirmatory (theory testing) | | + |
| 7. Useful variance | (a) For only single unit | + | |
| | (b) For many units | | + |
| 8. Ontology | | Indeterminate | |

For this research project the unit of analysis is the food waste caused by retail situated in the Netherlands. The population embraces all retail organizations in the Netherlands. According to the affinities of Gerring (2004) (Table 1), the case study is most suitable for this research project because 1) this research project intends to be descriptive on the obstacles and drivers of retail for food waste reduction efforts, and the policy options available to enhance driver and overcome barriers, 2) it aims at a more in-depth analysis of the cases in order to build a theory, 3) the cases selected are expected to be internally comparable due to the selection criteria applied (see further below), 4) the research project intends to identify casual mechanisms, i.e. establish hypotheses on the obstacles and drivers of retail's food waste reduction efforts. Moreover, measuring the causal effect of obstacles on waste reduction is unfeasible due to lack of data. Therefore, to explore the research field the elucidation of the casual mechanism is more feasible and suitable than measuring casual effects. 5) Building on the aforementioned, this

study is not intending to establish any probabilistic causal relationship. For a probabilistic casual relationship hypothesis on obstacles would need to be already established, and the amount of samples would need to be bigger, reducing the depth of the research. 6) The research contributes to theory building, 7) Concerning the useful variance of the research project, Gerring (2004) clarifies that a natural experiment is always desirable, but that it is not always possible. The lack of control of the researcher over the factors influencing retail behaviour makes a natural experiment impossible for this research project. Thus, useful variance is for a single unit, i.e. food waste in the supply chain caused by retail organizations in the Netherlands.

Following the arguments given, the choice for a case study is justified as it is more suitable and feasible for the given research objective than a non-case study (cross-unit study).

Case studies can further be distinguished into several types (Table 2) depending on the focus of analysis, i.e. is the case study looking at temporal (diachronically) variation or spatial (synchronically) variation? The choice of the case study type is dependent "upon the proposition in question" (Gerring, 2004, p.343).

**Table 2** Research designs: A covariational typology. Types of case studies (Source: Gerring, 2004)

| | | **Temporal Variation** | |
|---|---|---|---|
| | | No | Yes |
| **Spatial Variations** | None (1 unit) | [Logically impossible] | (a) Case study I |
| | Within-unit | (b) Case study II | (c) Case study III |
| | Across-unit | (d) Cross-sectional | (e) Time-series cross-sectional |
| | Across- and within-unit | (f) Hierarchical | (g) Hierarchical time-series, Comparative-historical |

This research objective requires a case study II because it intends to identify obstacles and drivers for retail's food waste reduction efforts within the Netherlands (the Netherlands is the unit) at this point in time. Thus, there is only a within-unit spatial variation and no temporal variation included. Furthermore, a case study II allows checking the findings on more than one case and thus increasing generalizability of the findings (Sauders et al., 2007).

The choice for a case study II was justified due to the lack of spatial and temporal variation included and the choice for more than one case for the research project, i.e. more than one retailer. To answer the research questions data has to be collected. The choice for data and the methods for data gathering will be elaborated on in the following.

## 2.2 DATA GATHERING

Above we have justified the choice for grounded theory as method of data analysis due to a current lack of knowledge and theory of the phenomenon under study. Grounded theory defines the way data has to be analysed, i.e. open coding, axial coding, and selective coding. However, grounded theory does not imply which data sources should be chosen. Therefore in the following the data sources and data gathering will be explained. In total, three sub-questions have been formulated to answer the main research question. For each sub-question different data is needed and thus each requires a tailor-made approach for data gathering. The research framework is shown in Figure 2, indicating the data sources used for the research questions and the sequence of data gathering.

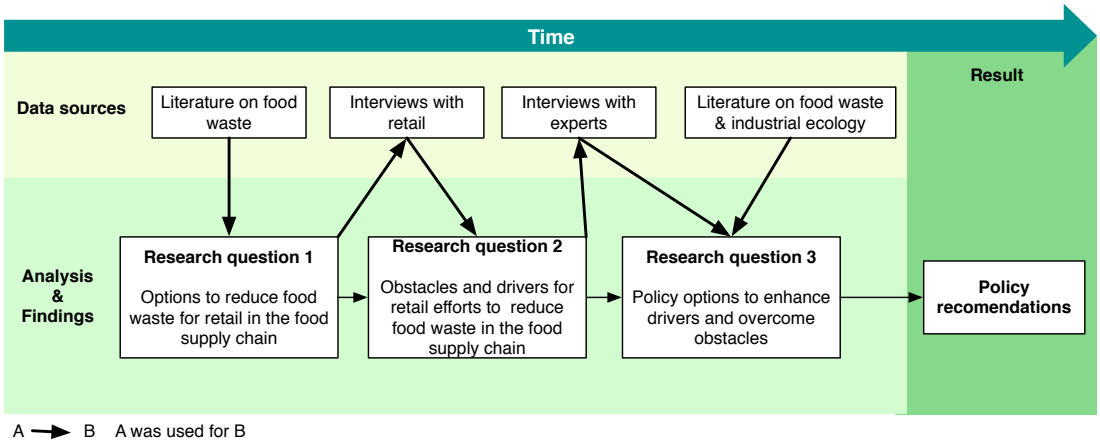


**Figure 2** Research framework

### 2.2.1 SUB-QUESTION 1

In order to answer sub-question 1 'What are the leverage points of retail concerning food waste reduction in the food supply chain?' a literature review was used.

There is a growing amount of literature describing food waste and causes of food waste within the European and global context, including the influence retail has on food waste in the food supply chain. Given the time frame of the research project, a desk research is the most efficient and effective research strategy to answer question 1 because it allows the use of a large amount of data within a short time-period (Verschuren & Doorewaard, 2010). The desk research was conducted as a literature survey with data gathered from literature and secondary data. These are the sources available for the information needed; official statistical data on the issue is not available. Furthermore, the literature survey focuses on quantitative analysis, as it is not intended to analyse in depth how the

literature differs and how precisely it was conducted, but more to give a broad overview of the existing knowledge.

The literature was identified via 1) a Scopus search, 2) literature named in the articles found with Scopus was analysed, and 3) the database on food waste of the European Commission was analysed for documents.

The Scopus search was conducted with the terms "food wast*" OR "food loss*" AND retail*, accounting for the different terminology used in literature, i.e. food waste, food wastage, food loss. From the first 20 articles sorted by number of citation, the first 20 sorted by relevance, and the first 20 articles sorted by date of publication the abstracts were scanned for relevance. For a deeper understanding of the causes of food waste by retail the literature used in the identified articles was used as well. In addition, the webpage on "causes for food waste" by the European Commission (European Commission, 2014a) and the literature in the EU "food waste library" (European Commission, 2014b) was analysed to account for reports and literature developed only recently. The selection of literature by the European Commission is based on the EU context, which makes it applicable for the Dutch context as a country that is part of the EU. In accordance with the grounded theory approach data was refined and gathered until no new findings occurred, and thus category saturation was achieved. The data gathered was compared with each other developing concepts and categories, resulting in a list of options for retail to reduce food waste in the supply chain.

### 2.2.2 SUB-QUESTION 2

To identify the important drivers and obstacles for retail's efforts in food waste reduction in the supply chain empirical data was gathered using interviews with different retailers and the CBL.

Literature on obstacles and drivers for retail's efforts in food waste reduction within the food supply chain is scattered or not available. Therefore, data needs to be gathered empirically. For empirical data gathering observations in the field or interviews can be conducted. Due to the complexity of the topic, the large scale on which retail acts and exerts influence (suppliers from other countries and continents), and due to the sensitivity of the subject by retail, observations are beyond the feasibility of the research project. Interviews with retailers can therefore easier and quicker provide an overview of the obstacles and drivers at hand.

The retail organizations were selected upon the following criteria:

i. The main sale of the retail should be made from food and foodstuff. Retail is "[t]he sale of goods to the public in relatively small quantities for use or consumption rather than for resale" (Oxford University Press, 2014). Thus also including stores for furniture, clothes, etc. To establish hypotheses on the reasons for retail to engage in food waste reduction, the research population was limited to grocery retail due to their focus on food, reducing external factors that might bias data, e.g. low priority for food section due to main sales for other products than food.

ii. The retail should have significant size: Within this research project, the focus is on retail companies with several stores within the Netherlands. This case population was chosen because for small organizations such as corner stores the justification of the choice for retail, i.e. the bargaining power in the food supply chain, would not hold as they have too little purchasing power. In addition, small corner stores do not have the same available financial means as bigger retail organizations to conduct food waste reduction measures in the supply chain.

iii. The retail should have done, tried to do a project, or conduct efforts to reduce food waste in the supply chain: In order to analyse the obstacles and drivers for food waste reduction, it is necessary that the actors interviewed have at least tried to implement projects to reduce food waste within the retail. If they had not tried, they would probably not know about the obstacles and drivers.

The interviewees were selected upon their experience with projects on food waste reduction, which are explained in more detail in chapter 6.1. In total five interviews were conducted with employees from Albert Heijn, Plus Rozenburg, the Centraal Bureau for Levensmiddelenhandel (CBL), and one retailer that prefers to stay anonymous (the retailer will be referred to as Retailer3 in the following).

In literature two streams of interviews are distinguished: Qualitative research interviews and structured interviews. The latter is used in research with specific questions, which makes it unsuitable for this research project due to lack of theory to formulate precise questions. The qualitative research interview in contrast is appreciated for its flexibility, it shows a greater interest in the interviewee perspective, it allows going off the specific focus and also allows the interviewee to depart from the initial questions and to ask questions to the interviewer (Bryman, 2001). As stated above, the field of food waste is still unexplored in a lot of aspects, rendering the formulation of specific questions and therefore a structured interview unfeasible and useless. Thus qualitative research interviews were chosen.

Within the qualitative research interviews there are two different options: Interviews can be unstructured or semi-structured. The unstructured interview, as the name says is more or less completely unstructured, giving a lot of freedom to the interviewee about what he/she wants to talk and it is more like a general conversation (Bryman, 2001). The semi-structured interview builds on a list of questions or a quite specific topic, but there is freedom for the interviewee how to replay. In the semi-structured interview the order of questions is variable, additional questions can be asked, but all questions will be asked to all interviewees and also with similar wording to ensure an investigation with fairly clear focus (Ibid.). The research objective in this research project has a fairly clear focus on the information that needs to be gathered (obstacles and drivers for retail effort to reduce food waste). In addition the information gathered from the interviews should be comparable to make general statements about obstacles and drivers. Nevertheless, unexpected information might evolve in the interviews. Therefore, the semi-structured interview was chosen due to the flexibility within set boundaries that semi-structured interviews offer.

For the selection of interviewees the snowballing method was used. Snowball sampling is the identification of further respondents through contacts via existing respondents (Rossi, Lipsey, & Freeman, 2004). As food waste is a sensitive topic access into retail companies can only be achieved through direct contacts within the organization, which were provided within the snowballing process. Nevertheless, this does pose a bias, which should be taken into consideration when interpreting the results. The interviews were built on the base categories developed by answering sub-question 1. Based on the interviews variables were identified that influence the decision of retail to engage in food waste reduction efforts. This was done by coding the interviews, using NVIVO, a recognized Computer Aided Qualitative Analysis Data Software for the analysis of primary data or literature in the context of establishing theory (Lozano & Huisingh, 2011). Variables that influence retail's decision on food waste reduction measures were then further subcategorized in drivers and obstacles for food waste reduction upstream the food supply chain, downstream the food supply chain, and at the retail. This resulted in a model showing the connection of options of retail to reduce food waste to the obstacles and drivers at hand.

The importance of the obstacles and drivers were determined by the frequency they were identified as driver or obstacles for food waste reduction, which is explained in more detail in chapter 5.

### 2.2.3 SUB-QUESTION 3

In order to identify policy options to overcome the identified obstacles and enhance drivers experienced by retail to reduce food waste along the supply chain, data was gathered from literature as well as from expert interviews.

There is an increasing number of documents on policy options from different European countries to reduce food waste, however, these are limited in the drivers and obstacles they address. Therefore, knowledge from other fields was employed to find policies tailored specifically to the obstacles and drivers identified in sub-question 2. Literature on policy options for industrial ecology (IE) was selected upon the results of sub-question 2 of the research project. IE draws parallels to food waste reduction because it aims to increase the sustainability outcome of industrial production by fostering cooperation, reducing waste, and encouraging reuse and recycling of resources (Mirata, 2004). In addition, expert interviews were used as source triangulation, i.e. "the use of different data collection techniques" (Sauders et al., 2007, p.139), to increase validity.

For the literature search, given the time frame of the research project, a desk research was the most efficient and effective research strategy to identify the policy options from IE literature because it allows the use of a large amount of data within a short time period (Verschuren & Doorewaard, 2010). The desk research was conducted as a literature survey with data gathered from literature and secondary data. The literature on IE was identified with a Scopus using the search terms "industrial ecology AND polic*". The first 20 articles sorted by relevance were analysed according to their use for the research project. Further literature was used from the literature referred to in the identified articles. Literature on food waste was identified form the web library on food waste from the European Commission (European Commission, 2014b).

Interviews were conducted with experts selected upon their experience in the field of food waste and their relation to the obstacles at hand. In total six experts were interviewed from the FAO, UK Waste Resource Action Programme (WRAP), the Dutch Food and Nutrition Centre, a member of the Dutch Ministry of Infrastructure and Environment, the Dutch Alliance for Sustainable Food, and Food Cabinet. Their qualification as experts is explained in detail in chapter 6.

The interviews were semi-structured, building on the identified obstacles in question 2 of the research project. As explained above semi-structured interviews are suitable for qualitative research as they allow for flexibility but remaining a fairly clear focus (Bryman, 2001). The semi-structured interviews were chosen in order to ensure all obstacles were addressed but also to be able to individually go more in depth in areas of special expertise of the interviewees. Not all aspects could be addressed in all interviews

due to specialization of the experts on specific parts of the problem of food waste. Triangulation of methods, literature and expert interviews, was therefore used to increase validity of the findings.

The findings of the three sub-questions generated the corroborative knowledge to answer the main research question: 'What are policy options for the Dutch government to encourage retail's efforts to reduce food waste in the food supply chain?'

# 3 THEORETICAL PERSPECTIVE

The research project has been conducted with the aim to generate knowledge on policy options for the Dutch government to encourage food waste reduction efforts by retail. Nevertheless, to ensure consistency with existing research and to contribute to the current scientific efforts the research is embedded in existing concepts and theoretical considerations. This includes concepts on food waste, corporate sustainability and organizational change. The concepts and theoretical considerations used are explained in the following.

## 3.1 FOOD WASTE

Food waste is an only recently developed field of study. There is still no one commonly agreed on definition of food waste, even within the EU there is no uniform termination among the member states (Waarts et al., 2011; Hafner et al., 2013). However, the problem is recognized and projects like the EU FUSIONS are working on the unification of terminology within the EU. In general definitions include the purpose of food intended for human consumption but they vary upon their distinction of food waste and food loss, e.g. depending on loss in mass, loss of nutria value, whether entire food and food products are wasted, on the phase of the food supply chain in which food is wasted, e.g. in the consumer-, distribution-, or production phase (Hafner et al., 2013), or on the reasons food is wasted, e.g. infrastructures, market oversupply, consumer eating habits, etc. (FAO, 2013). Soethoudt and Timmermans (2013) in the context of a study by Wageningen UR to quantify food waste defined food waste as:

> "Food waste exists if food intended for human consumption is not used for this purpose.[…] Food which was not intended for human consumption does not fall within the definition" (p.36)

In the following the definition of Soethoudt and Timmermans (2013) will be adapted for this research project because the borders of food waste and losses are not clear distinguishable within the food supply chain phase within the existing literature. In addition, the causes for the food waste will be identified throughout the research project and thus an up-front distinction between food loss and food waste based on its causes is of no value.

Furthermore, literature distinguishes between avoidable, partly avoidable and unavoidable food waste. Unavoidable food waste includes parts of food that cannot be used for human consumption e.g. bones or banana-peels; avoidable food waste is food that is "still fully fit for consumption at the time or would have been edible if they had been eaten in time" (Hafner et al., 2012, p.4). Partly avoidable food waste occurs due to

habits and customs and can be considered as a linking pin between avoidable and unavoidable food waste as it include mixtures of both other types of food waste (Ibid.). The distinction between avoidable, unavoidable and partly unavoidable food waste requires data on the nature of the waste, which is not available for this research project. Therefore the distinction will not be applied here.

In general, food waste occurs all over the food supply chain. However, the food supply chain is different for a lot of items that the retail offers, but highly simplified, the food that shows up in the Dutch retail is first of all produced by agricultural practices all over the world, this includes Europe but also Africa, South America, etc. The food is either directly processed somewhere nearby the production, or it is first transported closer to the retail where it is processed, or if it does not need to be processed it might directly enter the wholesale. From the wholesale it goes to the retail and then in the consumer's grocery bag. As stated before, the chain can actually include a lot of middlemen and different arrangements between the links. In line with most literature on food waste the food supply chain can be divided into production, processing, retail, and out-of-home (OOH), e.g. restaurants, and consumers (Figure 3)

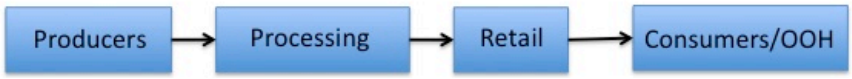


**Figure 3** Simplified picture of the food supply chain and phases. OOH=Out-of-home

No matter how the food supply chain looks like, food waste occurs in various phases of the supply chain due to a variety of reasons that differ within world regions (Gustavsson et al., 2011). This research project focuses on the role retail plays in the reduction of food waste in the entire food supply chain, i.e. what influence does retail have on food waste in the food supply chain. Retail is an umbrella term including grocery, as well as apparel, electronics, furniture, online retailing, etc. In the following the term retail always refers to grocery retail, unless otherwise mentioned.

## 3.2 POLICY THEORY

Based on the focus of retail, the aim is the establishment of hypotheses on policy options to encourage retail's efforts to reduce food waste in the supply chain, i.e. upstream, downstream and at the retail. This implies that policy options will be identified that encourage a behavioural change by retail towards greater efforts to reduce food waste.
Building on theory of policy effectiveness to bring about behavioural change programme theory describes how a policy programme intends to bring about the behavioural

change. Programme theory identifies the connections between input, output and outcome of a policy (Figure 4).

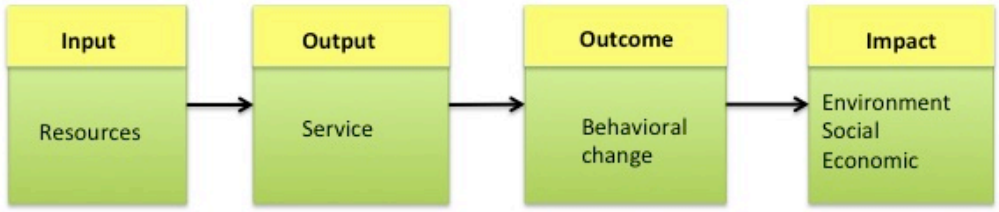


**Figure 4** Elements of a programme theory for behavioural change towards sustainability

The programme theory includes the assumptions on the change process and expected improved conditions (impact theory), i.e. the means (outcomes) to bring the intended effect (impact). It further includes the instruments used to reach the target population (output), e.g. via enforcing laws, distribution of information, etc., and the needed resources of the programme (input), i.e. facilities, personnel, financial resources, activities (Rossi et al., 2004).

The division into elements of programme theory is important to identify the logical flow of the research project leading to the policy options recommended as the final result.

The input is beyond the scope of the research project. To identify the impact, outcome, and output, the research project is divided into three parts, corresponding to the research questions. It starts with the impact, followed by the outcome and then output.

It is important to first identify what behavioural change is needed to achieve the intended effect (impact), and what factors does policy need to address to bring about the intended behavioural change, i.e. obstacles and drivers (outcome) before identifying policy options (output). The theoretical framework is shown in Figure 5.

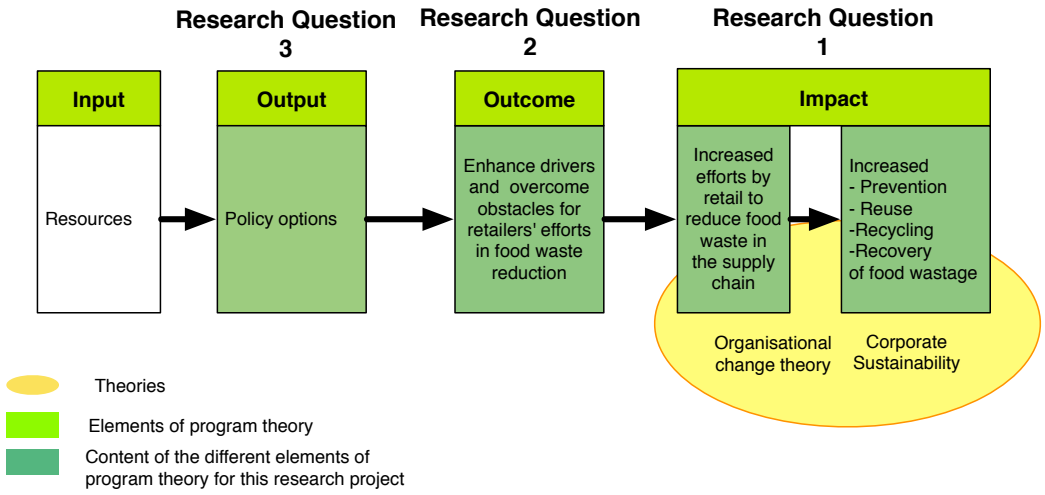


**Figure 5** Theoretical framework

To identify the impact and outcome the research builds on theory from corporate sustainability, and organizational change. The theories are explained in the following.

## 3.3 CORPORATE SUSTAINABILITY AND ORGANIZATIONAL CHANGE

Food waste reduction is an important element of sustainable development and thus theories on corporate sustainability can be applied to identify the intended outcomes for corporations, in this case retail. The concept of **corporate sustainability (CS)** embraces corporate engagement in the environmental, social, and economic sphere of sustainability. The scientific community has not yet agreed on one definition, possible figures and indicators to measure CS (Freimann & Walther, 2001). In addition, the concept is often mixed with similar concepts such as corporate social responsibility (CSR). It has been understood as part of CSR or vice versa, with CSR having a more social and economic focus and CS a more environmental focus (Koehler, 2013). Wempe and Kapstein (2002) define CS as embracing CSR. Lozano (2012) defines CS as including the economic, environmental, social, and time (inter-generational perspective) dimension. In the context of this research project CS refers to the reduction of the negative social, environmental, economic and intergenerational impact of food waste caused by retail behaviour. Sub-question 1 identifies the options for retail to increase CS, i.e. retail's leverage points to reduce food waste in the supply chain.

Authors like Baumgartner (2009) and Azapagic and Perdan (2000) emphasize that increased CS can demand organizational change. In general scholars distinguish between first-order and second-order change: First-order changes are the "adjustments in systems, processes, or structures, but it does not involve fundamental change in strategy, core values, or corporate identity" (Newman, 2000, p.604), developing the organization but maintaining the organizational order and continuity (Bate, 1994). Second-order change "fundamentally alters the organization at its core" (Newman, 2000, p.604) through transformation of its nature (Bate, 1994). First order change is incremental, second order change is discontinuous (Palmer, Dunford, & Akin, 2006). However, Schein (1997), among internal organizational factors, identified external factors to be relevant for organizational change. As grounded theory is the establishment of new hypotheses and theory, organizational change theory serves here only to embed the research in the current scientific considerations. Sub-question 2 will identify the drivers and obstacles for retail's effort to reduce food waste and thus the factors influencing organizational change in the context of food waste reduction efforts.

This chapter has embedded the research project into current considerations and concepts of food waste, policy theory, corporate sustainability and organizational change. Food waste is the very general topic of the research project, policy theory determines the logical sequence of knowledge generation, and corporate sustainability and organizational change guide the content of research questions. In order to reach the aim of this research, i.e. to identify policy options to encourage retail's efforts for food waste reduction, the first step is to identify the options retail has to reduce food waste in the supply chain. This will be done in the following chapter.

# 4 OPTIONS FOR RETAIL TO REDUCE FOOD WASTE IN THE SUPPLY CHAIN

In order to answer sub-question 1, i.e. identify leverage points of retail on food waste reduction in the supply chain, a literature research was conducted. In the following a short introduction on the existing knowledge is given, followed by the analysis of the literature and the findings.

## 4.1 INTRODUCTION

Even though retail's direct percentage of food wastage is far below that of the consumer, retail has a special role in the food supply chain: First, retail has great influence upstream and downstream the food supply chain; second, when food has reached the retail many resources and environmental pressure have already been invested through production, processing and transport. Retailers are the second last phase in the food supply chain, where food has passed most of the value adding activities. Thus, the food has already accumulated costs and embedded energy creating a significant negative impact on resource efficiency and effectiveness if it is wasted (Mena et al., 2011). Third, as mentioned above, it is widely recognized that retail has a powerful role in food supply chain with high bargaining power (Bio Intelligence Service, 2010; European Commission, 2014c; Harvey, 1989; Stuart, 2009; Wrap, 2007). There are no figures available on the amount of food waste that is caused by factors upon which retail has an influence. This is due to a general lack of data in the field. However, literature on food waste identifies various factors causing food waste upon which retail has an influence on. To answer sub-question 1, a comprehensive literature research was done on food waste literature (see chapter 2.2.1) identifying retail's leverage points on food waste in the food supply chain, i.e. what can retail do to decrease food waste in the food supply chain. The analysis is presented in the following ordered into retail's influence upstream at the suppliers and producers, at the retail, and downstream at the consumer.

## 4.2 ANALYSIS

### 4.2.1 UPSTREAM THE FOOD SUPPLY CHAIN

**CONTRACTS WITH SUPPLIERS**

A large part of the relationship between suppliers and retail is laid down in contracts. Contracts include arrangements about the quality, the amount, and delivery of goods. In these contracts retailers include contractual penalties for suppliers for partial or non-

delivery of orders (Parfitt, Barthel, & Macnaughton, 2010; Bio Intelligence Service, 2013), which combined with a "large freedoms [for retail] in refusing stock due to changes in their supply needs"(Bio Intelligence Service, 2013, p. 11) and late order confirmation or order changes (Hyde, Smith, Smith, & Henningsson, 2001; Stuart, 2009), leads to food waste at suppliers and producers. First, because the supplier will be encouraged to produce more than needed to make sure the order can definitely be met. If orders are placed too late for the time needed for production, suppliers might start production before the actual order is placed and thus produce more than actually needed as a buffer to avoid penalties (Bio Intelligence Service, 2013). Second, orders are partly or fully cancelled even though goods have already been produced, packaged or transported towards the retail (Hyde et al., 2001; Stuart, 2009). Especially for perishable goods or products with retail specifications, e.g. specific package sizes or labels, differing for most supermarkets (Hyde et al., 2001), it is difficult to quickly find another market for the product due to lack of demand or due to restrictions that the product with a retail label cannot be sold to anyone else. These goods are very likely to end up as food waste. Thus retail has influence on food waste through the timing of order placement and through order cancelations.

Furthermore, product take-back clauses in supplier contracts allow retailers to return products after a specific residual shelf-life (FAO, 2013b; Parfitt et al., 2010; Bio Intelligence Service, 2013). These take-back clauses take away the consequences of insufficient shelf- and stock-management from retail and shift it to the supplier. Due to the reasons mentioned above and multiple handling of the returned products causing product and package damages suppliers will have difficulties finding a secondary market for the products. Consequently, the products end up as food waste.

**PURCHASING POLICIES**

Konefal, Mascarenhas, and Hatanaka (2005) analysed the emergence of the power of transnational supermarket chains in restructuring the agro-food network in the light of the increasing domination of private standards on decisions regarding public health risks, food safety, and environmental impacts. They observed that the setting of standards has shifted to the backstage of the global agro-food system, away from the public participation towards supermarket procurement offices. The authors state: "[T]ransnational supermarket chains are increasingly controlling what food is grown where, how, and by whom" (Konefal et al., 2005, p.291). Within Europe, ''in 1996, the top five supermarket chains had a total food market share of more than 50% in all but three countries (Spain, Greece and Italy)'' (Dolan & Humphrey, 2000, p.148) and in the

UK during this time 76% of fresh produce sales were controlled by the six largest food retailers (Ibid.). Furthermore, retailers are increasingly having their own wholesale operations (Konefal et al., 2005). Retail sets standards for the food purchased, including cosmetic and risk standards as well as product and packaging specifications. The currently applied cosmetic standards (e.g. shape and appearance of a product and its packaging) and risk standards (e.g. residual shelf-life time of a product, or residual of toxic substances) lead to high rejection of perfectly edible food already in the production and processing phase (Beretta, Stoessel, Baier, & Hellweg, 2013; FAO, 2013; Bio Intelligence Service, 2013; Hafner, Barabosz, & Schneider, 2012). The rejection of food along the supply chain can count up to "40% or even as much as 50% of the raw vegetable or salad by weight" (Hyde et al., 2001, p.57). In the context toxic residuals on food (e.g. of pesticides) the 'blaming and shaming' of retail by NGOs led to higher standards then requested by the EU (Waarts et al., 2011; Wognum, Bremmers, Trienekens, van der Vorst, & Bloemhof, 2011). However, for standards such as the residual lifetime of products or appearance there seems to be no valid reason for retail to reject food. Many authors (e.g. Stuart, 2009; Waarts et al., 2011; Wognum et al., 2011) argue that the standards currently applied do not present real consumer preferences. The private retail standards applied are not used to reduce transaction costs but to create and maintain markets (Konefal et al., 2005; Reardon & Farina, 2002). They have become ''strategic instruments of product differentiation, agrifood chain coordination, market creation and share growth'' (Reardon et al., 2001, p.6). The EU lowered the standards of fruit and vegetables from 36 specific marketing standards to 10 in 2009 thus recognizing the low risk associated with the lowering of these marketing standards. However, the internal retail standards prevent the EU effort to reduce fruit and vegetables to be discarded due to cosmetic imperfections. Minimum product requirements for e.g. appearance, packaging defects, and/or residual shelf-life are a source of food waste (Bio Intelligence Service, 2010, 2011; European Commission, n.d.; Dorward, 2012; Gustavsson, Cederberg, Snnesson, van Otterdijk, & Meybeck, 2011; Stuart, 2009). Therefore, the lowering of these retail standards can reduce food waste in the supply chain.

Moreover, Bio Intelligence Service in their reports for the European Commission (2011, 2013) stressed the option for retail to demand supply chain efficiency upstream, reducing food waste at suppliers and producers.

Another component of purchase policies causing food waste is the distance of production to retail. Whether short distance production is always better in terms of resource efficiency is disputed due to climatic factors in other regions that facilitate the

growth of specific food, reducing resource use for irrigation, growth temperature and protection of plants from fungi, insects, etc. This reduced need for resource might outweigh the resources invested in the transport of the good. However, the distance food has to travel to reach the retail is a source for food waste, especially for perishable goods. The longer the transport the less residual shelf-life time at the retail is left (Hafner et al., 2012). Moreover, transport over longer distances increases handling, which decreases food quality, and it increases the probability of a break of the cooling chain (Ibid.).

Another cause of food waste identified in literature is the specification of unit of ordering, i.e. food is ordered in units that do not fit the natural shape. E.g. vegetables might be ordered in specific packages that are smaller than its natural size. Hyde et al. (2001) reports that bulk purchases in heads instead of weight result in portions being shaved off top-grade vegetables. Thus, adjusting the unit of orders is an option to decrease food waste.

### 4.2.2 AT THE RETAIL

Food waste at retail occurs due to food becoming unsalable or unmarketable, which beside the natural perishability of products can have several managerial causes identified by literature: Insufficient forecasting, ordering, storage and positioning of products, improper handling, and management of the cooling chain (Bio Intelligence Service, 2010; Mena et al., 2011). Thus, first of all food waste at the retail can be reduced through improved forecasting and stock management, e.g. through new technology like radio frequency identification [1] (Kärkkäinen, 2003). In addition, promotional mechanisms can be applied to sell food that has only a short shelf-time left, such as reduced price (Quested, Marsh, Stunell, & Parry, 2013).

Second, food that falls below the product requirements (specifications, quality defects, labelling issues, damage etc.) can be reused through donations, reused as a different product, or sold to secondary markets (Bio Intelligence Service, 2011; Espace Environnement, 2012; Hafner et al., 2012; Whitehead, Parfitt, Bojczuk, & James, 2013). The reuse of food reduces the environmental impact but also contribute to the economic benefit for retail in direct monetary terms (through less waste management costs or profit from selling to secondary markets) and indirect through reputation improvement.

[1] Radio frequency identification technology allows the electronic tracing of products increases, giving real-time information on product stocks, increasing operational efficiency (Kärkkäinen, 2003)

Food donations can be given to charity organizations that exist in most European countries.

Third, food that does not meet the quality standards anymore can be processed to other products such as smoothies, sandwiches, and warm meals (Espace Environnement, 2012). Lastly, within the shop food waste should first of all be prevented, nevertheless if products cannot be sold in the food market anymore, and all possibilities for reuse are exhausted, a high recovery of food waste can be ensured by e.g. using it as animal feed or for anaerobic digestion, reducing the environmental impact of food waste.

### 4.2.3 DOWNSTREAM THE FOOD SUPPLY CHAIN

In the Netherlands, consumers in total produce the most food waste of all supply chain phases. In line with research done by WRAP[2] (Quested, Parry, Easteal, & Swannell, 2011) retail can:

- Ensure consumers buy the right amount
- Help the consumers to keep the purchased product at its best
- Help consumers to use what they bought

This can be achieved through consumer awareness raising, information distribution, adjustment of products to consumer needs and the change of special offers (Bio Intelligence Service, 2010; Espace Environnement, 2012).

First, promotional mechanisms based on volume reduction and unsuitable portion sizes can lead to food waste because volume based promotion mechanisms induce the costumer to buy more than actually needed (Bio Intelligence Service, 2013; Quested et al., 2013; Wrap, 2007).

Second, there is high confusion of "best before" and "use by" dates among customers (Bio Intelligence Service, 2013; Swedish Environmental Protection Agency, 2012). According to Andrew Parry, WRAP Household Food Waste Manager, up to 1 million tonnes of food waste in the UK results from date labelling confusion (Bio Intelligence Service, 2010). Thus, alternatives like smart packaging can be introduced, which indicate the freshness of a product by means of a label in the packaging that changes colour according to the freshness of the product (Quested et al., 2013).

Moreover, awareness raising initiatives can be conducted through information provision on packaging, through contribution in awareness raising events, or through the retailer's own marketing channels, e.g. advertisement booklets, the retailer's webpage, etc.

[2] WRAP is the Waste & Resources Action Programme, an independent organization financed by the UK government.

Fourth, literature states the misuse of expiration dates for commercial purposes, i.e. products have a much shorter expiration date than needed, encouraging consumer to discard products earlier than necessary (Stuart, 2009).
Lastly, the adjustment of products to consumer needs refers to the portion sizes offered. They can be adjusted to single households or small households (Quested et al., 2011).

## 4.3 FINDINGS

Summarizing, a variety of leverage points of retail on food waste in the supply chain were identified from literature, including food waste at the retail, upstream the food supply chain and downstream the food supply chain. Answering sub-question 1 in total the following points of influence were identified:

**Upstream the food supply chain**

- Earlier timing of order placement at the supplier and elimination of order cancellations
- Elimination of product take-back clauses
- Lowering cosmetic and risk standards in purchasing policies
- Demand food waste reduction at suppliers and producers
- Purchase more food with lower distance
- Adjust the unit of ordering in order to reduce food waste

**Within the retail**

- Improve forecasting and stock management
- Donation of potential food waste
- Reuse of potential food waste for other products
- Ensure high recovery use of food waste

**Downstream: At the costumer**

- Consumer awareness raising
- Adjustment of products to consumer needs (portion size)
- Reduced use of expiration dates for commercial purposes
- Introduction of smart packaging as alternative to expiration dates
- Reduction of volume based market mechanisms

# 5 OBSTACLES AND DRIVERS FOR RETAIL TO REDUCE FOOD WASTE IN THE FOOD SUPPLY CHAIN

In the preceding part options for retail to reduce food waste in the food supply chain have been identified. In order to give policy recommendations to encourage retail's effort in food waste reduction, answering sub-question 2, the obstacles and drivers for efforts will be identified in this chapter. In the following a quick introduction will be given on the cases used to answer sub-question 2, followed by the analysis of the data and the findings.

## 5.1 INTRODUCTION

Based on the options retail has to reduce food waste in the food supply chain interviews were conducted with retail organizations, and the Dutch retail association (CBL) to identify obstacles and drivers for food waste reduction efforts.

In total five interviews were conducted with two employees, an auditor and a project manager, from Albert Heijn, with B. Groesz, storeowner of PLUS Rozenburg, a category manager of Retailer3, and L. Hamelink-Veen, manager for sustainability at the CBL.

Albert Heijn is the largest retailer in the Netherlands with in total 832 regular Albert Heijn stores, 46 Albert Heijn To Go, Albert Heijn XL, 30 bigger supermarkets in the Netherlands. Albert Heijn is the biggest donator of food to the food banks, Ahold, the retail organization of Albert Heijn, signed a retail agreement on consumer food waste reduction in 2012 (see Appendix), which obliges all signatories to conduct two initiatives to reduce consumer food waste.

PLUS Rozenburg is one of the 254 stores of PLUS in the Netherlands. PLUS Rozenburg participated in a project to reuse food waste in cooperation with Wageningen University to measure food waste at retail stores and find solutions for reuse. The project is now in the phase of scaling up.

Retailer3 is relatively small retail organization with 11 stores in Amsterdam, Rotterdam, The Hague, and Haarlem. The retail organization has a strong sustainability agenda, and has partnerships with its suppliers and producers. The retail actively promotes consumer awareness on food waste through its own communication channels, and helps its suppliers/producers to reduce food waste.

The CBL is the branch organization of the big retailers in the Netherlands. Within the sustainability agenda, food waste is one topic that the organization works on together with retail. The CBL can give a good overview over the general obstacles and drivers for

retail to engage in food waste reduction activities and was therefore included as source for data.

A list of the activities in which the respondents were involved is shown in Table 3.

The interviews were held between May and Mid-July 2014. They were semi-structured and each interviewee had the opportunity to make changes after the interviews have been typed. From the interviews categories of variables were identified. In the following the individual variable categories will be explained, followed by the prioritization of the most important variables in general, and the most important obstacles and drivers for efforts to reduce food waste upstream the food supply chain, downstream the food supply chain, and at the retail.

**Table 3** Involvement of interviewees in different activities of the retailer related to reduce food waste in the food supply chain

| **Respondent 1 Albert Heijn** |
|---|
| - Study on the reasons of food waste at the retail, i.e. stores and distribution centre<br>- Internal research on the possibilities to lengthen expiration dates of products<br>- Investigations on the advantages and disadvantages of donating food waste to the food banks<br>- Project to help consumers waste less, which included the gratis distribution of tools to consumers to measure portion sizes easier<br>- Rejection of project for consumer food waste reduction by the respondent's working group this year |
| **Respondent 2 Albert Heijn** |
| - Organization of the support of the 'Damn Food Waste' event in Amsterdam to raise consumer awareness on food waste<br>- Organization of donations to the food bank |
| **Respondent PLUS Rozenburg** |
| - Engagement in project that investigated the potential to reuse food waste occurring at the retail |
| **Respondent Retailer3** |
| - Improvement of suppliers' and producers' logistics<br>- Reduction of food waste upstream by helped suppliers to reuse food waste<br>- Attempt to introduce lower standard fruit and vegetables<br>- Donations of potential food waste on a regular basis to different organizations, e.g. the homeless, the food banks, youth food movements<br>- Current project development to reuse potential food waste<br>- Promotion stickers in post-box advertisement to inform costumer about food waste and raise awareness that they can contribute to food waste reduction<br>- Encourage of consumer to eat also other parts o the animals by offering also less frequently eaten parts of animals<br>- Exploration of options of encouraging the consumer to think critically about expirations dates |

## 5.2 ANALYSIS

From each case, the obstacles and drivers were identified, which are summarized in Table 4. In total 12 variables were identified that influenced the decision of the retailers to reduce food waste upstream the supply chain, downstream the supply chain and at the retail. These variables are: *Technology, firm policy, lack of information, commitment of individuals, profitability, collaboration with suppliers/producers, lack of information*

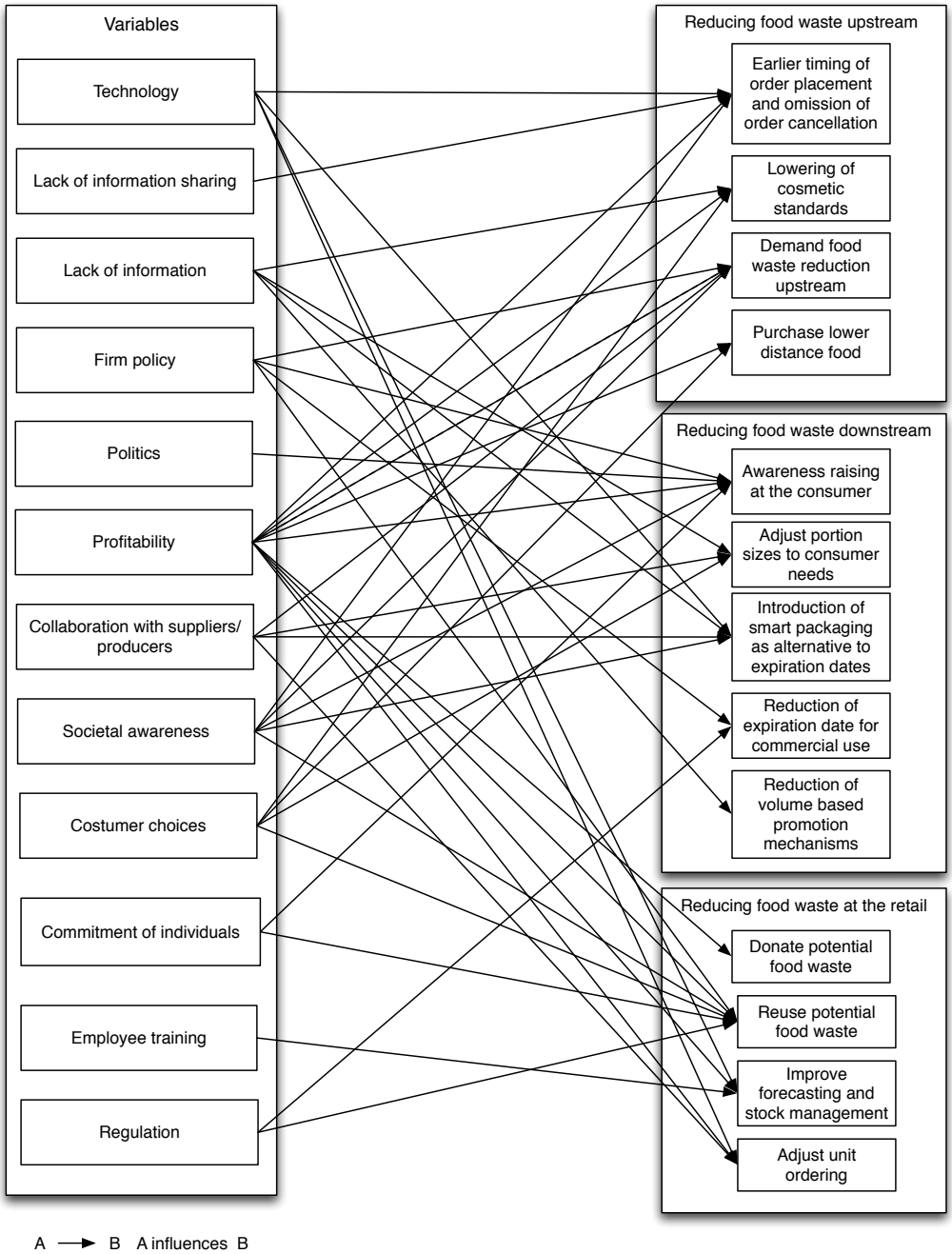


**Figure 6** Influencing variables for retail's options to reduce food waste. Variables are linked to the to an option when they were identified to influence the decision of retail to engage in the options. Options include food waste reduction upstream the food supply chain (at the producers and suppliers), downstream the food supply chain (at the consumer), and at the retail (in the stores and distribution centers).

*sharing, societal awareness, customer choices, politics, employee training, and regulation*. The connection between variables and options for retail to reduce food waste is shown in Figure 6. As the interview transcripts are not attached to this report for reasons of anonymity of the interviewees, a summary of which variable was mentioned by which actors are shown in Table 4.

Two of the leverage points of retail identified in chapter 4 were erased from the further analysis. The leverage point *eliminate product take-back clauses* was erased as it was not covered by any of the cases. The leverage point *ensure high quality recovery of food waste*, was erased from the analysis because the CBL and Albert Heijn stated that there is a lack of influence of retail on the issue. Both parties pointed at the responsibility of the waste companies to ensure high recovery of food waste. A lack of influence was also mentioned in the context to r*educe the use of expiration date for commercial purposes:* In the context of investigations by Albert Heijn on expiration dates it was stated that expiration dates were found to be tested differently by different suppliers.

In addition, the testing condition did not always match with the real conditions of a product, i.e. products were tested on higher temperatures than prevalent during production, transportation, and storage, thus leading to an expiration date that is shorter than actually necessary. In order to lengthen expiration dates the testing conditions on which the expiration date is determined were therefore adjusted in collaboration between retail and suppliers to the real conditions. However, "*the big A-brand companies are not always willing to give information about their tests and they are also not willing to talk about the expiration date*"[3]. Therefore, further investigation are needed concerning the determination of expiration dates. The CBL could not verify that the *use of expiration dates for commercial use* is happening at all.

Furthermore, a lack of influence by retail was identified for *the adjustment of order unit to reduce food waste*. This option was moved from an option to reduce food waste upstream the food supply chain to reducing food waste at the retailer because most retail organization referred to it as option to reduce food waste at the retail: They referred to the unit of order as the amount of products that need to be ordered, e.g. whether it is possible to order small amounts of a product at the supplier or whether it is only possible to order in large amounts. The lack of influence in this respect refers to the lack of cooperation of A-brands to deliver in smaller quantities, mentioned by Albert Heijn and the CBL.

> *"What I hear from members of the CBL is that when they order a-brand products, that they are not able to order in the amount that they actually need*

[3] Interview Respondent 1 Albert Heijn, 2014

*but only in very large units. The industry does not give them the possibility to order in the amount they need […]"*[4]

**Table 4** Obstacles and drivers for options to reduce food waste in the food supply chain, identified from the cases analysed. The cases from which a specific variable was identified as driver or obstacle are in brackets behind the variable: The data is based on interviews with PLUS Rozenburg (PLUS R.), Albert Heijn, Retailer3, and the Dutch retail branch organization (CBL).

| Option | Obstacles | Drivers |
|---|---|---|
| **Upstream at the supplier and producer** | | |
| Earlier timing of order placement at the supplier and elimination of order cancellations | **Technology** (PLUS R., Retailer3, CBL)<br>**Lack of information sharing** (PLUS R., CBL)<br>**Profitability** (CBL) | **Societal awareness** (CBL)<br>**Technology** (CBL)<br>**Profitability** (CBL) |
| Lowering cosmetic and risk standards in purchasing policies | **Costumer choices** (Albert Heijn, PLUS R., CBL)<br>**Profitability** (Albert Heijn, Retailer3)<br>**Lack of information** (CBL) | |
| Demand food waste reduction in the food supply chain | **Profitability** (Retailer3) | **Collaboration with suppliers/producers** (Albert Heijn, Retailer3)<br>**Firm policy** (Retailer3, CBL)<br>**Societal awareness** (Retailer3)<br>**Profitability** (CBL) |
| Purchase more food with lower distance | **Costumer choices** (CBL) | **Costumer choices** (CBL)<br>**Profitability** (CBL) |
| **At the retail** | | |
| Adjust the unit of ordering in order to reduce food waste | **Technology** (Albert Heijn)<br>**Lack of influence** (Albert Heijn, CBL) | **Collaboration with suppliers/producers** (Retailer3, Albert Heijn)<br>**Profitability** (Albert Heijn, CBL) |
| Improve forecasting and stock management | | **Profitability** (Albert Heijn, PLUS R., Retailer3, CBL)<br>**Technology** (Albert Heijn, PLUS R., CBL)<br>**Employee training** (Albert Heijn, Retailer3, PLUS R.) |
| Donation of potential food waste | **Profitability** (Albert Heijn, PLUS R., Retailer3, CBL) | |
| Reuse of potential food waste for other products | **Costumer choices** (PLUS R.)<br>**Profitability** (Albert Heijn, PLUS R., Retailer3, CBL)<br>**Regulation** (PLUS R., Retailer3, CBL) | **Commitment of individuals** (PLUS R.)<br>**Societal awareness** (CBL)<br>**Profitability** (CBL) |

[4] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014

| | | |
|---|---|---|
| | **Firm policy** (CBL) | |
| **At the consumer** | | |
| Consumer awareness raising through e.g. information provision | **Firm policy** (Albert Heijn, PLUS R.)<br>**Profitability** (Albert Heijn) | **Commitment of individuals** (Albert Heijn, Retailer3)<br>**Firm policy** (Retailer3)<br>**Politics** (CBL)<br>**Societal awareness** (CBL) |
| Adjustment of products to consumer needs (portion size) | **Costumer choices** (Retailer3) | **Collaboration with suppliers/producers** (Albert Heijn, Retailer3) |
| Introduction of smart packaging as alternative to expiration dates | **Technology** (PLUS R., (CBL)<br>**Lack of information** (CBL) | **Collaboration with suppliers/producers** (Albert Heijn)<br>**Societal awareness** (CBL) |
| Reduction of expiration dates for commercial purposes | **Firm policy** (Albert Heijn)<br>**Regulation** (Albert Heijn)<br>**No influence** (Albert Heijn) | **Profitability** (Albert Heijn) |
| Reduction of volume based promotional mechanisms | **Lack of information** (CBL) | |

In the following the content of the variables, i.e. categories, (Figure 6) are elaborated on.

### 5.2.1 INFLUENCING VARIABLES

**PROFITABILITY**

*Profitability* as influencing variable was identified in cases where food waste was named by retail as own financial loss, when food waste reduction measures were named to cause reduced sales, when costs for investments, an increase or decrease in efficiency, or effectiveness of resource use was mentioned.

1) For Retailer3 *profitability* was identified as an influencing variable to demand food waste reduction at suppliers and producers, which was related to the investment for supplier development. The retailer is mainly dealing with small producers, who lack the financial means to improve their logistics, therefore, the retail needs to make the needed investment:

> *"The fact that we work with a lot of small suppliers, which are not the most professional suppliers, often results in logistics and logistic facilities that are not optimal in efficiency. One of our dairy suppliers, who is very small, did not have the rolling containers. Because it took a long time to move the product from the one pallet to the other we had quality problems, especially when the weather was a bit warmer. We realized that in some cases the product was perished before it reached the expiration date. We changed this, which is a*

*very expensive project: We bought rolling container for the supplier in order to decrease the time until the product is in the shop. […] financial means are often the barriers to do so[i.e. reduce food waste].”* [5]

2) Lack of *profitability* was identified as obstacle for Albert Heijn and Retailer3 for introducing lower grade vegetables in the stores, i.e. fruit and vegetables that do not meet the high standards for visual appearance and shape. For both retail organizations logistical inefficiency to integrate lower grade fruit and vegetables was the reason why it was not successful.

*“Honestly, the reason why these standards exist is because the products are then more easy to transport. It allows you to stack your crates fuller and this increases the efficiency of the supply chain. If there would be weird shaped vegetables in the crates, this would make the trucks less full. Then you are not as efficient as possible.”*[6]

*“[T]he logistics of our suppliers is a problem because the second and third choice fruit and vegetables require a second path next to the first choice fruit and vegetables. Therefore, at this moment the integration of second and third choice vegetables is too complex.”*[7]

*3) Profitability* was named as driver for most of the options to reduce food waste at the retail. For Albert Heijn the costs of wasted food was a driver to adjust the unit of orders to reduce food waste, however this failed due to a lack of cooperation on the side of the suppliers.

4) *Profitability* in terms of costs of wasted food was for all retailers an incentive to improve forecasting and stock management.

5) For the donation of potential food waste the lack of *profitability* was the main obstacles for the donation of potential food waste to charity organization such as the Food banks. All retailers mentioned the lack of professionalism of the Food banks to cause costs associated with trainings and investment to ensure products are treated according to the food safety regulation.

*“The products that we give away have our name on it. If someone gets sick or dies from it, we are responsible and we have a long history of reputation to protect. So what we do is that we send it in our own trucks, at 2°C to the food banks. We are giving the food banks tools to check the temperature, we are giving coats because they have to put the food into bags in the cooling cells, we*

[5] Interview respondent Retailer3, 2014
[6] Interview respondent 2 Albert Heijn, 2014
[7] Interview respondent Retailer3, 2014

*have given them procedures, we have someone who is checking the food banks, whom we have to pay."*[8]

For Retailer3 costs for donating food were associated with the space needed to store the food:

*"Every square meter in a shop has a high price, thus you want to use the space as efficient and effective as possible, if food waste has to be stored, the space cannot be used for something else. This can be a problem. Especially if the party you want to donate it to cannot pick it up as soon as possible. But until now it was always doable."*[9]

In addition the limited amount of food waste that can be donated was identified to contribute to the lack of *profitability* for food donations from Albert Heijn and PLUS R.:

*"[The Food banks] only do pick ups twice a week, which restrict the products that can be donated due to expiration dates."* [10]

*"The problem with food banks in the Netherlands is that it is not a professional organization. They are all volunteers. One day in the week they distribute food to needy people, so on all the other days of the week food that cannot be stored anymore for almost a week cannot be given to the food bank."*[11]

However, despite the costs associated with donating food, both Albert Heijn and Retailer3 donate food on a regular base to charity organizations. The CBL could confirm that the lack of professionalism as an obstacle for retailers to donate food to the food banks.

L. Hamelink-Veen (CBL) mentioned the costs of separating edible from non-edible food waste streams as part of the lack of *profitability* to donate food.

*6) Profitability* was identified as a driver for PLUS Rozenburg to engage in the investigation to reuse potential food waste for other products. B. Groesz mentioned that when he realized how much in terms of money is wasted due to food waste in his store he started to search for an alternative to use this food.

This was also confirmed by the CBL to be a factor relevant for retail to make investigations in this respect. However, *profitability* was also identified as obstacle for PLUS R. to upscale the reuse of potential food waste due to the initial investment needed for the machinery to reuse potential food waste. For both Albert Heijn and Retailer3 *profitability* was also identified as an obstacle to reuse potential food waste but this was

[8] Interview respondent 1 Albert Heijn, 2014
[9] Interview respondent Retailer3, 2014
[10] Interview respondent 2 Albert Heijn, 2014
[11] Interview respondent PLUS Rozenburg, 2014

related to the costs of logistics to transport the potential food waste and irregular supply.

> *"Our shops are in an urban environment. Due the high density of traffic the local authority has decided to limit the logistical stops for a shop.[…] in the context of the project to reuse food waste we want to start, we will have to arrange all the pick-ups of the waste from our shops, which could be a problem. This is an obstacle. Second, with waste you never know the amount and kind of ingredients you will be able to use. This is a challenge."*[12]

L. Hamelink-Veen (CBL) mentioned the costs associated with the separation of edible and non-edible food waste streams as *profitability*-related obstacle to reuse potential food waste.

7) For the reduction of consumer food waste the *profitability* was identified as influencing variable to engage in awareness raising for Albert Heijn:

> *"In my project we decided not to do the consumer side. Honestly, if the consumer throws away 10% less, then our turnover will be less. […] It is very tricky because it is always the trade-off between responsible retailing and making money. The shareholders find it very important that you are a responsible retail but not if you do a lot of effort in that area but you did not make any profit anymore."*[13]

However, despite the reduced sales obviously the drivers were stronger because both Albert Hejin and Retailer3 conducted projects to help the consumer waste less.

8) Furthermore, *Profitability* was identified as driver for Albert Heijn to engage in the reducing the commercial use of expiration dates. Together with their suppliers they investigated for which products the expiration date could be lengthened. Lengthening the expiration date enabled the retailer to extent the shelf-life of product. Therefore, there was also less waste at the retail reducing loss of profit form unsold goods.

9) In the interview with the CBL *profitability* was also mentioned as drivers for the options to reduce food waste at suppliers and producers through earlier timing of orders and production, through demanding food waste reduction upstream in the supply chain, and through the purchase of food from lower distance. *Profitability* was in that context referred to as "*financial loss from food waste"*[14] when orders and production are not aligned, and as increased efficiency by shortening supply chains. But it was also mentioned as an obstacle for the earlier timing of orders as retailer's focus is on the

[12] Interview respondent Retailer3, 2014
[13] Interview respondent 1 Albert Heijn, 2014
[14] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014

reduction of their own food waste as priority to reducing food waste in other parts of the supply chain. *"But for retail it is also an economic aspect because if retail buys more then it can sell, it will have to throw part of the products away, so this is a loss of food but also of money."*[15]

**SOCIETAL AWARENESS**

The variable *societal awareness* was mainly identified in the interview with the CBL, referring to the societal importance of the topic of food waste. Only for the demand of food waste downstream in the supply chain the *societal awareness* was identified as a driver for Retailer3.

> *"What I noticed in this 3,5 years is that food waste has become more and more an issue to talk about with suppliers. […] due to the media exposure of the topic, and big events like 'Damn Food Waste' the importance of the topic has risen."*[16]

Thus, in general the variable includes the general public awareness about food waste, but also NGO work and media coverage of the topic. In total the variable was identified as driver for earlier timing of order placement at the supplier, for demanding food waste upstream the food supply chain, for the reuse of potential food waste, for consumer awareness raising, and for the introduction of smart packaging.

**TECHNOLOGY**

The variable *technology* was identified as obstacle and as driver for retailers' efforts, and it embraces the need for technological improvement for forecasting, the availability of existing forecasting technology, the lack of flexibility of existing machinery to adjust to different order units, and the lack of tested technologies for smart packaging.

First, for both PLUS R. and Retailer3 the need to improve forecasting technology was identified as an obstacle towards earlier timing of orders at the supplier and elimination of order cancellations. For PLUS R. this was related to unpredictable behaviour of consumers, which was also confirmed by the CBL as an obstacle.

> *"The problem is that consumer behaviour is very difficult to predict. So a sudden change in demand cannot easily be compensated then. […] it might still occur that consumer behaviour changes in such an unexpected way that orders are cancelled. But this is hard to avoid."*[17]

[15] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014
[16] Interview respondent Retailer3, 2014
[17] Interview respondent PLUS Rozenburg, 2014

For Retailer3 the implementation of available technology was still an obstacle because they still had to improve the forecasting to make earlier orders, which was going to be implemented soon. However *technology*, was also identified as a driver for earlier order placements allowing more precise production according to demand. The existing forecasting technology was mentioned as a driver to enable earlier orders by the CBL. *"[Late order changes] are getting less due to the improvement of forecasting systems, which allow more precise calculations of consumer demand."*[18]

Second, to improve forecasting and stock management *technology* was identified as a driver for Albert Heijn, PLUS R., and by the CBL. This was related to the availability of forecasting technologies and information processing. For Retailer3 this was not applicable because they were just about to implement forecasting systems.

Third, for Albert Heijn the *technology* played a role for the adjustment of order units to reduce food waste. Albert Heijn tried to adjust the amount that was delivered by the suppliers to the actual sales in the stores; beside the lack of cooperation of A-brands the lack of flexibility of packaging machines was identified as an obstacles to order in smaller amounts: *"[…]the machines of the suppliers are constructed that they wrap the product up in 6 and not in two, so the supplier would need new machines to do so."*[19]

Lastly, *technology* was identified as a barrier in the introduction of smart packaging. There is currently no Dutch retailer using smart packaging. In this context B. Groesz (PLUS R.) referred to technologies still being in the testing phase:

> *"At the moment they are testing it. At first, the chips where very expensive; this was two years ago. Now the chips are much smaller and cheaper. So it is possible, but only if a large retailer takes the initiative to do this. But at the moment it is not used, only tested."*

**FIRM POLICY**

The variable *firm policy* includes references to the firm philosophy, internal priorities, lack of internal incentives for waste reduction measures, and internal quality standards.

*1*) To demand food waste reduction upstream the food supply chain, *firm policy* was identified as a driver for Retailer3. The retailer addresses the topic in conversations with the suppliers and regularly asks for updates on progress done in that respect.

> *"Sometimes if a supplier is not that sustainable yet, we help him to become more sustainable and reach the outreach of our company. […] because the reduction food waste is part of the philosophy of our organization, I am*

[18] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014
[19] Interview respondent 1 Albert Heijn, 2014

*willing to invest more time. I could also go the easy way: For a lot of our suppliers there are alternatives that are much quicker."* [20]

2) L. Hamelink-Veen (CBL) mentioned the setting of priorities as an obstacle for retail to engage in reusing potential food waste for other food products.

3) The *firm policy* was identified as obstacle for consumer awareness-raising projects. In the case of Albert Heijn a general lack of incentive for employees to engage in projects for consumer awareness raising was identified. Employees are judged upon the sales that they make. In addition, the time dedicated for projects to help consumers waste less comes on top their normal workload.

*"Also with the project on consumer waste reduction we did this year, we had to clarify with the person responsible for the products that this project might result in less purchases of specific products because this person might have a target to increase turnover of this products the next year. We are all driven by turnover so there will always be tension because we are a profit driven company."* [21]

Especially for helping with food donations for the 'Damn Food Waste' event, the *firm policy* was perceived as hindering the success of the project:

*"The reason why it was hard to get the [donation of potential food waste for the 'Damn Food Waste' event] through was because within these persons' [store employees and management] functions there was no actual benefit. […] In the end we only got a few stores in Amsterdam to join in the project because for these projects you are asking something from the employees on top of their normal work to store food in the supermarkets at the side.[…] It is not that employees do not want to do it but they are just very busy and these projects will come on top of their normal work."* [22]

B. Groesz (PLUS R.) stated that the overall firm goal to make profit makes the retail organizations not credible if they conduct consumer awareness raising measures:

*"It also has to be a bit in your DNA to reduce food waste because otherwise you are not perceived as trustworthy in your action."*

*4) Firm policy* was also identified as hindering variable in the reduction of using expiration dates for commercial purposes at Albert Heijn. Retailers profile themselves with the quality of the products they sell. Therefore, they set standards for quality of products that need to be given when a product reaches the expiration date. This leads to

[20] Interview respondent Retailer3, 2014
[21] Interview Respondent 1 Albert Heijn, 2014
[22] Interview respondent 2 Albert Heijn, 2014

expiration dates being shorter then needed:

> *"So if a product is on its last day in the store, what kind of a quality does the product still need to have on a scale from 0 to 10. We agreed on 7.5. […] Some departments said that they want to have it a 9.4; other departments said if I have a cheap product and I get a large discount on the last day, then a 6.5 is ok. "*[23]

**LACK OF INFORMATION**

*The variable lack of information* refers to the lack of proof that certain options are able to reduce large amounts of food waste and to the *lack of information* how the consumer will react to smart packaging solutions, both mentioned by the CBL. The former was mentioned for the lowering of marketing standards and the reduction of volume based promotion mechanisms. The latter in the context of alternatives for expiration dates:

> *"The complication with [alternatives for expiration dates] is that the consumer still wants to know when it has been produced and that the consumer more easily disposes food where there is no indication at all. The difficulty is that you will have to explain it or set something like a production date on the product."*[24]

**COLLABORATION WITH SUPPLIERS/PRODUCERS**

The variable *collaboration with suppliers/producers* refers to the working together of suppliers/producers and retail to reduce food waste. Collaboration on the topic of food waste was identified between Albert Heijn and their own brands and suppliers/producers with whom Albert Heijn shares a close relation like Bakker Barendrecht (fruit and vegetables), VZ (fresh produce), and Hilton (meat and meat products). For Retailer3 the relationships with its suppliers are in general on the basis of partnerships.

First, c*ollaboration* was identified as driver to reduce food waste at retail by adjusting order units for Albert Heijn and Retailer3:

> *"In the beginning we had problems that suppliers could only supply in specific amounts […]. Sometimes the order unit is too big for the sales and for the expiration dates. But since we don't have traditional buyer supplier*

[23] Interview Respondent 1 Albert Heijn, 2014
[24] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014

*relationships, but partnerships with our suppliers, the suppliers recognized our problem and made the order unit more flexible."*[25]

Second, *collaboration with suppliers/producers* was also identified for Retailer3 as driver to demand food waste reduction at suppliers and producers and help them realize improvements in this respect.

Third*, collaboration with suppliers/producers* was identified as a driver to adjust products to consumer needs for Albert Heijn and Retailer3 and as driver for investigations in smart packaging for Albert Heijn.

*"With fresh produce you can ask a lot concerning packaging. In this direction there is also a lot happening, a lot of innovation[…] for example simple things help increase the product shelf-life: For example with cucumbers in salads, the producers remove the inside of the cucumber, the pits and the moist, so the entire salad stays longer fresh. This is something Ahold figures out with his partners."*[26]

**COSTUMER CHOICES**

*The variable costumer choices* refers to the choice costumers make for products in the retail stores. The variable was identified as obstacle and driver to reduce food waste.

*Costumer choices* were identified as obstacles to lower the marketing standards of products for Albert Heijn and PLUS Rozenburg: Costumers were said to still prefer the most perfect vegetables and fruit. In addition, costumers were found to buy products with long expiration dates.

*"Consumers are not that picky with vegetables they already have at home but when they trade something for money they want to have the highest quality for their money"*[27]

The influence of *costumer choices* for perfect optical appearance was also confirmed as an obstacle for the lowering of marketing standards by the CBL. However, L. Hamelink-Veen (CBL) stressed the current change in mind-set of consumers and retailers, which will increase the chance that, in the future, marketing standards concerning optical standards are lowered for products sold in the stores:

*"Currently consumers are opting for the most perfectly shaped fruit and vegetables. So, these marketing standards are based on consumer demand. However, retailers and consumer are getting more aware of the consequences*

[25] Interview respondent Retailer3, 2014
[26] Interview respondent 2 Albert Heijn, 2014
[27] Interview respondent PLUS Rozenburg, 2014

*of these marketing standards and realize that they can be less picky in their choice. But it takes some time before it changes."*[28]

*Costumer choices* were also identified for Albert Heijn and PLUS Rozenburg to influence standards for the residual shelf-life time of products, i.e. how much time has to be left on the expiration date before a product has to be removed from the shelf.

*"So what we throw away at the supermarket is partly still good for consumption but consumer don't buy it because they want to keep vegetables and fruits still for a few days at home. "*[29]

Furthermore, the CBL identified *costumer choices* as obstacle and driver for an increase in food from lower distances. C*ostumer choices* are drivers because more costumers demand more sustainable food and costumers increasingly want to know where their food is coming from. Simultaneously, *costumer choices* act as an obstacle because costumers still do not always chose for locally grown food or food from low distances, which hinders increased offers of low distance food as it does not make any economical sense for retail to offer products that are not bought in sufficient amounts.

**COMMITMENT OF INDIVIDUALS**

The variable *commitment of individuals* refers to efforts invested by individual employees for food waste reduction measures.

First, the variable was identified as driver for Albert Heijn for the food donations to the 'Damn Food Waste' event. Efforts to join the project mainly came from an employee who worked at the waste department and who answered a call of support by the 'Damn Food Waste' event. The employee had to clarify the option with several departments, i.e. the quality manager, the category manager, and the communication department. In addition, the employee had to convince several employees from stores to invest effort in collecting food that could potentially be donated.

Second, for the project of PLUS Rozenburg with Wageningen University, the store owner of PLUS Rozenburg engaged in the search for alternative options for retail food waste after seeing the Valentin Turm's 'Taste the waste' movie and reading the book 'Waste: Uncovering the global food scandal' by Tristram Stuart (2009). In this context he found out that Wageningen UR was working on the topic, got in contact with them and agreed to engage in a project to identify food waste streams and options how to reuse them. Without his personal commitment the project would have not been conducted with the store.

[28] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014
[29] Interview respondent PLUS Rozenburg, 2014

**LACK OF INFORMATION SHARING**

The variable *lack of information sharing* refers to a lack of information shared between different supply chain actors. The *lack of information sharing* influenced the reduction of order cancellation and earlier order placements at suppliers. In this context L. Hamelink-Veen mentioned the lack of communication between producers and retail on the amount of overproduction:

> *"[I]f there is an overproduction of a private label product, due to the producers hoping to sell more or due to other reasons, the producers have to get permission from the retailer to give it away to e.g. Food banks because of the private label. But I heard that they don't want to ask the retailer because they don't want to let them know they produced too many products."*[30]

B. Groesz (PLUS R.) mentioned the alignment of computer systems between retail and suppliers as possibility to allow the supplier to have real time information about the amount of products sold at the retail.

> *"The main obstacle is different computer systems. […] We in the supermarket notice the change of costumer behaviour first but the producer does not know. The moment the costumer is through the counter we know how much of the product is still in stock and if the computer systems of us and the producer are linked to each other the producer can estimate how much of a product will be needed as well."*[31]

Apparently Albert Heijn is using it already for some products. However, the exact reasons why the alignment of computer systems was not applied for more products could not be identified.

**REGULATION**

The variable *regulation refers* to legislation and regulation in place or the absence of such. In this research project *regulation* was identified as obstacle for retail to reuse potential food waste for other products. The CBL mentioned food safety regulations as obstacle, however it was not clearly pointed towards one single option for food waste reduction but rather more stated as a general problem:

> *"[F]ood safety is often very strictly handled, which could be loosened for some products. […] food safety regulations are an obstacles experienced by retail to reduce food waste."*[32]

[30] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014
[31] Interview respondent PLUS Rozenburg, 2014
[32] Interview L. Hamelink-Veen (Sustainability manager CBL), 2014

Related to the strict regulation is the precaution with meat and fish products to be reused, which was prevalent for PLUS Rozenburg and Retailer3.

Furthermore, the lack of *regulation* on the testing conditions for expiration dates was perceived as a barrier in efforts to reduce the use of expiration dates for commercial purposes by Albert Heijn. Due to the lack of legislation the testing conditions differ among producers.

**POLITICS**

*Politics* was only mentioned as driver to engage in consumer awareness raising in the interview with the CBL. L. Hamelink-Veen (CBL) referred to *"governmental pressure"* as one of the reasons for retail to sign the retail agreement (see Appendix), in which retailers oblige themselves to each conduct two consumer awareness raising initiatives.

**EMPLOYEE TRAINING**

*Employee training* refers to any training given for employees on food waste, including awareness raising of the topic, and training on how to handle and store products in the shop.

The variable was identified as driver to improve stock management for Albert Heijn , Retailer3, and PLUS R.:

> *"For every company it is important to train the employees in the function of logistics and the store managers about the topic of food waste, and make sure they take it into account in their daily work. The topic needs to be addressed in conversations with suppliers because you cannot take it for granted that they take the topic into consideration."*[33]
>
> *"If you have an experienced person in the shop, he can see whether the product is not good anymore. […] A young, inexperienced person in the shop cannot precisely estimate whether the product is still good to be kept in the shelf […]"*[34]

According to B. Groesz (PLUS R.), the low margins of retail force the retail mangers to cut costs on the employees. Therefore, there are many inexperienced young employees in the stores, who don't know how to store and handle products right.

[33] Interview respondent Retailer3, 2014
[34] Interview respondent PLUS Rozenburg, 2014

### 5.2.2 PRIORITIZATION OF OBSTACLES AND DRIVERS

In order to give recommendations certain variables have to be prioritized. Therefore, the most important variables are identified in the following: 1) The general importance of the variables for food waste reduction efforts, 2) the importance of variables as obstacles and drivers for food waste reduction in each part of the supply chain, i.e. upstream, downstream, and at the retail.

For the general importance of the variables for food waste reduction, the frequency with which they were identified by the different retailers and the CBL (Table 5) was analysed. The importance of the variables as driver or obstacle for food waste reduction upstream the food supply chain, downstream the food supply chain, and at the retail was analysed using the frequency with which a variable was identified as driver or obstacle (Table 6).

The distinction between the parts of the supply chain was made because it can be assumed that obstacles and drivers for food waste reduction at the retail differ from obstacles and drivers for upstream and downstream food waste reduction. This is based on the direct link of food waste at retail, i.e. in stores and distribution centres, to the companies profit, i.e. food waste is loss in profit due to unsold products.

**GENERAL IMPORTANCE OF VARIABLES TO REDUCE FOOD WASTE**

To determine the general importance of the variables for the individual retailers and the CBL, the three most frequently identified variables were taken (Table 5). Some variable were mentioned with the same frequency, which caused that sometimes more than three variables were identified as most important for an actor. For the frequency it was not distinguished whether the variables were identified as drivers or obstacles. A variable that was mentioned as driver and obstacle by a retailer for a specific option was counted as identified once for the retailer for the specific option.

In total *profitability* was the most frequently identified variable to influence retail's efforts to reduce food waste in the food supply chain. In total it was identified 22 times as influencing variable for options to reduce food waste. *Technology* was identified 8 times, and *costumer choices*, *firm policy*, and *collaboration with suppliers/producers* were each identified 7 times in total. The variable *societal awareness* was identified 5 times, *regulation* 4 times, *lack of information* and *employee training* three times, *commitment of individuals*, lack of *information sharing* and *politics* each two times.

**Table 5** General importance of variables for retailers: Frequency with which the variables were identified to having influence on retail for options to reduce food waste in the food supply chain based on interviews with Albert Heijn, PLUS Rozenburg, Retailer3, and the CBL. The frequency is shown for each retailer and the CBL individually and aggregated in total.

| Variable | Albert Heijn | PLUS R. | Retailer3 | CBL | Total |
|---|---|---|---|---|---|
| Technology | 2 | 2 | 1 | 3 | 8 |
| Firm policy | 2 | 1 | 2 | 2 | 7 |
| Lack of information | 0 | 0 | 0 | 3 | 3 |
| Commitment of individuals | 0 | 1 | 1 | 0 | 2 |
| Profitability | 7 | 3 | 5 | 7 | 22 |
| Collaboration with suppliers/producers | 4 | 0 | 3 | 0 | 7 |
| Lack of information sharing | 1 | 0 | 0 | 1 | 2 |
| Societal awareness | 0 | 0 | 1 | 4 | 5 |
| Customer choices | 1 | 2 | 1 | 3 | 7 |
| Politics | 0 | 0 | 0 | 1 | 1 |
| Employee training | 1 | 1 | 1 | 0 | 3 |
| Regulation | 1 | 1 | 1 | 1 | 4 |

The variable *societal awareness* was mainly mentioned by the CBL, however during the interviews all retailers referred to the *societal awareness* as being important in terms of how media will take up the efforts made by the retail. Moreover, all of the retail organizations were very concerned to be associated with food waste as it was well summarized by the respondent of Retailer3:

> *"Retail in general is scared of any publication of food waste. We are a bit different in this respect but we also do not want to shout it out that there is still too much food waste."*

For the individual retailers the importance of variables, i.e. the frequency with which they have been identified, varies. For Albert Heijn *profitability* was identified as influencing variable for 7 options. The importance of the variable was well summarized as follows:

> *"If you want to do responsible retailing you almost always have to make sure that it also makes money. […] Everybody wants to do more, the mind-set is that we want to do double of what we do now, but if someone has to pay for it and our KPIs [key performance indicators] for responsible retailing do not get better, then it is a difficult decision."*[35]

[35] Interview respondent 1 Albert Heijn, 2014

The variable *collaboration with suppliers/producers* was identified for Albert Heijn for four options, *technology* and *firm policy* each for two options. The variable *firm policy* refers here to the KPIs on which employees are judged by the board:

> *"The problem is that if your KPI is turnover then your primary focus is on turnover and waste management is then not of primary importance. […] The employees might do it due to their good heart but it is not in their own interest because they will have to spend time on an issue they are not judged upon by the board."* [36]

For PLUS Rozenburg *profitability* was also the most frequently identified variable, in total for three options. The variables *technology* and *costumer choices* were each identified for two options.

For Retailer3 the three most important variables identified were *profitability*, identified for five options, *collaboration with suppliers/producers*, identified for three options, and *firm policy,* identified two times. The importance of *firm policy* was clearly expressed by the respondent of Retailer3: "*[I]t starts with persons: How do we in this office handle our own food; the mind-set starts there."*

The CBL stated *profitability* the most frequently as influencing variable, followed by the variable *societal awareness*. The variables *technology, lack of information*, and *customer choices* were identified third most frequently.

**SPECIFIC IMPORTANCE FOR VARIABLES AS DRIVERS AND OBSTACLES TO REDUCE FOOD WASTE UPSTREAM, DOWNSTREAM OR AT THE RETAIL**

It is not possible to indicate the most important variable for each option because that would request information about how important the respondents perceived the variable for a specific option. The identification of the perceived importance was not part of the interviews because, in line with grounded theory, the categories were established after data collection. However, inferences can be made about the importance of variables for reducing food waste upstream, downstream, or at the retail according to the frequency with which the variables were identified as obstacle or driver. To identify the specific importance of variables for the reduction of food waste in the different supply chain parts, the frequency with which a variable was in total identified to be influencing for options downstream, upstream or at the retail was calculated. Furthermore, the frequency with which it was identified as a driver or obstacles was identified to give

[36] Interview respondent 1 Albert Heijn, 2014

insight about the nature of the influence a variable had. The calculated frequencies are shown in Table 6.

**Table 6** Importance of variables as obstacles and drivers: Frequency with which the variables were identified in the context of reducing food waste upstream the food supply chain, downstream the food supply chain, and at the retail. The frequency is shown in how often the variables were mentioned as an obstacle (O), as a driver (D), and in total (T= O+D).

| Variable | Food waste reduction | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Upstream | | | At the retail | | | At the consumer | | |
| | O | D | T | O | D | T | O | D | T |
| Technology | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 0 | 1 |
| Firm policy | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 1 | 3 |
| Lack of information | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 |
| Commitment of individuals | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 |
| Profitability | 2 | 3 | 5 | 2 | 3 | 5 | 1 | 1 | 2 |
| Collaboration with suppliers/producers | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 2 | 2 |
| Lack of information sharing | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Societal awareness | 0 | 2 | 2 | 0 | 1 | 1 | 0 | 2 | 2 |
| Customer choices | 2 | 1 | 3 | 1 | 0 | 1 | 1 | 0 | 1 |
| Politics | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Employee training | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Regulation | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |

For the calculation no distinction was made between individual retailers or between retailers and the CBL. Thus, a variable mentioned as obstacle for a specific option by more than one retailer was counted as one. Retailers could not all provide information about all options, e.g. PLUS R. could not provide information for some of the options to reduce food waste upstream, whereas Albert Heijn could. Therefore, taking the general frequency with which a variable was named as a driver or obstacle avoids a bias towards a specific respondent or retail. Only the most frequently identified obstacle and driver were chosen as important, however due to same frequencies for some variable, more than one variable was sometimes identified as most important driver or obstacle.

1. Upstream the food supply chain

For reducing upstream food waste, i.e. at the suppliers and producers, the most frequently named variable was *profitability*. It was also the most frequently mentioned driver. *Profitability* was named three times as a driver by the CBL referring to costs associated with loss of unsold food and increased supply chain efficiency through the shortening of the supply chain. *Profitability* was also one of the most frequently named

obstacles to reduce food waste upstream the food supply chain, next to *costumer choices*. All two variables were mentioned as obstacle for two options: *Profitability* was mentioned by the CBL as obstacle for earlier timing of orders because early orders can result in to high order amounts, which then creates food waste at the retail. For Retailer3 the investment for supplier development in the context of demanding food waste reduction upstream was an obstacles referring to *profitability. Costumer choices* were mentioned as obstacle by Albert Heijn, Plus Rozenburg and the CBL to lower marketing standards; all parties stated that costumers are opting for the optically most perfect products. The CBL mentioned *customer choices* also as obstacles for the offering of more local food.

2. At the retail

For food waste reduction at the retail *profitability* is the most frequently identified variable influencing the decision of retailers to engage in food waste reduction efforts. *Profitability* is also the most frequently identified driver and obstacle. Lack of *profitability*, i.e. costs for logistics and irregular supply, was an obstacle identified for Albert Heijn and Retailer3 to engage in the reuse of potential food waste. Nevertheless, both retailers are currently working on projects to reuse potential food waste form retail. In the case of PLUS Rozenburg the up scaling of reusing potential food waste was associated with lack of *profitability* due to the initial investment for machines. All respondents identified a lack of *profitability* as obstacle for food donation, referring to the lack of professionalism of Food banks and costs for storage of potential food waste. Nevertheless, Retailer3 and Albert Heijn are regularly donating food to the Food banks or other organizations. The CBL identified the costs of separating edible form non-edible food waste streams as costs for both the donation and reuse of potential food waste.

*Profitability* was identified as driver to adjust order units with suppliers, to improve forecasting and stock management, and for the reuse of potential food waste, referring to the reduction of costs that food waste causes, i.e. loss of profit from non-sold products and costs of waste disposal.

3. Downstream the food supply chain

In total *firm policy* and *lack of information* were the most frequently identified variable influencing the decision of retailers to engage in options to reduce food waste downstream at the consumer. Both variables were identified for three options. *Firm policy* and *lack of information* were also the obstacles identified most frequently. The *lack of information* was identified in the interview with L. Hamelink-Veen (CBL) as

obstacle for the introduction of smart packaging and the reduction of volume based promotion mechanisms. For the latter the *lack of information* refers to the lack of evidence how important volume based promotional mechanisms are in causing consumer food waste. For the introduction of smart packaging a *lack of information* exists on how the consumer will react, mentioned by the CBL.

The most frequently identified drivers for consumer food waste reduction are the variables *collaboration with suppliers/producers* and *societal awareness*. Both variables were identified as drivers for two different options to reduce consumer food waste. *Collaboration with suppliers/producers* was identified as a driver for the adjustment of products to consumer needs. For Albert Hejin and Retailer3, the *collaboration with suppliers/producers* made it possible to adjust together portion sizes. For Albert Heijn the *collaboration with suppliers/producers* also allowed the improvement of packaging to increase the products lifetime. *Societal awareness* was identified as a driver for consumer awareness raising projects and the introduction of smart packaging, both times the *societal awareness* was mentioned by the CBL.

## 5.3 FINDINGS

From the leverage points of retail to reduce food waste in the supply chain, identified in chapter 4, not all points could be identified as options for retail in the Dutch context or were identified as partly not under the influence of retail: To *ensure the high value use of food waste* was in the responsibility of waste companies; efforts to *reduce product take-back clauses* in supplier contracts were not covered by any of the cases analysed; the *adjustment of order units* and the *reduction of expiration dates for commercial purposes* was partly outside the influence of retail. For these options further investigation is needed.

From the interviews with retailers and CBL 12 variables were identified to influence the decision of retail to engage in efforts to reduce food waste. A model was established that shows the linkages between the variables and the options they influence.

To identify the importance of variables for food waste reduction 1) the general importance (frequency of variables identified for the different cases), and 2) the importance as obstacles and drivers for food waste reduction upstream, downstream, and at the retail (frequency of variables identified as obstacles and driver for different options) were analysed.

For the general importance, the variables that were the most frequently identified to influence a decision were *profitability* as most frequently followed by *technology, costumer choices*, *firm policy,* and *collaboration with suppliers/producers*. The

importance of variables differed between the retailers, however *profitability* was for all retailers the most frequently identified variable.

For the separate supply chain parts variables differed in the frequency they were identified for options. The variables also differed in the frequency they were identified as obstacles or drivers. For food waste reduction upstream *profitability* was the most frequently identified variable for different options in total, but also most frequently as driver and along with *customer choices* most frequently as obstacle. For the food waste reduction at the retail *profitability* was the most frequently identified variable, in total, as obstacle and as driver. For food waste reduction downstream at the consumer *firm policy* and *lack of information* were the most frequently identified variables in total, and the most frequently identified obstacles. *Collaboration with suppliers/producers* and *societal awareness* were the most frequently identified variables as drivers for retail to engage in consumer food waste reduction activities.

# 6 POLICY OPTIONS TO ENCOURAGE RETAIL'S EFFORT TO REDUCE FOOD WASTE IN THE FOOD SUPPLY CHAIN

In the preceeding part important drivers and obstacles were identified that influence the decision of retail to engage in food waste reduction efforts. The most important obstacles and drivers for retailer's efforts in food waste reduction upstream (at the supplier/producer), downstream (at the consumer) and at the retail (in stores and distribution centres) were identified. To meet the research objective, i.e. to give recommendations for the Dutch government, in this chapter policy options to enhance drivers and overcome obstacles will be identified. A short introduction will be given on the data used, followed by the data analysed, and the findings, answering sub-question 3 of the research project.

## 6.1 INTRODUCTION

The policy options to enhance drivers and overcome obstacles were identified from literature on food waste, literature on policy options for industrial ecology (IE) and from expert interviews.

From literature on food waste, policy options recommended in reports or documents and examples of policies from other countries were identified.

From literature on policy options for IE, policy options for specific obstacles and drivers identified in chapter 5 were identified. IE aims at the reduction of virgin-material use, non-renewables dependency, pollution emissions, and waste discharges, thereby improving the sustainable outcome of industrial production (Mirata, 2004). The concept translates the circular energy and resource flows found in natural ecosystems to industrial systems, aiming at efficiency and effectiveness of industry through cooperation of different actors. The concept of IE finds practical application in two pathways, the product-based and the geographically focused approach.

The product-based approach focuses on the resource use of a product along all its life steps: Its design, production, distribution, consumption, disposal, and possible recycling (Korhonen, 2002). The geographically oriented approach mainly engages with eco-industrial parks, in which geographically close industrial actors use each other's waste streams as resources in place of virgin materials. Terms like industrial symbiosis (collaborative relationship), industrial ecosystems (efficient consumption on system level) are used as synonyms for concepts of eco-industrial parks (community of collaborating businesses) (Mirata, 2004).

For both practical approaches literature has emerged giving policy recommendations to foster industrial ecology. These policy options can also be options in the context of food waste due to the overall focus of IE on sustainable development as its goal. Furthermore, the aim of IE to foster cooperation, reduce waste, and encourage reuse and recycling of resources draws parallels to the important variables of food waste reduction efforts by retail, identified in chapter 5. The policy options identified from the literature will still be discussed under the specific features of food waste reduction.

Interviews were conducted in total with 6 experts from the FAO, WRAP, the Dutch Food and Nutrition centre (Voedingscentrum), a member of the Dutch Ministry of Infrastructure and Environment, the Dutch Alliance for Sustainable Food (Alliantie Verduurzaming Voedsel), and Food Cabinet.

C. Bucatariu works as policy development consultant for the Save Food Initiative in the Agriculture and Consumer Protection Department at the FAO. Within her work at the FAO and as member of the EU FUSIONS project[37] she has knowledge on food waste policy development on a global and European level.

A. Parry in his work at WRAP in the UK was involved in the development of the Courtauld Commitment, a voluntary agreement of the food industry and retailer organizations to decrease food waste. The Courtauld Commitment finds international recognition as frontrunner example in the reduction of food waste in the supply chain.

M. Schrijnen and A. Hofman are project managers at the Dutch Food and Nutrition Centre for the reduction of food waste. The Dutch Food and Nutrition Centre serves as a organization that supports the Ministry of Economic Affairs in realizing policies on food waste. They have actively been involved in projects conducted in cooperation with retail organizations to help consumers reduce their food waste including the distribution of "eetmatje", measuring cups for portion sizes, by Albert Heijn and blueprints for shopping lists distributed in Lidl shops.

M. Mann works at the Dutch Ministry of Infrastructure and Environment (Ministry I&E), which is one of the Ministries responsible for the reduction of food waste in the food supply chain. She is also winner of the 2013 Nudge leadership challenge in which she worked on a project to reduce food waste.

F. Uitterhoeve is part of the Dutch Alliance for Sustainable Food as the sustainability project officer at the Federation of the Dutch Food and Grocery Industry. The Dutch Alliance for Sustainable Food is an association introduced by the Dutch government for

[37] FUSIONS (Food Use of Social Innovation by Optimising Waste Prevention Strategies) is a four year research project (2012-2016) funded by the European Commission to improve the resource efficiency of Europe by significantly reducing food waste.

collaboration in the food production chain, including the CBL, the Dutch Food Industry Federation (FNLI) and the Dutch Federation of Agricultural and Horticultural Organisations (LTO), among others. The Alliance for Sustainable Food integrated food waste into its agenda and can therefore provide insight information about options in the Dutch context.

S. Aalts is part of the team of Food Cabinet; a consultancy bureau specialized on food. Food Cabinet helps organizations that want to contribute to a more sustainable food system to realize their ambitions. Food Cabinet was involved in the 'Damn Food Waste' events, consumer awareness raising events for food waste. Among further projects, the company also initiated the Food Film festival to raise awareness on the food system. Food cabinet has thus experience in raising consumer awareness on food waste and knowledge about the Dutch food system.

In the following the policy options identified from the interviews will be structured according to the part of the food supply chain for food waste reduction, i.e. upstream the food supply chain, downstream the food supply chain and at the retail.

## 6.2 ANALYSIS

### 6.2.1 OPTIONS TO ENCOURAGE UPSTREAM FOOD WASTE REDUCTION

The main obstacles for retail to reduce food waste at the suppliers and producers were *lack of profitability*, and *costumer choice*s. Furthermore, *profitability* was the main driver identified for retail to engage in food waste reduction upstream. The variable *costumer choices* as an obstacle to reduce food waste upstream in the food supply chain includes the choice of costumers for perfectly shaped fruit and vegetable and optically perfect products, and costumer choices for products, which are not from low distances. Lack of *profitability* was identified as an obstacle to reduce food waste downstream, referring to costs associated with logistical inefficiency to transport lower grade vegetable and fruit, i.e. abnormally shaped fruit and vegetables, the focus of retail on its own profit-maximization when it comes to earlier order placements at the supplier, and costs for supplier development to reduce food waste downstream.

Therefore, to increase retail efforts to reduce food waste upstream in the supply chain, policy options should aim at encouraging costumers to reduce their expectations for optical features of fruit and vegetables and buy products from low distances, increase profitability to reduce food waste upstream, and strengthen awareness of the

profitability to reduce food waste upstream. The policy options identified are shown in Figure 7.

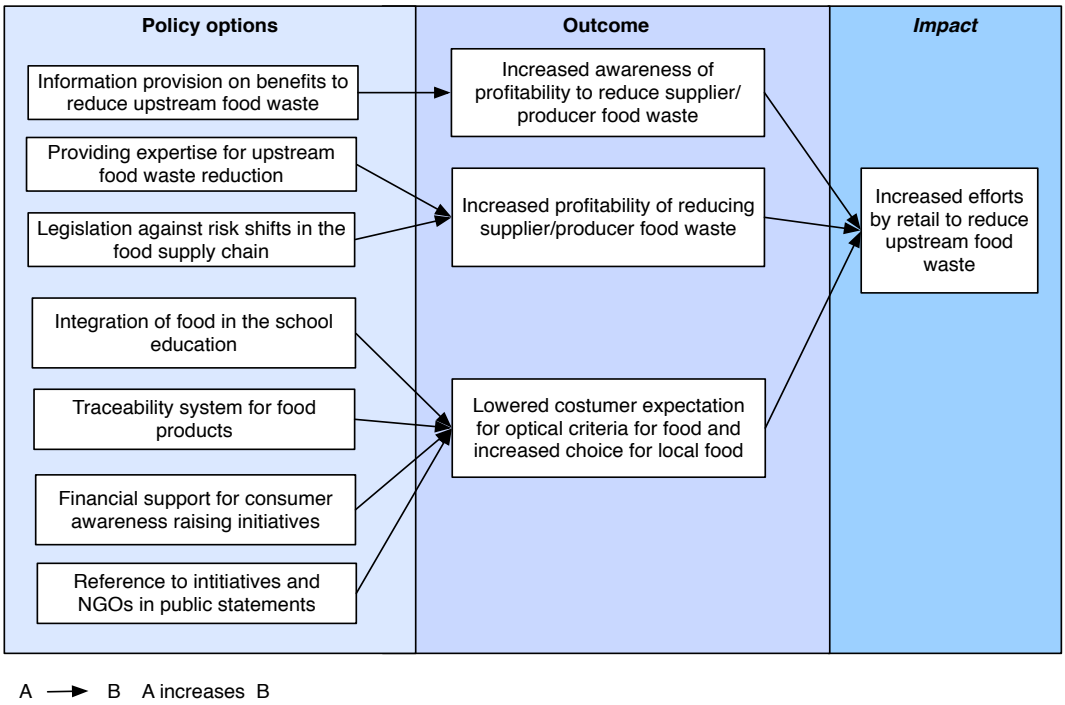


**Figure 7** Policy options to encourage the reduction of supplier/producer food waste from retail.

**ENCOURAGE COSTUMER CHOICES**

Identified policy options to encourage costumers to lower their expectation for fruit and vegetables and buy more products from low distances are 1) the inclusion of food waste in school education, 2) the establishment of a traceability system, 3) the financial support of awareness raising initiatives, and 4) the support of NGOs and awareness raising campaigns by referring to them in public statements.

1) The experts C. Bucatariu (FAO), M. Mann (Ministry I&E), and M. Schrijnen and A. Hofman (Dutch Food and Nutrition Centre) mentioned the option to integrate food into the school education.

> *"[Education about food waste] is very important and should already start at school. […] starting from Kindergarten to University"*[38]
> *"The education system is still to a large part determined by government and there you have a chance to raise children with the right values. If the 'smaak lessen' programme [, i.e. a primary school programme that touches on all the topics concerning food, e.g. flavours, production, food waste,] would be mandatory for primary schools, it would be a huge achievement."*[39]

[38] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014
[39] Interview M. Mann (Ministry of Infrastructure and Environment, Winner of sustainability challenge), 2014

Most of the experts suggest the topic integrated into a broader theme of food and sustainable consumption. M. Mann (Ministry I&E) emphasized that the integration of food into school education would have a long lasting effect because *"[children] will keep what they learned for the rest of their life".*[40]

2) Awareness raising initiatives and NGOs were mentioned by the experts to be important in changing costumer choices. There are currently many initiatives in the Netherlands that raise awareness among the civil society, e.g. 'Damn Food Waste' events, the Youth Food Movement, etc., however their impact seems to be limited:

> *"[A close bond to food] is now coming up more and more with initiatives like the Youth Food Movement who give incentive to think and talk about food [or] KROMKOMMER, who engage with the topic of food waste. […] But we do see in the data that it does not lead to a reduction of consumer waste."*[41]

To increase the impact of NGOs and initiatives S. Aalts from Food Cabinet mentioned the option of governmental support in form of financial support or making references to NGOs in public statements, thus increasing their credibility.

> *"[The Dutch government] can support the grass root initiatives, financially or facilitating working together. […] One thing that could help is for example that the Deputy Minister of the Netherlands mentioned 'Damn Food Waste' in one of her letters. That is also a form of support. If we are mentioned by the Deputy Minister, it is easier for us to get funds. If the government approves what we are doing it is easier to find private partners as well."*[42]

3) Another policy option to alter costumer choices is a traceability system, identified from literature, but not mentioned by any of the experts. Wognum et al. (2011) investigated the options to introduce a tracking system for food waste, with which the costumer could make dedicated choices. The authors analysed 4 different information systems to support sustainability in food supply chains: Environmental reporting, Life Cycle Assessment (LCA), traceability, and labelling. For LCA the lack of reliable data, the allocation of environmental burden (e.g. differentiation between product and by-products which are also used for other products), and the definition of the supply chain have been identified as obstacles to use this instrument. The other two information systems (labelling and environmental reporting) were identified to be more suitable for issues such as food safety and human health. In this respect traceability would facilitate

[40] Interview M. Mann (Ministry of Infrastructure and Environment, Winner of sustainability challenge), 2014
[41] Interview F. Uitterhoeve (Part of the Alliance for Sustainable Food as Sustainability Project Officer at the Federation of the Dutch Food and Grocery Industry), 2014
[42] Interview S. Aalts (Food Cabinet), 2014

the identification of production distance. However, in the context of food waste reduction in the Netherlands, the international character of the food system would require the implementation of such a tracking system also outside the Netherlands.

**INCREASE PROFITABILITY TO REDUCE PRODUCER/SUPPLIER FOOD WASTE**

Lack of *profitability* to reduce upstream food waste was identified as main obstacle for retail efforts in this respect. From literature and expert interviews the following policy options were identified to increase *profitability* of upstream food waste reduction: Regulation to reduce risk shifts from retail to producers, and expertise offered by the government to help reduce food waste upstream.

The Grocery Code of Practice is a legal instrument introduced in the UK to ensure fair relations between retail and its suppliers. The code sets binding guidelines for retail behaviour towards its suppliers, among others to avoid risk shifts form retail to the supplier. The Code of Practice obliges retail to compensate suppliers in case of forecasting errors. The extra costs for forecasting errors might outweigh profits that can be made through late order placement. Thus, the code is an example of a legal instrument that can be used to increase profitability of upstream food waste reduction, i.e. cost for penalties are higher than saved money form late order placement.

Furthermore, experts stressed that a lack of profitability can also be overcome by providing expertise. In the Courtauld Commitment (UK), a voluntary agreement for the reduction of food waste, the provision of expertise, i.e. *"the fact that we are having expertise at WRAP: We will go work with the signatories, we will waste prevention reviews or training sessions for their staff"*[43], was mentioned as an important factor for retail to overcome obstacles to join into the agreement. The UK Courtauld Commitment is an example of a voluntary agreement in which different parties are working together on the topic of food waste. The Commitment was established between WRAP and UK retail in 2005 and started as an agreement on packaging. However, in the follow-up commitments food waste was included to reduce food waste at the retail (Courtauld Commitment 2) and to reduce food waste in the entire supply chain (Courtauld Commitment 3).

The provision of expertise can also be an option in the Dutch context. Building on IE literature for expertise provision the government can either take the role of a knowledge bank or a knowledge broker (Malmborg, 2004). As knowledge banks local authorities hold knowledge that they transfer to companies and engage closely in small

[43] Interview A. Parry (Project Manager WRAP), 2014

active networks with the companies; as knowledge brokers local authorities provide contacts to experts and consultants who hold the needed knowledge (Ibid.).

**INCREASE AWARENESS OF PROFITABILITY OF UPSTREAM FOOD WASTE REDUCTION**

P*rofitability* to reduce food waste upstream the food supply chain was mainly related to increased efficiency and effectiveness of the supply chain, reducing costs. In order to foster this driver the experts C. Bucatariu (FAO) and A. Parry (WRAP) highlighted the importance to promote the benefits of food waste reduction in the supply chain through targeted research:

> *"Governments may be good facilitators to say that even though you have this initial investment, medium to long-term you will have return that will just keep on growing. […] Government can facilitate targeted research or at national level in consortium with public and private sector."*[44]

The identification of retailers' benefits was also done for the Courtauld Commitment 3, which was elaborated on earlier.

> *"You have to be able to talk about the benefits of reducing food waste. [So] that you can say: 'this is going to save you xy tons of food waste and as a sector it is going to save you xy € for every ton of food waste you save'. [With an] analysis you can actually say that it will costs retail that much time and that much material, but the benefit is significantly higher than that. Thus retail is going to save money by doing this."*[45]

The Dutch government can thus provide information on the benefits for retail to reduce food waste upstream.

### 6.2.2 OPTIONS TO ENCOURAGE FOOD WASTE REDUCTION AT THE RETAIL

The main obstacle and driver for retail to engage in food waste reduction at the retail, i.e. in the stores and in the distribution centres, was *profitability*/lack of *profitability*. The lack of *profitability* was identified for the donation and reuse of food. For the donation of food costs resulted from ensuring food safety of the products donated and from storage space. For the reuse of potential food waste lack of *profitability* resulted from initial investment for machinery, costs for logistics to reuse food waste, and separation of waste streams. *Profitability* of food waste reduction as a driver was related

[44] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014
[45] Interview A. Parry (Project Manager WRAP), 2014

to the decreased costs for non-sold products. Policy options to increase profitability to reuse and donate food waste and to raise awareness on the profitability of food waste reduction are summarized in Figure 8.

**INCREASE PROFITABILITY TO REUSE AND DONATE POTENTIAL FOOD WASTE**

From the expert interviews and literature the financial obstacles to donate or reuse potential food waste can be reduced by loosening food safety regulation, or exempt donors from the responsibility of the food donation, by waste separation legislation, by setting economic incentives through tax release for donated food or increased tax on food waste. Furthermore, the government can provide experts' support for the Food banks to improve their professionalism, establish networks for demand and supply for potential food waste, and introduce voluntary agreements for food waste measurement.

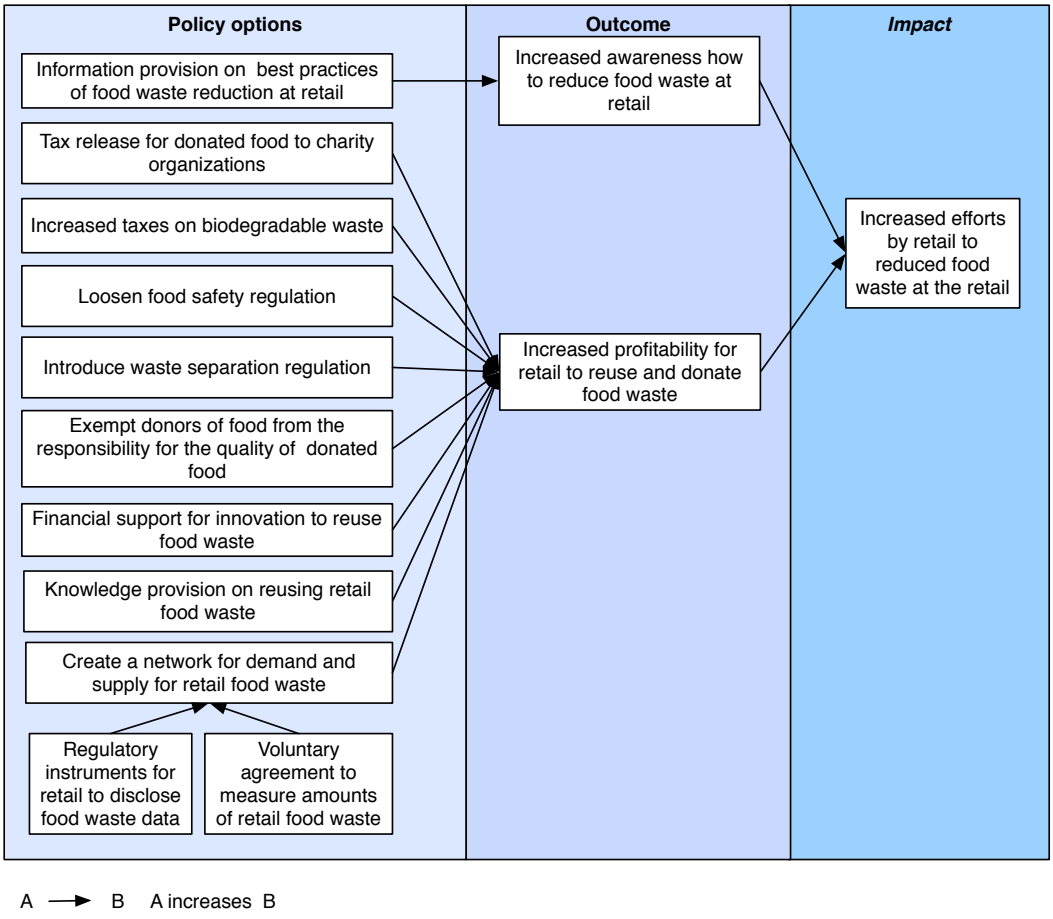


**Figure 8** Policy options to encourage effort of retail to reduce food waste at the retail, i.e. in stores and distribution centers.

1) The change of legislation to improve profitability for the reuse and donation of potential food waste was identified in literature and also proposed as policy option by experts: In IE literature, Desrochers (2002) strongly argues for an institutional

framework that "forces firms to internalize their externalities while leaving them necessary freedom to develop new and profitable uses for by-products" (Desrochers, 2002,p. 1032). He argues that those regulatory barriers that favour the use of virgin products restrict the use of by-products. Re-usable products often have to be considered under waste laws, which bring along bureaucracy and an immense amount of approvals in case of reuse, pollution prevention defined in away that excludes recycling and reclamation, and biases against technological innovation, arbitrary distinctions made between useful material and waste, and the legalization of pollution by preventing injunctions foster the use of virgin materials (Ibid.). Many other authors from IE literature also stress the impact of the regulatory and legal environment on the development of industrial symbiosis (Boons, Spekkink, & Mouzakitis, 2011; Desrochers, 2002; Heeres, Vermeulen, & de Walle, 2004; Korhonen, 2002; Mirata, 2004; Niutanen & Korhonen, 2003). Also food waste literature indicates regulatory changes as a policy option: The "Preparatory Study on Food Waste in the EU27" by Bio Intelligence Service (2010) recommended the removal of legal barriers for food redistribution. Examples of legal instruments are the waste regulation of Scotland and Ireland that oblige food business to separate food waste from other waste streams. The Scottish and Irish regulations create a new level playing field for food business to reuse potential food waste because the costs for separating food waste are than paid by all competitors, thus not causing a competitive disadvantage.

Furthermore, Waarts et al. (2011) names the loosening of food safety regulation as an option to remove legal barriers for food waste reuse and donation. The authors also discuss the options for releasing food donators from the responsibility of the products donated. The Good Samaritan law in Italy is an example for this kind of legislation. The law takes away the responsibility for the food quality and safety from the parties who donate food. However, Waarts et al. (2011) found that the introduction of such a law might not change the costs associated for food business to donate food because the industry wants to make sure the quality is guaranteed due to the retailers name on the products.

Overall, to establish new legislation literature stresses that this can be best achieved in cooperation with industry (Korhonen, 2002); Thus linking and aligning public and private players thinking for cohesive policies and strategies is important (Costa & Ferrão, 2010; Lowe & Evans, 1995). Literature and experts also stress the importance to include the entire supply chain in the considerations for new legislation to avoid the transferring of waste streams to other supply chain actors:

*"You can only really reduce food waste along the supply chain, if you make it a co-owned problem, including retailer, manufacturers and together they can improve the entire supply chain."*[46]

2) IE highlights the importance of economic instruments to increase *profitability* of resource reuse. Niutanen and Korhonen (2003) demonstrated the importance of economic instruments for closed loop models in agriculture of food production. In their analysis of the Finish agricultural system, they come to the conclusion that anaerobic digestion has a high potential to serve the IE philosophy in agriculture but that due to energy prices and support for renewable energies the development of such closed loops are hindered. In the context of food waste, economic incentives that favour the reuse and donation of food waste are tax release on the donated products, e.g. as the Coluche law in France does. The UK introduced high taxes on biodegradable waste going to landfill, which make the reuse or donation of food waste economically more profitable than its disposal. In this context C. Bucatariu (FAO) stresses the importance to evaluate the options for supporting the reuse of food waste also in a broader European context:

*It is very important to highlight that whatever measure is suggested for governments, the government should take risk assessment, risk management and impact assessment into account before having this solution implemented to ensure coherence at EU level and at national level. We should be aware of the medium to long-term impacts such as competition of resources and it is relevant to highlight the priority for natural resources sustainable use and food and nutrition security."*[47]

3) Further identified options to increase *profitability* of reuse were to lower costs by knowledge provision, and expertise. IE literature stresses that governmental bodies can provide tools in order to facilitate the cooperation, networking, and communication between companies, and thus help in the transfer of knowledge, information and ideas (Malmborg, 2003). As mentioned above governments can act as knowledge brokers or knowledge banks. In the context of food waste

*"[g]overnments can facilitate transferring knowledge from different countries or from other regions. […] Solutions that are considered to be of high risk might already be successfully implemented somewhere else"*[48]*.*

[46] Interview F. Uitterhoeve (Part of the Alliance for Sustainable Food as Sustainability Project Officer at the Federation of the Dutch Food and Grocery Industry), 2014

[47] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014

[48] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014

4) The lack of profitability to reuse food waste is also related to the lack of demand, which can be overcome by a) linking demand and supply and b) by creating demand through innovation.

M. Schrijnen and A. Hofman (Dutch Food and Nutrition Centre) and F. Uitterhoeve (Alliance for Sustainable Food) stressed the importance of innovation in the Dutch context to reduce costs associated with the donation and reuse of food waste. As an example experts mentioned

> *"the soup bus in The Hague that provides warm soup and bread for homeless people every day. […] It makes it easy for supermarkets to donate the food that is left at the end of the day because they don't have to do anything and they can also mention this cooperation in their social media."*[49]

The government can in this respect foster innovation through financial support of innovations in the field of food waste reuse.

5) An option for governments to help existing initiatives, identified from IE literature, is help to find complimentaries among parties (Mirata, 2004). Governments can act as initiating actor of networks, as network broker (Burström & Korhonen, 2001; Korhonen, Malmborg, Strachan, & Ehrenfeld, 2004; Malmborg, 2004). This option was also mentioned by the food waste experts form the FAO and from the Dutch Ministry of Infrastructure and Environment.

> *"It is a matter of networking. If retailers are integrated into a network, they can be linked with other actors that need the product or who can prepare the products and return it to them cooked."*[50]

In this context literature highlights the importance to generate information on the material flows, as information can often be a barrier for the development of industrial symbiosis (Heeres et al., 2004). In the context of food waste in the Netherlands F. Uitterhoeve (Alliance for Sustainable Food) stressed that some companies are already measuring food waste but most companies measure in different ways. Therefore, information has to be generated in a comparable manner. Guidelines have just been published on EU level to measure food waste. Thus the government only needs to make sure these guidelines are applied by food businesses. Nevertheless,

> *"data on resource efficiency is very sensitive at the end of the food supply chain because it affect the way you do your business and the competitive advantage you have in comparison to the others. If you have less waste it means that you*

[49] Interview M. Schrijnen and A. Hofman (Project manager for reduced food waste at the Dutch Food and Nutrition Centre), 2014

[50] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014

*have a better business case. So the actors are reluctant to disclose this kind of information."*[51]

A policy option to overcome this obstacle is a voluntary agreement like it is done in the UK, i.e. the Courtauld Commitment already mentioned above. The agreement includes the measurement of food waste numbers by the signatories. A. Parry (WRAP) highlighted the importance of WRAP's independency (initiating party for the Courtauld Commitment) and that the organization does not publish individual numbers but aggregated numbers of a sector, thus circumventing competitive obstacles. Such a kind of agreement can also be made in the Dutch context. The option will have to be further explored concerning which organization will oversee the project, and how the aggregated numbers can be published. Moreover, for voluntary commitments Boons et al. (2011) stresses that in most cases voluntary agreements are made on the basis of threat for future legislation. This was also confirmed by A. Parry as important element for retail to sign into the Courtauld Commitment:

*"The prospect of introducing legislation was a real focus for industry to commit to a voluntary agreement. They would rather avoid regulation and legislation. So a voluntary approach was much more attractive"*[52]

Besides a voluntary agreement, the Bio Intelligence Service in the 'Preparatory study on food waste across EU 27' report (2010) propose "regulatory instruments, such as the requirements or incentives to disclose food waste data [, which] can encourage competition among retailers for good performance in this area, offering both substantial environmental and social benefits" (Bio Intelligence Service, 2010, pp.93-95).

**INCREASE AWARENESS ON PROFITABILITY OF FOOD WASTE REDUCTION**

*Profitability* was the main driver for food waste reduction at retail. Therefore, awareness of the profitability should be increased in order to encourage other retailers to follow. For the Dutch context experts stated that *profitability* of food waste reduction is already known within the sector:

*"Increasing their efficiency concerning food waste is something companies are already doing because it safes them money."* [53]

Nevertheless, the Dutch government can increase the sharing of information among parties by providing information on best practices.

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[51] Interview F. Uitterhoeve (Part of the Alliance for Sustainable Food as Sustainability Project Officer at the Federation of the Dutch Food and Grocery Industry), 2014
[52] Interview A. Parry (Project Manager WRAP), 2014
[53] Interview F. Uitterhoeve (Part of the Alliance for Sustainable Food as Sustainability Project Officer at the Federation of the Dutch Food and Grocery Industry), 2014

*"Now, it is important to be aware of the possible solutions, what retailers have done already and have publicly available information on how systems work. Governments might just, in their own national consultations, provide the knowledge that retailer x has implemented this system with this result."*[54]

### 6.2.3 OPTIONS TO ENCOURAGE DOWNSTRAM FOOD WASTE REDUCTION

The main obstacles for retail to reduce consumer food waste were *firm policy* and *lack of information*. *Firm policy* as an obstacle referred to 1) the KPIs used to judged employees (e.g. sales), which do not support the engagement in consumer food waste reduction, 2) the lack of time available for projects, asking extra working hours from employees supporting projects, 3) the lack of importance dedicated to the topic by high levels, and 4) it referred to the retailers' quality standards set for products, which restrict the lengthening of expiration dates. *Lack of information* refers to the lack of evidence about the effect of specific options on food waste reduction. Drivers for consumer food waste reduction were *collaboration with suppliers/producers* and *societal awareness*.

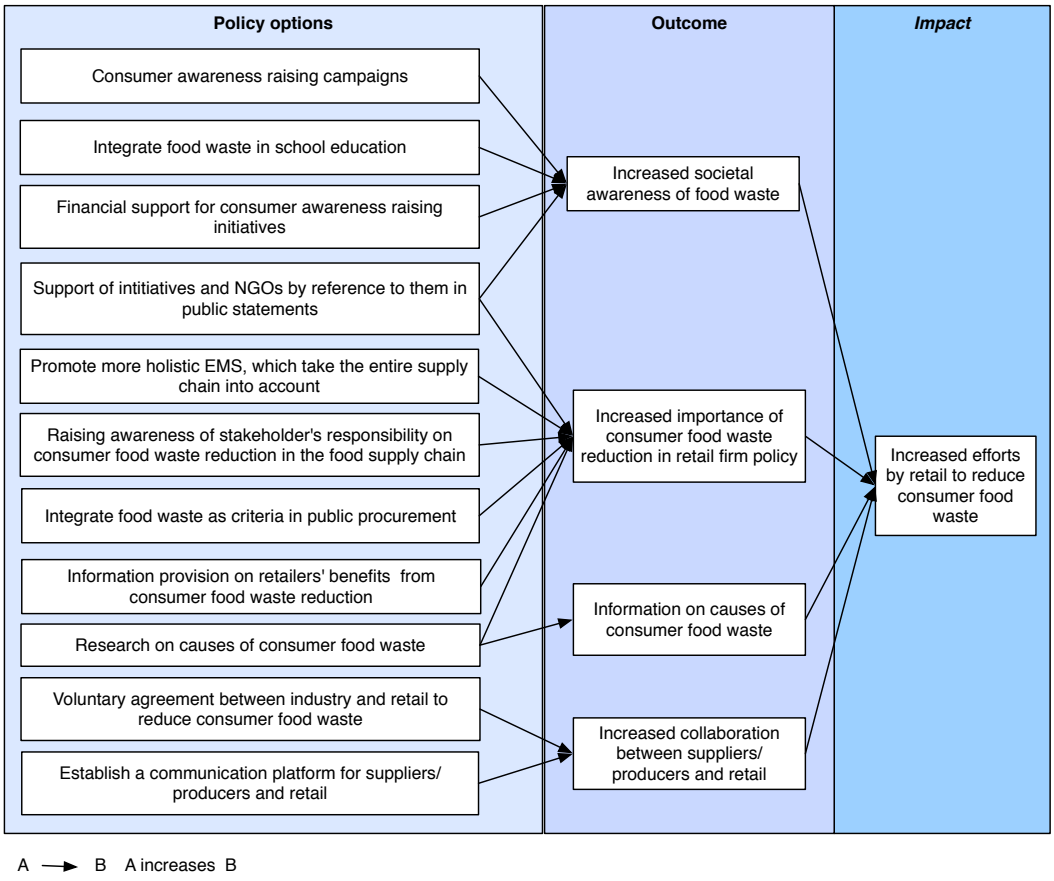


**Figure 9** Policy options to encourage efforts by retail for consumer food waste reduction.

[54] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014

The *collaboration with suppliers/producers* referred to joint efforts by retail and suppliers to introduce smart packaging and to adjust products to the consumer needs, i.e. introducing smaller package sizes. *Societal awareness* refers to the importance of the topic given by society that triggered the engagement of retail in awareness raising campaigns and the engagement in research on smart packaging. Therefore, to increase the efforts by retail to reduce consumer food waste, policy options should aim to increase *societal awareness* of the topic, foster collaboration within the chain, provide information on causes of food waste, and increase importance of consumer food waste reduction in firm policies. The policy options identified are shown in Figure 9.

**INCREASE IMPORTANCE OF CONSUMER FOOD WASTE REDUCTION IN FIRM POLICY & INFORMATION PROVISION ON CAUSES OF FOOD WASTE**

1) In order to increase the importance retail dedicates to consumer food waste reduction the expert A. Parry (WRAP) stressed the importance of a solid evidence base on causes of food waste and on the benefits for retail to engage in food waste reduction. Research on causes of consumer food waste reduction and the benefits for retail were important success factors in the Courtauld Commitment (UK) for signatories to sign up the voluntary agreement.

> *"The signatories [for the Courtauld Commitment] got on board very quickly to support the campaign because of the work we did on the causes of food waste; they could see that for example date labelling or the shelf-life of their product were not helping consumers to waste less. So they were very keen to see how they could improve their products as well as supporting the campaign.[…] [WRAP] started publishing the research.[…] Due to the evidence base and a campaign we developed the signatories were quite confident that WRAP knew what it was taking about."* [55].

Furthermore, the Dutch expert M. Mann (Ministry I&E) stressed the importance of information on benefits for firm internal individuals to encourage organizational change:

> *"[I]n the large companies there are people who want to make a difference. […] these people still need to convince the upper levels of the company that the idea is interesting and that it is worth looking into. However, this is still easier from the inside than from the outside."*[56]

[55] Interview A. Parry (Project Manager WRAP), 2014
[56] Interview M. Mann (Ministry of Infrastructure and Environment, Winner of sustainability challenge), 2014

Providing good arguments for these individuals to convince upper levels of the importance to reduce consumer food waste is needed.

Therefore, one option for the Dutch government to increase retail effort to reduce consumer food waste is information provision on the causes of food waste and on benefits for retail to engage in consumer food waste reduction. This can be done by targeted research. For retailer's benefits research might analyse whether consumers trade up, i.e. consumers buy higher quality products when they save money from wasting less food, or whether consumers' perception of a retail changes with the efforts the retail conducts for consumer food waste reduction. As governments cannot take over the costumer assessment and individual profit margins gained from food waste reduction programmes, they can nevertheless strengthen evidence on the general household behaviour as has been done in the UK by WRAP.

The evidence base on causes of food waste also helps overcoming the obstacle of *lack of information* on the effect of certain measures.

2) A. Parry (WRAP) and M. Mann (Ministry I&E) stated that awareness and firm commitment can be increased by NGOs and media coverage.

> *"NGOs have a very important role in bringing new problems under the attention of governments and companies. […] NGOs can signal what can go wrong within the next year. Big organizations may very easily miss these things if NGOs would not tell them."* [57]

As already mentioned earlier (see changing costumer choices) the government can support NGOs by providing financial support or increasing NGOs' credibility by mentioning them in public communications.

3) Another option to influence firm policies for the governments is to promote holistic Environmental Management Systems (EMSs), which take the entire supply chain into account. This option was identified from literature but from none of the experts for food waste reduction. In literature, there is wide agreement and evidence on the insufficiency of measuring only financial performance as KPI (Chen & Paulraj, 2004). Non-financial measures are more timely (Chen & Lee, 1995), more precise and measurable, they are consistent with strategies and goals of companies, and tend to be flexible as they change with market needs over time (Medori & Steeple, 2000). Moreover, literature also stresses the importance of internal organizational exchange and organizational learning, which can serve as a facilitator for change (Korhonen et al., 2004). EMS like ISO14001, GRI (Global Reporting Initiative) and European EMAS take up elements like

[57] (Interview M. Mann (Ministry of Infrastructure and Environment, Winner of sustainability challenge), 2014)

commitment, organizational learning, etc. Governments can play a major role in promoting EMSs with a stronger focus on corporate sustainability and thus redirect firm policies and stimulate organizational innovation (Wognum et al., 2011). To promote EMSs, governments can make references in policy argumentation thus giving more presence to EMS in the political arena (Korhonen et al., 2004). However current EMSs are mainly focuses on individual firms and organizations and are internally oriented (Korhonen et al., 2004; Wognum et al., 2011), implying that more comprehensive EMSs will have to be identified and developed first.

4) IE literature also stresses the importance of the institutional context companies are embedded. The institutional context can lead companies to fall back in old behavioural patterns (Lambert & Boons, 2002). Therefore, emerging operations have to be linked to long-term sustainability requirements (Mirata, 2004) and systemic change has to include all actors (Lambert & Boons, 2002). For food waste reduction this means including the entire supply chain in legislative measures and economic incentives. Furthermore, awareness raising, network brokerage, and coordination bodies helps to create an institutional framework (Mirata, 2004). Translated to the context of food waste:

> *"[G]overnments can raise awareness by actively communicating to all stakeholders that this is a problem and that we should do something on it"*[58]

and

> *"highlight the priority for natural resources sustainable use and food and nutrition security"* [59]

In the case of consumer food waste reduction A. Parry (WRAP) stressed the importance of the topic as a political issue to increase commitment of retail in the UK [60].

Thus raising awareness on the topic of food waste and informing stakeholders about their responsibility is a policy option to increase corporate commitment.

5) C. Bucatariu (FAO) and S. Aalts (Food Cabinet) stressed the potential of public procurement to increase the commitment of corporations to engage in the topic. The inclusion of food waste reduction in the selection for public procurement can motivate firms to integrate the topic to a greater extent in their firm policy.

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[58] Interview M. Mann (Ministry of Infrastructure and Environment, Winner of sustainability challenge), 2014

[59] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014

[60] "It has become much more of a political issue though" (Interview A. Parry (Project Manager WRAP), 2014)

**INCREASE SOCIETAL AWARENESS**

In order to increase *societal awareness* of the topic of consumer food waste, the experts referred to the same policy options as mentioned for encouraging consumers to buy more local food and lower their expectation for visual criteria for food, e.g. shape of vegetables (see above). These policy options are the inclusion of food waste into school education, the support of awareness raising initiatives and NGOs, but also awareness raising campaigns. The Dutch government launched an awareness campaign 'Hoezo 50kilo'[61] delivered by the Dutch Food Nutrition centre. However, the campaign did not lead to a reduction in consumer food waste until now (Soethoudt & Timmermans, 2013).

**INCREASE COLLABORATION BETWEEN SUPPLIERS/PRODUCERS AND RETAIL FOR CONSUMER FOOD WASTE REDUCTION**

In the chapter 5 the *collaboration between producers/suppliers* and retail was identified as important enabling factor to adjust products to consumer needs and introduce smart packaging. To alter e.g. portion sizes or packaging retail has to work together with the food supply chain upstream because these features are already determined in the production/manufacturing phase.

The Courtauld Commitment, mentioned earlier, is an example of how a voluntary agreement can increase the collaboration of the supply chain to reduce consumer food waste. Thus a voluntary agreement for cooperation is one option for the Dutch government to increase cooperation. However, to make the agreement work resources have to be invested

> *"in form of people and materials, which help signatories to meet the targets.[…] We will arrange information material from the consumer side, we will arrange information material that they can make use of"* [62].

Within the Dutch context a voluntary agreement of retail to reduce consumer food waste already exists, however the agreements focuses on general advices to reduce food waste, information provision on the meaning of expiration dates and innovative marketing tools (see Agreement in the Appendix). The Dutch government is currently providing expertise for retail project to conduct consumer food waste reduction through the Dutch Food and Nutrition Centre. The centre also developed material on packaging and food waste, which could be used for further agreements. As mentioned earlier, for

[61] The campaign 'Hoezo 50 kilo' ('Why 50 kilo') refers to the 50 kg food that is wasted by every citizen in the Netherlands. The campaign aims to reduce consumer food waste by providing tips and tricks to reduce food waste. The information is mainly provided in small video clips.
[62] Interview A. Parry (Project Manager WRAP), 2014

voluntary agreements to work, literature and experts stress the importance of the prospect for future regulation (Boons et al., 2011).

Other options identified from IE and food waste literature are the establishment of a communication platforms to facilitate a common understanding, objectives, and collective commitment (Mirata, 2004). In this context the experts C. Bucatariu (FAO) and A. Parry (WRAP) highlighted the role of governments to facilitate dialogue to overcome misunderstandings and to develop trust, which might be a time consuming process.

> *"Bringing together different actors need to take time to develop trust between all different actors that need to talk with each other. In the first meeting it might not be feasible to share the information that is needed. Or just be aware that actors are talking about different things and that they have different expectations."*[63]

A. Parry (WRAP) furthermore suggested starting up with non-sensitive topics to first build trust and start the communication. After trust has been established more sensitive topics can be addressed.

## 6.3 FINDINGS

Policy options have been identified from literature and expert interviews that enhance the drivers and overcome obstacles experienced by retail to engage in food waste reduction upstream the supply chain, downstream the food supply chain, and at the retail. The policy options have been identified separate for efforts upstream, downstream and at the retail due to their differences concerning drivers and obstacles.

Answering sub-question 3 of the research project, options were identified including legislative measures, economic incentives, and facilitating instruments summarized in Table 7.

**Table 7** Policy options identified to enhance drivers and overcome obstacles for retail to engage in efforts for food reduction upstream the supply chain (U), i.e. at the supplier and producer, at the retail (R), i.e. at the retail stores and distribution centres, and downstream the supply chain (D), i.e. at the consumer.

| **Policy options** | Target |
|---|---|
| **Information and knowledge provision** | |
| Information provision on retail's benefits to reduce upstream food waste | U |
| Providing expertise for food waste reduction upstream | U |
| Information provision on best practices of food waste reduction at retail | R |
| Information provision on reusing retail food waste | R |
| Research on causes of consumer food waste | D |
| Information provision on retailers' benefits from consumer food waste reduction | D |
| **Legislative measures** | |
| Legislation against risk shifts in the food supply chain | U |

[63] Interview C. Bucatariu (Policy Development Consultant for the Save Food Initiative, Agriculture and Consumer Protection Department at FAO), 2014

| | |
|---|---|
| Integrate food waste in school education | D, U |
| Regulative instruments for food waste disclosure | R |
| Loosen food safety regulation | R |
| Waste separation regulation | R |
| Exempt donors of food from the responsibility for the quality of donated food | R |
| Integrate food waste as criteria in public procurement | D |
| Labelling system for food waste of products | U |
| **Facilitation of communication** | |
| Create a network for demand and supply of retail food waste | R |
| Establish a communication platform for suppliers/producers and retail | D |
| **Awareness raising** | |
| Promote more holistic EMS, which take the entire supply chain into account | D |
| Raise awareness of stakeholder's responsibility on consumer food waste reduction in the food supply chain | D |
| Make references to initiatives and NGOS in public statements | U, D |
| **Voluntary agreements** | |
| Voluntary agreement to measure amounts of retail food waste | R |
| Voluntary agreement between industry and retail to reduce consumer food waste | D |
| **Economic incentive** | |
| Consumer awareness campaigns | D |
| Tax release for donated food to charity organizations | R |
| Increased taxes on biodegradable waste | R |
| Financial support of innovation to reuse food waste | R |
| Financial support for consumer awareness raising initiatives | U, D |

# 7 RESULTS

In the preceding part policy options were identified to enhance drivers and overcome obstacles for retail to reduce food waste upstream the supply chain, downstream the supply chain, and at the retail, including legislative measures, economic instruments, and facilitating measures. The Dutch government currently pursues a facilitating role to encourage retail to reduce food waste along the supply chain. In this context measures have been implemented, which are summarized in Table 8. The table includes only measures that were implemented until July 2014. The implanted measures cover partly the policy options identified in chapter 6.

This research project does not aim to recommend a specific path for the Dutch government to increase retail's efforts to reduce food waste. It provides options for the government to take a stronger role by implementing legislative measures and economic incentives, e.g. legislation on food waste separation, increased tax for food waste, integrate food waste in school education, etc. or to remain more in a facilitating role by focusing on information provision, research, and network brokerage.

**Table 8** Measures taken by the Dutch government to encourage food waste reduction and encourage retail and food industry to reduce food waste along the supply chain, information taken form 'Policy letter on Sustainable Food Production' (Dijksma, 2013), 'Policy agenda for Sustainable Food Systems' (Verburg, Cramer, & Koenders, 2009), and the webpage of the Dutch government on policy content for sustainable food production (Government of the Netherlands, 2014).

| **Measures for food waste reduction implemented by the Dutch government** |
|---|
| **Facilitating communication** |
| Finance No waste network: Provide information and instruments for companies to reduce food waste on their own, including measurements, whom to contact for advice, best practices and research, interactive character of the webpage |
| Introduction of Dutch Alliance for Sustainable Food: Brings together the different parties of the food supply chain to work on sustainable food system including the reduction of food waste among others |
| **Information and knowledge provision** |
| Finance the Dutch Food and Nutrition Centre, which provides help for the retail who want to engage in projects to reduce food waste at the consumer side |
| Research for the options to reuse food wastes that occurs at retail |
| Research on legislative and regulative barriers to reduce food waste in the food supply chain |
| Research on product categories for which the expiration date can be eliminated on EU level |
| Ministry of social affairs is clarifying issues of responsibility between retail and food banks concerning quality and food safety concerns |
| Research on options to alter the 2 hour hygiene rule (part of food safety regulation) to reduce food waste in the food supply chain |
| Promoting innovation in relation to food waste through the Small Business Innovation Research programme (SBIR) |
| Research to monitor food waste by Wageningen UR |
| Information provision about the use of expiration dates, clarifying the meaning of 'use-buy' and 'best-before' dates |

| **Financial support** |
|---|
| Green deals for small initiatives who engage in food waste reduction |
| Subsidies for food waste reduction projects with financial part contribution of applying party and condition to find cooperation partners for the project to enhance cooperation |
| Awards for food waste reduction (in the past) |
| **Awareness raising** |
| Awareness raising of food waste through the State-minister in public speeches |
| Why 50kg campaign: consumer awareness raising campaign by the Dutch Food and Nutrition Centre |

There is no information available about the potential impact of the different measures. It is not even possible to give priorities about a specific leverage points of retail in the supply chain, e.g. reuse food waste, or earlier timing of orders at suppliers, etc. that should be fostered because there is no quantitative data on different causes of food waste for the Netherlands. The only quantitative data available is by the Food Waste Monitor (Soethoudt & Timmermans, 2013) showing that 2/3 f the food waste is caused by the consumer and 1/3 by trade , service, and the government combined. Therefore, in order to set priorities for action to be taken research on the causes and quantities of food waste related to causes should be conducted. A first step in this respect has been made: Guidelines for food waste measurement have been published on EU level by the FUSIONS programme.

Nevertheless, to reach the target of 50% food waste reduction in the food supply chain by 2020 further measures should be taken soon. As 2/3 of the total food waste derives from consumers the government should set priority on actions that focus on the consumer part of the supply chain, i.e. encouraging retail to engage more in consumer food waste reduction, as long as further data is lacking.

In addition the previous parts show that it is important to take the entire supply chain into consideration when implementing measures because many measures demand addressing retail through other actors, e.g. costumer expectation, and to avoid waste shifts form one part of the supply chain into another.

# 8 CONCLUSION

In the preceding all sub-questions have been answered, and policy recommendations for the Dutch government were given. In this chapter a short summary of the research project will be given including the main findings and the implications that can be made for the Dutch government on its strategy for food waste reduction.

In the introduction of this report, the negative environmental, social, and economical impacts of food waste have been presented. The current focus and ambitions of the Dutch government were shown, i.e. the EU target of 50%food waste reduction by 2020, and the Dutch interim target of 20% by 2015. It was found that the Dutch government currently focuses on the consumer as the main source of food waste (2/3 of the food waste in the Netherlands). However recent reports showed that food waste did not decrease until now. Indicated by literature on food waste retail was identified as a powerful actor in the food supply chain, influencing food waste upstream the food supply chain, downstream the supply chain, and at the retail.

The observation that the current policy measures for food waste reduction did not lead to a decrease in food waste and the observation that retail plays an important role in food waste reduction from production to end-consumer was the motivation for the exploratory study on leverage points of retail to reduce food waste, on obstacles and drivers for retail to exert its influence, and on policy option to overcome obstacles and enhance drivers for retail's efforts on food waste reduction in the Dutch context

Using a grounded theory approach the leverage points for retail to reduce food waste were identified from literature on food waste. The identified options served then as basis to explore the obstacles and drivers for food waste reduction efforts using selected cases of Dutch retailers. The drivers and obstacles were identified in interviews with the retailers Albert Heijn, Retailer3, PLUS Rozenburg, Retailer3 and the CBL. For the identified drivers and obstacles policy options from literature and expert interviews were identified to encourage greater retail efforts to reduce food waste, from which policy recommendation for the Dutch government were derived.

In chapter 5 twelve variables have been identified to influence retailers' choice for efforts to reduce food waste. A model has been established showing the relation between variables and the options to reduce food waste in the supply chain. The most frequently identified variables by retailers and CBL (summed up) were *profitability, technology, firm policy, collaboration with supplier,* and *customer choices.* The importance of variables differed depending on whether options were addressed to reduce food

waste at the supplier/producer, at the consumer, or at the retail: Measured on the frequency with which the variables were mentioned for different options the main driver for upstream food waste reduction were *profitability, and societal awareness;* the most important obstacles are *profitability,* and *customer choices.* For food waste reduction at the retail *profitability* was the most important driver and obstacle. To reduce consumer food waste the most important drivers are *collaboration with supplier/producer* and *societal awareness* of food waste.

In chapter 6 policy options to enhance drivers and overcome obstacles were identified including legislative measures, economic instruments, and facilitating measures, providing options for a stronger role of the government or to further focus on a facilitating role.

The research objective, i.e. recommendations for the Dutch government on policy options to encourage retail's efforts to reduce food waste in the supply chain, does not intent to promote a specific policy strategy, but important elements that need to be included in any future policy were identified. These are:

**1. Research on the quantities of food waste and its causes**

In order to give concrete recommendations quantitative data was lacking to prioritize measures. Furthermore, this would also provide more convincing arguments for actors to engage in reduction of food waste.

**2. Focus on efforts to reduce consumer food waste**

The only available data on food waste in the Netherlands shows that consumers are responsible for 2/3 of the food waste in the Netherlands, trade, services and governments together for 1/3. Thus, as long as no other data is available on the quantities of food waste the highest reduction of food waste can be achieved by focusing on efforts of retail that reduce consumer food waste.

**3. Include the entire supply chain in policy considerations**

The results of chapter 5 showed that the cooperation between different parties is needed to achieve food waste reduction in all parts of the supply chain. Cooperation is needed because product features are often determined in the supply chain before the retail, and retail offers are dependent on consumer demand. In addition to avoid shifts of food waste form one part of the supply chain to another measures have to take the entire supply chain into consideration.

# 9 DISCUSSION

## 9.1 CONTRIBUTION OF THIS RESEARCH

This research project contributes to practical and theoretical considerations about food waste.

The theoretical contribution is based on the development of theory and the connection of food waste to existing theoretical concepts.

In the context of developing a theory on policy options to encourage food waste reduction efforts by retail, first, the research elucidated the position of retail as a powerful player in the reduction of food waste in the food supply chain, by creating hypotheses on retail's leverage points. Several literature sources of information have been linked, providing a comprehensive picture of the potential leverage points, allowing a deeper insight into the way the problem of food waste is integrated into the food supply chain and into the relations between different supply chain actors.

Second, the hypotheses on retail's leverage points were applied to the Dutch context, which revealed that some of the options were associated with different impacts, i.e. the unit of ordering was moved from options to reduce upstream food waste to options to reduce food waste at retail, and that some options were partly or completely beyond the influence of retailers. This allowed theory to be further matched with the Dutch context.

Third, variables have been identified, which influenced the decision of the retailers to use their leverage points to reduce food waste in the supply chain. A model has been developed on this base, which links the identified variables to the leverage points. The model gives insight into the complexity of the problem at hand and the influence of firm internal and external factors on organizational change, linking the topic of food waste to theories of Schein (1997), Newman (2000), (Baumgartner, 2009) etc.. Thus, contributing to the scientific debate on the application of the theories for different topics. The model also offers a theoretical base from which further investigation can be made in this field of research, bridging the current lack of theoretical considerations in this field of work.

Third, the research project identified policy options to overcome the identified obstacles and enhance the identified drivers. This contributes to literature on sustainable governance, i.e. how governments can pursue better sustainability efforts by organizations. Specifically the work contributes to the increasing literature on food waste policy currently emerging, by identifying the potential role governments can play to encourage retail efforts to reduce food waste in the supply chain.

The practical contribution of the research project lies in the identification of important variables to be address by future policy and allowing for a tailored policy approach.

First, the research objective identified the most important variables for retail's efforts to reduce food waste upstream, downstream and at the retail. The prioritization of variables helps to make policy more effective in their outcome.

Second, by identifying policy options to encourage retail's efforts for food waste reduction, the research project offers a very detailed view on policies for one player of the supply chain, which can contribute to more tailored policies in the Dutch context.

Third, the combination of expert interviews and literature on food waste and policy options for industrial ecology contributes to the identification of literature from other research fields that can be of use to find policy options to reduce food waste.

Lastly, the recommendations given offer a base for the evaluation of the current food waste policies implemented in the Netherlands to encourage retail to contribute to food waste reduction in the supply chain. The evaluation of the policy options identified was outside the scope of this research project. However, the options identified give an overview of potential solutions for the problem and can thus offer alternative options to which current policies can be compared.

## 9.2 VALIDITY AND RELIABILITY OF THE RESEARCH RESULTS

Reliability is understood as the extent to which the research can be replicated. Validity refers to the degree to which the data gathered truly measure reality.

As stated in section 2.1.2, a natural experiment as research design is always desirable (Gerring, 2004), but in case the researcher cannot manipulate the relevant behaviour, the research design has to be adapted to the circumstances. Due to the qualitative character of the research design of this project the validity and reliability of the research design should not be judged on the criteria that are established in the context of positivism but on criteria established in the interpretivism perspective (Weber, 2004). Positivism assumes that the researcher and the reality are separate, thus an objective reality exists. Interpretivism assumes that researcher and reality are inseparable, i.e. the world is constituted through a person's lived experiences. Therefore, reliability in the context of this research project should be judged upon the interpretive awareness of the researcher, i.e. the recognition of subjectivity and whether the researcher addresses the implications of this subjectivity. Validity cannot be judged upon whether the data truly measures reality but whether defensible knowledge claims are made (Ibid.).

Miles (1979) criticized qualitative research due to the lack of clear guidelines to analyse data, claiming a lack of validity. This potential point of critique was minimized in the

research design by using grounded theory approach, which offers clear guidelines on how to analyse the data gathered and which was explicitly designed to establish theories that are grounded in data of the real world (Corbin & Strauss, 1990).

All measures that were considered within the scope of the thesis and within the influence of the researcher have been taken to increase the robustness of the data, nevertheless several aspects should be taken into account:

1) A grounded theory approach was chosen, which requires the constant comparison of the findings with reality, i.e. a constant switch between analysis and data gathering, until category saturation has been reached, i.e. no new information can be found. For sub-question 1, category saturation had been reached. For sub-question 2, i.e. the identification of variables influencing retailers' efforts, due to the low number of cases used, i.e. retailers, it cannot be assumed that no new information would be gathered if more cases were included, thus category saturation can not be guaranteed.

2) The interviews were mainly conducted using one single appointment in which questions were asked. To ensure constant comparison, further questions that came up in the process of the research project were asked via mail. However, the fact that the interviews were conducted face to face and the later questions via mail can influence the extent to which obstacles identified later in the process were elaborated on by the interviewees. This poses a bias towards the interviews conducted later on in the research process because in the later interviews retailers were given the chance to answer the questions face to face.

3) Despite the constant comparison of findings with reality, the interpretation of phenomena as similar and the grouping of these phenomena as concepts and categories are partly influenced by the subjective choice of the researcher. This selection bias was diminished as far as possible by using semi-structured interviews, allowing for more detailed questions when the phenomena was not clear to the researcher.

4) The cases selected were chosen upon comparability. Nevertheless the cases selected were influenced by the willingness of individuals in retail organizations to give interviews and the contacts available through the snowballing method used for respondents. This indicates a bias in the selection of cases and of interviewees. Retail organizations differed in size and store locations, e.g. Albert Heijn has stores in urban as well as more rural areas whereas Retailer3 has only urban store locations. Furthermore, interviewees differed in the position they occupy in the retail organizations, e.g. storeowner or auditor. The different positions and store locations might have influenced the perceived obstacles and drivers. This selection bias could not be avoided due to the

lack of positive response by retail organizations on the request to conduct interviews on the topic.

5) Food waste is a very sensitive topic in the retail sector, which was stated by most of the interviewees. The sensitivity might have had an influence on the openness of interviewees to talk about the topic, reducing the reliability of the data gathered. In addition, the interviewees were given the option to correct the interview transcript, which can lead to information being removed ex post. From the retail organizations only the CBL used the option to correct the transcript. From the experts only the interviewees from the Dutch Food and Nutrition Centre and from the Dutch Alliance for Sustainable Food used the option to correct the interview transcript. Furthermore, during the interviews with retailers the interviewees talked very freely about the obstacles they faced in the reduction of food waste, the sensitivity of the topic was more prevalent when it came to the retailer being associated with food waste or revealing future projects on the topic of food waste.

6) Due to reasons that were beyond the influence of the researcher the logical sequence of the interviews, i.e. first retailers and then experts, could not always be ensured. This gives a bias to the variables that could be addressed with the experts.

7) The data sources for the literature research both for sub-question 1 and sub-question 3 are considered as having revealed robust data. Nevertheless, the leverage points of retail in the food supply chain were identified using literature also from outside the Netherlands. The retail market of other European countries were regarded as similar enough to draw information from for the Dutch context, however, very specific features of the Dutch retail market, e.g. the Dutch retail price war, might have been neglected due to the lack of literature on food waste for the Dutch retail sector. For the identification of policy options, literature on policy options for industrial ecology and food waste were used in a combination with expert interviews, increasing validity of the findings. Given the time frame of the research project it was not possible to include further literature, which biases the findings towards the assumptions made in the used literature streams. Further literature could have been used in order to increase the options identified.

## 9.3 LIMITATIONS OF THE RESEARCH RESULTS

The limitations of the research project embrace the generalizability of the findings and the extent to which the research questions were answered.

The research project consists of three parts; for each an individual sub-question was guiding. The first part was the identification of retail's leverage points on food waste in the food supply chain. Due to the use of a literature search for the identification of

influence, leverage points that are not already stated in literature were not included. Therefore, the list of potential action retail can conduct to reduce food waste might miss out on some options.

The second part was the identification of important obstacles and drivers for retail's food waste reduction efforts in the Netherlands. A model was developed that attempts to make the influencing variables more tangible. This might underrepresent the interrelatedness and complexity of the variables with each other, with other market forces and the context of increasing awareness of the topic.

Furthermore, the most important drivers and obstacles for food waste reduction upstream, downstream and at the retail were identified using the frequency with which a variable was identified as driver or as barrier within all the options for food waste reduction in this part of the supply chain. Using frequency does not take account of the perceived importance of the variables by the respondents. In addition, due to the qualitative character of the research project no statement can be made in terms of the importance of a variable in quantities of food waste avoided. Both, i.e. the lack of integration of perceived importance and food waste quantities avoided, limit the extent to which the results can give an answer to the research question on important obstacles and drivers prevalent.

The third part of the research project was the identification of policy options for the Dutch government to overcome the obstacles identified and to enhance the drivers identified. A number of policy options were identified, however, the potential effect of the policy options to enhance drivers and overcome obstacles could not be given due to lack of existing knowledge in the field of food waste policies and the very specific institutional context of each country, i.e. policies that work in one country do not necessarily have the same effect in another country.

The overall research objective was to give recommendations for the Dutch government. The lack of knowledge on the effectiveness of the identified options does not allow strong recommendations to be given. In addition, the general lack of quantitative data of food waste rendered the prioritization of specific policy options useless. Therefore, the recommendations for the Dutch government did not include the prioritization of a specific policy strategy but important aspects that should be included in future policies.

The generalizability of the findings is limited 1) by the exploratory character of the research design, which aims for a more in depth approach, 2) by the low number of cases researched, and 3) by the case selection based on comparability. Case selection on comparability has a general trade off concerning generalizability (Gerring, 2004). In

addition, the inclusion of more cases would have increased external validity, and is a task to be addressed in future research. As stated above, the low number of cases was due to the lack of positive response to interview requests by retail organizations.

Additionally, the choice for the Dutch retail sector as research unit restricts the generalizability of the findings for retail sectors in other countries. This is based on differences in contextual factors such as political, economic, socioeconomic context, costumers, suppliers etc.

## 9.4 IMPLICATIONS FOR FURTHER RESEARCH

As stated above the low number of retail organizations interviewed reduce the generalizability of the research findings. Nevertheless, the research provides a starting point for further research embracing a larger number of retail organizations, increasing validity and generalizability of the findings.

Further research will also be needed, in order for the policy options to be implemented in the Dutch context, the policy options identified need to be evaluated on their suitability for the Netherlands. This is an essential step before implementing policies because cities, regions, and countries differ in the existing institutional context in which new policy has to be integrated.

Moreover, further research is needed to evaluate the potential effectiveness of the policy options in terms of food waste reduction. The research clearly indicates the need for quantitative data on food waste and the need to relate retail's leverage points with quantities of food waste.

Furthermore, for some options of retail to reduce food waste in the food supply chain a lack of influence was identified in the interviews, i.e. ensure high quality recovery of food waste, adjust unit of ordering to reduce food waste, and reduction of expiration dates for commercial purposes. Further research needs to be conducted to investigate the actors responsible for these options and the policy options to foster efforts in this respect by the responsible actors.

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# Retail Agreement on Waste

9 Octobre 2012

**State of Play**

Waste is a major environmental problem and is still growing in importance. A fundamental cultural change in behaviour is vital to address the issue of waste and the other environmental challenges and pave the way to a resource efficient and sustainable economy and society.

Retailers are a large contributor to the EU economy. Despite the current economic crisis, retailers are committed to remain responsible actors, and are keen to play their part in addressing societal issues.

Natural resources are becoming scarce, and retailers fully agree on the need to preserve them. Retailers therefore increasingly see waste as a valuable resource in its own right and are taking steps to reuse materials wherever possible so as to reduce reliance on raw-material inputs.

Waste management, and especially waste prevention and reduction, is a core objective of most retailers. Many retailers have already set up waste prevention and reduction programmes with ambitious targets, which are furthermore regularly reviewed. They focus primarily on the way their companies operate. They continuously strive to reduce their waste in their operations with all the means at their disposal in the segments of the supply chain where they may have a direct control (logistics, product design, packaging, recycling etc.).

Retailers also often collaborate very closely with suppliers. They use their expertise to help their suppliers improve their production process so as to reduce the overall environmental footprint of their activities and the products they supply them with.

**Looking Ahead**

The challenges in the field of waste are collective. Waste represents a cost for the environment but also for society at large. Retailers are committed to play a role in the waste recovery chain and participate in the overall efforts of preventing and reducing waste further.

Despite being a minor direct contributor to waste, retailers are fully aware that many products which become waste are bought in their stores or on-line. On average every citizen living in the EU throws away around half a tonne of household rubbish every year.

For many products, the environmental impact of the waste generated is highest at the consumer level. Adapting and/or changing behaviour is essential to reduce it. Retailers are therefore committed to instigate, encourage and accompany consumers in their efforts to reduce the environmental footprint derived from waste. The retail sector is in a strategic position to do this. It wants to put its knowledge of consumers, its proximity to them and its extensive experience in communicating and informing them to raise awareness about waste issues.

With this agreement, retailers intend to further reach out to their customers and involve them in the cultural change needed to address the waste prevention and reduction issue, thereby contributing to paving the way to a resource efficient and sustainable economy and society.

**Commitment**

Measuring waste reduction at consumer level is very difficult in the absence of the involvement of other players, such as local authorities. This agreement will therefore focus on raising awareness. Each food retailer will carry out awareness raising initiatives on food waste and how households can reduce it. For non-food retailers, the awareness-raising initiatives will focus on their main product range e.g. textiles, EEE. Each company will decide on an individual basis, the exact scope of the initiatives.

As responsible retail companies, each signatory to this agreement commits to:

**For food retailers[1]:**

1. Carrying out, at least, two awareness raising initiatives on a global and/or national level by end of June 2014 on waste reduction.

These initiatives should focus on providing consumers with e.g.:

- general advice on how they can reduce the amount of food waste they generate e.g. how to handle, store and use food more efficiently
- information about the actual meaning of "use-by" and "best before" dates in collaboration with the Commission's information campaign
- innovative marketing tools: shopping lists for consumers, information on prevention, etc.

2. Progress will be measured on the basis of the number of initiatives, the number of people reached by these initiatives. The latter will be calculated according to the number of visitors to the website, and/or the number of footfall in the stores etc.

3. Signatories will report on their initiatives by providing the relevant documentation (links to website, photos, reports etc.)

**For non-food retailers:**

1. Carrying out at least two awareness-raising initiatives on a global or national level by end of June 2014 focusing on their main product range e.g. textiles, EEE.

These initiatives should focus on providing consumers with e.g. information on the various collection, reuse and recycling options available to consumers including any voluntary take-back and/or incentive for re-use, and the importance of correctly disposing of products.

2. Progress will be measured on the basis of the number of initiatives, the number of people reached by these initiatives. The latter will be calculated according to the number of flyers, and/or, the number of visitors to the website, and/or, the number of footfall in the stores etc.

3. Signatories will report on their initiatives by providing the relevant documentation (flyers, links to website, photos, reports etc.).

The REAP secretariat will collect the documentation of the signatories about the different initiatives and summarise them in a report published to coincide with the 2014 annual event. This report will be distributed to all retail associations for further dissemination.

Ahold · APED · ASDA · Auchan · colruytgroup · DELHAIZE GROUP · El Corte Inglés · EROSKI · euro coop · IKEA · Kaufland · LIDL · MARKS & SPENCER · MERCADONA · Mercator · METRO GROUP · REWE GROUP · SONAE · TESCO

[1] *Food waste at retail level is limited: approximately 5% of the total amount of food waste along the supply chain. This results from improved logistics and monitoring. For food still fit for consumption, retailers often collaborate with food banks. Retailers also reuse or recycle unsold products. For example, organic waste is often recycled by fermenting it or by processing it into methane gas.*