

Consumer food waste

Fact sheet

The Netherlands Nutrition Centre informs consumers about sustainable food choices. This includes information about preventing food waste. The total quantity of food waste in the Netherlands in 2015 was between 1.77 and 2.55 billion kg. Consumers are the biggest wasters with a share of 33%. It is therefore important to find solutions that are relevant to consumers to enable them to change their behaviour.

In the Netherlands, seven in ten people are willing to reduce their food waste. The arguments they give include the fact that it's simply unacceptable, that it's a waste of money and that it's not right because many people in the world are hungry. However, in reality consumers are faced with several obstacles in preventing food waste, including buying or preparing too much of a specific product and incorrect storage habits.

To combat food waste, it is important for consumers to change their behaviour in terms of buying, preparing and storing food. Simple solutions include making a shopping list, using a measuring cup or a scale to determine the right portions and knowing where and how to store specific products.

This fact sheet focuses on food waste by consumers. How much do they waste, why do they waste and how can they reduce waste?



Who is this factsheet for?

Worldwide, we throw away almost one third of the food produced for human consumption.⁶ In 2015, the total amount of food waste in the Netherlands was between 1.77 and 2.55 billion kilos.¹ This is the total amount wasted in the food supply chain, from the farmer via the shop or food service to the consumer. In the Netherlands, consumers are the biggest wasters with a share of 33%. This is followed by agriculture, the hotel and catering sector, the processing and storage sector, supermarkets and the food industry.² It is therefore important to find solutions that are relevant to consumers to enable them to change their behaviour. This fact sheet is useful for professionals and chain stakeholders involved in providing information and formulating strategy and policy to prevent consumer food waste.

What are the issues at stake?

How much do consumers waste? What is the environmental burden? And why are consumers wasting food?

How much food do consumers waste at home?

The Dutch consumer wastes around 41 kilos of solid food each year, which amounts to € 145 per person.^{3,4} Solid food includes semi liquid dairy products and oils, but does not include beverages. Of these 41 kilos, 30 kilos disappear via household waste, and an estimated 11 kilos via alternative routes (figure 1).

Definition of 'food waste'

We refer to food waste when food intended for human consumption is not used as such.¹

We make a distinction between avoidable and unavoidable food losses. Avoidable food losses are viewed as food waste, since this is edible food.² Unavoidable food losses include shells, peels, stalks, cheese rinds, egg shells, coffee grounds, tea residue, and meat and fish remains (bones).³

Some four kilos of the food we waste in the Netherlands is prepared, for example, cooked or fried. About five kilos remain untouched in the packaging or are unpeeled fruit and vegetables. In total, Dutch consumers waste about 13% of their solid food.³ There is little information about beverage waste. An estimated 51 litres of beverages disappear down the sink or toilet, including 31 litres of coffee and tea and 13 litres of dairy products.^{4,5}

Figure 2 shows the products that are wasted the most, based on a waste-sorting analysis of household waste and consumer surveys. Bread, semi liquid dairy products, vegetables, fruit and meat score highest among household waste. The wasted quantities measured in these studies have shown a downward, though insignificant, trend since 2010 and 2013.³

Figure 1
Waste comprises solid food in household waste, alternative flows and beverages^{3,5}

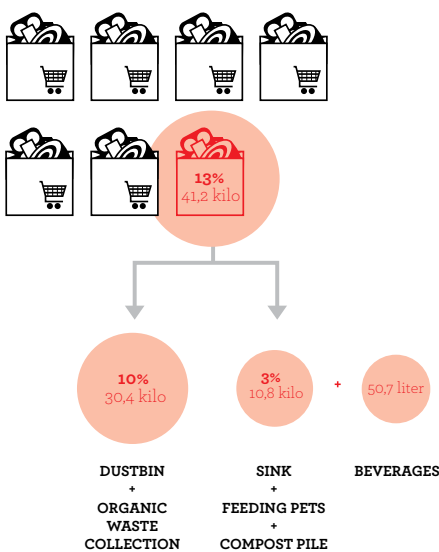
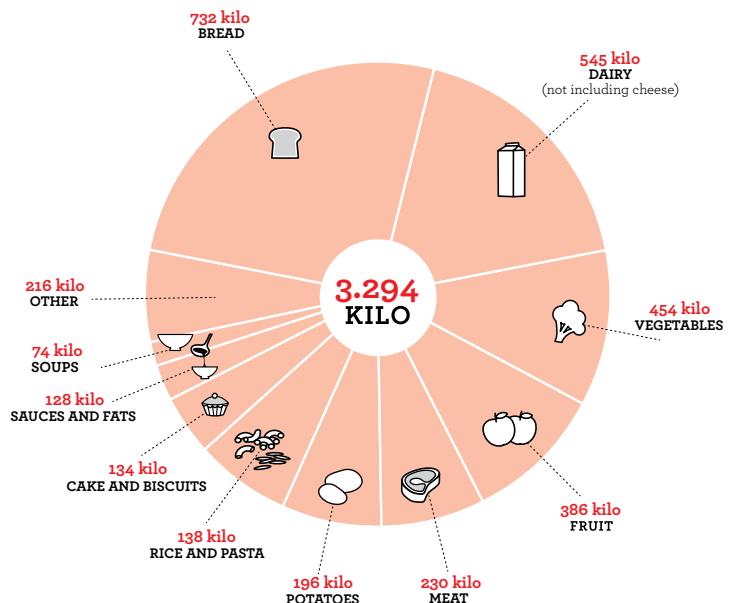


Figure 2
The ten most wasted products, excluding beverages (in kilograms during one person's lifetime)³



How does food waste affect the environment?

When food is thrown out further down the supply chain, it has a greater impact on the environment, as energy has already been consumed in processing, transport, packaging and preparation. The environmental burden of food production for consumption in the Netherlands is 229 ReCiPe points per person (land use, greenhouse gases and energy consumption combined), a burden that could be reduced by 14% if there was no waste.⁵ Worldwide, food waste costs about 500kg of CO₂ and 250km³ of water per year per person, as well as 28% of arable land.⁶ In particular, meat and cold cuts, milk and dairy products, vegetables and rice contribute to the environmental burden from foodwaste.⁵

Which consumer groups waste more?

As all groups waste substantial quantities of food, policy should be focused on all groups.

However, the groups that waste more than average are:

- Families with children, especially young children. Households with children under the age of four waste the most food.
- Young people, especially those younger than 25.
- Single-person households.

Other significant groups are:

- Wealthier people and working people also appear to waste more on average.^{7-10, 33}
- People with an above-average income waste almost twice as much food as people with a below-average income.
- Consumers who decide what to eat on a daily basis waste more food than those who plan what they are going to eat in advance.
- People who were already aware of their food wasting behaviour also waste less food.
- People who think about their ingredients (as carefully as they can), waste less food than those who do not.
- Households that often buy too much are also households where more food is wasted (15 to 30 kg more).³³

The reasons, and therefore the right approach for stimulating prevention, may be different for each group.

Arguments to avoid food waste

Consumers have several reasons for wasting food (see Table 1 on the next page). However, they also provide the following arguments for wanting to avoid food waste:

1. Throwing away food is just 'not right' or acceptable (67%)
2. It is more economical to use everything (61%)
3. There is a lot of hunger in the world (41%)
4. It is better for the environment, nature and landscape (31%)
5. It saves resources, which is good for the economy (17%)¹¹

Financial and social issues contribute to the reduction of food waste, or at least to the intention to waste less food.⁹ Reducing household costs partly results in buying better quality food.¹² Although most people realise that food waste affects the environment, almost half are not concerned about this issue.¹⁰

Factors influencing consumer behaviour

The main factors influencing behaviour with respect to food waste are:

- Awareness: Almost everyone knows that Dutch households throw away a lot (93%).⁷ Almost two-thirds of consumers are aware of the fact that they waste food themselves. This awareness is highest among women and the elderly, and they indicate a desire to do something about it.^{10, 12, 13} At the same time, consumers significantly underestimate their own behaviour in terms of food waste, and mainly blame the problems on other consumers.^{7, 9, 11, 14}
- Intention: 90% intend to reduce food waste.^{7, 11}
- Attitude: consumers find it important not to waste food. The generations born after World War II show less concern, although they agree that throwing away food is simply unacceptable.¹¹ Attitudes about food safety and food quality have a strong negative impact on wasteful behaviour.^{8, 9, 15} Rising affluence also plays an important role.¹⁶
- Self-efficacy: 80% of the public think they can contribute to reducing food waste. 77% are prepared to do something about food waste by buying and cooking specific quantities and using better storage techniques. Both have increased in the past few years.⁷
- Knowledge: one in every five consumers (often single people younger than 35 and families with young children) says they would like access to more information or advice. They say that there is a particular need for better information on food storage, correct amounts and expiry dates.^{7, 9, 17}
- Habits: previous attempts to prevent food waste and related habits are an important predictor of current food wasting behaviour and estimates of self-efficacy.^{9, 18}
- Involvement: when people are more involved, they are more willing to tackle food waste.^{8, 9, 17} Households that engage in recycling, composting and sorting waste, are more involved and waste less food.¹⁹

Most Dutch people are prepared to further reduce their food waste, but they face several obstacles, as shown in Table 1. Food waste is mainly caused by less-than-ideal buying, cooking and storage habits.²⁰ This means that everyday household management is a major factor.^{15, 21} An underlying problem is that food is relatively cheap, so there is little incentive to be economical or eat

Table 1: Matrix of the most important product groups, measures and tools, based on several studies.^{3, 7, 17, 18, 22}

			Most wasted foods ³											
			bread	dairy products	vegetables	fruit	meat	potatoes	sauces and fats	rice and pasta	cake and biscuits	leftovers		beverages
Reasons why consumers throw out food¹⁸			22%	17%	14%	12%	7%	6%	4%	4%	4%	1%		Possible solutions^{17, 22, 34}
Preparation	Prepared too much	27%			•		•	•	•	•		•		Preparing the right amounts (measuring cup, scales, apps)
	Used the wrong preparation method	1%			•		•	•	•	•		•		
Storage	Past best-before date*	30%	•	•	•					•			•	Flexibility regarding the best-before date (look, smell, taste)
			•	•	•		•					•	•	Freezing the product (containers, bags, stickers)
	Leftovers I will not use or eat at a later stage	28%	•	•	•		•	•	•	•			•	Creative food preparation (recipes, apps)
				•	•	•	•			•			•	•
	Used wrong storage method so product is spoiled	18%		•	•	•	•	•	•				•	Smart storage (storage indicator, packaging)
Buying	Too much of the product in packaging	10%	•	•	•	•	•						•	Portion sizes (smaller packages, special offers)
	Bought too many units of the product	5%	•	•	•	•	•	•	•				•	Buying the right amounts (shopping list, check household supplies)
Other	Did not have time to consume the product	20%	•	•	•	•	•	•	•				•	Do not keep so much in storage
	Did not consume the product as I didn't like it	10%	•	•	•	•	•	•	•				•	
	Made too much of the product (coffee or tea)	3%												•
	Poured out too much of a drink	2%												•

*"Forgot that I had the product at home"(32%), "I have hardly been home lately" (32%) and "I bought too many" (30%)¹¹

yesterday's leftovers.²¹ This results in wasteful storage habits, buying too many groceries and throwing out food sooner than necessary because its appearance has degraded.^{8, 15} After all, the main reason people give for throwing away food is no longer trusting the product safety (67%), regardless of what the expiry date says, based on the food's appearance, smell and/or taste.¹⁸ Most products that are dumped come out of the fridge.³

What science tells us

Most scientific studies focus on the volumes of food waste and the reasons people throw away food, but there have not been many studies into how this can be prevented and dealt with effectively. The Netherlands Nutrition Centre provides the public with advice, based on current scientific knowledge.

What is the best way to prevent food waste?

People wishing to reduce their food waste need a concrete action plan. Buying the right quantities, putting bread in the freezer, checking the pantry and fridge before shopping and preparing meals with products that are close to their expiry dates are the most logical ways for consumers to reduce food waste, but these simple strategies are still employed too infrequently.³⁴ Households that use products that are past their sell-by dates and do not throw out leftovers, manage to reduce food waste. They have also found that it is effective to plan meals, make shopping lists, weigh out the correct amounts and adopt proper storage habits.¹²

Table 1 gives the reasons for food waste and the solutions for reducing food waste. The possible solutions are further elaborated below. The 'Focus on the future' section discusses solutions that still need to be developed by the food supply chain.

1. Preparing the right amounts

The main reason people throw away food is because they prepare too much. More than half say they weigh or measure the ingredients as much as possible when preparing a meal, with 13% using a measuring jug or cup, such as the 'Eetmaatje' measuring cup for individual portions. People who do not use a measuring cup or jug do not know the right amounts (when cooking rice, for example), they just follow their instincts (e.g. when cooking pasta) or they simply cook the whole pack. Households that never measure how much they need to cook throw away more.^{7, 22}

Possible solution: providing the right information regarding quantities and measuring out quantities with a measuring cup or scales.

2. Flexibility regarding the best-before date

Confusion and lack of knowledge regarding the best-before and use-by dates are an important cause of food waste.²⁰ Sixty per cent of consumers now know the difference between the best-before and use-by dates. That is a 15% increase since 2011.^{7, 18}

The difference between the best-before and the use-by date

There are two types of expiry dates: the best-before date (THT in Dutch) and the use-by date (TGT). Products with an expired best-before date (quality guaranteed) can often still be consumed without people becoming ill. Products with an expired use-by date (safety) should be thrown out immediately as people may contract a food-borne disease if they consume the product.

People forgetting what they have in stock and frequently being away from home results in products passing the best-before date or spoiling.^{7, 9, 18} People who decide whether to consume a product based on appearance and smell tend to use products two days or more after the best-before date.²⁴

Consumers throw out food immediately after the best-before date has expired less frequently than was the case in 2011.⁷ According to the Netherlands Food and Consumer Product Safety Authority (NVWA), a range of products such as canned vegetables, coffee, tea, pasta, rice, sweets and syrup can be consumed after the best-before date without any problem.

Possible solution: be flexible regarding the best-before date. Explain the difference between the best-before and use-by dates and emphasise the importance of looking, smelling and tasting before you decide to throw out products past their best-before date.

3. Creative food preparation

The reason consumers throw out food after having prepared too much is that they consider the leftover portions too small for storage or they simply do not know what to do with their leftovers or partly used products⁹, such as dairy, vegetables, sauces and other ingredients. Consumers store all products with the intention of consuming them later, and only throw them out if they really feel the food can no longer be eaten. Two thirds of consumers sometimes throw out leftovers from the fridge.⁴

Possible solution: recipes and apps giving ideas for using leftovers. Plan your menu for the whole week.

4. Freezing and refrigerating at 4 °Celsius

Many people mention freezing or refrigeration as the most important measure to combat food waste (though cooking the correct quantities is more important).¹⁷ Freezing products will keep them for a very long time. Products suitable for freezing are bread, leftovers and meat. Plastic trays, bags and stickers are very useful in this respect. Refrigeration is important for products such as dairy, meat and vegetables. Storing products at a temperature of 4 °C extends or maintains their storage life. One in four households has set the fridge over 7 °C, and more than 75% over 4 °C. Half of the public checks the fridge temperature occasionally. One fifth knows that 4 °C is the best temperature for the fridge, but this number is growing.^{7,18} Households that consciously use a fridge thermometer set the fridge at the right temperature.

Possible solution: inform the public of proper freezing and refrigeration methods and the best places for storing food. A fridge thermometer can help keep the fridge at the right temperature. Proper storage advice on packaging is also helpful.

5. Smart storage

Storage methods play an important role. Many consumers think products should be removed from their packaging before storage, but that is not the case.²³

Possible solution: inform the public about correct storage methods. An important message to convey is that packaging helps keep the product fresh for a longer period, both at home and on the shop shelves.²³

6. Portion sizes

One in every five consumers purchases excessive quantities if a particular product is not available in smaller portions. Fifty-eight per cent indicate being able to buy the right-sized portions would help them to waste less food.²⁵ One in every four consumers throws out food regularly as the packaging is too large or non-resealable. Among young single people and double-income households, this is almost 40%.⁸ The numbers of one- and two-person households, and households maintained by the elderly, are growing substantially.²⁷

Possible solution: raise consumer awareness of smaller packages and of the risk of buying products on offer in bulk. However, with regard to packaging sizes, it is primarily up to the supermarkets and producers to make changes.

7. Buying the right amounts and reducing excessive storage

Around a quarter to a half of consumers say they buy too much food.^{9,18} They do this due to special offers, unavailability of the product in smaller packaging, inability to assess the right amounts or concern that they would have an insufficient quantity of the product at home.²⁵ Consumers who try to avoid buying excessive quantities of food throw out almost 15-30 kilos less than those who prefer to have too much than too little of a product. Around half of consumers are careful about not storing too much food.²² Consumers also mention that sometimes they simply do not have enough time to finish a product before it spoils, but this is also the result of storing too much in the first place. Making a shopping list and sticking to it helps reduce food waste²⁶, accounting for a reduction of around 4-13 kilos in waste per person per year. One in ten consumers never makes a shopping list, however 53% regularly do, mostly on paper.^{18, 22}

Possible solution: encourage consumers to buy the right sizes by making a shopping list, planning meals ahead and checking household stocks before shopping.



Special offers and consumer buying behaviour

Special offers, promotions and large portion sizes tempt consumers to buy more of the product than they require.²⁷ The more often consumers make unplanned purchases, the higher the levels of waste. This applies in particular to consumers with impulsive buying behaviours.²⁸ The main reasons for overbuying, however, are not the special offers, but rather changed plans, cooking for more people than will actually be present at the meal, trying out new products, or buying products for recipes or buying products for special occasions.^{26, 29}

Netherlands Nutrition Centre: tools and resources

- Website: www.voedingscentrum.nl/minderverspillen
- Storage guide (leaflet): www.voedingscentrum.nl/webshop
- The digital storage guide: www.voedingscentrum.nl/bewaarwijzer
- Useful recipes (including tips for what to do with opened products and weekly menus): www.voedingscentrum.nl/recepten
- The recipe app Slim Koken! (with easy recipes, help preparing the right amounts and smart storage): www.voedingscentrum.nl/receptenapp
- The Eetmaatje (a handy measuring cup specially designed for measuring out portions of pasta and rice): www.voedingscentrum.nl/eetmaatje
- The Fridge Tab (a tool that reminds you to use leftovers in the fridge): www.voedingscentrum.nl/minderverspillen
- The Fridge Thermometer (which allows you to see at a glance whether your fridge is cold enough): www.voedingscentrum.nl/koelkast
- The Yes-No Fridge Sticker (reminder for the storage space of 12 products): www.voedingscentrum.nl/koelkaststicker
- The Food Battle from Milieu Centraal and Wageningen University & Research (WUR) (a tool for individuals or groups to waste less in 3 weeks): www.foodbattle.nl



Focus on the future

Solving the complex food waste problem cannot happen overnight. In recent years, considerable effort has been put into raising awareness and knowledge, and several interventions have been implemented. Influencing behaviour will be a key part of further reducing food waste in the future. This will require resources such as internet solutions and smart shopping list apps with self-learning abilities. But it will also require technological innovations, such as stickers for fridges that change colour when the temperature is right or chips on packages that keep track of the shelf life.^{9, 13, 23}

Measures to combat food waste are more effective when consumers, producers, retailers and authorities work together. A good example is offering smaller sized portions and packages due to the increase in households with fewer people and the elderly. Some consumers are prepared to pay extra for smaller portions and do not consider the extra packaging a problem.²³ Better, smarter packages that are adapted to storage conditions offer a solution, especially for products with a short shelf life.²⁰ In addition, consumers would also benefit from clearer and bolder storage advice on packaging. Clarity and uniformity about the best-before date can also contribute to less food waste.³⁰

Finally, reduced prices for products close to their best-before dates would also be a great incentive to reduce food waste.¹³ A substantial reduction in food waste is a key condition for more sustainable food patterns.

Government objectives

Both the Ministry of Infrastructure and Water Management and the Ministry of Agriculture, Nature and Food Quality have included reducing food waste in their policies. One of the objectives of the UN Sustainable Development Goals (SDG 12.3) is halving food waste per person by consumers and supermarkets by 2030 compared to 2015. In order to reduce food waste at the level of consumption, the EU has joined as well. The Netherlands also endorse this objective.

In preparing this document the following experts were consulted:

Drs. S.A. (Sytske) de Waart, researcher at environmental educational organisation Milieu Centraal

Ir. A.J.M. (Toine) Timmermans, Programme manager sustainable food chains at Wageningen University & Research

Dr H.E.J. (Hilke) Bos-Brouwers, researcher at agricultural research service DLO, Wageningen University & Research

Y (Yuca) Waarts, MSc, Senior researcher of sustainable value chain development, Agricultural Economics Research Institute (LEI), Wageningen University & Research

Drs. G.A. (Trudy) Rood, Sustainable Development Sector, PBL Netherlands Environmental Assessment Agency

Dr I. E. (Ilona) de Hooge, Assistant Professor of Marketing and Consumer Behaviour, Wageningen University & Research

References:

1. Soethoudt, H., Vollebregt, M. and Van der Burgh, M., *Monitor Voedselverspilling; Update 2009-2014*, 2016, Wageningen UR.
2. Lipinski, B., et al., *Reducing Food Loss and Waste*, working paper, in *Creating a sustainable food future 2013*, World Resource Institute: Washington.
3. Van Dooren, C. (2016) *Oplegnotitie Voedselverspilling in Nederland in 2016*, p22, Voedingscentrum, Den Haag.
4. Milieu Centraal, *Brondocument Voedselverspilling, versie 4.12*, 2012, Utrecht.
5. Sevenster, M.N., H. Blonk, and S. van der Flier, *Milieuanalyses Voedsel en Voedselverliezen. Ten behoeve van prioritaire stromen ketengericht afvalbeleid*. 2010, CE Delft, Blonk Milieu Advies: Delft
6. FAO, *Food Wastage Footprint: Impacts on Natural Resources*, 2013, FAO: Rome.
7. Temminghoff, M.B.M. and N. Damen, *Voedselverspilling 1-meting*, 2013, GfK: Dongen.
8. WRAP, *Food Behaviour Consumer Research: Quantative Phase*, 2007, WRAP/ BrookLyndHurst: Banbury.
9. Janssen, E., et al., *Voedselverspilling in huishoudens; determinantenonderzoek*, 2010, Rescon research and consultancy: Amsterdam.
10. van Dooren, C. and F. Scheffers, *Consumentenbewustzijn rond voedselverspilling*. *Voeding Nu*, 2011 (5): p. 24-26.
11. Rood, T., M. van Gelder, and H. van Zeijts, *Nederlanders en duurzaam voedsel. Enquête over motieven voor verduurzaming van het voedselsysteem en consumptiegedrag*, 2014, Planbureau voor de Leefomgeving: Den Haag.
12. Qusteded, T. and P. Luzecka, *Household Food and Drink Waste: A people focus*, 2014, WRAP: Banbury, UK.
13. RLI, *Doen en laten; Effectiever milieubeleid door mensenkennis*, 2014, Raad voor de leefomgeving en infrastructuur: Den Haag.
14. Eurobarometer, *Attitudes of Europeans towards resource efficiency; Analytical report*, 2011, The Gallup Organization: Hungary.
15. LNV Consumentenplatform - *Voedselverliezen, verspilde moeite?*, 2006, Ministerie LNV: Den Haag.
16. Bos-Brouwers, H., et al., *Reductie milieudruk voedsel. Met nadruk op voedselverspilling door huishoudens*, 2011, Wageningen Universiteit.: Wageningen.
17. Vermeir, I. and W. Verbeke, *Sustainable food consumption: exploring the consumer "attitude – behavioural intention" gap*. *Journal of Agricultural and Environmental Ethics* 2006(19): p. 169-194.
18. Temminghoff, M.B.M. and G. van Helden, *Voedselverspilling, meting 2017*, 2017, GfK: Dongen.
19. WRAP, *The Food We Waste*, G. van Helden, *Food Waste Report vs2*, 2008, Waste & Resources Action Programme: London.
20. HLPE, *Food losses and waste in the context of sustainable food systems*, 2014, High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security: Rome.
21. Bogerd, M.v.d., *Verspilling van voeding, Vooronderzoek naar de achtergronden van het consumentengedrag*, 2001, Universiteit Leiden, Vakgroep Sociale en Organisationspsychologie: Leiden.
22. Steenhuisen, F. (2017), *Bepaling voedselverliezen bij huishoudens in Nederland*, 2017, CREM Waste Management Amsterdam.
23. Plumb, A., P. Downing, and A. Parry, *Consumer Attitudes to Food Waste and Food Packaging 2013*, WRAP/ Icaro Consultants: Berbury, UK.
24. WRAP, *Research into consumer behaviour in relation to food dates and portion sizes*, 2007, WRAP/ BrookLyndHurst: Banbury.
25. Consumentenbond, *Weggegooid voedsel én geld. Consumentengids*, 2011. nr. 7/8 (juli/augustus 2011): p. 101-103.
26. Segers, M., *Onderzoeksrapport Aankoopgedrag en Voedselverspilling*, 2012, Voedingscentrum: Den Haag.
27. van Dooren, C. and V. Klostermann, *Supermarkt laat kansen liggen; Ouderen, vrouwen en kleine huishoudens vaker ontevreden over portiegrootte*. *VMT*, 2013. Nr.16/17 9 augustus: p. 26-26.
28. Kan, J.d., *Verdwijnen etenswaren die in aanbieding gekocht waren zomaar in de vuilnisbak? Een onderzoek naar inkoopgerelateerd gedrag, aanbiedingen, neiging tot impulsief aankoopgedrag en verspildgedrag*, 2012, Voedingscentrum: Den Haag.
29. Wansink, B., *Abandoned Products and Consumer Waste: How Did That Get into the Pantry?* *Choices*, 2001(October): p. 46.
30. Newsome, R., et al., *Applications and Perceptions of Date Labeling of Food*. *Comprehensive Reviews in Food Science and Food Safety*, 2014. 13(4): p. 745-769.
31. Voedingscentrum, *Consumentenonderzoek koelkastthermometer*, 2002.
32. Manuel Kaal, Sabine Hooijmans & Iris Houtepen (14 February 2017), *Voedselverspilling in Nederland op basis van zelfrapportage*, Kantar Public, Amsterdam.
33. Frits Steenhuisen (March 2017), *Bepaling voedselverspilling in huishoudelijk afval Nederland 2016*, CREM Waste Management, Amsterdam

Authors: dr. ir. Corné van Dooren en Frédérique Mensink, Msc.

Juli 2018