

Food waste avoidance initiatives in Danish food retail

COSUS WP6.2 Report

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Executive summary

Food waste has gained increasing attention in the past years. According to FAO (Food and Agriculture Organization of the United Nations), approximately a third of all food is lost or wasted in the agriculture and food supply chain. Given the environmental resource inefficiency of this issue, the social injustice and the lost economic revenue, tackling food waste is regarded as a question of improving food chain sustainability.

In developed countries, with approximately 40% of the food wasted, consumer households cause the majority of food waste. It has been estimated that 10-30% of consumers food purchase ends as waste. However, consumer perceptions and behaviours are influenced by a complex interaction of factors in their immediate surrounding and their macro-environment. Retailers as the actor at the consumer-supply chain interface play a crucial role in tackling food waste avoidance.

In Denmark, retailers have given a great focus to food waste avoidance initiatives in the past decade and by now, most retailers in the market appear to communicate or conduct at least some initiatives. This favourable development has amongst others been fuelled by a very active NGO Stop Spild af Mad, the retailers interest and their drive to engage in sustainability-related initiatives as well as support by policy makers and research, and also by consumers favourably reacting to the initiatives.

In this situation, a need arises to take stock of and understand which retailer engages in which type of initiatives. This is in order to identify which initiatives are specifically common and established, which initiatives are implemented differently, raising questions as to the most effective or targeted approach, and which initiatives appear to hold greatest challenges. Knowing this allows identification of further, targeted research questions, and the best way forward for retailers and food market stakeholders in further developing food waste avoidance initiatives.

We researched current food retailer initiatives against food waste in Denmark in April to June 2016 based on two sources: firstly, analysing secondary data in the form of retailer's communicated action via corporate websites of retailers, associated supermarket chains and media data and reports, and secondly, analysing primary data in the form of store-checks including observations and short employee interviews. Seven retail groups were researched and 18 stores visited in the cities of Aarhus and Copenhagen. Initiatives were categorised as five types of initiatives, relating to price, product type, product unit, communication, and collaborations with other actors. We differentiated between the food categories of fruit and vegetable, bread, dairy, meat and seafood, cold cuts and sausages, fresh convenience food, and others.

We find that on the website and in reports, retailers commonly describe their price initiatives, communicate and inform about the food waste issue and suggested initiatives against it, and describe their collaboration-related initiatives and donations. In-store, the most commonly found initiatives are price-related initiatives and product unit initiatives such as weighing of fruit and vegetable or offering smaller units.

Results show that all supermarkets of the groups analysed are selling suboptimal food (close to the expiration date or visually or sensory sub-optimal) at lower prices. These foods are typically placed side-by-side with the normal-priced items, but also in designated areas. Most of the retail groups engage in some form of initiatives or collaboration with other actors in order to reduce food waste in the supply chain. Product type initiatives are still rare or in the development phase (e.g. packaging innovations designed to reduce food waste, products re-using foods or by-products otherwise wasted).

Retailers differ in the issue of multi-item price offers, with some having abolished them as an action against food waste (e.g. Rema1000 and Lidl), while others are commonly using this pricing

mechanism (e.g. Irma, Meny, Løvbjerg). Retailers also differ in the extent to which they communicate the issue of food waste publicly, especially at the point of sale (e.g. Rema1000 and certain chains of Coop and Dansk Supermarked). These differences become apparent in terms of posters and flyers in the store but specifically on the stickers used to indicate suboptimal food at reduced prices. The extent to which weighing of certain fruit and vegetable is offered differs across the supermarket chains. Also, while all supermarkets offer suboptimal food at reduced prices and highlight these items with stickers, the approach to it differs in terms of the colour (yellow, red, or other) and shape (circle or price tag format) of the stickers, the extent of the price reduction, whether or not the current price or the percentage reduction is communicated and whether the original price is mentioned as reference. It also differs in whether or not the retailer brand is mentioned on the sticker, the text on the sticker (communicating the economic incentive, or an ethical argument of food waste reduction, or both), and how the act of reducing suboptimal foods is organised and managed in store.

Results also show that the groups of Coop and Reitan communicate the greatest number and breadth of initiatives when inspecting websites and reports, while Dansk Supermarked, Coop, and Reitan are found having implemented the most initiatives when visiting their stores (in the sequence that they are listed). Rema1000 stands out with a clear point of sale presence of the food waste communication and being known for specific initiatives (especially the abolishment of multi-item offers and offering smaller packaging units), while Coop and Dansk Supermarked appear to engage in the greatest breadth and number of initiatives, including developing Apps, product innovations and re-use, and collaborations in the supply chain. In terms of pricing, Lidl stands out with allowing customers to pick up the price promoted item in a subsequent week ('forlæng dit tilbud'), while the supermarket chain Føtex is among a few supermarkets offering most transparent information, with appearing to homogenously offering a 50% price reduction and communicating original and current price.

We conclude that Danish food retail indeed has broadly adopted food waste avoidance initiatives and that engaging in some form has become a kind of 'industry-standard'. Price reduction of suboptimal items is the norm, collaboration with other actors on this issue widespread, and a number of retailers also engage in various further initiatives. The action apparently posing most challenges is the development of new product types, where a few examples are found so far. For some issues, retailers employ contrasting approaches, most notably the abolishment or use of multi-item price offers. This shows that there is also disagreement in terms of the best approaches to tackle food waste, or that retailers decided differing initiatives had been the best approach for their customer base.

Results suggest that greater research is needed in identifying the most effective and best customer-targeted approaches for in-store management and presentation of suboptimal foods offered at reduced prices. It also appears useful to analyse more in-depth whether initiatives approached differently by retailers are indeed employed most effectively for the customers of the specific store, for example with regard to multi-item offers or the extent of in-store communication of the food waste issue and using an economic versus an ethical argument. Further, more efforts might be needed to support and establish new product types and innovations that allow food waste reduction in the supply chain.



COnsumers in a **SUS**tainable food supply chain:
understanding barriers and facilitators for acceptance of suboptimal foods

The study on food waste avoidance initiatives in Danish food retail is part of the COSUS project, a European collaboration project with researchers from five countries such as Norway, Sweden, Denmark, the Netherlands and Germany. COSUS runs from June 2014 to May 2017 and is a SUSFOOD ERA-net research project that stands for 'consumers in a sustainable food supply chain: understanding: barriers and facilitators for acceptance of visually suboptimal foods (SUSFOOD). This study is funded by Styrelsen for Forskning og Innovation, (Dasti - Danish Agency for Science, Technology and Innovation) Denmark.

I. Background – food retail landscape in Denmark

Food waste has received increasing attention in the past years. Food waste occurs at all levels of the food supply chain from those who produce foods to those who make foods available for consumption and ultimately consumers in households. Recent studies have shown that in the European Union around 88 million tonnes of food are wasted annually (Stenmarck, 2016). In Denmark around 700000 tonnes of food, which could be eaten, are wasted in 2012 (Miljøstyrelsen, 2015). Around 260.000 tonnes of food waste occurs in households and 227.000 tonnes of waste occurs in services, including 163.000 tonnes in retail, 29.000 tonnes in hotels and restaurants, and 31.000 tonnes in institutions and large kitchens (Miljøstyrelsen, 2015). Food waste from primary production amounts to 100.000 tonnes per year while the food industry accounts for an annual food waste to 133.000 tonnes (Miljøstyrelsen, 2015).

All actors in the food supply chain have a role to play in preventing and reducing food waste in Denmark. Especially, retailers are in a unique position to contribute to food waste reduction, not only by reducing the amount of food that is wasted in their stores and distribution networks but also by influencing consumer perception and behaviour (Halloran et al., 2014), both in the household as well as at the point of purchase (Aschemann-Witzel et al., 2015). Yet, it is unclear which food avoidance initiatives are conducted to greater or lesser extent by supermarket chains and how these initiatives vary across different food categories. The report thus addresses this issue and explores the extent to which food waste avoidance initiatives are communicated, applied, and implemented for different categories in Danish food retail market.

Danish retail food market is characterised by high market concentration among retailers. According to Dansk Handelsblad (2016), the three dominant retail groups have a combined market share of 82.7 per cent in 2015 (see Table A). They are Coop, Dansk Supermarked, and Dagrofa. Foreign retailers such as Aldi and Lidl play only a limited role on the Danish market having a market share of 5.7 per cent in 2015 (Dansk Handelsblad, 2016).

Table A: Structure of Danish food retail market in 2015

Name	Number of stores	% of retail market
Aldi/Lidl	320	5.7
Aldi	222	3.1
Lidl	98	2.6
Coop	1172	37.1
Dagli'Brugsen	301	4.4
Fakta	433	9.3
Irma	81	2.1
Kvickly	79	8.4
LokalBrugsen	50	0.5
SuperBrugsen	225	12.3
Coop Danmark ejede brugser	272	13.0
Selvstændige brugser	386	12.8
Dagrofa	596	13.2
Kiwi	103	2.1
Meny	119	6.3

Spar	122	2.6
Min Købmand	194	1.8
ABC Lavpris	13	0.8
Dansk Supermarked	576	32.4
Bilka	17	5.0
Føtex	95	11.7
Netto	452	14.6
Salling	2	0.2
Løvbjerg	15	0.9
Løvbjerg	15	0.9
Reitan	270	9.7
Rema 1000	270	9.7

Source: Dansk Handelsblad, 2016

Retailers operate a number of different retail formats such as discount, supermarket, and hypermarket.

Table B: Retail formats in Danish food retail market

	Share %	Total
Hypermarkets	17.2	99
Big supermarkets	25.9	367
Small supermarkets	12.5	489
Minimarkets	5.1	385
Discount stores	39.4	1588
Total	100	2928

Source: Dansk Handelsblad, 2016

As presented in Table B, discount stores are dominating the Danish retail market. Big supermarkets are popular formats operated by Danish retailers followed by hypermarkets, small supermarkets, and minimarkets.

II. Methodology

To shed light on food waste avoidance initiatives conducted by individual retailers in Denmark, the study utilised both secondary and primary data. The secondary data was collected from seven retail groups in Denmark such as Aldi, Coop, Dagrofa, Dansk Supermarked, Lidl, Løvberg, and Reitan. The secondary data material included both corporate data such as information found on corporate websites of retailers and associated supermarket chains and media data. The primary data was collected to identify initiatives implemented in the physical stores of individual supermarket chains. Observational data from store visits was complemented with short unstructured interviews with employees met randomly in the store. They were asked a few predefined questions about suboptimal foods¹, price reductions on suboptimal food items and different initiatives that were present in the store. In total, 18 stores were visited within a month in a period between the 22nd of May and the 20th of June 2016. Five out of these stores were visited twice in order to detect any differences in terms of how and when initiatives are executed in the stores with regard to a day of the week and time of the day. A store visit typically took from 15 minutes to nearly an hour. A template with observational points and questions for a store visit and conversation with an employee was used and photos were taken during the store visit.

As a limitation, it has to be underlined that the results of the secondary data analysis are based on the author's joint understanding and interpretation of the food waste avoidance actions described in the material, and that misinterpretations might have occurred. Also, it is possible that the actual retailer actions conducted are different or of a greater scope than described in the material. For the description of the supermarket strategy and basic characteristics, the supermarket chain's self-description has been used. For the primary data gathered, it has to be cautioned that the data has been gathered in stores of the two largest cities and only within a certain time frame, and that the small number of stores visited only provides a snapshot of what the analysed retailers are enacting in their stores. It is possible that the visit of other stores might have lead to other observations. However, despite these limitations that have to be taken into account when interpreting the findings, both secondary and primary data provide an overview of the current state and enactment of food waste avoidance actions.

¹ "Foods that consumers perceive as relatively undesirable as compared to otherwise similar foods because they either: (1) are close to, at or beyond the best-before date; or (2) deviate (visually or in other sensory perception) from what is regarded as optimal (usually equal to what is perceived as "normal")" (Aschemann-Witzel et al 2015, p. 6458-9).

III. Food waste avoidance initiatives by Danish food retail groups – results based on secondary data

A variety of food waste avoidance initiatives have been identified in Danish food retail based on the collation and analysis of the secondary data material, including both internal data e.g. corporate websites and CSR reports and media data. These initiatives are mapped in Table 1 illustrating the extent to which individual Danish retail groups put emphasis on them.

Table 1: Food waste avoidance initiatives by Danish food retail groups

Initiative type	Initiative name	Aldi	Lidl	Coop	Dagrofa	Dansk Supermarked	Løvbjerg	Reitan Group
Product-related	Development of products otherwise wasted in the supply chain (e.g. bended carrots)							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to expiry							
	Abolishment of multi-item offers							
	Implementation of a special offer concept 'Forlæng dit tilbud' (Extend your offer)							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate about the topic of food waste avoidance, food storage, etc.							
	Promotion campaign for suboptimal foods							
Collaboration and expansion	Collaboration with NGOs or other organisations							
	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to expiration date for new applications							
Instore-related	Implementation of technology to improve storage facilities							
	Day-to-day order-planning based on customer demand							

Legend Food waste avoidance initiatives identified in secondary data sources

I. ALDI

Aldi Nord is one of the leading trading companies in Europe being represented in nine countries. Aldi Denmark is part of Aldi Nord Group. Aldi discount stores operate in Denmark since 1977. There are about 222 stores in Denmark (Dansk Handelsblad, 2016). Aldi assortment includes a careful

selection of items for the best price and quality. Twice a week they present actual offers to their customers.

1. Collaboration and expansion initiative: Food donation to Perron 4 shelter

Description of Initiative: Aldi takes part in the collaboration initiative with Perron 4 shelter to donate food to vulnerable citizens. Aldi's central warehouse in Haverslev provides Perron 4 shelter centre in Randers with about 100 kg of excess groceries and vegetables weekly (Nygaard Larsen, 2016).

Effect of initiative: Both actors were pleased with collaboration. According to Director of Aldi Haverslev, with this initiative they ensured that a large amount of raw materials were not wasted, but would benefit others. According to Department leader of Perron4, it was a huge success, providing aid to citizens who really needed it (Nygaard Larsen, 2016).

Time period: 02.2016

II. COOP

Coop Danmark A/S is the second largest retail group with 1200 stores and 36.000 employees in Denmark. Coop operates the retail chains Kvickly, SuperBrugsen, Dagli'Brugsen, LokalBrugsen and the subsidiaries Fakta A/S and Irma A/S. Coop is cooperative, owned by 1.4 million members (Coop, 2016)¹. Coop puts special efforts on environmental issues and organic products in stores.

Kvickly opened its first store in 1961 in Aalborg. Today there are 79 Kvickly stores across Denmark (Dansk Handelsblad, 2016). They are one of Denmark's leading consumer goods companies when it comes to ecology (Coop, 2016)².

SuperBrugsen have 225 stores in Denmark (Dansk Handelsblad, 2016). In stores the focus is on quality food, butcher, fruit and vegetables, wine, ecology and organic food products, and a good customer service (Coop, 2016)³.

Dagli'Brugsen and **LokalBrugsen** have 351 stores in Denmark (Dansk Handelsblad, 2016). Stores are open 7 days a week, so they meet the customer's need for groceries to everyday life (Coop, 2016)⁴.

Fakta A/S is a discount chain with 433 stores across Denmark (Dansk Handelsblad, 2016). These stores offer a selection of fresh meat, fruits and vegetables and convenience items such as pre-cut vegetables or salads that make it easy customers to make healthy food every day. Some stores even have bake-off (Coop, 2016)⁵.

Irma A/S operates since 1886. Stores offer a wide range of quality goods and inspiring specialties, which are the cornerstone of Irma's concept (Coop, 2016)⁶. There are 81 stores in Denmark (Dansk Handelsblad, 2016).

Coop Group is the first retail group in Denmark who has announced an official target how they will reduce its food waste. In partnership with the NGO Stop Wasting Food Movement ('Stop Spild af Mad' Coop prepared Madspildsmanifest (food waste manifesto) in 2013 (Coop, 2013). Coop has set an objective that the Group will reduce its food waste by 10% in 2013 and 2014. The Group has launched a number of initiatives and projects in five chains Kvickly, Super, Dagli'Brugsen, Irma and Fakta (Coop, 2016)⁷. As a result, in the period of January and September 2014, Coop has reduced food waste by 9.8% in their stores compared to the same period of 2012. They have also thrown out almost 500,000 million fewer packages of bread and nearly 250,000 fewer packages of meat. The results are due to the fact that all stores make goods cheaper for sale when they close to expiration date (Coop, 2014). They continue to improve their food waste related efforts every day in all the stores.

1. Collaboration and expansion initiative: Collaboration with NGO and other organisations

Food donation to National Association for Vulnerable ('Landsorganisationen for Udsatte (LOFU))

Description of Initiative: Coop has donated food surplus to Landsorganisationen for Udsatte (LOFU) (LOFU, 2016). The food surplus from Coop at Copenhagen Food Fair that should have been thrown out was collected by LOFU volunteers and distributed to vulnerable citizens in Vordingborg. The purpose was to stop food waste and help vulnerable citizens.

Effect of Initiative: Food was donated to 11 families and several shelters.

Time period: 04.2016

Cooperation with Environmental Logistics A/S to convert organic waste to biogas

Description of Initiative: Coop has made a partnership with Environmental Logistics A/S that ensures that all organic waste, including discarded food is converted into biogas instead of being driven to combustion (Coop, 2016)⁸. 1,200 Coop stores are part of the scheme by the end of 2015.

Effect of Initiative: It is the first national collection concept of organic waste saving the environment from 10,000 tonnes of CO₂ per year and using biogas to heat 5,700 households.

Cooperation with Food Bank ('fødevareBanken')

Description of Initiative: Irma.dk cooperates with Food Bank ('fødevareBanken') which distributes surplus food to vulnerable citizens (Coop, 2016)⁸. Foodbank purpose is twofold: to work against the large food waste and help socially vulnerable people. The food surplus that was previously thrown out directly into containers is now delivered to homeless, children in crisis and other vulnerable citizens.

2. Collaboration and expansion initiative: Reuse of food items close to expiration date for new applications

Description of Initiative: Irma reuses food items close to expiration date for new applications. They make rye bread into bread chips once a week instead of throwing the bread out (Coop, 2016)⁸.

3. Communication initiative: Communication about the topic of food waste outside the Point of Sale

Description of Initiative: Coop increases awareness to reduce food waste through lectures (Coop, 2016)⁸, campaigns (Coop, 2016)⁹, member activities (Coop, 2016)⁸, tips and recommendations, membership magazines ('samvirke') (Mejdahl et al. 2011) and brochures (Coop, 2016)¹⁰. Coop has created a brochure 'Klima på menuen' about the connection between food and climate impact. The brochure has been prepared together with the Information Centre for Environment and Health ('Informationscenter for miljø & sundhed') in the context of the climate campaign in 2008 (Coop, 2016)¹⁰. Besides, Coop has formulated 10 climate-friendly tips and recommendations. The following sixth tip is related to food waste - 'Tilbered ikke mere mad, end du skal bruge - og undgå madspild' ('Do not cook more food than you need - and avoid food waste') (Coop, 2016)¹¹.

4. Communication initiative: Promotion campaign for suboptimal foods

Description of Initiative: A special campaign was organised by Coop where a debate on food waste took place and free 6000 bananas given in front of SuperBrugsen in Allinge on the 14th of June in 2013 (Coop, 2016)⁹. Those were corresponding to an amount of single bananas being thrown out every day of the year in stores of the Coop Group. Often customers break bananas from a bunch of bananas and leave single ones behind, although they are as good as others.

Time period: 06.2013

5. Communication initiative: Development of digital application to communicate the topic of food waste avoidance

Description of Initiative: Coop has developed an application (app), specialized program downloaded onto mobile devices to communicate the topic of food waste avoidance. The app contains tips on how to store more than 600 raw materials, so they end up on the dinner table and not in the trash as well as recipes associated with each food item as inspiration to get used everything that is in the fridge (Coop, 2016)⁸. The user of the app can also get useful tips for how to use food leftovers.

6. Price-related initiative: Abolishment of multi-item offers

Description of Initiative: Fakta has eliminated all multi-item offers (Coop, 2016)⁸.

7. Price-related initiative: Reduction on food items close to expiration date

Description of Initiative: Coop reduces prices on food items with a close expiration date in their stores (Coop, 2016)⁸. Kvickly puts a red label 'Køb i dag, spis i dag. Gør en forskel' (Buy today, eat today. Make a difference) on food items close to expiration date which should be eaten soon, with the price significantly reduced (Kvickly, 2016)¹. Since the end of 2011 Irma has used a 'Dato service' label that indicates that products are new expiration and are reduced in prices because of the shorter residual durability. As a result, in 2012, Irma reduced food waste with 295,000 products that correspond to 3,500,000 DKK compared to 2011 (Irma, 2016)¹.

8. Product-related initiative: Development of packaging to reduce food waste

Description of Initiative: Coop cooperates with Danish Technological Institute ('Teknologisk Institut') and other partners to develop packaging that reduces food waste (Coop, 2016)⁸.

9. Product-related initiative: Development of products otherwise wasted in the supply chain

Description of Initiative: Kvickly sell bended carrots which look slightly different and would otherwise have been thrown out (Coop, 2016)⁷. Customers can find bags with 'bended carrots' in Kvickly stores across the country. Coop has chosen to take the carrots that are slightly different in shape or size of the assortment as a way to help reduce the waste of carrots at the farmers.

Time period: 2013 - ongoing

10. Unit-related initiative: Selection of food items in packages that contain several separate units

Description of Initiative: Kvickly sells fruit and vegetables in bulk (Coop, 2016)⁸.

1. Unit-related initiative: Selection of food items in small packages

Description of Initiative: Fakta launched 'Dinner for One' ('Middag for en'), selection of meat in smaller packages that consists of 8 different kinds of meat, from chicken filet to chopped beef steaks (Coop, 2016)¹². The price of 15 DKK is the same for all variants. It is a possibility for customers to buy meat in smaller package size. Fakta will still have meat in larger packages for customers who need it.

Effect of initiative: Smaller portion size of meat products are available those customers who live in household consisting of one person.

Time period: 2015 – ongoing.

III. DAGROFA

Dagrofa Group operates in the business areas retail, wholesale and food service. The retailer operates the chains Kiwi, Meny, Spar, Min Købmand, and Let-Køb.

Kiwi as a discount chain was established in 2008 in Denmark and has 103 discount stores (Dansk Handelsblad, 2016). Kiwi has a clear vision to become Danish favourite discount store in the local areas. Besides long hours, guaranteed quality on fruits and vegetables and a wide discount range with many brands. This chain is offering special benefits to its customers (Dagrofa 2016)¹. As a special offer in the discount market KIWI has a benefit program with Kiwicard ('Kiwikort') (Kiwi, 2016)¹.

Meny chain introduces a concept with a strong focus on specialties, fresh products and good, qualified service. Meny offers a largest product range and has 119 stores in Denmark out of which 10 are special Meny Gourmet stores (Dansk Handelsblad, 2016). This chain has about 5500 employees (Dagrofa 2016)¹.

Spar has 122 stores in Denmark (Dansk Handelsblad, 2016). Spar is large convenience store offering a wide selection of groceries, strong promotions and discounts (Dagrofa 2016)¹.

Min Købmand has about 194 stores across the country (Dansk Handelsblad, 2016). It is a smaller grocery store often with service functions such as a post office, pharmacy and product delivery. Min Købmand focuses on the presence, security and good service (Dagrofa 2016)¹.

There were accounted 13 **ABC Lavpris** stores in Denmark in 2015 (Dansk Handelsblad, 2016).

Dagrofa wants to improve the environment and make it easier for customers to be climate and environmentally conscious. This has resulted in Dagrofa work towards food waste reduction. Dagrofa is a member of the Environment and the Ministry of Food Partnership for Less Food waste ('Mindre Madspild'), and the group's stores reduced products that are close to expiration date to ensure these products are not thrown out.

1. Collaboration and expansion initiative: Collaboration with NGOs and other organisations

Food donation to National Association for Vulnerable

Description of Initiative: When Kiwi store is closed, the food is donated to various purposes (LOFU, 2016). Kiwi cooperates with National Association for Vulnerable ('Landsorganisationen for Udsatte - LOFU') (Dagrofa, 2016b). LOFU volunteers collect food surplus from grocery stores and give it to vulnerable citizens (Dagrofa, 2016b).

Time period: 05.2016

Cooperation with Foodbank ('fødevareBanken')

Description of Initiative: Dagrofa S-Engros (Wholesale) and Foodbank had partnership in order to reduce food waste and provide better food for disadvantaged community members (Dagrofa, 2015b). Foodbank collects and delivers suboptimal food products that with close expiration date or damaged package. When products vegetables, dairy products, breath and other products are approaching end of their shelf life, Foodbank collects and distributes these products between the institutions/organisations for vulnerable people that Foodbank deals with. Foodbank purpose is twofold: to work against the large food waste and help socially vulnerable people. The food surplus that was previously thrown out directly into containers is now delivered to homeless, children in crisis and other vulnerable citizens.

Effect of Initiative: Dagrofa S-Engros is pleased with this collaboration and at that time has donated more than 6 tonnes of food to organisations, equivalent to 13,000 (Dagrofa, 2015b). At that time there were four out of wholesale chains of 30 stores that helped to reduce food waste through cooperation with the food bank. The plan was to implement it in the entire chain.

Time period: 02.2015

2. Communication initiative: Development of digital application to advertise promotions and suboptimal food products

Description of Initiative: Dagrofa in Cooperation with YourLocal has developed a special application where supermarkets can advertise promotions and those products that are close to expiration and the city's local citizens, who are enrolled in the app, then can buy food products cheaply. By using the app everyone can support their local community and its businesses by receiving spontaneous deals on food, products and services that would otherwise have been wasted (Olsen, 2015).

3. Price-related initiative: Reduction on food items close to expiration date

Description of Initiative: Dagrofa reduces prices on food items with a close expiration date in their stores (Dagrofa, 2015a).

4. Product-related initiative: Development of packaging to reduce food waste

Description of Initiative: Dagrofa has developed a new cooking bag for fish (Dagrofa, 2016c). A day's fish meal is delivered in a new cooking bag directly at the fish counter and can be cooked in the oven at home properly. This roasting bag ('stegepose pose') retains flavour and juiciness of the fish.

Effect of Initiative: An added bonus of the new meal solution is that portioning contributes to food waste reduction, at the same time the closed bag holds both moisture and odour.

Time period: 04.2016 – ongoing

IV. DANSK SUPERMARKED

Dansk Supermarked Group is a 100% Danish-owned company, owned by Salling Fondene (81%) and A.P. Møller – Mærsk (19%). Dansk Supermarked supplies approximately 2 million convenience goods and non-food products to its customers every day through the chains Føtex, Bilka and Netto, as well as the department stores Salling and online shops Bilka.dk, foetex.dk and Salling.dk (Dansk Supermarked, (2016)¹. The Group's chains together comprise more than 1,466 stores and have 50,553 in five countries (Dansk Supermarked, 2016)².

The first **Føtex** supermarket opened in Aarhus in 1960. Today Føtex has over 90 supermarkets in Denmark, including a number of smaller-format convenience stores under the Føtex Food brand (Dansk Handelsblad, 2016). Group's supermarket chain Føtex offers a broad assortment of food, textiles, and non-food products. This supermarket chain aims to provide good quality to everyone in Denmark (Dansk Supermarked, (2016)¹.

The first **Bilka** hypermarket opened in Aarhus in 1970. Bilka remains the only hypermarket chain in Denmark, operating a total of 17 hypermarkets in the country, including one A-Z hypermarket exclusively focused on non-food products (Dansk Supermarked, (2016)¹. This hypermarket chain wants to be the preferred shopping universe, with a special focus on families.

Netto opened its first discount store in Copenhagen in 1982 becoming the first Danish chain of its kind in Denmark with 452 stores (Dansk Handelsblad, 2016). Today Netto has more than 1,320 discount stores in Denmark, Germany, Poland, Sweden and England altogether (Dansk Supermarked, (2016)¹. The Group's chain of discount stores aims to provide customers with good quality products at everyday low prices.

The Group's department store chain **Salling** was founded in Aarhus in 1906 (Dansk Supermarked, (2016)¹. With locations both in Aarhus and Aalborg, Salling's mission is to be the one-stop shopping destination for customers.

Food waste is one of the areas which Dansk Supermarked has focused their efforts and implemented various initiatives for purpose of reducing food waste. They recycle 90% of all organic waste in their stores and continue to improve their efforts.

1. Collaboration and expansion initiative: Collaboration with NGO and other organisations

Cross-functional food waste project

Description of Initiative: In 2015, Dansk Supermarked in partnership with Arla (a Scandinavian dairy producer) and AP Grønt (a large Danish supplier of lettuce, baby leaves and cabbages) have initiated a 2.3 million DKK cross-functional project that aims to investigate the food waste issue (Dansk Supermarked, [No date]; Dansk Supermarked, 2014). The project has focused on four categories such as cold cuts, sausages, fish and salads. The project is finalised in May 2016 where they will share their findings with the general public and the industry in order to convey new knowledge.

Effect of Initiative: The project has showed them that waste can be reduced significantly and they will apply the methodology to more categories in 2016.

Time period: 01.06.2014-01.04.2016

Food donation through Danish Christmas Aid (Dansk Julehjælp)

Description of Initiative: Netto Denmark has collaborated with Dansk Julehjælp (Danish Christmas aid) for the five years and provided discounted gift vouchers distributed to low-income families (Dansk Supermarked, 2014).

Cooperation with Food Bank ('fødevareBanken')

Description of Initiative: Dansk Supermarked Group, their suppliers and Food Bank (fødevareBanken) set up a partnership (Lund, 2015). The purpose of the partnership is to donate surplus foods to Food Bank, who then redistributes the food to organisations working with the socially disadvantaged citizens.

Effect of Initiative: This initiative is a win for all involved. Suppliers of Dansk Supermarked save costs, the beneficiaries receive healthy and good quality food, and less food is wasted, which benefits the environment (Dansk Supermarked, 2015). About 120,000 meals were donated (Yding and Lichscheidt, 2016).

Time period: 2014 -ongoing

Partnership with an alternative retail store WeFood

Description of Initiative: Due to cooperation between Dansk Supermarked Group and DanChurchAid, WeFood, the first social supermarket selling surplus food was opened in Amagerbrogade in Copenhagen in 2016 (Dansk Supermarked, 2015). The purpose is to reduce food waste therefore; the store sells a large varied of food products at 30 to 50 percent lower than normal retail price (Thelocal.dk, 2016). The profit goes to the charity projects in developing countries.

Effect of Initiative: If the first WeFood store demonstrates a success, DanChurchAid would open more stores in other cities of Denmark (Thelocal.dk, 2016). According to the latest news, the charity organisation is planning to open another store in Copenhagen and also in Aarhus in 2017 (Thelocal.dk, 2016).

Time period: 2015-ongoing

Food waste converted to biogas or animal feed

Description of Initiative: The unsold food with the passed the best before or consume by date is no longer available for food donation. Most of the organic waste is collected and converted into biogas (Dansk Supermarked, 2015). During 2014 they have also implemented a system for recycling organic waste in Bilka and Føtex (Dansk Supermarked, 2014). In the majority of Føtex and Bilka stores old bread, which cannot be donated, is converted to animal feed. In 2014, about 5,000 tonnes of bread was converted into animal feed (Dansk Supermarked, 2014).

2. Communication initiative: Communication about the topic of food waste outside the Point of Sale

Description of Initiative: Every year Dansk Supermarked Group issues a CSR Report where they outline their efforts in food waste avoidance. The food waste issue is extensively communicated on their website.

3. Communication initiative: Development of digital application to communicate the topic of food waste avoidance

Description of Initiative: Netto has introduced a new app 'Mad skal spises' ('Food should be eaten') where they engage Danish consumers to share information about surplus goods with each other (Helstrand, 2016). When a customer sees a product reduced in price and close to expiry, he or she takes a picture of the item and put it on the app.

4. Price-related initiative: Reduction on food items close to expiration date

Description of Initiative: When food item approaches sell-by date, reduce the price and highlight with yellow labels and often place these items in a designated area of the store (Dansk Supermarked, 2015; Dansk Supermarked, 2016³). A large number of stores use those labels so customers can easier recognise them.

V. LIDL

Lidl is one of Europe's leading retailers with nearly 10,000 stores in 29 countries. In Denmark they opened the first stores in 2005 (Lidl, 2016)¹ and today have 98 stores across the country (Dansk Handelsblad, 2016). Lidl focuses on offering their customers the best quality at the best price every day. At the same time Lidl continues to develop and implement its CSR activities that create value for people, the environment and society.

In Lidl they have a big focus on reducing food waste. They take their consumers' consumption behaviour in their considerations so that their activities to fight food waste not only reduce food waste in their stores, but also take into account their customers' actual consumption. Therefore, they focus on durability and methods of storage to make it easier for customers to get more out of the food and reduce food waste in their homes. Lidl say 'Stop madspild – Det betaler sig' (Stop food waste – it pays).

1. Collaboration and expansion initiative: Converting organic waste into biogas

Description of Initiative: In the last few years Lidl has delivered its organic waste to biogas industry where organic waste is processed in the biogasification and forwarded to various biogas plants to convert it into biogas, energy and fertilizer (Lidl, 2016)².

2. Communication initiative: Communication about the topic of food waste outside the Point of Sale

Description of Initiative: Lidl communicates the topic of food waste on website (Lidl, 2016)³, has prepared a free brochure 'Lidls Madspildsbrochure' with tips about food storage and durability as well as information on how consumers can ensure the sustainability of their fresh food in their home (Lidl, 2016)⁴.

3. Price-related initiative: Abolishment of multi-item offers

Description of Initiative: Lidl has established only single-item offers on all fresh products with a short shelf life (Lidl, 2016)³.

Effect of Initiative: Their customers are never forced to buy more in order to obtain product discounts.

4. Price-related initiative: Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')

Description of Initiative: To avoid food waste in households, Lidl has developed an offer concept named 'Forlæng dit tilbud' ('Extend your offer') which takes into account both customers' consumption patterns and fresh food items with a limited shelf life (Lidl, 2016)³. This concept allows customers to make use of special offers to their specific needs. Customers buy an amount of product they need for a week and ask for a discount coupon at checkout. This way they can extend the offer on this product for the following week, when they buy the same product again for the offer price.

Effect of Initiative: This allows customers to act responsibly so that they reach to consume food products and avoid food waste. From their experience customers support this initiative.

5. Price-related initiative: Reduction on food items close to expiration date

Description of Initiative: Price is reduced every day on products with a short shelf life such as dairy products, fruit and vegetables, fresh bread and fresh meat to ensure that fresh food is not wasted (Lidl, 2016)³. They ensure that products at reduced price can be eaten sufficiently in time and minimizes the risk of the occurrence of food waste in the home. Discounted food items can be found in a designated area in the store, refrigerator and the freezer. In bake off area breads are reduced in price before they reach the sell-by date. To avoid food waste of bake-off bread, the bread and pastries are sold at half price an hour before store closing time (Lidl, 2016)³. Also, price reduction is put on selected fruits and vegetables a few hours before closing time.

6. Instore-related initiative: Day-to-day order-planning

Description of Initiative: Product orders in Lidl stores are assessed from day to day, so it is adapted to customer demand.

7. Unit-related initiative: Weighing selected food items

Description of Initiative: To contribute to food waste avoidance Lidl has introduced the opportunity for customers to weigh fruit and vegetables and have price per kilogram instead of unit. Customers therefore can buy and pay only what they actually need.

VI. LØVBJERG

Løvbjerg is a Danish discount supermarket chain. The first store opened in 1926 in Silkeborg and today it operates 16 stores in Denmark (Wikiwand.com, 2016). Løvbjerg offers all the basic products at a fixed discount rate and a large variety of organic, gluten free, sugar free, keyhole symbol and eco-labeled products at fixed low price (Løvbjerg, 2016).

1. Instore related initiative: introducing technology to improve cold storage facilities

Description of Initiative: Løvbjerg has introduced new technology that helps monitor the temperature in cold storage facilities e.g. a refrigerator, a freezer (Løvbjerg, 2016). The new technology called CoolGuard and developed by a Danish company SensorClip ensures that products are stored properly and alerts about problems with the temperature (Jørgensen, 2015).

Effect of Initiative: Daily automatic monitoring prevents rotting food items and saves store energy, environment and money (RetailNews, 2015).

Time period: 2015 – ongoing

VII. REITAN

Reitan Group or Reitangruppen is a Norwegian wholesaler and retail franchiser which comprise four business areas: Rema 1000, Reitan Convenience as 7-Eleven in Denmark, Uno-X and Reitan real estate ('ejendomme'). REMA 1000 is a retail chain operating on a franchise basis in Denmark since 1994. Today REMA 1000 Danmark A/S has more than 270 stores (Dansk Handelsblad, 2016).

REMA 1000 strives to become Denmark's largest, most sustainable and responsible discount supermarket chain (Rema 1000, 2016)¹. REMA 1000 was the first food chain in Denmark to address the issue of food waste and has been leading the way since October eliminating price promotions for purchase of multiple units in partnership with the NGO Stop Wasting Food Movement ('Stop Spild af Mad'). In addition they have introduced other initiatives to reduce food waste. As a result, in 2014, REMA 1000 received CSR Awards Partnership Prize in recognition of its efforts to prevent food waste in collaboration with the NGO Stop Waste of Food ('Stop Spild af Mad'). In May 2016 REMA 1000 received dansk Fødevarer Forums kvalitets- og innovationspris 'Den Dybe Tallerken' (Danish Food Forum Quality and Innovation Prize 'The Deep Plate') for its initiatives to reduce food waste such as abolishment of volume discounts and introduction of bread and meat in smaller packages (Larsen, 2016).

1. Collaboration and expansion initiative: Collaboration with NGO and other organisations

Food donation to homeless people through the Project Homeless

Description of Initiative: REMA 1000 has made an agreement with Project Homeless ('Projekt Hjemløs') in Copenhagen to provide food surplus from their central warehouse that cannot be sold in their stores (Rema 1000, 2016)². These include items that are passed down from a pallet in their warehouse, after which the package has been broken and scratched. Previously, such items have been destroyed, but with this collaboration, these items now in place for the benefit of people who really need it instead of going to waste.

Effect of initiative: In 2014 REMA 1000 donated 33 tonnes of food to Project Homeless. That is equivalent to feeding about 85 homeless people throughout 2014.

Time period: 2014

Food donation to vulnerable families through the Project Christmas SURPLUS

Description of Initiative: REMA 1000 decided to initiate a partnership with The Danish People's Aid and Stop Wasting Food Movement Denmark with whom they created 'Project Christmas SURPLUS' and distributed food surplus to 500 vulnerable families in Denmark (Rema 1000, 2016)¹. The project involved collecting food surpluses from REMA 1000 and suppliers, which were repacked into Christmas aid packages together with a gift voucher for REMA 1000.

Effect of initiative: The partnership will continue in 2016 with an ambition to involve more stores, so more families can benefit from this project.

Time period: December 2015 – ongoing

2. Communication initiative: Development of digital application to advertise promotions and food products

Description of Initiative: REMA 1000 has developed a REMA 1000 app to help their customers with the planning of daily grocery shopping (Rema 1000, 2016). The app includes the special offer catalogue, recipes, intelligent shopping list and the shop information.

Effect of initiative: The app has become a huge success with more than 700,000 downloads and is used on a daily basis by customers of REMA 1000's stores (lroots.dk, 2014).

Time period: 2014 - ongoing

3. Price-related initiative: Abolishment of multi-item offers

Description of Initiative: REMA 1000 has changed marketing of product discounts and decided to abolish multi-item offers (Rema 1000, 2016)³. They believe that the multi-buy or volume discounts on foods leads to overconsumption and food waste because consumers are buying more than they actually need (Rema 1000, 2016)⁴. Since October 2008 volume discounts have been abolished (The Danish Environmental Protection Agency). The idea is that consumers buy only the quantity they need, and still at a low price. This would avoid food waste and packaging waste.

The REMA 1000 shops have developed into local convenience stores, where customers shop several times every week. It is therefore not necessary to purchase large quantities of the same item. They can buy fresh goods next time they go to the store and need the specific item. This mentality together with the vision that the customer is entitled to a transparent price was the background for REMA changing their sales campaigns from "take 3, pay for 2", at a reduced price for the specific item (The Danish Environmental Protection Agency).

Effect of initiative: The reaction of the customers has been positive, both in the store and by written approaches. No negative reactions have been received. Some employees were sceptical in the beginning but now they find it a brilliant idea. The turnover on campaign goods has decreased in the short run, since the customers do not have to buy three bottles of wine to obtain the campaign discount, but can be satisfied with buying only one (The Danish Environmental Protection Agency).

Time period: 2008 - ongoing

4. Price-related initiative: Reduction on food items close to expiration date

Description of Initiative: REMA 1000 also focuses on food items close to expiration date (Rema 1000, 2016)³. Their stores systemised the sale of products with a short shelf life. These products are labelled and assembled in specific locations in the store and sold at a significantly lower price. This initiative is applied for foods like meat, dairy and bread products. In this way their customers can make a good purchase while their stores avoid throwing food out.

Time period: 2012 - ongoing

5. Unit-related initiative: Selection of food items in small packages

Description of Initiative: It has launched a wide selection of bread and meat in smaller packages. Customers therefore do not have to buy more than they can manage to consumer. Customers pay the same low price per kilogram that they are used to. Meat packaging sizes have been also reduced.

Time period: 2015 - ongoing

6. Unit-related initiative: Weighing selected food items

Description of Initiative: REMA 1000 has introduced the opportunity for customers to weigh selected fruit and vegetables ('Vej varen og reducér spildet') in order to contribute to food waste avoidance (Rema 1000, 2016)³. REMA 1000 buys different sizes of vegetables from suppliers who avoid

discarding large quantities of vegetables, because they do not have the normal average size. The possibility to weigh products also gives customers the opportunity to choose such vegetable size that they need. A greater variety of root vegetables and cabbage as offered as part of this initiative.

Effect of initiative: This results in 10% less food waste at producers because they do not have to discard vegetables of an unmarketable size (Rema 1000, 2016)⁵.

Time period: 2008 – ongoing

IV. Food waste avoidance initiatives by Danish supermarket chains – results based on primary data

This section covers a variety of food waste avoidance actions by individual supermarket chains in Danish food retail based on primary data collected during the store visits and complemented with short interviews with employees in most of the stores. The following subsections shed light on various initiatives implemented in the physical stores of individual supermarket chains. Comprehensive tables combining these initiatives are presented in the end of this section.

1. ALDI

Table 2: Food waste avoidance initiatives by Aldi

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pålægg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forkæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell food items otherwise wasted							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							
Legend:		Initiatives based on primary data. In other words, these initiatives were implemented in the store						

Product strategies

N/A

Pricing strategies

In Aldi store they have weekly price-promotions for selected food items under 'Ugens Udvalgte' (Weekly selected) for all food categories and 'Ugens Ret' (Weekly Meal) (Appendix 1). The original price that is without reduction cannot be identified.

Initiatives in different product categories

1) Dairy

There were no reduced items in this category.

2) Bread

Aldi offers bake-off products sold on the day. However, there is no communication about price reduction at a certain point in time. There were no reduced items in this category.

3) Fruit and vegetables (FV)

Some FV were sold per piece. Some organic FV were sold in multi-item packages, therefore a customer is able to select certain FV in packages that contain several separate units. There were no reduced items in this category.

4) Meat and seafood

Only fresh meat is reduced in price without any information about food waste. According to the employee, only meat is reduced in price, food products of other categories are destroyed. The price reduction in a percentage is put on suboptimal items. An orange label with 30% discount (see Appendix 1) is used to identify those items. The label is put on food items on expiration date or one day before expiration date. For example, the label on chicken BBG spareribs and plaice filet has one day before expiration date while the label on salmon filet is on the same day as expiration date. The original price of the item is visible on the shelf where the item is placed. No communication about food waste or date. Price reduction of 30% is also found on the 'Ugens Udvalgte' meat. Suboptimal products are placed side by side with normal of the same type.

5) Sausage and pålæg

There were no reduced items in this category.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

There were no reduced items in this category.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

There were no reduced items in this category.

Overall, there is no communication about the topic of food waste in the store neither on a food item that is close to expiration date or expiration date nor in the store in general. In Aldi, they reduce prices only in one food product category e.g. fresh meat and seafood. According to the employee of the store, food products of other categories are destroyed. An orange label with 30% reduction is put on single suboptimal food items. Items close to expiry are reduced in price on the same day or one day before expiration date. Suboptimal food products are placed side by side with normal of the same type.

2. LIDL

Table 3: Food waste avoidance initiatives by Lidl

[illegible]

Product strategies

In the FV section, fruits and vegetables were sold per piece and price was defined per kilogram instead of unit. Customers were able able to weigh FV and buy the size and amount they needed.

Pricing strategies

No multi-item offers were seen in the store. There were only single-item offers (see Appendix 2). Customers could also make use of special offers to their specific needs e.g. customers could buy an amount of product they needed for a week and ask for a discount coupon at checkout in order to extend the price offer on the product for the following week. These offers were promoted on their weekly magazine.

Initiatives in different product categories

1) Dairy

There were 5 packages of yogurt, several creamy quark dessert items and four cheese items at reduced price. A red square shape label with a 30% reduction, a reduced price value and an original price of an item was put on single items. Yogurt items had 6 days before expiration date. Two cheese items were on expiration date and two items had two days before expiry. These suboptimal products were in a designated area in the fridge. There was a statement 'Stop madspild' (stop food waste) in the bottom of this fridge where suboptimal food items were placed creating awareness among their customer (see Appendix 2).

2) Bread

There was a section of 'bake-off' products sold on the day in the store (see Appendix 2). There was a poster informing about 50% price reduction for all 'bake-off' products 1 hour before closing of the store with communication about food waste (see Appendix 2). There were many bread packages at reduced price for example one piece of schwarzbread, one piece of ecological rural wholegrain bread, two pieces of kernelbread, 6 pieces of wholegrain sandwich bread, and others. A red square shape label with a 30% reduction, a reduced price value and an original price of an item was put on single bread packages. The original price of the item was also visible on the shelf where the item was placed. Price reduction and the topic of food waste were communicated on the red label. Price reductions were put on those products that had one day before expiration date. Suboptimal products were placed side by side with normal of the same type.

3) Fruit and vegetables (FV)

Some FV were sold per piece e.g. an orange, a pear, a lime, an avocado, and pomegranates. Others were sold in a tray ('bakke') e.g. strawberries, nectarines, apricots, and peaches, and a bag ('pose') e.g. potatoes. There were different FV types that could be weighted on the scale and were sold by weight such as kiwis, bananas, pears, watermelons, cherries, melons, squash, and potatoes. The same applied for organic bananas. There was communication stating that weighing reduces the hidden food waste on the shelf of one of these (see Appendix 2). There were no suboptimal food products found in this category. According to the employee of the store, they rarely reduce prices for fruit and vegetables.

4) Meat and seafood

There were several items products at reduced price found in this section. A red square shape label with a 30% reduction, a reduced price value and an original price of an item was put on all single suboptimal items. Price reductions on suboptimal items were put on those items that had one day before expiration. There were two items at reduced price that had four days before expiration date. Yet, minced beef package was not reduced in price and had one day of expiration while minced pork was reduced in price and had the same expiration date as the minced beef package. Suboptimal meat and fish products were placed side by side to the normal ones of the same kind. There was only one poster put on one of the fridges in the meat section. This poster informed that items with red -30% reduction labels were related to reduction of food waste.

5) Sausage and pålæg

There were a lot of different sausage and pålæg packages at reduced price and identifiable by a red square shape label with a 30% reduction, a reduced price value and an original price of an item put on all single items. These suboptimal items were placed either side by side to the normal of the same type or in a designated area in the fridge. There was a statement 'Stop madspild' (stop food waste) in the bottom of this fridge where suboptimal food items were placed. For example, among those placed side by side, there were 10 pieces of hotdogpølser sausages with four and five days before expiration date, 6 pieces of sønderjysk pølse with one day before expiration date, and three pieces of mini wienerpølser expiring in 3 days. There were levepostej at reduced price e.g. one with 2 days before expiration date, four with 5 days before

expiration date; and one levepostej package with 5 days before expiration date was not reduced in price. Among those found in a designated place, there were rullepølser with 7 days before expiry, peberrød salad with 2 days before expiry, and the same type of levepostej (as the one placed side by side) with 6 days before expiration date. Overall, the price reductions were placed on items being on the expiration date to 7 days before this date.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

There were 5 ready to eat salads, one bag of grated carrots, chicken breast fillet, and one bag of salat at a reduced price. These items were placed side by side to other of the same kind. There were only ready to eat salads that were reduced in price. These items had one – two days before expiration date. Other fresh convenience items e.g. five chicken burgers with 5 days before expiry and at reduced price were found in a designated area in the fridge. There was a statement 'Stop madspild' (stop food waste) in the bottom of this fridge where suboptimal food items were placed creating awareness among their customer (see Appendix 2). A red square shape label with a 30% reduction, a reduced price value and an original price of an item was put on all single items. For those products that were placed side by side, original price were visible on the shelves where they were placed.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

Frozen foods at reduced price were placed in a separate section in the freezer, where there were sections for other frozen products. In this designated section there were frozen white cabbage, frozen berries, frozen mangos, and yellow tuna steaks. The expiration date was not approaching soon on these products. There was not communication about food waste; the section was named 'restsalg' (remnant sale). Also, there were 11 pieces of sauce at reduced price in a designated area in the fridge. There was a statement 'Stop madspild' (stop food waste) in the bottom of this fridge where suboptimal food items were placed.

3. FAKTA

Table 4: Food waste avoidance initiatives by Fakta

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pølæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
Communication	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							

Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							
Legend:			Initiatives based on primary data. In other words, these initiatives were implemented in the store					

Product strategies

In the FV section, there was a permanent '10 pieces for 20 DKK' offer allowing customers to choose a mix of fruits they needed for a cheaper price.

Pricing strategies

N/A

Initiatives in different product categories

8) Dairy

There were no suboptimal food products found in this category.

9) Bread

In the first store there were no bake-off products sold on the day. There were no suboptimal food products found in this category in this store. However, according to the employee of this store, they reduce price of bread products. On the other hand, there were bake-off' products sold on the day in the second store. There was a poster informing about 50% price reduction for all 'bake-off' products before closing of the store between 21:00 and 22:00 with communication about food waste (see Appendix 3). According to the employee of this store, such a 50% offer was between 19:00 and 22:00 but customers were waiting in order to buy bakery products at reduced price. This has resulted in changing the time to 21:00. The bread is usually reduced in price two days before the expiry. Many bread packages of the same kind at reduced price were found in the second visited store (see Appendix 3). A yellow label with a fixed reduced price value was put on single suboptimal bread items. The original price of the item was visible on the shelf where the item was placed. Price reduction and the topic of food waste were communicated on the yellow label. For example, rye bread was reduced from 13 DKK to 10 DKK e.g. by 23% and placed on the actual expiration date. Suboptimal products were placed side by side with normal of the same type.

10) Fruit and vegetables (FV)

Some FV were sold per piece. There was not possibility to weigh items in this category. In the first visited store, a whole tray with iceberg salad at price of 5 DKK was found but no indication of the original price. Also, there were peas, organic turmeric, Jerusalem artichokes, mix of sweet peppers all being reduced at 10 DKK. Unexpectedly, there were bananas that were suboptimal but not reduced in price. In the second visited store, several boxes of strawberries with indication of the original price next to their placement and tomatoes with no indication of the original were found in this category. Price reductions varied from 28% to 50% of the original item price (see Appendix 3). Suboptimal FV products were placed side by side with normal ones of the same type.

11) Meat and seafood

In the first visited store, chopped meat, cutlet and minced fish at reduced price of 20 DKK were found in this category. In the second visited store, only pork fillet at reduced price of 30 DKK was found in this category. Price reductions varied from 28% to 50% of the original item price (see Appendix 3). A yellow label with a fixed reduced price value was put on single suboptimal items on expiration date. Price reduction and the topic of food waste were communicated on the yellow label. The original price of the items was visible on the shelf where they were placed or on the item itself. Suboptimal meat products were placed side by side with normal ones of the same type like in the FV category.

12) Sausage and pålæg

In each of the visited stores one pålæg-package was found at reduced price with price reduction and the topic of food waste communicated on the yellow label. The original price of the item was visible on the shelf where the item was placed. A yellow label with a fixed reduced price value of 10 DKK (priced reduction of 23-33%) was put on single suboptimal items on expiration date. Price reduction and the topic of food waste were communicated on the yellow label.

13) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

A package of cut vegetables reduced at 10 DKK and ready-made salad reduced at 15 DKK were found in the first visited store. Yellow labels with a price value were put on single items two days before expiration date. Price reductions corresponded to 38% of the original item price. Several ready-made salads of three different kinds reduced at 10 DKK were also found in the second visited store. Yellow labels with a price value were put on single items one the day of expiry. Price reductions varied from 30 to 58% of the original item price. Price reduction and the topic of food waste were communicated on the yellow label. Suboptimal fresh convenience products were placed side by side with normal ones of the same type.

14) Other (frozen foods, condiments, sauces, dry products, etc.)

Many suboptimal items of this category were found in a designated area 'markedspladsen'. There were different yellow labels put on suboptimal items such as a) yellow labels with price reduction and 'stop mad spild' (stop food waste) communication, b) yellow labels with price reduction and 'see date' communication, and c) yellow labels only with price reduction (see Appendix 3). According to the employee of the second store, they put yellow labels with 'stop mad spild' (stop food waste) on food products and yellow labels with 'nedsat' (discounted) on non-food items. However, yellow labels with 'stop mad spild' (stop food waste) were even put on the non-food products. The employee explained that they did not have yellow labels without food waste communication at that moment.

Overall, communication about the topic of food waste is visible in the store either on a food item, which is close to expiration date or expiration date or in the store in general. According to the employee of the store, they reduce prices of food items in all product categories due to the close expiration date and/or depending on a quantity of items being on stock. They tend to look at expiration date every day instead of two times a week because in this way they can still manage to sell sellable products and earn money.

Items close to expiry are reduced in price on the same day or one day before expiration date. A yellow label with a reduced price value is used to identify those food products. Price on data-labelled items in the FV category is usually reduced on the same day of expiry. Prices on data-labelled items in the bread and dairy categories are reduced days before expiry. In Fakta stores they use yellow labels with 'stop mad spild' (stop food waste) and a fixed price value of 5 DKK, 10DKK, 15DKK, 20DKK. The level of priced reduction is defined according to the level of original price of the product. For instance, if an item costs 15 DKK, a reduced price will be 10 DKK; if it costs 20 DKK, the

price will be 20 DKK, and etc. Communication about food waste is used on yellow labels for food products (see Appendix 3). In general, suboptimal food products are placed side by side with normal of the same type in the second. In addition, there is a designated area 'markedspladsen' for suboptimal food and non-food products as 'the last chance products' placed all together. In this area, yellow labels with 'stop mad spild' (stop food waste) were even put on the non-food products, however, according to the employee, they did not have yellow labels without food waste communication at that moment, therefore they used those labels.

According to employees of both stores, customers are very pleased with the opportunity to buy food products at reduced prices. They sell 9 out of 10 of reduced items.

4. IRMA

Table 5: Food waste avoidance initiatives by Irma

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pålæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore-related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							
Legend:		Initiatives based on primary data. In other words, these initiatives were implemented in the store						

Product strategies

Regarding packaging of products, there were special bags available for sale to keep FV products fresh for a longer time (see Appendix 4). In the FV section, three types of berries or three types of

mushrooms were sold in a single package. This seemed to be for the convenience and indirectly for food waste, though not communicated as the reason.

Pricing strategies

Multi-item pricing was extensively used the meat and seafood category. They were also found in other categories such as sausage and pålæg, organic, frozen, canned and dry products. These '2 for XX DKK' or '3 for XX DKK' promotions seemed to be permanently put on the plastic of the meat packages and temporarily put on digital labels in other sections. These promotions even had an amount of money that could be saved if a customer decided to buy these promoted items. In addition, there were items with special temporary promotions '3 for XX DKK as 'Kampagne-Vare' (campaign items) or '1/2 halv pris'(1/2 halv price) in the meat section and therefore customers could buy items of these promotions at a good price.

Initiatives in different product categories

1) Dairy

Some dairy suboptimal products including milk and yogurt were found in the dairy category. Special price reduction labels 'Dato Service-50%' were put on single food items. The labels were put on expiration date. The original price of the items was easy to see and visible on the digital shelf labels where they were placed. There was no communication about food waste in any of the stores. Suboptimal products were placed side by side with normal of the same type.

2) Bread

There were no 'bake-off' products sold on the day. Two types of bread were at reduced half price in the second store. Special price reduction labels 'Dato Service-50%' were put on single food items. Those labels were put one day before expiration date. The original price of the items was easy to see and visible on the digital shelf labels where they were placed. No communication about food waste. Also, Sprøde Rugchips (rye bread chips) were easily found in the bread category (see Appendix 4). In Irma, they make rye bread into bread chips once a week instead of throwing the bread out. This could be regarded as food waste avoidance action.

3) Fruit and vegetables (FV)

Some FV were at reduced price such as mango, banana, and boxes of berries. Special price reduction labels 'Rabat -5 DKK', 'Rabat -10%' and 'Rabat -50%' (Discount -5 DKK, Discount -10%' and Discount -50%' were put on single food items. The same applied for organic products. Those labels were put on expiration date. The original price of the items was easy to see and visible on the digital shelf labels where they were placed. Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste in any of the stores.

4) Meat and seafood

Different types of suboptimal products were found in this category in both stores. Special price reduction labels 'Dato Service-25%' and 'Dato Service- XX DKK' were put on single food items. The same applied for organic products. Those labels were put on expiration date. The original price of the items was easy to see and visible on the digital shelf labels where they were placed. For example, both chicken and fish products were among those suboptimal products. Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste in any of the stores.

5) Sausage and pålæg

Several different types of suboptimal pålæg items were found in this category in the first store. Special labels 'Dato Service-25%' and 'Dato Service-50%' were put on single food items. These labels were put on the actual expiration date or three to four days before. The original price of the items was easy to see and visible on the digital shelf labels where they were placed. Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste in any of the stores.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

Five different types of suboptimal products were found in this category in the first visited store (Lille Irma). A special label 'Dato Service-25%' was put on a single food item. The same applied for organic fresh convenience products. The label was put on expiration date. Two types of suboptimal products were found in this category in the first visited store (Lille Irma). A special label 'Dato Service-25%' was put on a single food item. The same applied for organic fresh convenience products. The label was put on expiration date.

The original price of the items was easy to see and visible on the digital shelf labels where they were placed. For example, four types of ready to use salads and pizza were among those suboptimal products. Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste in any of the stores.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

Rice pudding at reduced half price was found in the first store. A special label 'Dato Service-50%' was put on a single food item. The label was put on expiration date. The original price of the items was easy to see and visible on the digital shelf labels where they were placed. These items were placed side by side with normal ones of the same type. There was no communication about food waste.

Communication about the topic of food is seen on a poster 'Vil du bekæmpe madspild?' (Do you fight food waste?) together with the encouragement to join IRMA app 'Your Local' can be found in the meat section of the second store. This can be regarded as food avoidance action. Overall, there is no other way of communication about the topic of food waste. Price reductions are found in all food product categories except dairy and fruit and vegetables. Items close to expiry are reduced in price on the same day and one or one day before expiration date.

Special price reduction labels such as 'Dato Service-25%', 'Dato Service-50%', 'Dato Service- XX DKK', 'Rabat -5 DKK', 'Rabat -10%' and 'Rabat -50%' are used to identify suboptimal food items. According to the employee in the first visited store (Lille Irma), they have no special routine for price reductions. It depends on other tasks that they have because they do not have many employees. Usually they check food items every morning or evening. The same is for all food categories. The price reduction of 25% or 50% depends on quantity of items on stock or expiration date or what label with reduced price value the employee had in his pocket. According to the employee of the second visited store, they check quality of FV every morning and reduce the price according to their predefined rules and coding (e.g. LOT No). They use labels with 25%, 50% or 5kr, 10kr reduction and put them on suboptimal fruits and vegetables. They use labels with other price levels in other categories. If there is a date on the package, they put price reduction on the actual day. Regarding bread and dairy categories, they put price reduction one day before expiration date. In general, suboptimal products are placed either a) side by side with normal of the same type, b) in a designated area together in the same category, or c) a designated area mixing all types of food product categories. In the first store, they have placed suboptimal products only side by side with normal ones due to the size of the store.

5. KVIKLY

Table 6: Food waste avoidance initiatives by Kvickly

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pálaæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Collaboration with NGOs or other organisations							
	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

Product strategies

In the store, there was a mix of red fruits, a mix of sweet peppers and root vegetables in one package by a supplier. In the FV section, there was also a permanent offer selling '8 pieces for 18 DKK' so that customers could choose a mix of fruits they needed at a lower price. Some FV were sold per piece. Customers were also able to weigh certain fruit and vegetables.

Pricing strategies

Multi-item pricing was used in the meat and seafood category. The '2 for XX DKK' or '3 for XX DKK' promotions were found in other categories such as FV, other (condiments, sauces, dry products, etc.) Also, there were 3 oranges for 15 DKK. Those promotions seemed to be temporary.

Initiatives in different product categories

1) Dairy

Four different types of milk products were at reduced price. A yellow label with a price value was put on single food items. The label was put on actual expiration date, 2 or 9 days before the use-by-date. The original price of the items was visible on the digital shelf label where they were placed. For example, the label on skimmed milk was put 3 days before expiry, buttermilk, skyr, and whipping cream on the expiry, and mini milk four days before expiry. Price reductions varied from 14% to 40%. Suboptimal products were placed side by side with normal of the same type. Other suboptimal dairy products (e.g. whipping cream, skyr, and skimmed milk) reduced in price were placed in a designated fridge without original price. There was a poster 'Mindre madspild' (less food waste) next to the fridge creating awareness among their customers.

2) Bread

There were bake-off bread products sold on the day in the store. However, there was no communication about price reduction at a certain point in time. There were no suboptimal bread products in the section but they all were collected and placed in a designated basket. Those suboptimal breads had orange labels 'Se dato' (see date) put on single items. Original priced were not visible only reduce price values such as 6 DKK, 8 DKK for items expiring on the same date, and 10 DKK for items expiring in one day. There was a poster 'Mindre madspild' (less food waste) next to the basket creating awareness among their customers.

3) Fruit and vegetables (FV)

Some FV were sold per piece. Customers were able to weigh fruit and vegetables, so that they could select the size and number they wanted. There were 14 different FV that could be weighted on the scale and were sold by weight. There were no suboptimal food products found in this category.

4) Meat and seafood

Beef and rib steaks were at reduced price in this category. A yellow label with a reduced price value was put on single beef items. The label was put on expiration date. The original price of the items was not visible. A label 'se dato' with a reduced price value of 50 DKK was put on rib steaks. The original price of 59.95 DKK was visible on the package. These suboptimal products were placed side by side with normal of the same type. There was no communication about food waste.

5) Sausage and pålæg

There were many different kinds of sausage and pålæg-packages at reduced price with one day and two days before expiration date. These suboptimal products were in a designated fridge without original prices. There was a poster 'Mindre madspild' (less food waste) next to the fridge creating awareness among their customers.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

Different ready to eat salads were at reduced price. Any of two types of yellow labels either a) a label with a reduced a price value only, or b) a label 'stærkt nedsat' (heavily discounted) and a reduced a price value were put on single food items. Those suboptimal breads had a reduced price value to 10 DKK, 15 DKK, and 30 DKK. The original price of the items was visible on the digital shelf label where they were placed side by side with normal of the same type. These yellow labels were put on items that were on the expiration date. Other fresh convenience products (e.g. ready to eat fillet) reduced in price were placed in a designated fridge mixing all types of food categories and had no original price. There was a poster 'Mindre madspild' (less food waste) next to the fridge creating awareness among their customers.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

There were a few suboptimal food products found in a designated fridge all types of food categories. The same applies as for products in the sausage and pålæg the category.

Overall, the topic of food waste is only communicated through a poster placed at the two designated areas e.g. a basket for bread items and a fridge for sausage and pølæg and other suboptimal items of this category. Besides those designated areas, certain suboptimal food products are placed side by side with normal ones of the same type. Different labels with reduced price were used to identify those suboptimal food products such as a) a yellow label with price only, b) a yellow label with 'stærkt nedsat' and price, c) red label with 'se dato' and price (see Appendix 5).

In general, suboptimal products are placed either a) side by side with normal of the same type (e.g. dairy, meat and seafood, and fresh convenience products), b) in a designated area together in the same category (e.g. bread products), or c) a designated area mixing all types of food product categories (dairy, sausage and pølæg, and fresh convenience products). In the first store, they have placed suboptimal products only side by side with normal ones due to the size of the store.


According to the employee working in the FV section, the quality and expiration date (if FV are packaged) of FV are checked every day. In FV section, they do not communicate food waste topic. How much the price is being reduced depends on original price of FV and amount of FV being on stock at that time. They throw out what is not sold. Regarding bread, they check expiration date every morning. The price of bread is reduced at expiration date and suboptimal bread products are placed in a separate basket together with other product of the same category. According to the employee in the fresh meat section, fresh meat and fish are checked every morning and the price reduction is put on expiration date. They have no systematic way on deciding the amount of price reduction. Sometimes it depends on amount of fresh meat that they have in the supermarket. As they have their own kitchen, the suboptimal meat (that expires on the actual date and has been reduced and not sold) is not thrown out but frozen and used for preparing meat balls or other ready to eat /conveniences meals. They have very limited minimal food wastage.

6. SUPERBRUGSEN

Table 7: Food waste avoidance initiatives by SuperBrugsen

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pølæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							

Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend:  Initiatives based on primary data. In other words, these initiatives were implemented in the store

Product strategies

Regarding packaging, there were sub-units of two types of grapes, a mix of peppers, several types of root vegetables, a mix of two types of grapes in the package made by suppliers.

Pricing strategies

Multi-item pricing was extensively used the meat and seafood category. They were also found in other categories such as sausage and pålæg, organic, frozen, canned and dry products. These '2 for XX DKK' or '3 for XX DKK' promotions seemed to be permanently put on the plastic of the meat packages and temporarily put on digital labels in other sections (see Appendix 6). At the time of the store visit, there was a special 25% promotion for selected organic products. Also, other temporary price reductions of 50% (for mango, valmose) or 3 pieces for 10 DKK (for avocado) were seen in the store.

Initiatives in different product categories

1) Dairy

Only coffee cream found at reduced price. An orange label with a reduced price value of 2.95 DKK (55% reduction) was put on single food items. The label was put on expiration date. The original price of the items was visible on the digital shelf label where they were placed. Suboptimal cream items were placed side by side with normal of the same type. There was no communication about food waste.

1) Bread

There were two types of bakery products reduced in price due to date. The orange label with 'se dato' and a reduced price value of 10 DKK (50-55% reduction) was put on single items. The original price was visible on the digital shelf label where they were placed. Suboptimal bread items were placed side by side with normal of the same type. There was no communication about food waste. At the time of store visit, the employee was removing all bread products with expiration date that was an actual date and putting them into a box. According to this employee, one employee checked bread products and put price reduction on bread products 1 day before expiration date. Next day another employee on the shift removed those bread products even though it was only afternoon and it was 4 hours before closing the shop. Those bread products had to be thrown out that was a typical procedure according to their policy.

2) Fruit and vegetables (FV)

There were no suboptimal food products found in this category.

3) Meat and seafood

There were two types of suboptimal meat products such as boxes of veal and pork found in this category. The orange labels with a reduced price values of 29.95 (50% reduction) were put on

single food items. The label was put on expiration date. The original price was also kept on those items. Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste. There was one box of pork on the date of expiry with no price reduction (see Appendix 6).

4) Sausage and pølæg

There were a suboptimal food products found in this category. The orange labels with a reduced price value or with a reduced price value and 'se dato' (see date) were put on single food items. The label was put on the actual expiration date or one day before it. The original price of the items was not visible. Suboptimal products were placed in a designated area together of the same kind. There was one pålæg-package at reduced price placed side by side with normal of the same type. It was reduced to the price of 34.95 DKK (26% reduction). The original price was visible on the digital shelf label. There was communication about food waste where those suboptimal items where placed.

5) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

There were some food products at reduced price. For example, one classic potatoes salad was at reduced price to 10 DKK (60% reduction), pulled pork salad – 20 DKK (55% reduction), other salads – 25 DKK (44% reduction). Either an orange label with price only or an orange label with 'se dato' and price were used on those discounted products on expiration date. The original prices were visible on the digital shelf labels. Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste.

6) Other (frozen foods, condiments, sauces, dry products, etc.)

There were different kinds of items at reduced price found in a designated area mixing all types of categories. The original price of the items was not visible neither on the items itself nor in the designated area. It did not seem that those items were reduced due to date rather than their appearance or perhaps a few being on stock. The orange labels with a reduced price value and 'se dato' (see date) were put on the bottle of oil that had more than a year before expiration date and even on not-food items (see Appendix 6). There was no communication about food waste.

The topic of food waste is only communicated through a poster placed at the designated area for suboptimal sausage and pølæg items. Besides those designated areas, certain suboptimal food products are placed side by side with normal ones of the same type. Overall, there is no other way of communication about the topic of food waste in the store. Price reductions for suboptimal food items are found in all food product categories except fruit and vegetables. Items close to expiry are usually reduced in price on the same day and one or one day before expiration date. Different labels with reduced price were used to identify those suboptimal food products such as a) an orange label with price only; b) an orange label with 'se dato' and price; and c) a yellow round label with price only (see Appendix 6). In general, based on the product category, these suboptimal products are placed either a) side by side with normal of the same type; b) in a designated area together in the same category; or c) a designated area mixing all types of categories including food and non-food items.

7. KIWI

Table 8: Food waste avoidance initiatives by Kiwi

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pålæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							

	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							
Legend:	Initiatives based on primary data. In other words, these initiatives were implemented in the store							

Product strategies

In the FV section, there was a permanent '10 pieces for 20 DKK' offer allowing customers to choose a mix of fruits they needed for a cheaper price. Also, customers could buy a mix of root vegetables in one package made by a supplier.

Pricing strategies

In the store, a benefit program with Kiwikort (kiwicard) was promoted in all the categories which gave discounts for the card holders.

Initiatives in different product categories

1) Dairy

There were no suboptimal food products found in this category.

2) Bread

There were 'bake-off' products sold on the day. There was no communication about price reduction at a certain point in time. According to the employee of the store, they did not sell bake-off bakery products at reduced price because the supplier who delivered the products collected themselves what was not sold. There were two boxes with lots of different type of bread reduced in price. There was a paper with the original price put on one box. The items in this box had one day before expiration date and were reduced by 17%. The items in the second

box had also one day before expiration date, the original prices were not visible. Reduced price values varied from 5 DKK for 500g bread to 10 DKK for 1 kg bread. There was no communication about food waste.

3) Fruit and vegetables (FV)

There were no suboptimal food products found in this category.

4) Meat and seafood

There were several meats at reduced price such as minced pork, pork schnitzel, and fresh pork sausages. A yellow round label with 'Nedsat' (discounted) and a reduced price value was put on meat boxes. Price reductions varied from 16% to 59%. For example, the label with price reductions of 16% and 50% were put on items that had 2 days before use-by-date. The label with price reduction of 59 % was put on item that was on the expiration date. The original price of the items was visible on the shelf. Suboptimal products were placed side by side with normal of the same type. There was no reduction for chicken fillet that was expiring on the same date and was placed side by side with those that had more days before expiration (see Appendix 7). In addition, there was one box of pork (svine mørkebrød) that passed the expiration date 2 days ago and was a reduced price value of 15 DKK.

5) Sausage and pålæg

Some suboptimal food items were found in a green box and side by side with the normal ones of the same type. A yellow round label with 'Nedsat' (discounted) and a reduced price value was put on single food items. Those items that were in the green box had two and 7 days before expiration date. The original price of the items was not visible in the green box where they were placed. There were three items of pickles at price of 5 DKK that passed expiration date one day ago (see Appendix 7). Other pålæg packages e.g. smoked fillet and ham were reduced at 10 DKK (28% reduction) five and six days before expiry. These items were placed side by side with normal of the same type. There was no communication about food waste.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

There was only broccoli salad at reduced price. A yellow label with 'Nedsat' and a price value was put on the salad box that was on expiration date. The original price of the items was visible on the shelf where it was placed side by side with normal of the same type. There was no communication about food waste. There was no reduction for another salad that was expiring on the same date. According to the employee, they usually reduced priced on ready to eat salads or other conventional products on the same day or one day before expiration date.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

There were various items of this category in a separate area names 'stærkt nedsat!' (heavily discounted) mixing different products including foods and non-foods. Those products seemed to be reduced in price not due to close expiration date or short shelf-life but their appearance. For example, broken ice-cream waffles were at reduced price of 15 DKK and some chocolates or other condiments were also at reduced price of 6. Original price was not visible- There was no communication about food waste.

Overall, there is no communication about the food waste in the store. However, there are many products found at reduced prices due to sub-optimality. Notably, items which were on the expiration date but not reduced in price were found in fresh convenience and fresh meat categories. Also, items being reduced in price but still available on sale even though they had passed expiration date. These items were found in the sausage and pålæg and meat categories. The reasons for why this has occurred are unknown. According to the employee of the store they usually check and reduce prices in every day. Items close to expiry are reduced in price on the same day or one day or a few days before expiration date depending on the category.

A round yellow label 'nedsat' (discounted) and a reduced price value is used to identify those suboptimal food items. In general, these products are placed either a) side by side with normal of the same type, b) in a designated area together in the same category, or c) a designated area mixing all types of categories including food and non-food items.

According to the employee, customers tend to buy suboptimal food products. Usually all ready to eat salads are sold out quickly.

8. MENY

Table 9: Food waste avoidance initiatives by Meny

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pålæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

Product strategies

Certain fruits and vegetables were sold per pieces. There was a permanent '10 pieces for 25 DKK' offer allowing customers to choose a mix of fruits they needed for a cheaper price. There was also an offer buying 7 pieces of bananas in a package for 7 DKK.

Pricing strategies

Multi-item pricing was used in these categories: fruit and vegetables, meat and seafood and frozen foods (see Appendix 8). In the FV section, there was possibility to buy 7 bananas in a plastic bag for 7 DKK while 10 pieces of self-selected bananas for 25 DKK where the piece of one banana was 2.75 DKK. In the frozen foods section, there were a lot of promotions with 3 packages of chicken for 100 DKK. The price per package was visible on the package. In the meat section, they had special weekly promotions 'Ugens Tilbud' (weekly discount).

Initiatives in different product categories

1) Dairy

There was only one cheese found at reduced price without indication of the original price. An orange label 'se dato' (see the date) with a reduced price value was put on this item four days before the date of expiration. There were no other suboptimal dairy products in the store.

2) Bread

There were no 'bake-off' products sold on the day. There were no suboptimal food products found in this category.

3) Fruit and vegetables (FV)

Some FV were sold per piece. Fruits were sold by piece. Vegetables they were generally sold in a bag, basket, net. Customers were able to weigh fv, so that they could select the size and number they wanted. There were 5 FV types that could be weighted on the scale and were sold by weight such as potatoes, ginger, onion (white and red), carrots, white asparagus, green grapes, and mixed root vegetables. Only strawberries had orange labels with a reduced price (reduced by 20 % of original price). They were placed together in the category. The original price was well visible. No communication about food waste or date.

4) Meat and seafood

Many packages of suboptimal chicken breast and turkey of the 3 for 100 DKK promotions were reduced in price at 24.95 DKK and 19.95 DKK respectively. Prices were reduced by 50% and 38 % of the original price. Orange labels 'stærkt nedsat' (heavily discounted) with the reduced price value were put on single items. Suboptimal products were placed together with products of the same category in the separate section of the fridge. According to the employee working in the meat section, the topic of food waste is not communicated in the store at all. Price reduction is put on a single suboptimal food item. Suboptimal meat products of the same type are placed next to the normal ones.

5) Sausage and pålæg

There were a lot of suboptimal food products found in this category. Orange labels 'stærkt nedsat' (heavily discounted) and orange labels with 'se dato' (see the date) and reduced price values were put on single items. There was no communication about food waste. Those suboptimal items were on the date of expiry or one to three days before expiry. Original prices of the items were not visible neither on the items nor where they were placed. They were placed together in a designated area of the fridge mixing other food product categories.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

A lot of BBQ-Potatoes were at reduced price. The same orange labels with 'se dato' signs and reduced price value were put on single items. They were placed together in a designated area of the fridge mixing other food product categories. There was on type of salads being on expiration date but not reduced in price.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

Only some ready to make carry sauces were found at reduced price with the same orange labels with 'se dato' signs and reduced price value put on single items. They were placed together in a designated area of the fridge mixing other food product categories.

Overall, there is no general communication about the topic of food waste in the store neither on a food item that is close to expiration date nor in the store in general. In Meny they price reductions are found in all food product categories, except the bread category. An orange label with a reduced price value is always put on single suboptimal food items. Items close to expiry are reduced in price on the same day or one to three days before expiration date. Suboptimal food products are placed side by side with normal of the same type in the FV section. Other suboptimal food products such as meat, sausage and pålæg, convenience foods are placed in a designated section in the fridge mixing different items of those categories.

9. NETTO

Table 10: Food waste avoidance initiatives by Netto

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pålæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

Product strategies

N/A

Pricing strategies

N/A

Initiatives in different product categories

1) Dairy

There were no suboptimal food products found in this category.

2) Bread

There was a designated place for 'bake-off' bakery products in the store. It was also communicated that all products were priced 50% less after 20:00 every day. This was communicated as an anti-food waste action (see Appendix 9). There were also several items of bread of the same type, expiring on the same day at price of 5 DKK (reduced by 72% of the original price). The bread was placed in its own box with a big sheet of paper underneath communicating this as an anti-food waste action.

3) Fruit and vegetables (FV)

Some FV were sold per piece. There was no possibility to weigh items. There were no suboptimal FV items found in this category.

4) Meat and seafood

There were six suboptimal fresh meat products found in this category. A yellow label 'nedsat vare' (discounted item) with a price value was put on single suboptimal food items (see Appendix 9). The label was put on the same date or one day before expiration date. The original price of the items was visible on five of them and seen on the shelf where they were placed. Price reductions varied from 20% to 40% of the original price of the product (see Appendix 9). Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste.

There were no suboptimal fish items found in this category.

5) Sausage and pålæg

There were several kinds of suboptimal pålæg- and sausage-packages being reduced in price at either 5 or 10 DKK. Those items were placed in its own box with a big sheet of paper underneath communicating this as an anti-food waste action. There was one sausage that passed expiration date three days ago.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

One ready to eat salad reduced in price was found in the store. A yellow label with reduced price (21% reduction of the original price) was put on this item on the day of expiry (see Appendix 9). The original price of the salad was visible on the shelf where the item was placed. This suboptimal salad was placed side by side with normal of the same type.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

A package of chips at 5 DKK was found in a designated area named 'stærkt nedsat' (heavily discounted). A package of at 20 DKK was found in another designated area named 'stærkt nedsat'. Dry items with the same yellow label were reduced in price. There was no indication of original price of these items.

Overall, communication about the topic of food waste is visible in the store where suboptimal food items were placed. Price reductions are found in all food product categories except dairy and fruit and vegetables. Items close to expiry are reduced in price on the same day and one or one day

before expiration date. A yellow label 'nedsat vare' (discounted item) and a reduced price value is used to identify those suboptimal food items. In general, these products are placed either a) side by side with normal of the same type, b) in a designated area together in the same category, or c) a designated area mixing all types of categories including food and non-food items.

Table 11: Food waste avoidance initiatives by Salling

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

N/A

There was an extensive amount of products with multi-item promotions in the meat section. There were many 'Tillbud' and 'Spare 30%' (save 30%) items. According to the employee of the meat section, these temporary discounts are promoted in their special Salling magazine.

Initiatives in different product categories

1) Dairy

Different types of cheeses were at reduced price. Yellow labels with reduced price value were put on single items three days before expiration date. It was not possible to see original prices on some of those items, because the yellow labels were put on them. However, original prices of some items were not hidden. These items were reduced from 29% to 60%. These items were placed together separately on the shelf next to other products of the same category. Other items in the cheese sections were placed side by side with normal ones of the same category. These were reduced by 50% four days before expiry date. In the milk section, there was koldskål (buttermilk dessert drink) at half price and placed side by side with other ones.

2) Bread

There were no 'bake-off' bakery products sold on the day. There were two suboptimal bread products found in this category: one being reduced to 10 DKK (52% reduction) one day before expiration date and another one being reduced to 17.47 DKK (50% reduction) four days before expiration date. These products were placed side by side with normal ones.

3) Fruit and vegetables (FV)

There were no suboptimal FV products found in this category. According to the employee in the FV section, they reduced prices for suboptimal items.

4) Meat and seafood

Different types of meat were at reduced price such as chicken and meat steaks. A yellow label with a price value was put on single food items. Price reduction of 30% was set on the items on the use-by-date. Price reduction between 18% and 28% was set on the items one day before the use-by-date. The Original prices were visible on those items. Suboptimal products were placed side by side with normal of the same type. There was no communication about food waste. There was one of the multi-item promotion meats with the passed the use-by-date in the cooler.

5) Sausage and pålæg

Several pålæg items including salads were reduced in price. Yellow labels with a reduced price value of 5 DKK were put on the single items of tzatziki, sausage and leverpostej. Price reductions were on the same date as expiry and one to seven days before expiration date. One suboptimal pålæg item with 50% reduction had five days before expiry. Original prices were visible on the digital shelf or the label itself. All suboptimal products were placed side by side with normal ones of the same category.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

There were no suboptimal food products found in this category.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

Some suboptimal food products belonging to this category were placed in a separate designated area with different products of this category ranging from toppings, dry products, marmalades, syrups and sauces. However, these products do not seem to expire soon. They might be reduced in price due to having a few on stock or appearance. Original prices were not visible on these products.

Overall, there is no communication about the topic of food waste in the store neither on a food item that is close to expiration date or expiration date nor in the store in general. Price reductions are found in all food product categories except FV, however according to an employee working in the FV sections they set price reductions on FV due to the deviated appearance. Two different types of yellow labels are used to identify suboptimal food items (see Appendix 10).

According to the employee working in cheese section, the manager and the employee together decides on the price reductions and when prices should be reduced. On the one hand, cheese has a long shelf life. On the other, hand they do not plan or make orders for an amount of cheese to be delivered to the store. Therefore depending on the amount in stock they start gradually reducing the price of cheese such as 25%, then 30 or 35%, and then 50%. They do not have much food waste because they reuse it, for example, they sell the cheese with close expiration date to another department or reuse it such as they mix it with olives and sell it as ready to use products. On the other hand, it was noted that FV and dairy sections have a lot of food waste.

According to the employee working in FV sections, their customers are looking for quality not price so there is not any communication about food waste. They check the appearance and quality of FV every day. If FV loses its appearance they put a yellow label and place the item in front of the shelf side by side with items of the same kind. Ready to eat salads are reduced at the same date.

In general, suboptimal products are placed either a) side by side with normal of the same type or b) in a designated area where products of different categories are placed together.

11. FØTEX

Table 12: Food waste avoidance initiatives by Føtex

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pålæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend:

 Initiatives based on primary data. In other words, these initiatives were implemented in the store

Product strategies

In the FV section, there was a permanent '10 pieces for 24 DKK' offer allowing customers to choose a mix of fruits they needed for a cheaper price. They also had omtanke meat in the meat section. According to an employee of the second visited store, there were expecting to receive selected FV in smaller packaging.

Pricing strategies

Multi-item promotions were used in Føtex stores. In the first visited store, there were '2 for the price of XX DKK' promotions indicated on the digital shelf labels and on the yellow labels. These promotions were among the sweets, chocolate, bakery and meat products. Multi-item offers were extensively used in the meat section. There were a lot of '2 items for XX DKK' or '3 items for XX DKK' permanent promotions. The quantity was always put with the packaging. Price per item and price reduction / saving was also shown. Also, similar 'Tilbud' promotions were used.

Initiatives in different product categories

1) Dairy

There were several dairy products at reduced price. A yellow label with a reduced price value was put on single items. The original price of the items was visible on the yellow label. For example, four paper bottles of 3.5% milk and one paper bottle of light milk reduced to 6 DKK (14% reduction) had four and 8 days before expiration date respectively; 15 packages of 0.2% sour cream reduced to 8 DKK (45% reduction) had three days before expiration date. There was no communication about food waste at the designated place where suboptimal food items were placed. According to an employee of the first visited store, they also put suboptimal dairy items side by side to the normal one of the same kind.

2) Bread

There were no 'bake-off' bakery products sold on the day. A lot of bread items were at reduced price.

In the first store, there were items reduced to half price on the expiration dates. These items were placed side by side with other breads of the same kind. There was also a table with different types of bakery products with a '2 for XX DKK' promotion that expired in three days. In the second store, there was one bread reduced to 10 DKK (47% reduction) found side by side with normal ones of the same type. A lot of different kinds of bread products reduced to 3 DKK (50% reduction), 6 DKK (45% reduction), and 10 DKK (50% reduction) were found in the designated place together with products of other categories. These bread products had two days before expiration date. There was no communication about food waste at the place where suboptimal food items were placed.

3) Fruit and vegetables (FV)

Some FV were sold per piece. Customers were able to weigh fruit and vegetables, so that they could select the size and number they wanted. There were 9 FV types that could be weighted on the scale. In the first store, there were water melons reduced to 25 DKK (34% reduction) at the entrance but this did not seem to be due to sub-optimality. In the second store, there were two empty baskets with 'Stop Mad Spild' (stop food waste) in the FV section. When asked the employee about these baskets, he showed two big trays with different FV that were going to be reduced. There were a lot of FV with some appearance deviation or bad quality that were going to have 50% or even 75% price reduction. FV were assessed based on quality and appearances not date. For FV area they usually used labels with fixed prices such as 5 DKK, 10 DKK, 15 DKK,

and 20DKK. At the time of store visit, all employees were inspecting all FV. The employee also mentioned that they supposed to have brochures / booklets with guidance and tips for food storage and on how customers could reduce food waste at their homes (see Appendix 11)

4) Meat and seafood

There were a lot of reduced meat items including pork, beef, and chicken close to expiration date in both visited stores. The original and the new price were easy to see. Organic meat items were also reduced in price. A yellow label with a price value was put on single items. The label was put one the same day or one day before expiration date. Price reductions varied from 30% to 37% for items on expiration date. Price reductions varied from 18% to 40% for items one day before expiration date. Suboptimal items were placed side by side with normal of the same type. There was no communication about food waste.

5) Sausage and pålæg

In the first store, there were pålæg-packages from 'omtanke' (using end-pieces that otherwise would be wasted). In the second store, there were a few pålæg-packages reduced at half price having three to 6 days before expiration date. Original priced were easy to see on the yellow labels. These items were in the designated place together with products of other categories. There was no communication about food waste at the place where suboptimal food items were placed.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

One box of tabouleh salad at reduced price was found side by side to normal ones of the same kind. A round label with 'Spis nu Spare mere Spild mindre ☺' (Eat now Save more Waste less) and a reduced price value of 10 DKK (62% reduction)(see Appendix 11) was put on the box. The label was put on use-by-date.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

Four sushi sauce bottles were reduced to 10 DKK (55% reduction) but reduction was not due to date. These items were found in a designated place together with products of other categories. There was no communication about food waste at the place where suboptimal food items were placed.

Overall, there is communication about food waste 'Stop Mad Spild' only at the designated area e.g. two baskets in the FV section. The topic of food waste is also communicated on a round green label with a price value that is put on a single food item with close expiration date (see Appendix 13). According to the employee of the second store, Føtex stores expect to receive selected vegetables sold in smaller packaging. They also have a brochure with guidelines on how customers can minimise food waste at home. However, at the time of the store visit, these have not been available.

According to the employee of the first store, they reduce price in the morning for all food product categories, however less is needed in the dairy section. It is always a reduction at 50% and nearly all is sold. If there are a lot of items to be reduced in price, they are put in a separate section in the cooling counter otherwise it is placed side by side with the normal. According to the employee of the second store, food waste communication is only in the FV category that was also seen at the time of the store visit. If there are a lot of FV with some appearance deviation or bad quality, it is a reduction at 50% or even 75%. In the FV sections products are assessed based on quality and appearances not date. For FV area they usually used labels with fixed prices such as 5 DKK, 10 DKK, 15 DKK, and 20DKK. They reduce prices in the morning for all food product categories. In the meat and fish sections, products are assessed based on a date. They put price reductions three to four before the expiration date so that customer can still buy fresh meat. In the bread section, products are reduced one day before the expiration date. In the dairy section, products are reduced one to two days before the expiration date. Suboptimal dairy, bread, sausages and pålæg packages and

sauces are placed in a separate section where products of different food categories are mixed together. There is not communication about food waste at this place, except in the FV s

According to both employees, customers tend to buy suboptimal food products. Some suboptimal food products are reduced in price and sold in Føtex and some suboptimal food products are collected by volunteers of WeFood, the first social supermarket selling surplus food in Copenhagen. That is regarded as effective food waste avoidance action.

12. LØVBJERG

Table 13: Food waste avoidance initiatives by Løvbjerg

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pålæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

Product strategies

There was no multi-item packaging found in the fruit and vegetables section. Some FV were sold per piece. There was a permanent '10 pieces for 19.95 DKK' offer allowing customers to choose a

mix of fruits they needed for a cheaper price. Customers were able to weigh fruit and vegetables, so that they could select the size and number they wanted.

Pricing strategies

Multi-item pricing was used in these categories: dairy, meat and seafood, dairy, sauces and dry foods (see Appendix 12). Multi-item offers were extensively used in the meat section. There were a lot of '3 items for XX DKK' that seemed to be permanent promotions. The quantity was always put with the packaging. Price per item and price reduction / saving was also shown. For example, the typical offer was '3 items for 120 DKK' (when one item for 45 DKK). There was '3 items for the price of X temporary promotion' on the digital shelf label in the dairy section, where 3 yogurt items were sold for 10 DKK (when one item - 2.95 DKK). In the FV section, there were temporary promotions for big potatoes and big oranges '3 pieces for 10 DKK'.

Initiatives in different product categories

1) Dairy

There were no suboptimal food products found in this category.

2) Bread

There were no 'bake-off' products in the store. Two types of rye bread were reduced in price. A yellow label 'nedsat' (discounted) and a reduced price value was put on single item. The price was reduced by 17%. Those items had one, three and four days before expiration date and were placed in a separate box.

3) Fruit and vegetables (FV)

Some FV were sold per piece. Customers were able to weigh fruit and vegetables, so that they could select the size and number they wanted. There were several FV types that could be weighted on the scale and were sold by weight. There was communication stating that weighing reduces the hidden food waste on the shelf of one of these. There were no suboptimal food products found in this category.

4) Meat and seafood

There were a lot of suboptimal meat products items of different kinds at reduced price. Yellow labels with 'nedsat pga. dato' (discounted due to date) and a reduced price value were put on single items on the date of expiration. The original prices were visible on the single items. For example, the labels with a new reduce price of 25 DKK (reduced price) were put on beef and pork that were initially on the promotion of '3 items for 120 DKK' (when one item for 45 DKK). The value of price reduction was set according to price of a single item, therefore suboptimal meat product was reduced by 44%. Other suboptimal meat items were reduced by 20 or 40% of the original price on the date of expiration. All suboptimal products were placed side by side with normal of the same type. There was no communication about food waste, just the date.

5) Sausage and pålæg

There were some suboptimal items. A red label with 'nedsat pga. dato' (discounted due to date) and a reduced price value was put on single food items. The original price of the items was not visible on the item. For example, the labels with 5 DKK were put on the leverpostej and Italian salad on the same day while the labels with 10 DKK were put on the same type of leverpostej that had one day before expiration date. Those items on expiration date were half price cheaper than those that had one day before expiration date. There was no communication about food waste. Suboptimal products were placed a designated area together in the category.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

Two sandwiches of the same type were reduced in price due to the date. A yellow label with 'nedsat pga. dato' and a reduced price value was put on single food item on the date of expiration. The original price of the items was also on the item. The price was reduced by 17%. There was no communication about food waste just the date. Those suboptimal items were placed side by side with normal of the same type.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

There were no suboptimal food products found in this category.

Overall, there is no communication about the topic of food waste in the store neither on a food item that is close to expiration date or expiration date nor in the store in general. Price reductions are found in all food product categories except dairy, FV and other (frozen foods, condiments, sauces, dry products etc.). Special price reduction labels such as a) a yellow label without date, b) a yellow label with 'nedsat pga. dato', or c) a red label with "nedsat pga. dato" are used to identify suboptimal food items (see Appendix 12). Price reductions varied from 17% in both bread and fresh convenience categories to 20% - 44% in the meat category put on items single items on expiration date and a few days before expiration date. In general, suboptimal products are placed either a) side by side with normal of the same type or b) in a designated area together in the same category.

13. REMA 1000

Table 14: Food waste avoidance initiatives by Rema 1000

Initiative type	Initiative name	Product category						
		Dairy	Bread	Fruit and vegetables	Meat and seafood	Sausage and pálcæg	Fresh convenience	Other
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							

Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

Product strategies

Rema 1000 had a selection of food items in smaller packaging. A selection of bread in smaller packages was available in the store. This possibility was also communicated in the store. There were sub-units in a single package found in the FV category, for instance, a mix of 3 different types of peppers in the package (see Appendix 13). Some FV were sold per piece. Customers were able to weigh fruit and vegetables, so that they could select the size and number they wanted.

Pricing strategies

Multi-item pricing was not used in the stores.

Initiatives in different product categories

1) Dairy

There were no suboptimal food products found in this category.

2) Bread

Rema 1000 offered 'bake-off' bakery products sold on the day. However, there was no communication about price reduction at a certain point in time. There were no reduced items in this category.

3) Fruit and vegetables (FV)

Some FV were sold per piece. Customers were able to weigh fruit and vegetables, so that they could select the size and number they wanted. There were 5 FV types that could be weighted on the scale and were sold by weight. There was communication stating that weighing reduces the hidden food waste on the shelf of one of these. There were no suboptimal food products found in this category.

4) Meat and seafood

There were some suboptimal food products found in this category in the second visited store. A yellow label with a price value was put on single food items. The label was put one or several days before expiration date. The original price of the items was not visible on the shelf where they were placed. According to the employee of this store, suboptimal fresh meat products had a yellow label and were reduced by 25% of the original price typically put one or several days before expiration date. If those items were not sold, then a yellow label with a 50% price reduction was put on a day of expiry. For example, the label on minced beef had one or four days before expiration date. There was no communication about food waste on the label but next to the place where suboptimal food items were placed. Suboptimal products were placed side by side with normal of the same type.

5) Sausage and pålæg

There were no suboptimal food products found in this category.

6) Fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.)

Four reduced items were found in this product category in the first visited store and one reduced item in the second one. Yellow labels with a price value of 10 DKK and 15 DKK were put on single food items on expiration date. Price reductions therefore varied from 33% to 57% of the original item price (see Appendix 13). The original price of those items was visible on the shelf where they were placed. For example, crashed cauliflower was reduced from 15 DKK to 10 DKK e.g. by 33% and placed on the actual expiration date (see Appendix 13). There was no information about food waste on the labels. Suboptimal fresh convenience products were placed side by side with normal ones of the same type.

7) Other (frozen foods, condiments, sauces, dry products, etc.)

There were no suboptimal food products found in this category.

Overall, lots of different communications about food waste and food waste avoidance actions in several places in the store and outside the store. The topic of food waste was communicated in the store either on a food item, which is close to expiration date or expiration date or in the store in general. Posters with communication about food waste avoidance were visible and placed in sections of different product categories, particularly in the fresh meat and seafood category (see Appendix 13). According to the employee of the store, they reduced prices of food items in all product categories due to the close expiration date and/or depending on a quantity of items being on stock. In an instance when they had 10 milk packages on stock and did not expect to sell them before expiration date, they reduced their price.

Items close to expiry are reduced in price on the same day or one day before expiration date. A yellow label with a reduced price value is always used to identify those food products. Price on data-labelled items in the FV category is typically reduced on the same day or a day before expiry. Price on data-labelled items in the bread category is reduced one day or two days before expiry. A yellow label with 50% reduction is put on a single bread product two days before expiry. A yellow label with a fixed price value of 2 DKK or 5 DKK is put on the single bread product one day before expiry. The value of price reduction is defined according to the original price of the product. Communication about food waste is used only on yellow labels with a fixed price value of 2 DKK (see Appendix 13). Suboptimal food products in fresh meat and seafood category have a yellow label and are reduced by 25% of the original price typically put one or several days before expiration date. If those items are not sold, then a yellow label with a 50% price reduction is put on a day of expiry. In general, suboptimal food products are placed side by side with normal of the same type in the second. In the first visited REMA 1000 they check dates of products every Monday and only meat and pålæg-packages are reduced and placed together in a designated cooling counter. According to the employee in the second store, customers tend to buy suboptimal food products. If those products are not sold within expiration date, they are placed in the container from which people come to collect those products. The visited store does not have any cooperation with farmers.

To sum up, a variety of food waste avoidance actions have been identified in Danish food retail based on observational data collected during the store visits and interviews with employees. These actions at individual supermarket chain level are mapped in the following Table 15. The same initiatives at retail group level are mapped in Table 16.

Table 15: Food waste avoidance initiatives by Danish supermarket chains**

Initiative type	Initiative name	Aldi	Lidl	Fakta	Irma	Kvickly	Super-Brugsen	Kiwi	Meny	Netto	Salling	Føtex	Lønbjerg	Rema 1000
Product-related	Development of products otherwise wasted in the supply chain (e.g. bended carrots)													
	Development of packaging to reduce food waste													
Price-related	Reduction on food items close to expiry													
	Abolishment of multi-item offers													
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')													
Unit-related	Selection of food items in small packages													
	Selection of food items in packages that contain several separate units													
	Weighing selected food items													
Communication	Communication about the topic of food waste on labels on suboptimal food items													
	Communication about the topic of food waste at a place where suboptimal food items are placed													
	Communication about the topic of food waste in other ways at the Point of Sale													
	Communication about the topic of food waste outside the Point of Sale													
	Development of digital application to communicate about the topic of food waste avoidance, food storage, etc.													
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items													
	Reuse of food items close to expiration date for new applications													
Instore related	Placing suboptimal food items side by side with normal ones of the same													

	category													
	Placing suboptimal food items in a designated area together in the category													
	Placing suboptimal food items in a designated area mixing all types of categories													

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

**Based on primary data material

Table 16: Food waste avoidance initiatives by Danish food retail groups**

Initiative type	Initiative name	Aldi	Lidl	Coop	Dagrofa	Dansk Supermarked	Løvbjerg	Reitan - Rema 1000
Product-related	Development of products otherwise wasted in the supply chain							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer concept 'Forlæng dit tilbud' ('Extend your offer')							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other ways at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
Collaboration and expansion	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore related	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							

Legend: Initiatives based on primary data. In other words, these initiatives were implemented in the store

****Based on primary data material**

V. Food waste avoidance initiatives in Danish food retail - combined results

The collation and analysis of data from across Danish food retailers and their supermarket chains have generated a total 22 food waste avoidance initiatives in Danish food retail (Table 17). These initiatives are derived from secondary and observational data. They can be grouped into five distinct categories related to product, price, unit, communication, collaboration and expansion, and instore-related actions. Depending on individual initiatives they are communicated, applied and implemented for different product categories to various degrees.

Based on secondary data analysis, 11 out of 22 food waste avoidance initiatives are communicated by Coop, 8 initiatives by Reitan, 6 initiatives by Lidl, only five by Dansk Supermarked and Dagrofa. The most common initiatives are a) price-related e.g. price reduction on food items close to the expiration date and abolishment of multi-item offers, b) communication e.g. communication about the topic of food waste outside of the point of sale through websites, brochures, samvirke magazines, and development of digital applications (apps) to advertise promotions and those products that are close to expiration, c) collaboration and expansion e.g. collaboration with NGOs or other organisations by donating on food items otherwise wasted. Price reductions as food avoidance initiatives are communicated by all Danish retail groups. Collaboration with NGOs or other organisations is communicated by all except Lidl and Løvbjerg.

Based on observational data, Dansk Supermarked and Coop have implemented the most initiatives (13 and 12 respectively out of 22 initiatives) in their stores compared to other retail groups in Denmark. 10 initiatives are found in REMA 1000 stores of Reitan, 8 initiatives - Lidl, 6 initiatives - Dagrofa, four initiatives - Løvbjerg, and only three initiatives are found in Aldi. The most common initiatives implemented in the stores are a) price-related e.g. price reduction on food items close to the expiration date, b) instore-related e.g. placing suboptimal food items side by side with normal ones of the same category and having a designated area for suboptimal foods, c) unit-related e.g. allowing weighing of fruit and vegetables so that people select a size and a number they want, and offering packages that contain several separate units. Price reductions as food avoidance actions are prevalent in Danish food retail. With regard to weighing of FV is available, it is possible in all Danish retail groups, except Aldi. The placement of suboptimal food products is not an initiative being communicated but an action being implemented in the stores. Suboptimal items are mostly placed side-by-side with the normal ones of the same type in the stores of all retail groups. Some stores have a designated area in the same product category. There is also a designated area where a mix of products of different categories is placed together; mainly those that have deviations of appearance and/or have close expiration date. The placement of suboptimal products in the designated area is usually a complementary action to the side-by-side product placement in all Danish retail groups, except Aldi.

Based on both secondary and observational data, Coop exploits 18 out of 22 food waste avoidance initiatives, followed by Dansk Supermarked which uses 15 initiatives and Reitan which uses 13 initiatives. Dagrofa uses 11 initiatives while Lidl uses 10 initiatives. Only a few food avoidance actions are taken by Løvbjerg and Aldi. With regards to the initiatives which are communicated by retail groups and implemented/found in their stores, Reitan and Coop have taken five actions in their stores that are also communicated on their website, followed by four actions in Lidl, three actions in Dansk Supermarked, and one action in Dagrofa. In general, the most common categories of food waste avoidance initiatives and actions among the retail groups are: a) price-related e.g. price reduction on food items close to the expiration date and abolishment of multi-item offers; b) unit-related e.g. allowing weighing of fruit and vegetables so that people select a size and a number they want; c) instore-related e.g. placing suboptimal food items side by side with normal ones of the same category; d) communication e.g. communication about the topic of food waste outside of the point of sale; and e) collaboration and expansion e.g. collaboration with NGOs or other organisations by donating food items otherwise wasted. These four categories are used to

greater extent in various supermarket chains. On the other hand, product-related initiatives such as developing products otherwise wasted in the supply chain (e.g. banded carrots) or developing products that allow food to keep fresher for longer (e.g. smart packaging, better resealing) are executed to the lesser extent in the supermarket chains.

Depending on types of food waste avoidance initiatives, they are used for different food categories such as dairy, bread, fruit and vegetables (FV), meat and seafood, sausage and pålæg, fresh convenience (e.g. ready to eat salads, sandwich, fruit in pieces, etc.), and others (e.g. frozen foods, condiments, sauces, dry products, etc.) to greater or lesser extent.

Product strategies and related initiatives are used to a very low extent by retailers. Only Coop and Dansk Supermarked are developing products otherwise wasted in the supply chain (e.g. banded carrots, 'omtanke' meat) for FV and meat. Only Coop and Dagrofa are developing products for FV that allow food to keep fresher for longer (e.g. smart packaging, better resealing). In Irma, customers can buy a special bag for salads to hold longer.

Pricing strategies and related initiatives are extensively used in Danish food retail. On the one hand, abolishment or different execution of multi-item promotions such as '2 items for XX DKK' or '3 items for XX DKK' is communicated by several retailers. On the other hand, there are no multi-item promotions only in Rema 1000 stores. This action is communicated both in the store and out the point of sale. Multi-item pricing is widely used in the meat and seafood category as permanent promotions. Similar temporary promotions are also found in other categories such as FV, sausage and pålæg, organic foods, and other (frozen foods, condiments, sauces, dry products, etc.). Original price of a single item is usually visible on a package or a shelf where the item is placed. This applied for both temporary and permanent offers. In addition, there are special weekly and monthly promotions offering single items at a lower price. The possible justification for these actions is that shelf life of some items e.g. fresh meat and seafood is shorter and therefore stores want to sell these items as soon as possible. Especially, this might be the case if there are no instore facilities where they can process, freeze and use certain foods for other applications e.g. making bread chips from old bread in Irma, offering meals cooked from foods that else might have gone to waste in Salling and Kvickly.

Outstandingly, Lidl has developed an offer concept named 'Forlæng dit tilbud' ('Extend your offer') which takes into account both customers' consumption patterns and fresh food items with a limited shelf life. This concept allows customers to make use of special offers to their specific needs. Customers buy an amount of items on offer they need for a week and ask for a discount coupon for the same item at the checkout. As a result, customers can extend the offer on this item for the following week, when they buy the same product again at the offer price.

With regards to suboptimal foods, different pricing mechanisms are applied for items of different food categories. Price reductions are set on items of all food categories, including organic, by all retailers, except Aldi stores, where they reduce prices only in one food category e.g. fresh meat and seafood. In some supermarket chains the level of price reduction may depend on a food product category, an amount of items on stock, an original price of a product, deviated appearance a number of days before expiration date and shelf-life while in other supermarkets fixed price reduction levels are set. Depending on type of product, price reductions are set on the same day as expiration date, one or a few more days before expiration date. However, in some stores they lack a systematic approach for a) when employees should check dates of food items, b) when employees should remove unsold suboptimal food items from the shelves, and c) deciding on a value of price reduction. To note some instances from store visits, Føtex uses a systematic approach for evaluating suboptimal foods and also have a certain procedure in place. A 30% reduction in price is always set on suboptimal food items of all product categories in Lidl. Irma has also some procedures. However, there is no special routine for defining a level of price reduction in some supermarkets. In general,

based on observational data, typical level of price reduction for suboptimal food items is around 25-30 % of the original price. Yet, the reduction levels vary from 10% to 75% of the original price depending on the food category.

In the dairy category, price reduction ranges from 14 to 50% and even 60%. The 50-60% reduction is set for items on expiration date. The lower reduction levels e.g. 14% are set for items with more than two or three days before expiration date. Lower than 25% reductions are found on suboptimal items in supermarkets of Dansk Supermarked (Føtex) and Coop (Kvickly). 25-50% reductions are found on suboptimal bread items in supermarkets of Dansk Supermarked (Føtex, Salling) and Coop (Kvickly). Price reductions of 50% and/or above are found on suboptimal items in supermarkets of Dansk Supermarked (Salling) and Coop (Superbrugsen). The expiration date of dairy products is checked every day, either in the morning, noon or evening before the closure of the store.

In the bread category, price reduction ranges from 17 to 50% and even 72%. The 50% reduction is set for items on expiration date or one day before expiry. The lower reduction levels e.g. 17% are set for items with one to four days before expiration date. Lower than 25% reduction is found on suboptimal items in supermarkets of Løvbjerg, Dagrofa (Kiwi), and Coop (Fakta). 25-50% reduction is found on suboptimal bread items in supermarkets of Lidl. Price reductions of 50% and/or above are found on suboptimal items in supermarkets of Lidl, Dansk Supermarked (Netto, Salling, Føtex) and Coop (Superbrugsen). The quality and expiration date of FV (if FV are packaged) are checked every day. If a supermarket chain sells bake-off bakery products, a typical 50% reduction is offered for these products one hour before closure of the store. Price reduction of 50% is found on suboptimal items in supermarkets of Lidl, Dansk Supermarked (Netto) and Coop (Fakta, Irma) Dagrofa (Kiwi). The expiration date of products of this category is checked every day, either in the morning, noon or evening before the closure of the store.

There are a few supermarket chains that sell suboptimal fruit and vegetables (FV). Typical price reduction levels range from 10 - 20% to 50 - 75% for suboptimal items on expiration date. Below 25% reductions for suboptimal FV are found in supermarkets of Dagrofa (Meny) and Coop (Irma). Price reductions of around and/or above 50% for suboptimal FV are found in supermarkets of Dansk Supermarked (Føtex) and Coop (Fakta, Irma). The quality and expiration date of FV (if FV are packaged) are checked every day.

In the fresh meat and seafood category, price reduction level ranges from 16 to 50 % and even 59%. The reduction levels vary independently from a number of days before expiration date. Lower than 25% reduction is found on suboptimal items in supermarkets of Dansk Supermarked (Netto, Salling, Føtex), Dagrofa (Kiwi), Løvbjerg, and Coop (Kvickly). 25-50% reduction is found on suboptimal bread items in supermarkets of Aldi, Lidl, Coop (Fakta, Irma), Dansk Supermarked (Netto, Salling, Føtex), Løvbjerg, and Reitan (Rema 1000). Price reductions of 50% and/or above are found on suboptimal items in supermarkets of Dagrofa (Kiwi, Meny), Coop (Fakta, Superbrugsen). The price reduction is put on suboptimal items that are on the actual expiration day or one day before expiration date.

In the sausage and pålæg category, price reduction is around 23-28%. There are a few instances with 50% reduction on suboptimal items. The price reduction is put on suboptimal items that are on the actual expiration day or have one - two days or nearly a week before expiration date. Lower than 25% reduction is found on suboptimal items in supermarkets of Coop (Fakta). 25-50% reduction is found on suboptimal bread items in supermarkets of Lidl, Coop (Fakta, Irma, Superbrugsen), Dagrofa (Kiwi), Dansk Supermarked (Netto, Salling, Føtex), Løvbjerg, and Reitan (Rema 1000). Price reduction of 50% is found on suboptimal items in supermarkets of Dansk Supermarked (Føtex).

In the fresh convenience food category, the price reduction level ranges from 30 to 60% independently from whether it is a ready to eat salad, a sandwich or a burger. Typically, price reduction is put on items being on the expiration date. Lower than 25% reduction is found on suboptimal items in supermarkets of Dansk Supermarked (Netto) and Løvbjerg. 25-50% reduction is

found on suboptimal bread items in supermarkets of Lidl, Coop (Fakta, Irma, Superbrugsen), and Reitan (Rema 1000). Price reduction of 50% and above is found on suboptimal items in supermarkets of Coop (Fakta Superbrugsen), Dansk Supermarked (Føtex), and Reitan (Rema 1000).

In the most of visited stores, the original price of the suboptimal items within the other category has not been visible because they tend to be placed in a designated area. However, reduction of 30 % is found in Lidl; reduction of 50% is found in Coop (Irma); and reduction of 55% is found in Dansk Supermarked (Føtex).

Communication initiatives for price reduction and food waste. Different labels with reduced price are used to identify suboptimal food products (see Table 18). In most of supermarkets, price reduction is communicated with either a yellow or orange label or both labels. Besides using a yellow label, Føtex also uses a white-green label. The label with price reduction is always put on a single suboptimal item. The price reduction labels focus: a) on price only; b) price/economic argument alone e.g. 'Stærkt nedsat' (heavily discounted), 'Rabat' (discount), 'Nedsat' (discounted); c) on price/economic argument and date e.g. 'Se dato' (see date), 'Dato Service-50%', 'Nedsat pga Dato' (discounted due date), and c) price/economic argument and food waste/ethical appeal e.g. 'Spis nu Spare mere Spild mindre ☺' (Eat now Save more Waste less), 'Stop mad spild' (stop food waste), 'Bekæmp Madspild'. The price or economic argument alone is used in all supermarket chains. Yet, three retail groups Coop, Dansk Supermarked and Reitan use labels that combine price/economic argument with food waste/ethical appeal. Coop uses such labels on all suboptimal food items only in Fakta stores. Dansk Supermarked uses such labels on items of the FV and convenience food categories in Føtex stores. Reitan uses such labels with a fixed price value of 2 DKK on items of the bread and FV categories in REMA 1000 stores. If there is a designated area for suboptimal food items, the topic of food waste is usually communicated at that place where those items are placed.

On the one hand, the topic of food waste problem is mostly communicated outside the point of sale through company's websites, brochures, samvirke magazine, digital applications (app) downloaded onto mobile devices to communicate the topic of food waste avoidance or to advertise promotions and suboptimal food products. On the other hand, communication about food waste is limited in the stores. In some supermarkets there is no communication at all (Aldi, Meny, Kiwi, Salling, and Løvbjerg). In other supermarkets communication about food waste is on labels on close-to-expiry-date items, at a place where suboptimal food items are placed, and other way in the store e.g. posters and brochures put in various sections, communication stating that weighing reduces the hidden food waste on the shelf.

Unit-related actions, especially allowing weighing selected food items in the stores, so that customers select an amount and a size of units they need are available in all retail stores, except Aldi. Also, selection of food items in packages that contain several separate units, such as three types of berries, three types of mushrooms, and a mix of root vegetables, is common among retailers. These initiatives are implemented only for FV category. Selection of food items in small packages/unit sizes are applied in bread and meat categories in Coop, Dansk Supermarked, and Reitan - Rema 1000). As a result, such packaging should be favourable by customers who live alone or are a few people in household as they can buy for their actual needs and do not have to pay more for a smaller package.

Collaboration and expansion activities are regarded as food waste avoidance initiatives in the stores. Most retailers (e.g. Aldi, Coop, Dagrofa, Dansk Supermarked, and Reitan – Rema 1000) communicate about their collaboration and partnership with different NGOs or other organisations to which they are donating food items otherwise wasted. There is no communication in the stores about food being donated to NGOs or other associations. Only, partnership between Dansk Supermarked and an alternative retail store to sell suboptimal food items is both communicated in media and during the interview with an employee working in Føtex.

Instore initiatives are mainly related to the placement of suboptimal food products. These products are a) placed side by side with the normal ones of the same type in all stores b) placed in a special designated area in the same category for example Kiwi in the bread section, c) placed in a special area where a mix of products of different categories are placed together. The designated areas are usually supplementing the side by side placement of the products. In some stores, there can be a) foods that are suboptimal but not reduced in price, b) foods that have expired but not removed from the shelf or the designated area for suboptimal foods, c) foods with misplaced food waste communication such as batteries and other non-food products. These matters might have occurred due to the lack of staff in the store or care by the staff, and/or the lack of resources or processes.

Food waste initiatives differ depending on the setting they are applied in. In the online setting certain initiatives are used to communicate food waste efforts by retailers. In the physical setting distinct initiatives are applied and implemented in the stores. These results provide new insights into food waste avoidance actions conducted by retailers. The findings allow for suggestions of developing CSR strategies and for recommendations to effectively implementing initiatives for diverse categories and across different settings.

Table 17: Mapping of food waste avoidance initiatives by Danish food retail groups***


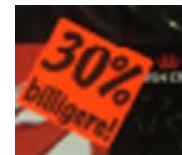



Initiative type	Initiative name	Aldi	Lidl	Coop	Dagrofa	Dansk Supermarked	Løvbjerg	Reitan - Rema 1000
Product-related	Development of products otherwise wasted in the supply chain (e.g. bended carrots)							
	Development of packaging to reduce food waste							
Price-related	Reduction on food items close to the expiration date							
	Abolishment of multi-item offers							
	Developing an offer 'Forlæng dit tilbud' (extend your offer)							
Unit-related	Selection of food items in small packages							
	Selection of food items in packages that contain several separate units							
	Weighing selected food items							
Communication	Communication about the topic of food waste on labels on close-to-expiry-date items							
	Communication about the topic of food waste at a place where suboptimal food items are placed							
	Communication about the topic of food waste in other way at the Point of Sale							
	Communication about the topic of food waste outside the Point of Sale							
	Development of digital application to communicate the topic of food waste avoidance							
	Promotion campaign for suboptimal foods							
Collaboration and expansion	Collaboration with NGOs or other organisations							
	Partnership with an alternative retail store to sell suboptimal food items							
	Reuse of food items close to the expiration date for new applications							
Instore-related	Implementating technology to improve cold storage facilities							
	Day-to-day order-planning based on customer demand							
	Placing suboptimal food items side by side with normal ones of the same category							
	Placing suboptimal food items in a designated area together in the category							
	Placing suboptimal food items in a designated area mixing all types of categories							








Legend:




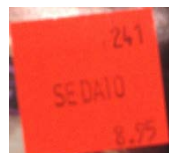


- Initiatives found from secondary data. In other words, these initiatives were communicated on organisation's websites
- Initiatives found from primary data. In other words, these initiatives were implemented in the store
- Initiative from both secondary and primary data. In other words, what is communicated online is implemented in the stores.







***Based on secondary and primary data material



Table 18 Communication of price reduction and food waste on labels

		shape	colour	brand name	brand specific	price reduction pointed	date pointed	reference price pointed	food waste issue pointed	quality pointed	Example
Retail group	Supermarket chain	1-square 2-circle 3-other	1-orange 2-yellow 3-mixed	1- with 2-without	1-yes 2-no	1-yes 2-no	1-yes 2-no	1-yes 2-no	1-yes 2-no	1-yes 2-no	
Aldi	Aldi	1	1	2	2	1	2	2	2	2	
Lidl	Lidl	1	1	2	2	1	2	1	2	2	
Coop	Fakta	2	2	2	1	2	2	2	1	2	
Coop	Fakta	2	2	2	2	2	1	2	2	2	
Coop	Fakta	2	2	2	2	2	2	2	2	2	

Coop	Irma	2	3	1	1	1	1	2	2	2	
Coop	Irma	2	1	2	2	1	2	2	2	2	
Coop	Kvickly	3	1	2	2	2	1	2	2	2	
Coop	Kvickly	2	2	2	2	1	2	2	2	2	
Coop	Kvickly	2	2	2	2	2	2	2	2	2	
Coop	SuperBrugsen	3	1	2	2	2	1	2	2	2	
Coop	SuperBrugsen	3	1	1	2	2	1	2	2	2	

Coop	SuperBrugsen	2	2	2	2	2	2	2	2	2	
Dagrofa	Kiwi	2	2	2	2	1	2	2	2	2	
Dagrofa	Meny	1	1	2	2	1	2	2	2	2	
Dagrofa	Meny	1	1	2	2	2	1	2	2	2	
Dansk Supermarked	Netto	3	2	1	2	1	2	2	2	2	
Dansk Supermarked	Salling	3	2	2	2	2	2	1	2	2	

Dansk Supermarked	Salling	3	2	2	2	2	2	2	2	2	
Dansk Supermarked	Føtex	3	2	2	2	2	2	1	2	2	
Dansk Supermarked	Føtex	2	3	2	1	2	2	2	1	2	
Lønbjerg	Lønbjerg	2	2	2	2	1	2	2	2	2	
Lønbjerg	Lønbjerg	1	1	2	2	1	1	2	2	2	
Lønbjerg	Lønbjerg	1	2	2	2	1	1	2	2	2	

Retain - Rema 1000	Rema 1000	2	1	2	1	2	2	2	1	2	
Retain - Rema 1000	Rema 1000	2	2	2	2	2	2	2	2	2	

References

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