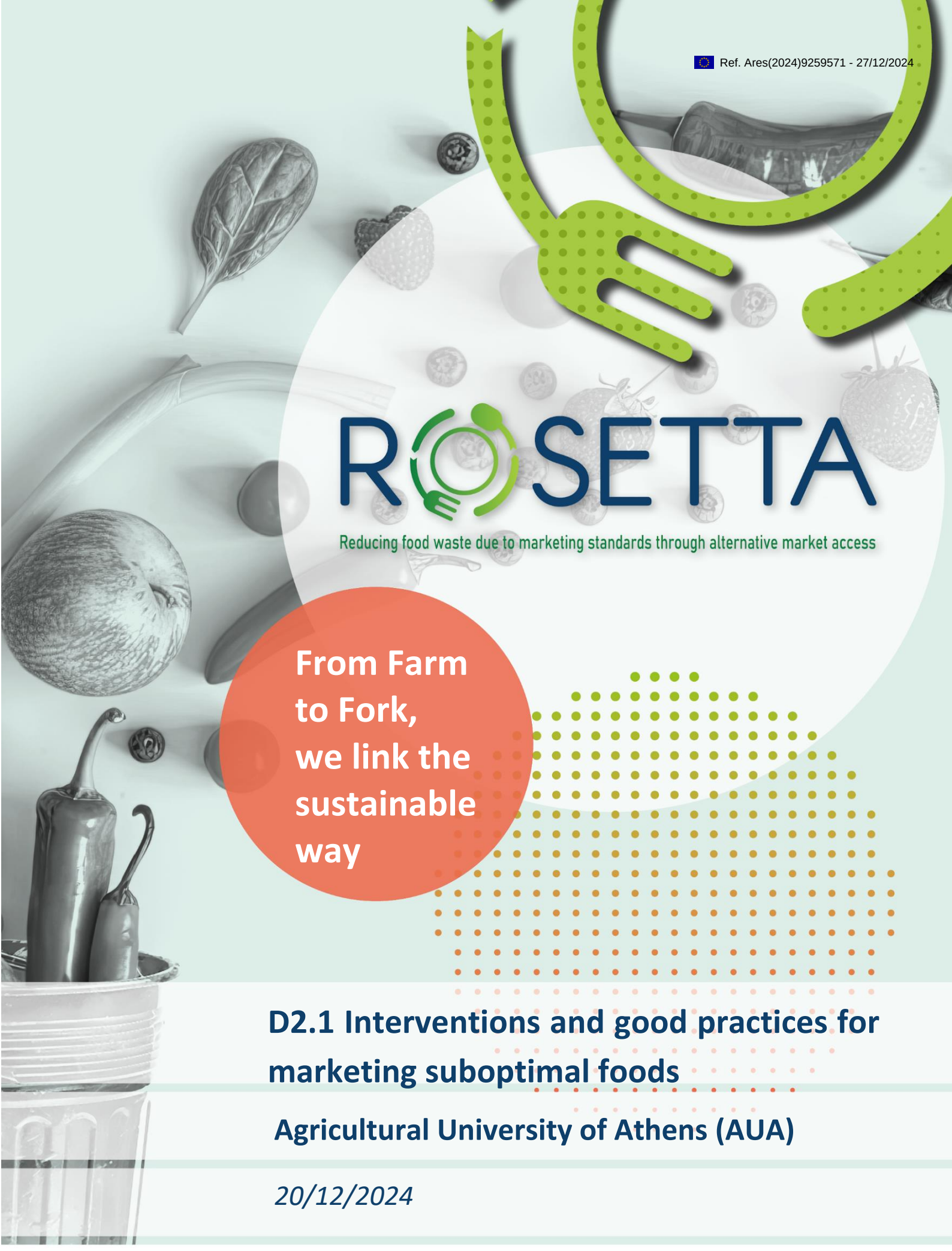


ROSETTA

Reducing food waste due to marketing standards through alternative market access

From Farm to Fork, we link the sustainable way

D2.1 Interventions and good practices for marketing suboptimal foods

Agricultural University of Athens (AUA)

20/12/2024

Funded by the European Union

Project Information

Programme:	**Horizon Europe**
Topic:	HORIZON-CL6-2023-FARM2FORK-01-14
Type of action:	Horizon - RIA
Project number:	101136427
Start date:	01 January 2024
Duration:	36 months
Coordinator:	Q-PLAN INTERNATIONAL ADVISORS PC

Document Information

Title:	**D2.1 Interventions and good practices for marketing suboptimal foods**
Work Package:	2
Task:	T2.1 Collection and analysis of relevant promising interventions and good practices
Authors (Organisation):	Evangelos Anastasiou (AUA), Kalliopi Antonopoulou (AUA), Marilena Gemtou (AUA), Konstantina Kakkavou (AUA), Sofia Stringa (AUA), Spyros Fountas (AUA), Knud Hjortlund Hansen (FBCD), Eirini Efthymiadou (Q-PLAN), Evangelos Genitsaris (Q-PLAN), Estela Hoffmann (TEAGASC), Maeve Henchion (TEAGASC), Przemyslaw Mochnik (MOCH), Lluis Puig (FRESHIS), Agnieszka Sykta (UNI), Tomasz Bober (UNI).
Reviewers:	Evangelos Genitsaris (Q-PLAN), Eirini Efthymiadou (Q-PLAN), Stelios Tsafarakis (TUC)
Date:	20 December 2024

Dissemination Level

PU:	Public, fully open	X
SEN:	Sensitive, limited under the conditions of the Grant Agreement	

Document History

Version	Date	Changes	Responsible partner
V0.1	29/11/2024	First draft ready for review	AUA
V0.2	20/12/2024	Version based on partners' feedback	AUA
V1.0	20/12/2024	Final version ready for submission	AUA

Table of Contents

Table of Figures

List of Tables

Abbreviations

Table 1: Abbreviations

AI	Artificial Intelligence
AUA	Agricultural University of Athens
B2C	Business to Consumer
D	Deliverable
DPO	Data Protection Officer
EU	European Union
FEFO	First - Expired / First Out
FLW	Food Losses and Waste
GA	Grant Agreement
GFN	Global Food Banking Network
GPS	Global Positioning System
MIP	Multi-Actor Innovation Platform
NGO	Non- Governmental Organisation
P2P	Peer to Peer
PFID	Radio- Frequency Identification
ROI	Return On Investment
SSM	Socia Supermarket
TGTG	Too Good To Go
UK	United Kingdom
US	United States
USD	United States Dollar
VAT	Value Added Tax
WP	Work Package

Executive Summary

The main aim of the deliverable D2.1 “Interventions and good practices for marketing suboptimal foods” is to outline the work performed in WP2 “Analysis of business potential for suboptimal foods that do not meet marketing standards but are safe to eat” and specifically on task 2.1 “Collection and analysis of relevant promising interventions and good practices”. The document is organised into six main sections, each focusing on a specific aspect of the work conducted in Task 2.1. In Section 1, the report begins with an introduction that highlights the global challenge of food waste and its profound environmental, economic, and social consequences. It underscores the urgent need for integrated strategies to address this issue and improve the business potential of suboptimal foods. The introduction also outlines the study's objectives, which include identifying effective interventions and best practices across the food supply chain. The following sections outline the work conducted and its results for the purposes of this task through a literature review, interviews, and a focus group discussion.

Specifically, section 2 presents a comprehensive literature review, structured to provide both the methodology used and the key findings which can be classified into three main areas, namely prevention, redistribution, and social interventions. Within prevention, strategies related to pricing, visual marketing and display, packaging and labelling innovations, flexible contracts, communication and awareness campaigns, product design and advancements in logistics and inventory management have been identified as critical to reducing waste and maximising efficiency. The redistribution strategies that have been identified include transforming suboptimal produce into new products, social supermarkets, direct sales channels, and digital platforms for food redistribution. In social interventions, food donation programmes, the use of digital platforms for social interventions, and the role of food banks and other food donation initiatives has been identified.

Section 3 details insights from interviews conducted with food value chain actors, advisors, researchers, and consumers across five countries. Section 3.1 describes the methodology for selecting and interviewing participants, while Section 3.2 presents the findings for each stakeholder group, namely food value chain actors, advisors and researchers, and consumers. Section 3.3 offers a discussion of the interview findings, drawing conclusions for each stakeholder group.

The methodology and findings from the focus group are presented in Section 4 in which key insights across six areas, namely promising markets for suboptimal foods, effective marketing strategies, technological and logistical challenges, challenges in scaling the use of suboptimal foods, expanding redistribution and repurposing models, and policy recommendations for quick impact are outlined.

Section 5 provides a general overview, synthesising the findings from the literature review, interviews, and focus group discussions to present a holistic perspective on food waste reduction strategies. The section emphasises the importance of collaboration, innovation, and tailored approaches to address regional and stakeholder-specific challenges.

Finally, Section 6 concludes the report by summarising the key findings and offering actionable recommendations. It underscores the need for preventive measures, redistribution efforts, policy support, and technological advancements to combat food waste effectively. The results of this deliverable will contribute mainly to the rest of WP2 activities as well as in the activities of the rest of the ROSETTA project WPs.

1. Introduction

Food waste is a global issue with significant environmental, economic, and social implications (Skaf et al., 2021). According to the Food and Agriculture Organisation, approximately one-third of the food produced worldwide gets wasted, which is nearly 1.3 billion tons per year (Agarwal & Singh, 2016). This waste represents a missed opportunity to feed the growing global population and contributes to climate change and environmental degradation by increasing greenhouse gas emissions, overusing natural resources, and straining waste management systems. The economic cost of food waste is also huge, with estimates that global food waste costs the economy nearly 1 trillion USD annually (*Food Wastage Footprint Full-Cost Accounting*, 2014). Thus, interest in reducing food waste and improving resource efficiency within the food system has increased over recent years (Corrado & Sala, 2018; Parfitt et al., 2010).

One of the main contributors to food waste is the disposal of suboptimal foods—those that are safe and nutritious but fail to meet standard marketing criteria due to aesthetic imperfections or minor deficiencies (Stangherlin et al., 2019). Along the food value chain, the reason for disposal of suboptimal foods includes the regulatory provisions and contractual agreements between producers and retailers, which result in very high standards in relation to quality and appearance of foodstuffs (Alexander et al., 2013; Raak et al., 2017). These standards influence what is deemed acceptable for sale and shape purchasing decisions (Oosterkamp et al., 2019). Consequently, perfectly edible and nutritious foods are often left unharvested or discarded because they do not meet these imposed standards (Joardder & Masud, 2019).

To tackle this issue, there is a need for innovative approaches to enhance market viability for suboptimal foods (de Hooge et al., 2018). The European Green Deal and the Farm-to-Fork Strategy provide a timely context for these efforts, promoting sustainability across the food supply chain (*Farm to Fork Strategy - European Commission*, n.d.; *Food Loss and Waste Prevention - European Commission*, n.d.).

ROSETTA aims to revolutionise the food waste landscape linked to marketing standards, while also proposing and validating alternative marketing pathways for the effective utilisation of suboptimal foods, fostering sustainability and resource optimisation. To achieve this, the landscape of food waste interventions and good practices should be identified and evaluated. Consequently, the purpose of deliverable 2.1 “Interventions and good practices for marketing suboptimal foods” was to gather and analyse existing information through literature review, stakeholder interviews and a focus group, about the most effective solutions for enhancing the business potential of suboptimal foods, hence promoting sustainability within the food value chain. In the following chapters the methodologies and the key findings are presented for the activities that were conducted under task 2.1 “Collection and analysis of relevant promising interventions and good practices”.

2. Literature Review

2.1 Methodology

Initially, a literature review of scientific articles, industry reports, and other relevant documents was conducted on selected key themes. The main aim was the collection and analysis of best practices and most effective interventions in improving business potential for foods that are less than optimal. Thus, the methodology was divided in two phases, namely (1) the collection phase and (2) the analysis phase.

For the collection phase, a keyword set was identified for literature searching. The set was defined based on the understanding of suboptimal foods from academic literature. The scope of the literature included peer-reviewed studies examining marketing standards, consumer perceptions, and food waste interventions. Specifically, *suboptimal foods* refer to food products that do not comply with marketing standards, often due to aesthetic reasons such as unusual shape, size, or colour; expiration dates approaching or having foods past their "best before" date; or defective packaging. (Cao & Miao, 2021). Marketing standards are established as a set of rules aimed at ensuring that agricultural products within the single market meet consistent quality expectations (Nes & Ciaian, 2021). Despite these deviations from standardised criteria, suboptimal foods are generally safe to eat. Their less-than-perfect appearance, however, presents significant marketing and consumer acceptance issues, thereby resulting in a lot of food wastage. This is because products with minor defects or non-standard appearance are barred from the market (de Hooge, 2022). Cosmetic standards, instituted to make trading easier by offering common vocabulary during business transactions, are responsible for about 20% of the world's food loss and more than one-third of Europe's food loss (Crama et al., 2023). This aligns with findings from the WP1, specifically Tasks 1.2 and 1.3 of the ROSETTA project, which analyses the current situation regarding food marketing standards and food waste. In most instances, contractual agreements between the manufacturers and retailers are guided by private marketing standards; this sometimes leads to the rejection of suboptimal foods (Nes & Ciaian, 2021). From the consumer perspective, marketing standards reduce information asymmetry by giving uniform and trustworthy product information to consumers. Marketing standards guide the consumers' purchases with an assurance that they would get a minimum level of quality and external appearance of foods purchased. However, these expectations can contribute to the perception that suboptimal foods are inferior, further driving food waste (Huang et al., 2020).

Suboptimal foods can be categorised into the following types:

1. **Aesthetic Imperfections**: Includes foods that are oddly shaped, discoloured, or not uniform in size. These aesthetic imperfections do not affect the nutritional quality or safety of the food but can make them less appealing, as foods with such imperfections are considered flawed from the outset. Fresh produce, particularly items with soft tissues such as certain types of fruits and vegetables, are highly susceptible to damage during transportation due to improper stocking or unsuitable packaging (Raak et al., 2017). Such deficiencies, when compared against a benchmark of perfection, are major causes for loss of food along the supply chain. These imperfections may therefore vary depending on local conditions or marketing efforts since they are based on what food value chain actors view as perfect or imperfect (Suher et al., 2021), and vary according to food commodity.

2. **Near Expiration**: Foods approaching or past their "best before" dates that remain safe for consumption. These items, once considered perfect, are now viewed as imperfect due to the natural process of aging

and potential deterioration. Date labelling is one of the most prevalent issues within scientific studies and societal circles today (Newsome et al., 2014; Samotyja, 2022; Toma et al., 2020). Regulations require supply chain actors to adhere to date labels, which often do not reflect the actual condition of the food. This mismatch leads to consumer confusion between "best before", "sell by" and "use by" dates causing unnecessary food waste out of misplaced safety concerns (Briault, 2018). "Best before" dates refer to the period during which the product retains its optimal taste, freshness, and nutritional value, but they do not relate to food safety. Expiration dates, on the other hand, indicate the point beyond which the product may not meet nutritional and compositional standards (*Food Labels | EFSA*, n.d.). Consumers are highly attentive to expiration dates, often avoiding products close to their best-before date, irrespective of their actual condition (Cicatiello et al., 2019).

3. **Packaging Defects**: Includes products with damaged packaging, such as dented cans, torn labels, or crushed boxes. Although the food inside is still safe, it can deter consumers from buying because of the nature of the defects in the packaging (De Hooge et al., 2017). Throughout the food supply chain, logistical operations are prone to causing mechanical damage to products. Such damage can range from minor package deformations that reduce consumer appeal to more severe impacts that render the products unmarketable (Raak et al., 2017).

Thus, the keyword set contained the phrases "suboptimal foods", "food waste reduction strategies", "food waste prevention", and "food redistribution". The keywords were selected upon the definition of Task 2.1 objectives and scope. Thus, an initial document list was obtained through Google Scholar, Google Search, Web of Science, and Scopus using the aforementioned terms. Abstract review was conducted as a first screening, whereupon non-pertinent sources could be excluded. We targeted sources that shed light on how to develop effective interventions to increase the use of suboptimal foods for human consumption. This initial phase of the data collection process provided a rough list of papers, which were then refined to comprehensively analysed. The synonyms that helped enlarge the search were "ugly food", "imperfect food", "imperfect-looking food", "abnormally-shaped food", "oddly-shaped food". Other keywords used in combination with the above included, "food recovery", "pricing strategies", "social supermarkets", "food donation", "food labelling", and "awareness campaigns", expanding the results of our search and leading to increased diversity in the range of documents for analysis.

The snowballing method for the literature review was followed (Wohlin, 2014) (Figure 1). The snowballing method can offer significant advantages compared to the systematic literature review method, as it reduces the inclusion of non-relevant results in the initial analysis (Jalali and Wohlin, 2012) and help uncover additional relevant studies in interdisciplinary areas like agricultural data value creation, where the concept is still emerging and has not yet been extensively explored in existing literature (Uyar et al., 2024). For this review, initial decisions on whether to include a paper were based on its title. Abstracts were then reviewed to assess relevance to the research scope. A total of 102 documents from various sources were used in the literature review, ensuring comprehensive coverage of the topic.

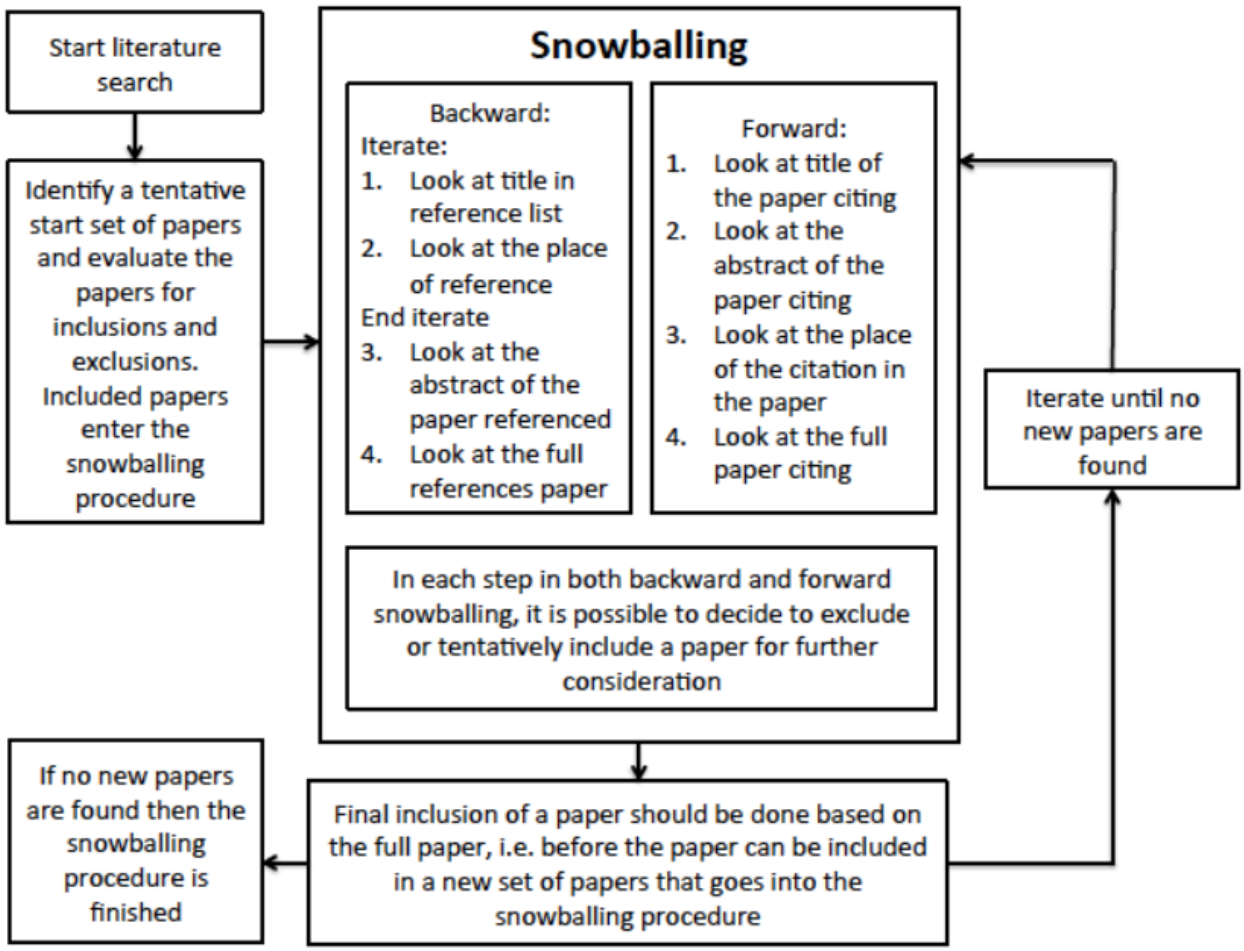


Figure 1: Snowballing procedure (Wohlin, 2014).

After collecting all relevant data, the second phase consisted of a detailed analysis of the literature and the identification of key practices to enhance the business potential of suboptimal food that does not comply with marketing standards.

2.2 Findings

According to the results of the literature review, the growing awareness of food waste and the economic potential of suboptimal foods has led to a range of strategies across the food supply chain aimed at reducing waste and promoting sustainability (Varese et al., 2022). These can be grouped into three classes: prevention, redistribution, and social initiatives. On the prevention side of things, it would involve changing consumer perception by making suboptimal foods more appealing and accessible, and putting in place better food management practices. The redistribution strategies relocate unsold but edible food from the supply chain and channel these to new markets by transforming suboptimal produce into new products, operating social supermarkets, and using direct sales channels. It is important to note that these strategies primarily address

interventions at the supply chain and community levels, though some prevention efforts, such as consumer education and improved food storage practices, can also impact households. Last but not least are the social practices aimed at implementing structured food donation programmes. The next sections are detailed presentations of good practices identified within the literature review based on the aforementioned classification.

2.2.1 Prevention

2.2.1.1 Pricing Strategies

Offering significant discounts on foods with imperfections is quite effective in attracting price-sensitive and value-seeking customers and increasing the sales volume of suboptimal foods (Aschemann-Witsel et al., 2017; Hartmann et al., 2021). Normalising the sale of these items at reduced prices will help retailers shift consumer perceptions, making the buying of suboptimal foods commonplace. This in turn, reduces food wastage as more consumers are willing to buy food which they may otherwise have ignored (Perreault, 2015). There are several campaigns that help demonstrate how this approach works. For example, Intermarché, a major French supermarket chain, launched the "Inglorious Fruits and Vegetables" campaign in 2014, creatively marketing imperfect fruits and vegetables with humorous branding and offering them at a 30% discount, which not only significantly reduced food waste but also raised consumer awareness about sustainability and the value of these often-discarded products (Aschemann-Witsel et al., 2020). In the US, retailers like Walmart and Whole Foods have launched campaigns to sell cosmetically flawed food at discounted prices. Similarly, in the UK, Asda has initiated comparable efforts promoting "Wonky Fresh Produce" (Qi et al., 2022). In addition, the "Odd Bunch" programme by Woolworths retail company in Australia sources suboptimal fruits and vegetables directly from farmers and offers them at a discounted price to consumers who appreciate their quality despite minor imperfections (*Woolworths Supermarket - Buy Groceries Online*, n.d.). Another example is the "Naturally Imperfect range" by Loblaws in Canada, which offers smaller or slightly misshapen fruits and vegetables that taste just as good as regular varieties and cost up to 30% less than traditional options in stores (*Imperfection Moves into the Frosen Aisles at Loblaw Stores*, n.d.). Regarding the expiration date, last-minute discounts, applied one to two days before expiration, also help quickly clear stock and increase the sales of suboptimal foods. In this way retailers capitalise on the urgency of trading close-to-expiry products before they become unsellable (Mullick et al., 2021). However, some retailers have stopped these practices due to logistical challenges, regulatory constraints, or concerns over profit margins. Additionally, the perception that selling discounted items might harm brand reputation or lead to a reduction in full-price sales has also contributed to the discontinuation of such approaches in certain markets. Establishing a routine of such discounts normalises the practice of taking advantage of them, making it an anticipated event and encouraging regular turnover of soon-to-expire goods. Familiarity with such discounts reduces the perceived risk, as consumers become aware that the products are still of good quality no matter their lower price (Tsalis, 2020). This works best for commodities that are very perishable, such as fruits, vegetables, and fish, whose values depreciate over time and could result in total loss if the commodities were to go to waste. This strategy has already been tried to maximize revenues while at the same time helping to avoid food wastage (Schols & Kulko, 2022). Specific to discount techniques, it has been proven in the case of suboptimal foods as well that high original prices combined with clear discount prices (e.g., showing the reduced price) tend to generate more positive consumer attitudes and higher purchase intentions, as consumers see significant savings. Conversely, low original prices are better paired with percentage discounts, which make the relative savings appear more

impactful (Chang et al., 2024). An example of pricing alteration based on expiration date is presented in Figure 2.

Figure 2: Example of pricing alteration based on expiration date. (https://trellis.net/article/new-dynamic-duo-pricing-and-food-waste/).

2.2.1.2 Visual Marketing and Display Strategies

To enhance the sales of suboptimal foods at the retail stage, creative display and strategic placement are highly productive strategies. Placing suboptimal foods in prominent, easily accessible locations within the store increases their visibility, making them more likely to catch the eye of shoppers (Cooremans & Geuens, 2019). Furthermore, integrating suboptimal foods as the default choice or presenting them alongside perfect foods can influence consumer behaviour positively as it makes them see them as a regular part of their shopping and reduce the perceived level of ugliness (Qi et al., 2022). These nudging techniques simplify the decision-making and thus naturalise the choice process in a subtle way, making customers choose suboptimal food. This could reduce the effort that consumers need to use in searching for and selecting suboptimal food, hence giving the retailers a chance to increase the likelihood of these products' purchase (Hartmann et al., 2021). Besides, good hygiene of food, cleanliness, and tidiness from where the suboptimal foods are presented will have positive impacts on consumer perception. Selling suboptimal goods within shops that are highly rated for food safety ensures consumers of the good quality and safety of the products, thus motivating purchase. In addition, a clean and tidy arrangement of the shop and enjoyable background music, coupled with scientific colour matching and moderate light intensity, creates a welcoming shopping atmosphere that could help the purchase of suboptimal foods (Cao et al., 2023). An example of a visual marketing and display strategy for reducing food waste is presented in Figure 3.

Figure 3: Example of a visual marketing and display strategy for reducing food waste (https://ensia.com/features/food-waste/ ; https://www.tescoplc.com/sustainability/planet/food-waste).

2.2.1.3 Packaging and labelling

Attractive packaging and labelling techniques can improve consumer acceptance of suboptimal foods (Simões et al., 2022). Implementing specially designed price badges that highlight the price and great taste of suboptimal foods can attract consumer attention and boost sales. For example, using red price badges with messages like “great in taste” or “small in price” has been shown to capture consumer attention for longer periods, thereby increasing purchase intentions. By placing these eye-catching badges prominently on or near suboptimal foods, retailers can enhance visibility and positively influence consumer behaviour (Rohm et al., 2017). In addition, using labels that emphasize the human care and attention afforded during the production process is another efficient strategy. Labels such as “made with care” or “grown with care” have been used effectively, as these practices appear to enhance the appeal of aesthetically imperfect foods (Suher et al., 2021). Additionally, highlighting attributes such as local origin, traditional production techniques, and the naturalness of the products appeals to consumers' values and preferences. Presenting suboptimal products as authentic seeks to improve consumer perceptions of quality and freshness, thereby increasing their willingness to buy suboptimal foods (de Hooge, 2022; Van Giesen & de Hooge, 2019). Furthermore, labels that highlight the ethical and sustainable attributes of suboptimal foods, such as environmental friendliness or sustainable production, further boost their appeal. Naturally, suboptimal foods labelled as environmentally friendly or sustainably produced tend to be more attractive to consumers who value sustainability and ethical consumption (Chang et al., 2024). Regarding date labels, careful use of labelling has also been emphasised as regards omitting “best before” dates on certain own-brand products, as consumers often equate freshness with safety. This strategy, adopted by UK grocery retailers Asda and Morrisons, aims to prevent customers from discarding food prematurely based on these dates, thereby reducing food waste (Filimonau & Gherbin, 2017).

In addition, in order to boost the sales of misshapen produce, retailers use anthropomorphism techniques in labelling by attributing human characteristics to these items (Hartmann et al., 2021). This strategy involves displaying misshapen foods with features like smiling faces and presenting their irregular shapes as quirky body parts at the point of purchase. Such visual stimuli evoke positive emotional reactions in consumers, which enhance their perceptions of the taste and quality of the produce. These positive feelings increase consumers'

intentions to buy and choose misshapen produce (Cooremans & Geuens, 2019). In addition, offering in-store taste samples has also proven effective in encouraging consumers to purchase suboptimal foods, as it allows them to experience firsthand that these products are just as delicious and high-quality as their more visually appealing counterparts (Symmank et al., 2018). Furthermore, emphasising the aesthetic flaws through "ugly" labelling, rather than downplaying them or using no labels at all, can ameliorate consumer perceptions and increase the purchase of unattractive produce. By embracing the imperfections, retailers can effectively transform what might otherwise be considered waste into desirable, marketable products (Mookerjee et al., 2021). Tesco, a multinational retail company based in the UK, introduced "Perfectly Imperfect" labels on suboptimal produce to highlight and promote the sale of fruits and vegetables that do not meet traditional cosmetic standards (Filimonau & Gherbin, 2017; *Wonky Veg 5th Anniversary*, n.d.).

Furthermore, innovative packaging designs are essential in reducing food waste by improving the usability and longevity of food products. Food manufacturers and packaging companies are developing innovative packaging solutions, such as packages that are easier to empty and redesigning packaging to increase product shelf life. For example, Morrisons, one of the largest supermarket chains in the UK, has developed the "great taste less waste" packaging system including best-kept stickers advising consumers on optimal storage methods at home (Aramyan et al., 2021). In addition, technologies such as temperature-sensitive labels and freshness indicators are being used to allow consumers and retailers to accurately monitor the condition of food products, reducing waste caused by spoilage. Intelligent packaging systems can detect, sense, record, trace, communicate, and apply scientific logic to facilitate decision-making, extend shelf life, enhance safety, improve quality, provide information, and warn about potential problems. For instance, time-temperature indicators (TTIs) provide visual cues if a product has been exposed to temperatures that might cause it to spoil, while freshness indicators detect gases like ammonia or ethanol emitted by spoiling food, revealing the true freshness of the product beyond the printed expiration date (Ghaani et al., 2016; Poyatos-Racionero et al., 2018). For example, "Mimica Touch" labels, developed by the UK-based company Mimica, change texture to indicate the freshness of food, offering a simple and clear method for consumers to determine whether a product is still good to eat. This technology decreases food waste by providing more accurate information about the edibility of food products (Närvänen et al., 2023). Examples of a product package and a product label for reducing food waste are presented in Figure 4 .

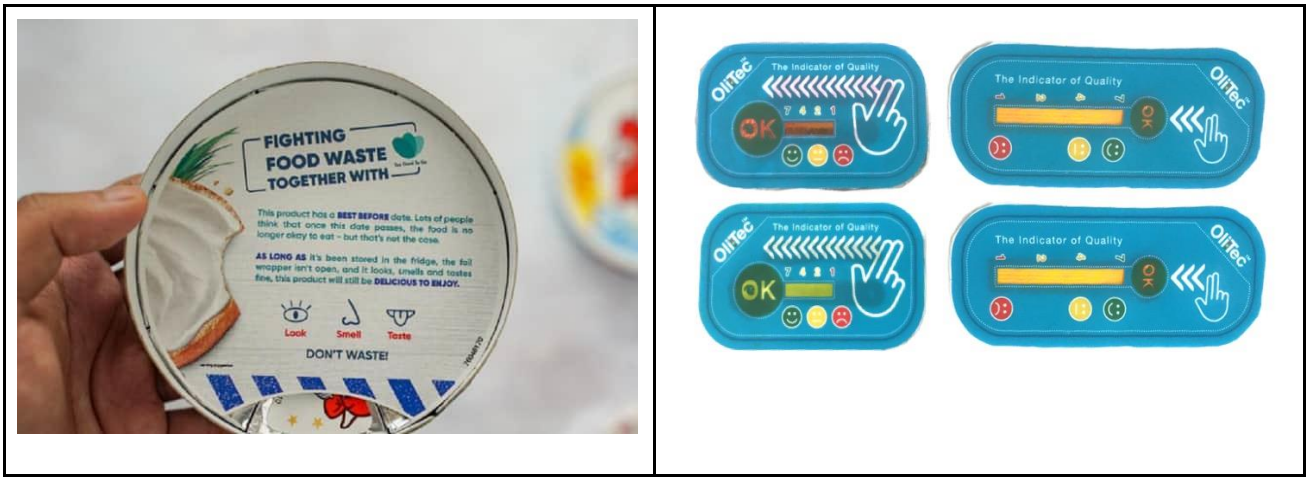


Figure 4: Examples of a product package (left image) and a product label (right image) for reducing food waste (https://www.bedfordtoday.co.uk/lifestyle/food-and-drink/heres-why-bedford-shoppers-will-start-seeing-these-labels-during-their-trip-to-the-sup)

2.2.1.4 Flexible contracts

One course of action recommended as most promising in reducing food loss and enhancing the business prospects of suboptimal foods is relaxing market standards. This strategy involves collaborating with retailers and industry stakeholders to expand the acceptable size and shape ranges for produce, thereby ensuring that perfectly edible crops are not discarded solely due to cosmetic imperfections (Hwang & Kudrowits, 2022). Yet, value generated by the standard tends to be captured by downstream market operators, particularly large-scale retailers, and only a small share of it accrues to producers. The problem is compounded when the standard is de facto mandatory, because a majority of large buyers demands it. This means that small producers are under threat of exclusion from high-value markets (Liu, 2009). Retailers typically enforce stringent quality standards based on the assumption that consumers will either reject suboptimal products or be willing to pay less for them (Pietrangeli et al., 2023). Expanding the definition of what is considered marketable greatly increases the volume of produce graded acceptable for sale, increasing the market opportunity for suboptimal foods (Kennard, 2020). During periods of low supply, some retailers temporarily relax their quality standards, particularly regarding the visual appeal of foods. This regulatory flexibility allows for the inclusion of produce with minor visual imperfections, which would otherwise be discarded. By accepting a wider range of produce, retailers are able to reduce food waste and maintain supply levels even in challenging conditions. However, this would require a multi stakeholder dialogue that can take a critical look at the need and impact of existing standards, rules, and quality specifications. In these discussions, consumer protection and food safety issues should be placed in the forefront so as not to throw them out while relaxing standards on highly important elements for which they are purchased in the first place by consumers (De Moraes et al., 2020).

2.2.1.5 Communication and awareness

The business potential of suboptimal food can also be improved by communication and awareness strategies that make consumers aware of the benefits of suboptimal foods and break associated myths related to quality, taste, nutrition value, and safety. Being the intermediate players between the farmer and the consumer, the retailers and wholesalers apply different communication strategies to ultimately change consumer attitude towards suboptimal foods (Hartmann et al., 2021). However, public bodies and policymakers also have a vital role to play in supporting these efforts through regulatory frameworks, public awareness campaigns, and educational initiatives that complement industry-driven strategies. To achieve this, they employ a range of communication methods, including in-store signage, posters, promotional materials, and social media campaigns. These strategies effectively communicate the benefits of suboptimal foods, such as affordability, sustainability, and reduced waste, addressing common health and safety concerns. The promotion also underlines the public welfare gain of food waste reduction and catering to the wants of those without, touching the altruistic motivations of the consumer (Cao et al., 2023; Simões et al., 2022). As this strategy underlines goals that include ethical and pro-environmental dimensions, such as reducing environmental impact, this is especially uplifting to customers and may build long-term devotion better than the short-term benefits emphasised in the value-for-money and perceived quality orientation (Bolos et al., 2022).

In Greece, the Alliance for the Reduction of Food Waste brings together public authorities, companies, food service businesses, social organisations, and academic institutions to sensitise the general public to the environmental and economic effects of food waste, offer training and education on food waste prevention,

and exchange best practices (*Foodsavingalliancegreece* – *Food Saving Alliance Greece*, n.d.). Educational efforts are also directed towards clarifying date labels. For instance, the "Look-Smell-Taste" campaign by the Too Good To Go (TGTG) company encourages people to trust their senses rather than automatically rejecting food with a "best before" date. This method helps reduce food waste by evaluating food based on its appearance, smell, and taste (*Too Good To Go Date Labelling | Look-Smell-Taste*, n.d.). In addition, TGTG managers use social media platforms like Instagram, Facebook, and YouTube to educate people about food waste, including the correct interpretation of product labels and the value of suboptimal foods. They share tips and best practices to prevent food waste, encouraging consumers to make use of suboptimal foods that are still good to eat (Fragapane & Mortara, 2022).

Furthermore, industry actors and policymakers are involved in efforts to better educate the public regarding the concept of expiration dates. Date label education and standardisation are the current focus of recent proposals by policymakers and grocery trade groups in Europe and the US (Collart & Interis, 2018). For example, in the US significant efforts are underway to address the confusion and waste associated with date labelling on food products. The introduction of the Food Date Labelling Act of 2023 aims to standardise date labelling on food products to reduce consumer confusion and food waste. The Act proposes a uniform system of labelling that distinguishes between "best if used by" dates, which indicate peak quality, and "use by" dates, which signify the date after which the item should not be consumed. By providing clear and consistent labelling, the Act seeks to help consumers make better-informed decisions about the edibility of their food, thereby reducing unnecessary waste (Kessler, 2017; Rep. Pingree, 2023). An example of raising public awareness about food waste is presented in Figure 5. This campaign, organized by Rogue Disposal & Recycling, highlights strategies for reducing waste at the household level and was implemented in the United States.

Figure 5: Example of a campaign to raise awareness about food waste (https://roguedisposal.com/resources/education/environment/food-for-thought-simple-things-you-can-do-to-cut-food-waste-from-your-daily-routine-2).

In Europe, efforts to standardise date labelling are being coordinated by the European Platform on Food Losses and Waste (FLW). This platform has established a dedicated sub-group focused exclusively on improving date labelling practices. The sub-group works on developing guidelines and best practices for date labelling that can be adopted by all member states. Their goal is to ensure that date labels are clear, consistent, and informative, helping consumers to distinguish between "best before" dates and "use by" dates. The FLW sub-group collaborates with various stakeholders, including food producers, retailers, and consumer organisations,

to promote widespread adoption of these standards, aiming to reduce food waste across Europe (*Date Marking and Food Waste Prevention - European Commission*, n.d.; EFSA Panel on Biological Hazards (BIOHAS) et al., 2021).

In terms of preventing early discards of food at the household level, retailers and manufacturers play a role by promoting good practices in food storage. This involves guiding consumers to store food in airtight containers at the right refrigerator temperature to help in making their food usable for longer. (Hartmann et al., 2021). Additionally, the retailers share creative ways of using leftovers—they post recipes or meal ideas in order to encourage using up all the purchased food efficiently. For instance, marketing campaigns focusing more on using overripe bananas in smoothies or baking could enhance their sales and lower the wastage of such products (Symmank et al., 2018).

Mobile telephone applications can further communicate food waste-messages to consumers at home, thus averting the waste of suboptimal foods in the home. Such apps can also offer ways for inventory tracking, recipe suggestion, and learning on the proper storage and use of foodstuffs, which may be effective in reducing the wastage of less-than-optimal foods (Castro et al., 2023). For instance, No Waste app helps users keep track of their pantry, fridge, and freezer inventories, allowing them to set expiration dates and receive notifications when items are about to expire (*NoWaste - Food Inventory List*, 2021). Similarly, EatBy app aids users in managing their food inventory and provides timely reminders for expiration dates, ensuring that food is used before it spoils (*EatBy App*, n.d.) (Figure 6). An example of mobile app for food waste prevention that relies on consumer input, allowing users to manually add items to their inventory.

Figure 6: Example of a mobile app to prevent food waste (https://appadvice.com/app/eatby-app/899098100).

2.2.1.6 Product design

Simplifying product assortments can significantly reduce food waste by ensuring that only the most popular and efficient products are available. In this respect, through the selling of a narrower range of items in high demand, retailers can avoid overstocking that might lead to the decay of perishable products. This way, inventory levels are matched to consumer demand and can maximise shelf space efficiency while reducing the likelihood of products going to waste due to expiration before sale (Riesenegger & Hübner, 2022). One effective strategy is to eliminate, wherever possible, duplicative or substitutive food products from assortments. Such simplification would ensure that each product will have a unique function, without any redundancy in the supply line (Calvo-Porral et al., 2017). In this context, retailers, using data-driven decision support systems, could also analyse which products are consistently in high demand and which are not. These data drive informed decisions on how to get rid of look-alike products or duplicate appeal products, thereby reducing the quantity of products that sit on shelves and risk expiring (Felix, 2018). However, implementing this approach is not without challenges. Some retailers prioritise offering a wide range of products, including items that are relatively unique and not available elsewhere, to cater to specific market segments. This diversification is particularly important in competitive markets where product uniqueness can be a key differentiator.

Another strategy that food manufacturers and retailers use to ensure that food does not enter landfills prematurely, while it is still edible, is diversifying the sizes or portions available to best suit different household sizes. It enables consumers to purchase the exact amount they need, a factor particularly relevant for single-person households or smaller families. Such customisation of portion size reduces the tendency for food to go bad before it is used up, as consumers are more likely to buy only what they will realistically use up in a given amount of time (Marimuthu et al., 2024).

Figure 7: Example of a product design to prevent food waste (https://www.foodmag.com.au/82193-2/).

2.2.1.7 Logistics, inventory management and planning

Inventory control for suboptimal foods with shorter shelf lives comes with critically challenging problems. Besides, by adopting inventory minimization and control policies, it can help reduce inventory levels to demands, thus closing the gap and reducing this waste. For instance, stock management for perishable goods can be better handled if First-In/First-Out were to be replaced by First-Expired/First-Out. First-In/First-Out is a very common technique of inventory where the oldest stock is processed or sold first. While this works well for non-perishable items, it can be less effective for perishable foods because it doesn't account for the actual expiration dates of products. FEFO, on the other hand, prioritises the use or sale of items based on their expiration dates, ensuring that products with the shortest remaining shelf life are used first. This method reduces the likelihood of food expiring before it can be used or sold (De Moraes et al., 2020).

Advanced logistics technologies, such as Radio-Frequency Identification (RFID) and Global Positioning System (GPS) tracking, significantly enhance the management of suboptimal foods. These technologies facilitate real-time communication and provide up-to-date information on product conditions and shelf life, optimising transport and storage conditions. RFID and GPS enable suppliers and retailers to share inventory data and analyse needs accurately, leading to better negotiations and more efficient shipments. For example, such systems can identify near-expiry products and facilitate their timely sale or redistribution, thus preventing waste (De Moraes et al., 2020). In addition, the use of artificial intelligence (AI) in food logistics optimises the collection, transportation, and storage of food, ensuring that perishable items reach recipients while still fresh (Onyeaka et al., 2023). The APPETITE project for example employs advanced forecasting techniques based on AI methods to enhance supply and demand matching in perishable food supply chains for food waste reduction (Birkmaier et al., 2023). Despite their potential, the adoption of these advanced logistics technologies faces obstacles such as high implementation costs, data-sharing concerns, and the need for robust infrastructure and technical expertise. An example of using advanced technologies for reducing food waste is presented in Figure 8.

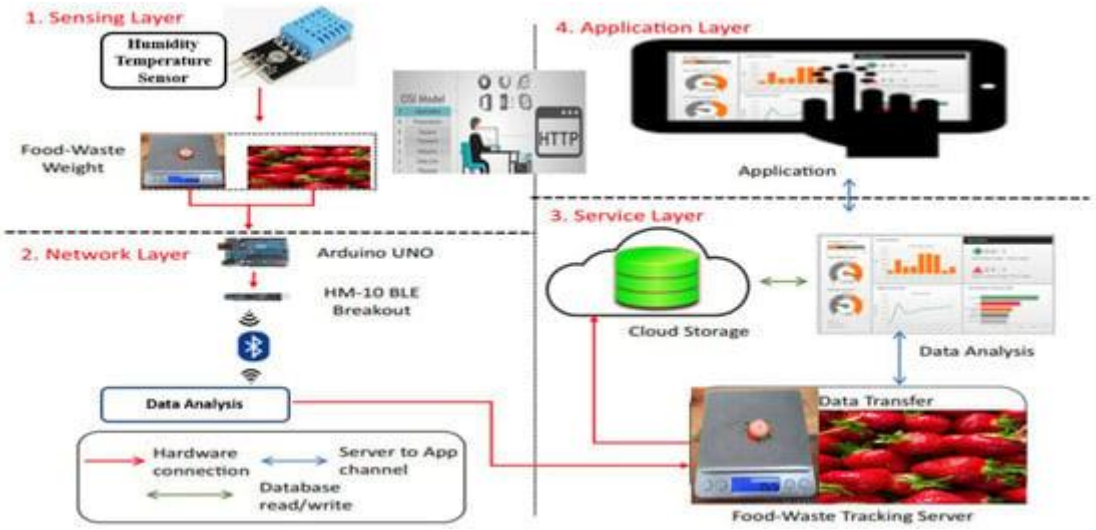


Figure 8: Example of advanced technologies use for reduction of food waste in the supply chain (Marjani et al., 2017).

Proper packing also plays a vital role in the process of logistics and inventory management. Resistant materials, properly sized, can avoid shocks, compressions, and abrasion during transport and handling. The right stacking of boxes and containers reduces breakages to a large extent (Heising et al., 2017; Makanjuola et al., 2020). Microbial contamination control is also important for enhancing the utilisation of suboptimal foods. Processing methods such as heat treatment, drying, freezing, and fermentation either remove or reduce the microbial load on the raw material, thereby increasing the product's shelf life. Modified atmosphere packaging involves the removal of oxygen by flushing it with nitrogen or carbon dioxide, thus slowing the growth of the microorganisms; this is useful when dealing with both bulk storage and packaged products like cheese and pre-cut bread. (Raak et al., 2017).

2.2.2 Redistribution

Food redistribution is the collection of surplus food in good condition that would otherwise have been rejected for minor imperfections, nearing expiration, or oversupply. This and other similar strategies are important in reducing food wastage and improving sustainability by ensuring that such food gets to those who can utilize it and not going to waste (Bech-Larsen et al., 2019; MacRae et al., 2016). This involves sourcing and stocking suboptimal foods and collaborating with local farmers, retailers or wholesalers who are willing to sell such products at a discount (Bech-Larsen et al., 2019; Castagna et al., 2021). Food redistribution has been implemented in a variety of ways, and it thus takes both non-profit and business-oriented strategies (Turner, 2018).

The success of redistribution initiatives relies on several critical factors: quickly identifying and redirecting surplus food before it spoils (timing); collaborating with stakeholders; balancing multiple goals such as reducing food waste, alleviating food insecurity, and supporting local economies; having the necessary skills and expertise in food safety and supply chain management; finding business opportunities like new markets for suboptimal foods and developing value-added products; securing diverse funding sources like grants, donations, and investments to cover costs related to infrastructure, logistics, and operations; and understanding local needs and logistical challenges to ensure effective distribution (Aschemann-Witsel, De Hooge et al., 2017; Turner, 2018).

2.2.2.1 Transforming suboptimal produce into new products

Processing suboptimal produce into new products is an effective strategy to reduce food waste and increase the marketability of imperfect crops and foods. In this regard, foods that are otherwise rejected based on cosmetic standards are converted into value-added products such as juices, jams, sauces, and snacks, among others (Barone et al., 2021). For fruit and vegetables, and cereal products gleaning is the first step in this process, where leftover crops are collected from farmers' fields after the main harvest. These crops, often left behind due to imperfections or market fluctuations, are then redirected to the processing industry. By gathering these otherwise wasted crops, gleaning helps ensure that more food is utilised rather than discarded (Beausang et al., 2017). Once the produce is collected, the processing industry plays a vital role in transforming it into new products that are more likely to appeal to consumers. For example, misshapen apples can be made into apple juice, while blemished apricots can be turned into jams or dried apricots. This transformation process not only makes the produce more acceptable to consumers but also increases its shelf life and market value (Roels & Van Gijseghem, 2017). A good example of this practice is the innovation lab developed by

Fundació Espigoladors in Spain, which makes use of surpluses to manufacture products like jams, creams, juices, and sauces (*Espigoladors | We Fight to Stop Food Waste and Losses*, n.d.). Processing suboptimal foods into alternative processed products is therefore a way to provide nutritious and acceptable food while reducing wastage at the same time. Processing alone has the effect of categorising the product to a more common and acceptable level, increasing purchase intention. This phenomenon has been observed across various types of transformations, including bars, chips, juice, and candies, and with different produce such as apples, apricots, and oranges (Barba & Días-Ruis, 2015; Barone et al., 2021). Culinary Misfits is a catering service based in Berlin, Germany. Their project focuses on reducing food waste by using aesthetically imperfect produce that would typically be discarded by supermarkets or farmers. They purchase this produce directly from these sources and incorporate it into their dishes, offering a sustainable and creative solution to food waste (Calvo-Porral et al., 2017). An example of a product derived from suboptimal food transformation is presented in Figure 9.

Figure 9: Example of a suboptimal food transformation (https://www.facebook.com/hellogoodly/photos/a.104378784627785/622102519522073/?type=3&source=57&locale=ms_MY&_rdr).

2.2.2.2 Social supermarkets (SSMs)

Social supermarkets (SSMs) are an innovative approach to addressing food waste and poverty. These stores recover food surpluses or suboptimal products from retailers and other actors in the supply chain, typically without cost compensation, and sell them at very low prices compared with traditional supermarkets—up to 70% less. SSMs are an example of cross-sectoral cooperation in retailing, where retailers, manufacturers, and government entities partner with non-profits and social enterprises (Sadílek, 2021). These stores operate on a not-for-profit basis and aim to make nutritious food more accessible while reducing waste. They often stock items that are close to their expiration dates or have minor imperfections (Berri & Toma, 2023; Sadílek, 2021). Products also include items with incorrect labelling, or damaged packaging. SSMs, such as Milchwerk in Germany, Wefood in Denmark, and Community and Company shops in the UK, differ in customer base and product variety. For example, Wefood is open to everyone and appeals to all customers' groups where low prices and sustainability act as drivers, unlike other shops that target a small or a particular social group. WeFood is one of the first social supermarkets in Denmark, which pioneered the concept of selling suboptimal foods at very low costs (Bech-Larsen et al., 2019). Profits from SSMs often support social programmes or are reinvested to expand and stabilise the product assortment, as seen with Milchwerk, which uses earnings to purchase suboptimal foods in the European wholesale market. SSMs promote awareness of food waste through in-store materials, highlighting the value of suboptimal foods and the importance of waste reduction and social responsibility. This strategy links food waste to social inequality and reinforces efforts to combat hunger and food insecurity (Aschemann-Witsel, De Hooge, et al., 2017).

2.2.2.3 Direct sales channels

Direct sales channels from farmers to consumers also have a large share of selling suboptimal food. This is because farmers' markets give farmers a direct avenue to sell produce that would otherwise be rejected by various retailers or consumers due to minor imperfections, hence assuring that a larger share of the harvest is used, which generally reduces food waste and generates local economic activity (de Hooge et al., 2018; Ribeiro et al., 2018). Direct farmer-consumer interactions at these markets help alter consumer perceptions and attitudes toward cosmetically flawed food for increased acceptance and reduced wastage, as consumers are educated about the nutritional value and quality of such products while developing a personal link with farmers (Puteri et al., 2022). Even retailers have recognized the potential of suboptimal foods through direct sales. Startups retail companies such as Imperfect Foods and Misfits Market have created delivery services that ship farmers' ugly or excess produce directly to consumers at reduced rates. This model helps rescue substantial quantities of edible but unmarketable food, thereby supporting local economies and increasing the availability of nutritious produce (Qi et al., 2022). Fruta Feia, a private cooperative company based in Portugal, combats food waste by purchasing unsold produce from local farmers at half the price that large supermarkets typically pay for flawless items. Fruta Feia then sells this produce to registered customers at a lower cost, thereby fostering community responsibility and accessibility to affordable produce (Dias, 2018).

2.2.2.4 Digital platforms for food redistribution

The rise of digital technology and the sharing economy increased opportunities for food redistribution through web platforms and food-sharing apps. In particular, surplus food is exchanged along the supply chain under models such as "sharing for money" (B2C for-profit), "sharing for charity" (non-profit), and "sharing for the

community" (P2P) (Michelini et al., 2018). For example, the OLIO app is based on a peer-to-peer model whereby individuals can list surplus food items for local pickup, while it supports business-to-consumer (B2C) transactions by allowing local shops, cafes, and restaurants to list surplus food for sale at reduced prices (Harvey et al., 2020). Another example is the Too Good To Go platform, founded in 2015 in Copenhagen, aiming to drive a worldwide movement against food waste by engaging and empowering collective action. TGTG connects consumers with all types of business entities, from small stores to big retailers, who have surplus products close to the end of their shelf life. It allows retailers participating in the scheme to push "mystery boxes" of unsold goods at the end of every day. Consumers can buy and collect these mystery boxes, by selecting a store. It utilises GPS smartphone capability to show available boxes nearby, categorised by price and type (Fragapane & Mortara, 2022).

Figure 10: Example of a mobile app for food sharing (https://www.devonfoodpartnership.org.uk/share-more-waste-less-with-olio-the-1-free-food-sharing-app/).

2.2.3 Social Interventions

Social interventions towards food waste reduction emphasise the donation of edible but unsellable food by coordination from the different actors involved in the food supply chain. Food rejected due to cosmetic imperfections or approaching sell-by dates is recovered for redistribution to food banks, shelters, and community groups through such efforts (Bech-Larsen et al., 2019; *Social Plate*, n.d.). Implementing food donation programmes requires businesses to establish strategic partnerships with food donation non-profit organisations (NGOs). These partnerships should be integrated at the highest organisational levels to effectively manage the distribution of surplus food across different regions. Understanding store locations and the logistics of food donation allows businesses to efficiently deliver surplus food to those who need it most, making their donation efforts more impactful and supporting the community in meaningful ways. Working closely with other organisations and partners in the supply chain is vital for these initiatives to succeed (De Moraes et al., 2020).

2.2.3.1 Food donation programmes

Many food donation programmes have already been implemented in the EU with great success. For example, Boroume is an NGO based in Greece that saves surplus food from various sources, including restaurants,

bakeries, supermarkets, and markets, to redistribute to charitable organisations and social services involved in the fight against food insecurity. They work in close collaboration with the Alliance for the Reduction of Food Waste, involving several stakeholders in improving food donation and ensuring that the surplus food is effectively redistributed to persons in need throughout Greece (*Food Waste in Greece*, n.d.; *Foodsavingalliancegreece – Food Saving Alliance Greece*, n.d.). Similarly, Milchwerk Jäger GmbH, a dairy company in Germany, rescues and redistributes surplus dairy products, relying on the willingness of food producers to contribute. Additionally, food rescue projects in Sweden collect surplus food from supermarkets and local restaurants for its distribution to food banks and shelters. In Norway, there are student-driven initiatives focusing on collection of surplus food from local grocery stores and distributing it to the community (Aschemann-Witsel, De Hooge, et al., 2017; Turner, 2018).

2.2.3.2 Digital platforms for food waste related social interventions

Digital platforms and apps have been very instrumental efficiently in reorganising food redistribution by directly linking food donors to charities and people. Indeed, these technologies ensure that food donations get to places where they are needed most and in the right amounts, hence not going to waste, while ensuring improved accessibility, affordability, and stability of food among populations experiencing financial instability, homelessness, and unemployment (Onyeaka et al., 2023). The LOWINFOOD project, financed by Horizon 2020 EU, has as its object the reduction of food waste through innovative tools and closer cooperation among those in the supply chain—including innovative software for the to manage and redirect surplus food to charities to be donated to charities (*LOWINFOOD – Multi-Actor Design of Low-Waste Food Value Chains through the Demonstration of Innovative Solutions to Reduce Food Loss and Waste*, n.d.).

2.2.3.3 Food banks

Moreover, food banks play a core role in food donation by collecting surplus food from many sources, such as retailers, manufacturers, and farms, and then donating it to people (Kennard, 2020). Food banks rely heavily on volunteers, but variability in skills and availability can be challenging. In that case, structured volunteer training programmes and management systems can be implemented to sort out such problems (Akkerman et al., 2023). Food banks often operate through a network of local agencies to ensure efficient distribution. It is worth mentioning that the Global Food Banking Network (GFN) which is an international organisation, supports food banks in over 30 countries. GFN helps these food banks recover and redistribute millions of pounds of food annually, addressing food insecurity and reducing waste (Penalver & Aldaya, 2022). Example of a food bank is presented in Figure 11.

Figure 11: Image of a food bank (https://www.theguardian.com/society/2023/feb/19/record-number-of-uk-households-depending-on-food-banks).

2.2.3.4 Food donation initiatives

Food donation at the municipal level forms another important channel. These programmes are often collaborations between local governments, non-profits, and businesses to systematically collect surplus food for redistribution. Milan Food Waste Hubs, in Italy, is a municipal-led program with the objective of reducing by half the quantity of food waste by recovering surplus food from supermarkets and corporate canteens. The program distributes this to non-governmental organisations, which further help the vulnerable citizens. This initiative recovers approximately 130 tons of food every year ('The City of Milan Food Waste Hubs', n.d.). In addition, government policies and incentives strongly support the recovery of food. Tax reductions for businesses that donate surplus food and laws that require the donation of unsold food can raise, to a large extent, the level of food recovery (Treutwein & Langen, 2021). In Italy, businesses receive tax reductions to help cover associated costs like transportation and storage (wdm, 2018). Similarly, France's Garot Law mandates that supermarkets larger than 400 square meters donate unsold food items to charities instead of discarding them. The law prohibits edible foods from being destroyed and the supermarkets had to enter into mutually agreed contract with charity organisations to have the perishable foods distributed to them (*France's Law for Fighting Food Waste*, n.d.).

2.3 Literature Review Discussion

An overview of the outcomes of the literature review are presented in the following table.

Table 2: Overview of the literature results on the Interventions and good practices for marketing suboptimal foods

Strategy Class	Strategy Type	Strategy
Prevention	Pricing strategies	Reduced prices
		Discount
	Visual Marketing and Display Strategies	Creative display and strategic placement
		Good hygiene of food
		Cleanliness and tidiness
	Packaging and labelling	Price badges
		Human care and attention labels
		Ethical and sustainable labels
		Local origin labels
		Anthropomorphism techniques
		Easier to empty packages
		Packages for longer shelf life
		Temperature-sensitive labels
		Freshness indicators
		Intelligent packaging systems
	Flexible contracts	Contracts between retailers and producers that allow relaxed marketing standards in low supply periods
	Communication and awareness	In-store signage
		Posters
		Promotional materials
		Social media campaigns
		Educational efforts
		Establishment of alliances for promotion of consumption of suboptimal products
		Standardisation of date labelling
		Promotion of good practices in food storage
		Reuse of leftovers posts and videos
		Apps for inventory tracking, recipe suggestion, and learning on the proper storage and use of foodstuffs
	Product design	Simplification of product assortments
		Matching of inventory levels to consumer demand for maximising shelf space efficiency
		Elimination of duplicative or substitutive food products
		Diversification of the sizes or portions available to best suit different household sizes

Strategy Class	Strategy Type	Strategy
	Logistics, inventory management and planning	First-Expired/First-Out approach Advanced logistics technologies (RFID, GPS, AI) Right piling of boxes and containers Microbial contamination control (heat treatment, drying, freezing, and fermentation)
Redistribution	Suboptimal produce transformation	Conversion to value-added products (e.g., juices, jams, sauces, snacks)
	Social Supermarkets	Selling of recovered food surpluses or suboptimal products from retailers and other actors Selling of incorrectly labelled, damaged or close to expiration date products
	Direct sales channels	Farmers to consumers Retailers to consumers
	Digital platforms	Web platforms Food-sharing apps Sharing for money Sharing for charity Sharing for the community
Social interventions	Food donation programmes	Collection of surplus food from various sources, including restaurants, bakeries, supermarkets, and markets, and redistribution to charitable organisations and social services
	Digital platforms	Directly connection of food donors to charities and people Close collaboration of all supply chain actors
	Food banks	Collection of surplus food from many sources, such as retailers, manufacturers, and farms, and then donation to people
	Food donation initiatives	Collaborations between local governments, non-profits, and businesses to systematically collect surplus food for redistribution

The table provides a comprehensive list of strategies for reducing food waste, including prevention, enhanced logistics, and effective management practices. Preventive strategies include discount pricing, inventive visual advertising, and guaranteeing food hygiene. Innovative packaging tactics are highlighted, such as freshness labels, sustainable designs, and temperature-sensitive features, as well as flexible contracts that allow for lower marketing standards during supply shortages. Social media advertising, in-store promotions, and apps are utilised to monitor inventory, suggest recipes, and educate customers on safe food storage and reuse. Product design strategies seek to simplify assortments, connect inventory and demand, reduce superfluous goods, and diversify portions to fulfil household needs. Logistics improvements include adopting the First-Expired/First-Out technique, advanced monitoring technologies (RFID, GPS, AI), and heat treatment, drying, and freezing to decrease microbial contamination. Redistribution initiatives include transforming unused food into value-added products, developing direct sales channels between farmers and customers, and aiding social supermarkets. Social interventions, such as food banks and donation drives, are critical in redistributing

surplus food through collaborations between governments, charities, and companies, with digital platforms allowing real-time interactions between donors and recipients.

These strategies aim to reduce waste and promote sustainability across the whole food supply chain. The following section presents insights from interviews conducted in five countries, highlighting the practical application of interventions and strategies aimed at enhancing the business potential of suboptimal foods.

3. Interviews Survey

3.1 Methodology

Interviews were conducted to collect insights on food waste from three identified stakeholder types, namely food value chain actors, advisors/researchers, and consumers. Specifically for the food value chain actors, the interviewees were Food retailers, Food distributors, Farmers cooperatives, Food service operators, Farmers - processors, Farmers, Food banks, NGOs, and Food processors/manufacturers. The survey was conducted in five countries (Greece, Spain, Ireland, Poland and Denmark) from May until October 2024. The number and type of the stakeholders who participated in the survey is presented in Figure 12.

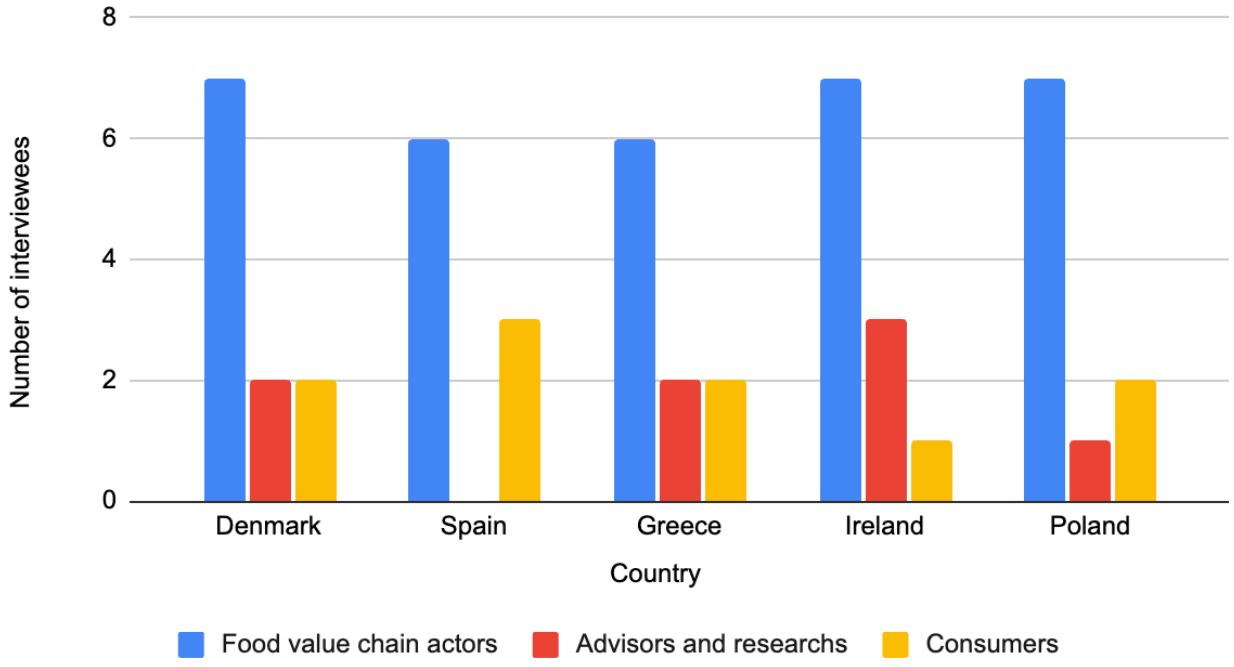


Figure 12: Stakeholder groups interviewed per country

The interview guide was adjusted according to stakeholder type with the interviews with the food value chain actors and the advisors and researchers being longer in comparison to the consumers' interview. Each interview consisted of three different parts. Specifically, interviews with food value chain actors were comprehensive, spanning three parts that delve into their organisational profiles, specific instances and causes of food waste due to marketing standards, and a detailed examination of their practices, challenges, and strategies for managing suboptimal foods. These interviews emphasised operational insights, including economic viability, marketing strategies, and collaboration across the value chain. In contrast, interviews with advisors and researchers focused more on overarching trends and expertise. While they addressed similar themes like drivers, barriers, and economic viability, they explored these topics from a broader, analytical standpoint, highlighting observed practices and systemic insights rather than organisation-specific experiences. Lastly, interviews with consumers adopted a personal and experiential lens, emphasising their awareness, purchasing behaviour, and barriers to buying suboptimal foods.

The interview questions per stakeholder group are presented in the following tables (Table 3 to Table 5).

Table 3: Interview structure for the food value chain actors

Interview Structure for the food value chain actors
Part 1
• ***Brief overview*** of company/organisation's profile and ***interviewees' role*** within it. • ***Instances of food waste*** that interviewees' company/organisation identified caused by marketing standards and examples provided. • The ***main reasons for the waste of suboptimal foods due to marketing standards*** in interviewees' company/organisation.
Part 2
• ***Current practices and interventions*** that interviewees' company/organisation implements to enhance the business potential of suboptimal foods and reduce food waste / ***practices currently under planning /practices that were previously implemented but not continued*** and why. • The **economic viability and profitability** of these practices and interventions aimed at improving the business potential of suboptimal foods. • ***Pricing strategies*** that interviewees' company typically employs for suboptimal foods, and how do these strategies contribute to their economic viability and profitability. • ***Challenges*** that interviewees identify when implementing practices and interventions aimed at enhancing the business potential of suboptimal foods. • ***Barriers*** when implementing practices and interventions aimed at enhancing the business potential of suboptimal foods. • **Drivers and enablers** that contribute to the effective implementation of these practices. • The ***perceptions of consumers/customers of suboptimal foods*** and what are their buying behaviours. • ***How do they convince their consumers*** (If they sell their products directly to them) ***to buy imperfect foods***. And ***if they sell to businesses like stores or restaurants, what do they do to persuade them*** to buy imperfect foods from them. • ***Marketing strategies*** that their company/organisation employs to promote awareness of their suboptimal food practices / ***the form of these strategies***. • ***The distribution channels*** they are using for suboptimal foods. • How do they currently collaborate with stakeholders to address food waste resulting from marketing standards, and how important they consider it.
Part 3
• ***Final thoughts, opportunities and suggestions*** interviewees share regarding the effective management of suboptimal foods and the reduction of food waste within the context of marketing standards.

Table 4: Interview structure for the advisors and researchers

Interview Structure for the advisors and researchers
Part 1
• **Overview of their organisation's profile**, the expertise it brings to the study of marketing solutions for suboptimal foods, and **interviewee's role** within it/relevant expertise. • ***Main reasons*** contributing to food waste due to marketing standards.
Part 2

Interview Structure for the advisors and researchers
• Insights into the **promising interventions and good practices** implemented by food value chain actors to enhance the business potential of suboptimal foods and reduce food waste, based on their experience or observations. • ***The economic viability and profitability of initiatives*** aimed at increasing the business potential of suboptimal foods and reducing food waste. • ***Pricing strategies*** that are effective in enhancing the business potential of suboptimal foods, and how these strategies contribute to their economic viability and profitability. • ***Challenges*** that companies and organisations face when trying to reduce food waste of suboptimal foods. • ***Barriers*** that companies and organisations face when trying to reduce food waste of suboptimal foods. • ***Drivers and enablers*** that they observed that contribute to the effective implementation of practices aimed at reducing food waste of suboptimal foods. • ***The perceptions of consumers/customers*** of suboptimal foods and their buying behaviours. • ***Practices***, from their perspective, that could encourage consumers and businesses to purchase suboptimal foods. • ***How do companies typically promote the specific practices or interventions*** they implement, such as through marketing campaigns, from their experience. • The ***distribution channels used for suboptimal foods***. • ***How important do they consider collaboration*** with different members of the value chain to be in reducing food waste due to marketing standards.
Part 3
• ***Final thoughts, opportunities and suggestions*** regarding the effective management of suboptimal foods and the reduction of food waste within the context of marketing standards

Table 5: Interview structure for the consumers

Interview Structure for the consumers
Part 1
• How ***aware are they of the concept of suboptimal foods,*** which may not meet marketing standards but are still safe to eat.
Part 2
• Have they ever purchased or consumed suboptimal foods / what factors influenced their decision to do so. • What are their ***main concerns or barriers*** when considering purchasing suboptimal foods. • ***What information or assurances would make them feel more comfortable*** purchasing and consuming suboptimal foods. • Are there ***specific types of suboptimal foods*** that they would be more willing to purchase or consume than others/why. • What do they think could be done to raise ***awareness*** and encourage more people to purchase and consume suboptimal foods.
Part 3

Interview Structure for the consumers
• ***Additional suggestions*** on how businesses or organisations can better promote and make suboptimal foods more accessible to consumers like yourself

3.2 Findings

The findings obtained from the analysis of the interviews are presented in the subsections below per stakeholder type, topic and country.

3.2.1 Food value chain actors

3.2.1.1 Food waste generation

The interviewees replied that food waste generation across various stakeholders **in Denmark** arises from diverse factors. Some challenges include strict weight and shelf-life standards, overproduction due to demand forecasting issues, and seasonal fluctuations. Waste also results from seasonal variations and communication gaps in the supply chain. For dairy operations, food waste primarily arises from production processes, including maturation waste from cleaning and scraping cheeses for visual appeal, and cutting waste from trimming cheeses to market-specific sizes. Specialty product expiration occasionally contributes to food waste. Significant waste is reported due to strict aesthetic requirements, damaged packaging, and premature product removal to maintain brand image. Minimal waste is achieved in certain cases through proactive safety practices. Other contributors to waste include consumer avoidance of near-expiry products, particularly among younger generations, as well as shelf-life limitations, incorrect packaging, and fluctuating demand for specialty items.

Food waste generation presents significant challenges across various stakeholders **in Spain** according to the interviewees**.** Waste is often attributed to strict internal quality standards, imperfections, and spoilage caused by temperature fluctuations during warmer months. Cosmetic flaws, customer handling, and consumer scepticism about suboptimal items are additional contributors. Retailer demands for uniformity, such as in specific agricultural products, are a major factor driving waste. Other causes include over-ordering to maintain a consistent supply, occasional overstocking of seasonal produce, and supermarket rejections due to strict appearance standards and transport damages. Requirements for visual perfection by retailers frequently lead to the rejection of otherwise edible products, compounding the issue.

Similarly, food waste generation varies across different stakeholders **in Greece.** Some challenges include strict marketing standards, a focus on appearance, and spoilage of unsold products in wholesale markets. Weather-related damage and stringent visual criteria also contribute, compounded by consumer avoidance of less visually appealing produce. Short shelf life, rejection of less fresh items, and strict quality requirements are significant factors for waste in retail settings. In meat processing, issues such as discoloration and specific client demands for size and weight lead to waste. For dairy distribution, challenges arise from short shelf life, seasonal demand fluctuations, and high aesthetic expectations for premium products. Certain sectors provide limited or no specific details on suboptimal food waste.

In Ireland food waste generation is a widespread challenge as well. High rejection rates due to strict standards, difficult harvesting conditions, and high processing costs contribute significantly to waste in some cases. Short shelf life and product damages are additional factors, while strict grading standards and financial constraints

also play a major role. Retail specifications, consumer preferences for perfect produce, and limited further processing infrastructure are common issues leading to waste. Challenges include standards, labelling issues, and consumer demand for flawless products. Expired products and appearance-based standards further exacerbate waste, along with retailers' rigid requirements and frequent rejections.

In Poland food waste generation varies across different stakeholders. Waste can result from suboptimal byproducts unsuitable for human consumption, while over-ordering has been addressed in some cases through optimised practices. Challenges also arise from bulk purchases of near-expiry items and high aesthetic expectations from clients. Production errors and unsold products with short shelf lives contribute significantly to waste, while others focus on encouraging retail chains to donate unsold food rather than discarding it. Additional issues include supply chain inefficiencies, improper handling, temperature fluctuations, short product shelf lives, and customer mishandling.

3.2.1.2 Strategies/Practices for the reduction of waste due to marketing standards

To tackle food waste, stakeholders employ diverse strategies in **Denmark**. Some participate in food waste initiatives, sell suboptimal products through factory outlets, repurpose excess raw materials, and explore methods to extend product shelf life. Others focus on portion control, upcycling leftovers into new dishes, and tailoring supply to client needs. Certain dairy operations convert production waste into biogas, improve packaging, and separate reusable byproducts for resale. Inventory management tools are used to monitor stock, with near-expiry items addressed through discounts, donations, or repurposing for animal feed or biogas. Imperfect items are sold via waste-focused outlets and webshops, while unsellable products are donated to food banks. Additionally, repackaging strategies are employed to extend shelf life, and close collaboration with customers helps customise orders and reduce waste.

In **Spain** to address food waste, organisations implement a range of strategies. Some run programmes to repurpose overly ripe produce and collaborate with food service providers to create dishes from suboptimal items. Others utilise digital platforms to sell imperfect products at discounted prices, prioritising sustainability alongside revenue. Imperfect ingredients are incorporated into value-added products, such as granola, limited-edition goods, or ready-made meals, emphasising artisanal and sustainable qualities. Seasonal availability is integrated into planning, and surplus food is donated to shelters. Rejected produce is redirected to smaller retailers or charities, while discounted sales and partnerships with processors transform imperfect fruits into products like jams and juices, reducing overall losses.

To reduce food waste, various strategies are implemented in **Greece.** Some organisations run programmes to redistribute unsold produce to charities and pilot waste reduction projects in local markets. Others focus on menu planning and utilise surplus buffet food for staff meals. Suboptimal produce is redirected for processing, such as juicing, creating alternative markets for visually imperfect items. Discount stickers are applied to suboptimal goods, near-expiry products are donated to food banks, and unsold groceries are repurposed into animal feed. Byproducts are reprocessed into animal feed, and vertically integrated systems are used to align with client specifications. Improved forecasting, packaging adjustments, surplus donations to charities, and efficient inventory management further contribute to waste reduction efforts.

To tackle food waste, various strategies are employed by stakeholders in **Ireland.** Some process suboptimal produce into products like juices or smoothies. Additionally, nutrients such as protein may be extracted. Mis-shaped or oversized vegetables are diverted into the food service sector rather than the retail sector. Moreover, retailers who offer in-store food service offerings can divert some sub-optimal foods into food service (e.g. into soup) within an individual store. Partnerships with redistribution platforms help donate

surplus food, complemented by consumer education. Some waste goes into anaerobic digestion; however, this is viewed as a last resort. Waste is also utilised for animal feed, starch production, and energy generation, with donations facilitated through regional hubs supported by fees and funding to cover logistics. Efforts to minimise waste include converting surplus crops into long-shelf-life products and planning to create nutritional powders from byproducts. Additionally, off-cuts are repurposed into other products, and collaborations drive new product development.

In **Poland** various strategies have been adopted to combat food waste. Some organisations repurpose byproducts as animal feed, while others optimise ordering processes and use surplus items in prepared dishes like soups. Creative approaches include incorporating imperfect ingredients into menus, preserving leftovers, and using drying techniques to extend shelf life. Unsold items are reintegrated into production as new products such as breadcrumbs or confectionery. Redistribution efforts focus on channelling food through community networks and charities. Discounting strategies are applied to suboptimal products, while minor imperfections in items like meat are addressed by converting them into processed goods. Frequent, tailored orders and close collaboration with suppliers ensure product freshness and minimise waste.

3.2.1.3 Barriers and drivers

Barriers and drivers for waste reduction differ across stakeholders in **Denmark.** Some face limitations from retailer-imposed shelf-life restrictions and stringent food safety rules, though they benefit from consumer interest in discounted products and established retailer partnerships. Regulatory constraints and logistical challenges pose difficulties for others, but data-driven strategies and staff expertise aid in mitigating waste. While resistance to suboptimal products is minimal for certain organisations, operational inefficiencies remain a challenge. Consumer hesitation and strict regulations hinder progress in some cases, but tools like waste-monitoring systems and growing demand for sustainable practices serve as key motivators. Proactive waste management minimises barriers in some contexts, while challenges such as distrust in near-expiry products and cultural expectations for freshness persist. Organisational culture, economic incentives, and sustainability-driven customer demand play significant roles in driving waste reduction efforts.

Barriers to waste reduction vary across stakeholders in **Spain.** Common challenges include high consumer expectations for visually perfect products, operational complexities in managing imperfect items, and outdated regulations on expiration dates. Consumer perceptions and limited profitability from suboptimal produce sales further complicate efforts, as do strict retailer standards and narrow markets for imperfect goods. Seasonal availability misaligned with demand and additional costs for handling and packaging suboptimal items also contribute to reduced profitability from discounted sales. Despite these obstacles, several drivers support waste reduction initiatives. Sustainability goals, growing consumer awareness, and the positive branding associated with eco-friendly practices motivate many stakeholders. Efforts are aligned with social responsibility and sustainability commitments, enhancing consumer loyalty and building strong reputations. Cost savings achieved by reducing waste, coupled with alternative markets for imperfect products, further support these initiatives. Additionally, emphasising artisanal and sustainable branding appeals to environmentally conscious consumers, creating long-term value.

In **Greece** barriers to waste reduction include resistance from stakeholders, infrastructure constraints, and legal or logistical challenges. Challenges such as unclear volunteering regulations, transport limitations, and stakeholder resistance hinder progress in some contexts. Strict freshness policies restrict the repurposing of leftovers, while high consumer expectations for perfection, supplier resistance to discounts, and the costs of storage and redistribution create additional hurdles. Stringent client specifications and reprocessing costs

impact meat processing, and short shelf life, high aesthetic standards, and consumer price sensitivity pose challenges in dairy distribution. Drivers for waste reduction vary widely. Some efforts are supported by external funding or grants, while others rely on supply and demand dynamics to make alternative uses, like juicing, economically viable. Discount programmes help incentivise consumer purchases of suboptimal items, and flexible sales channels, including freezing and reprocessing, provide additional solutions. Improved forecasting, adaptability to demand fluctuations, and efficient management of external challenges are also key factors driving waste reduction initiatives.

Barriers to waste reduction vary across stakeholders in **Ireland**, including financial constraints, geographical challenges, and strict product specifications. Difficulties in accessing accurate data, justifying sustainability efforts, and limited grant access add to the challenges faced by some organisations. High costs for implementing new processes, consumer preferences, stringent retail standards, and logistical constraints also pose significant hurdles. Additionally, issues such as marketing expenses, outdated strategies for suboptimal foods, and low consumer awareness of food waste complicate efforts to reduce waste. Drivers for waste reduction and sustainability efforts are diverse. Leadership and internal commitment play a crucial role, supported by consumer and regulatory demand for sustainable practices. Clear ROI, cost savings, and brand reputation benefits motivate stakeholders to implement waste reduction initiatives. Utilising near-expiry or out-of-spec products helps maximise resource use, while management involvement fosters creativity and ownership among staff. Research and feasibility studies enable innovative solutions, such as value-added products and shelf-life extensions, while funding from external sources supports redistribution programmes and infrastructure development. Strong relationships with distributors and growing consumer appreciation for local produce further drive growth in certain sectors. Meanwhile, collaborations with producers ensure a steady supply to meet diverse customer needs. However, some stakeholders highlight the need for further development and specific drivers to enhance their waste reduction efforts. Overall, leadership, collaboration, funding, and consumer awareness are critical for fostering sustainable practices and reducing food waste.

Barriers to waste reduction vary across stakeholders in **Poland,** including strict food regulations and technological limitations, high aesthetic standards, and shelf-life constraints. Challenges also arise from outdated regulations, economic disincentives, shifting consumer trends, bureaucratic hurdles in food donation, short product shelf lives, and transport errors. Key drivers for success include strong customer relationships, skilled management, and effective resource optimisation. Flexibility in ingredient use and employee awareness further support waste reduction efforts. Community networks play a vital role in fostering redistribution, while staff training and local sourcing enhance operational efficiency. Established operational standards contribute to overcoming obstacles and driving progress in reducing food waste.

3.2.1.4 Marketing strategies

Marketing strategies for food waste reduction focus on pricing, distribution, and promotion. In **Denmark** premium pricing is applied for artisan products, while discounted suboptimal items are sold through retailer collaborations, supported by consumer education campaigns. Flexible pricing, menu planning, and favourable supplier agreements are paired with staff training emphasising waste reduction. Discounts on suboptimal products are offered, with direct sales through stores, wholesale partners, and outreach via social media. Suboptimal items are discounted by up to 50% and distributed through digital platforms, with sustainability promoted through signage and online campaigns. Some prioritise practical distribution overactive marketing, while others highlight sustainability efforts in reports and sell suboptimal goods via specialised outlets and

web shops. Personalised outreach and strong retailer partnerships support effective waste reduction, leveraging discounts and tailored sales strategies for near-expiry items.

Marketing strategies focus on engaging consumers and emphasising sustainability in **Spain**. Dynamic pricing is applied to imperfect foods, with direct distribution to consumers through online platforms, highlighting environmental benefits in marketing efforts. Discounted sales of imperfect items are facilitated through digital apps, targeting price-sensitive consumers. Sustainable and handcrafted products are promoted through specialty retailers and local events, appealing to environmentally conscious customers. Social media campaigns emphasise the environmental impact of reducing food waste, attracting sustainability-focused audiences. Discounted imperfect produce is marketed through direct communication channels like email and messaging apps, catering to smaller retailers. Natural quality and extended product life are promoted in collaboration with processors, appealing to eco-friendly and budget-conscious consumers. These strategies showcase varied approaches to waste reduction and sustainability within the food value chain.

In **Greece** marketing strategies emphasise community engagement and cost reduction to address food waste. Some initiatives highlight sustainability and social responsibility, promoting programmes focused on redistributing surplus food. Others incorporate suboptimal products into offerings without specific marketing campaigns. Discount stickers are used to encourage purchases of suboptimal items, while unsold food is redistributed to charities or repurposed for animal feed. Suboptimal products in certain sectors are distributed through specialised channels, such as frozen goods for catering markets, without direct marketing efforts. Discounts on near-expiry items, coupled with quality assurance and transparent packaging, appeal to cost-conscious consumers. These varied approaches showcase efforts to reduce waste and promote sustainability within the food value chain.

Marketing strategies vary across stakeholders in **Ireland**, emphasising consumer engagement and sustainability. Some focus on educating consumers through newsletters, highlighting the benefits of local sourcing and sustainability practices. Others use centralised distribution systems, media outreach, and educational campaigns to promote sustainable practices. Efforts include raising awareness about the acceptability of "wonky" produce, offering price discounts and integrating suboptimal food redistribution with regular logistics. Partnerships and regional hubs ensure efficient redistribution without traditional pricing strategies. Credibility and visibility are enhanced through participation in taste awards, while business-to-business distribution networks are leveraged alongside plans to modernise marketing efforts. Certain stakeholders currently lack active marketing strategies, underscoring potential areas for development.

Marketing strategies are diverse and tailored to specific needs in **Poland.** Some stakeholders utilise discounts and direct business-to-business outreach to sell byproducts. Others repurpose surplus food internally, maintaining their premium brand image. While specific marketing for suboptimal foods may not always be employed, efforts include offering discounts on smaller products and collaborating with non-profits for redistribution. Free redistribution to communities and vulnerable groups is a priority for some, while others apply visible discounts and donate unsold items to charities. Progressive discounting and educational campaigns are also used to promote responsible consumer behaviour. These varied approaches demonstrate innovative methods for addressing food waste and enhancing resource efficiency within the food value chain.

3.2.2 Advisors and researchers

3.2.2.1 Food waste generation

Food waste in **Denmark** is predominantly driven by rigorous EU and private standards that enforce specific requirements for product size, appearance, and packaging. These stringent criteria frequently result in the rejection of food that is otherwise entirely edible. Additionally, the prevalent dependence on "best before" labels prompts premature disposal of products still safe for consumption, revealing inefficiencies in the existing food management systems.

In **Greece**, the generation of food waste stems from several factors, including the short shelf lives of perishable goods, packaging defects, and minor cosmetic imperfections. Seasonal overproduction, particularly during festive periods, and the failure of new product launches further exacerbate the issue. Furthermore, widespread confusion between "best before" and "use by" labels leads to the unnecessary disposal of food that remains suitable for consumption.

In **Ireland**, the primary contributors to food waste are stringent retail standards concerning product size and aesthetic appearance. Seasonal factors, such as unpredictable weather patterns, disrupt crop uniformity, intensifying the issue.

In **Poland**, bread waste presents a significant challenge. Overproduction, aimed at maintaining fully stocked shelves to meet consumer expectations for freshness, leads to substantial surplus. The absence of protective packaging accelerates the staling process, while concerns over hygiene regarding unwrapped bread further diminish consumer demand. This dynamic heavily impacts bakeries and retail outlets, contributing to considerable levels of food waste.

3.2.2.2 Strategies/Practices for the reduction of waste due to marketing standards

In **Denmark**, targeted strategies aim to curtail waste by fostering certifications that endorse sustainable food management practices and implementing advanced inventory tracking systems. These initiatives enable businesses to monitor stock levels with greater precision, thereby minimizing overproduction and inefficiencies within supply chains. This structured approach promotes a more sustainable and systematic method of handling surplus food, aligning with broader environmental goals.

In **Greece**, waste reduction initiatives focus on collaborative efforts with hotels and retail chains to ensure the efficient redistribution of surplus food. Direct redistribution models are employed to circumvent delays typically associated with storage, thereby reducing spoilage. Complementing these efforts, mobile applications offering discounts on items nearing their expiration dates, coupled with the expansion of food bank networks into additional cities, extend the accessibility and impact of these programmes.

Ireland's strategies prioritise enhancements in agricultural practices to improve the quality and consistency of crops, mitigating waste at the source. Partnerships between farmers and retailers are actively encouraged, allowing standards to be adapted in response to seasonal fluctuations and supply variations. Additionally, the development of secondary markets for suboptimal produce—transforming them into value-added products such as soups or purees—offers a practical and resourceful avenue for repurposing surplus food. FoodCloud is a very successful Irish social enterprise that takes suboptimal food from supermarkets and redistributes it to charities and community groups.

Poland has adopted inventive methods to address waste, particularly in the bread sector, by converting excess quantities into alternative products like beer, breadcrumbs, and substrates for mushroom cultivation. Public awareness campaigns, facilitated through platforms like “Too Good To Go”, play a crucial role in engaging consumers to actively participate in waste reduction. These creative and collaborative measures effectively tackle the structural challenges associated with surplus food management.

3.2.2.3 Barriers and drivers

Denmark faces significant barriers in its efforts to reduce food waste, including high VAT rates on donated goods, which discourage charitable contributions, and stringent allergen regulations that complicate redistribution efforts. Despite these challenges, the increasing consumer demand for environmentally sustainable practices serves as a powerful driver, motivating businesses to adopt waste-reduction measures. Additionally, EU regulations provide further incentives for companies to align with sustainability goals, encouraging progress in waste management systems.

In **Greece**, barriers include a lack of robust tax incentives for food donations, logistical difficulties associated with distributing perishable items, and cumbersome VAT exemption procedures, all of which hinder efficient redistribution. Nevertheless, international partnerships offer valuable access to best practices, while awareness campaigns at both corporate and societal levels drive momentum toward reducing food waste. These efforts foster a culture of accountability and collaboration, crucial for overcoming systemic obstacles.

Ireland encounters barriers such as stringent retail standards concerning product size and appearance, which limit the marketability of non-conforming produce, and insufficient consumer education on the utility and value of visually imperfect items. However, targeted training programmes, including those offered by social enterprises in partnership with manufacturers and retailers, government-backed initiatives promoting waste reduction, and partnerships between growers and retailers act as strong drivers. These efforts collectively encourage the adoption of sustainable practices and the exploration of secondary markets for surplus goods.

In **Poland**, economic challenges, including the low perceived value of surplus bread, and the difficulties in implementing upcycling solutions, present notable barriers to waste reduction. Nevertheless, EU directives mandating waste minimization, coupled with the influence of public figures such as chefs and advocates of zero-waste practices, serve as significant drivers. These elements inspire innovative approaches to managing food waste and encourage systemic change through increased public and private sector engagement.

3.2.2.4 Marketing strategies

Marketing strategies in **Denmark** focus on creating awareness around sustainable practices through collaboration with retailers and the implementation of transparent supply chains. By emphasizing the traceability of food products and showcasing initiatives aimed at reducing waste, these strategies cultivate trust among consumers and encourage active participation. Campaigns highlight the tangible environmental benefits of reducing food waste, fostering a culture of sustainability that aligns with the values of a conscientious consumer base.

In **Greece**, marketing efforts are primarily directed at increasing public awareness of food waste reduction through targeted social media campaigns. These campaigns emphasise the importance of sustainability and food redistribution, connecting with a diverse audience. Partnerships with retailers, hospitality businesses, and online platforms facilitate the effective redistribution of surplus food to those in need. This multi-channel

approach not only broadens outreach but also strengthens public engagement with the issue, positioning food waste reduction as a shared societal responsibility.

In **Ireland**, marketing strategies prioritise creating value for surplus food by targeting secondary markets with discounted pricing and innovative repurposing solutions. Surplus items are marketed through alternative channels, such as food processing companies, where they are converted into soups, purees, or other usable products. Public awareness campaigns complement these efforts, educating consumers about the nutritional value and environmental impact of purchasing imperfect or surplus produce. These initiatives aim to reduce stigma around such products while fostering a deeper understanding of the need for sustainable consumption.

In **Poland**, marketing initiatives actively engage consumers by leveraging platforms like "Too Good To Go" to offer surplus bread and other food products at discounted rates, effectively reducing waste and appealing to budget-conscious buyers. Campaigns highlight the creativity involved in transforming surplus items into innovative upcycled products, such as bread-based snacks or alternative ingredients. These efforts focus on inspiring consumers to see surplus food as a resource rather than waste, aligning with growing societal interest in sustainability and environmental responsibility.

3.2.3 Consumers

3.2.3.1 Awareness and Perceptions of Suboptimal Foods

In **Denmark**, suboptimal foods are primarily recognised as those that deviate from conventional appearance or weight standards, yet remain safe for consumption. These items are often perceived as high quality, even when past their labelled expiration date, indicating a strong level of trust in their safety and practical value. Awareness is predominantly concentrated on fruits and vegetables, while other forms, such as those with packaging imperfections, receive less consideration. It is suggested that educational initiatives could play a pivotal role in reshaping perceptions by underscoring the safety, functionality, and benefits of such foods.

In **Spain**, awareness of suboptimal foods exhibits significant variation, with concerns frequently directed toward the strict selection criteria employed by retailers, which tend to prioritise aesthetics over other attributes. Nutritional value emerges as a crucial determinant in the acceptance of these products. Public campaigns that emphasise the environmental advantages of embracing suboptimal foods are regarded as an effective strategy for shifting consumer attitudes and fostering greater acceptance.

In **Greece**, suboptimal foods are widely acknowledged as safe for consumption. However, societal preferences for flawless and uniform produce contribute to biases against irregular or visually imperfect items. These attitudes are often attributed to deeply ingrained cultural norms. Efforts to enhance understanding of the nutritional value and broader benefits of suboptimal foods are viewed as essential to improving their acceptance and addressing food waste challenges.

In **Ireland**, suboptimal foods are generally regarded as safe for consumption, with minor imperfections often considered inconsequential compared to the practical and economic advantages they provide. Previous experiences, particularly with baked goods, through programme such as "Too Good To Go" highlight a pragmatic approach, where affordability and utility are prioritised over appearance. This perspective reflects a growing openness to alternative options that align with consumer needs and values.

In **Poland**, awareness and engagement with suboptimal foods are particularly pronounced. Collaborative efforts, such as those between social workers and NGOs, underscore their value in addressing both social and

environmental challenges. These foods are increasingly viewed as a vital resource, with their sustainability benefits frequently highlighted as a means of promoting their use and reducing food waste. Practical initiatives and community involvement further reinforce their importance within the broader context of environmental and social responsibility.

3.2.3.2 Motivations and Barriers to Purchase

In **Denmark**, cost savings and prior positive experiences serve as significant incentives for purchasing suboptimal foods. Many consumers hold the belief that appearance does not impact quality, further reinforcing their willingness to consider these items. Nevertheless, concerns regarding food safety and taste—particularly with meat products—create hesitation. Additionally, ingrained habits and apprehensions about potential spoilage continue to hinder wider adoption, even when the advantages are evident.

In **Spain**, affordability and environmental consciousness are key factors driving interest in suboptimal foods. Sustainability initiatives and the opportunity for financial savings render these items appealing to a wide range of consumers. However, concerns related to freshness, perceived reductions in nutritional value, and the potential for social judgment temper enthusiasm, creating a delicate balance between perceived benefits and lingering reservations.

In **Greece**, efforts to reduce food waste and confidence in trustworthy suppliers encourage the selection of suboptimal foods. These motivators foster greater acceptance of minor imperfections in specific cases. Nonetheless, scepticism surrounding labelling practices and the aesthetic appeal of certain products generate hesitation. Items with unclear expiration dates or sourced from less reliable suppliers are often avoided, reflecting a cautious and discerning approach to purchasing.

In **Ireland**, practicality and cost-effectiveness are primary considerations when choosing suboptimal foods. Freshness is typically prioritised over appearance, leading to a pragmatic perspective that supports wider acceptance, particularly when economic benefits are apparent. However, a strong aversion to products nearing spoilage remains a significant barrier, as concerns about quality and safety continue to outweigh other factors.

In **Poland**, financial savings and the convenience of discounted items contribute significantly to the appeal of suboptimal foods. Environmental motivations, such as the desire to combat food waste, further reinforce these purchasing decisions. Despite these advantages, concerns regarding spoilage and food safety persist, prompting a careful evaluation of risks even as economic and ethical incentives encourage broader adoption.

3.2.3.3 Information and Trust Needs

In **Denmark**, there is a pronounced need for more accessible and comprehensive information to foster trust in suboptimal foods. Public campaigns and early educational initiatives are proposed as effective strategies to underscore the safety of these products, particularly in the context of meat. The provision of clear and reliable safety information is deemed essential to enhance consumer confidence, complemented by broader efforts to educate the public on the advantages and practical applications of suboptimal foods.

In **Spain**, transparency is identified as a critical factor in addressing information and trust requirements. Detailed disclosures regarding harvest dates and the criteria for categorising foods as suboptimal are highly valued, alongside clear and consistent labelling practices and storage guidance. The availability of such

information is considered pivotal for cultivating consumer confidence and promoting the broader acceptance of these products.

In **Greece**, the significance of transparent labelling is widely recognised. Initiatives to educate consumers on the interpretation and relevance of food labels are regarded as instrumental in building trust. Furthermore, clarity in product information and the reliability of brands are emphasised as key elements in reinforcing consumer confidence and encouraging the purchase of suboptimal foods.

In **Ireland**, the communication of clear, detailed information regarding the safety and quality of suboptimal foods is considered imperative. Educating consumers on their culinary applications and practical utility is seen as an effective approach to mitigating resistance. Such measures could address prevalent concerns while demonstrating the value of these products in routine meal preparation.

In **Poland**, providing detailed and transparent information on food safety and storage practices is deemed essential to alleviate concerns about spoilage. Consumer trust may be further strengthened by highlighting the sustainability benefits associated with suboptimal foods and offering precise, practical guidance on their usability. Ensuring transparency through accurate labelling and reliable sourcing is regarded as a vital means to enhance consumer confidence while aligning with broader environmental objectives.

3.2.3.4 Strategies for Awareness and Support

In **Denmark**, strategies to increase awareness and support for suboptimal foods focus on creating dedicated sections in supermarkets and launching educational campaigns. These measures aim to normalise the presence of these products and encourage their acceptance. Social media campaigns and price reductions are also proposed as practical tools to enhance visibility and incentivise purchases, addressing both accessibility and cost-related concerns.

In **Spain**, the promotion of suboptimal foods emphasises educational campaigns and clearer labelling to inform consumers about their qualities. Proximity-based charity systems and direct sales of suboptimal produce are suggested as methods to increase their distribution and usage. Additionally, school programmes and collaborations with community organisations are highlighted as important initiatives to integrate sustainability principles and encourage the acceptance of these products.

In **Greece**, raising public awareness about food waste and educating consumers on the benefits of suboptimal foods are seen as essential strategies. Retailers are encouraged to focus on emphasising cost savings and the quality of these items to build consumer trust. Such efforts are expected to address existing biases and foster a broader acceptance of suboptimal foods in the market.

In **Ireland**, television and school-based campaigns, along with summer events, are recommended as key approaches to promote suboptimal foods. Collaborations with NGOs are also suggested to expand outreach efforts. Dedicated sections in stores and the introduction of discounted bundles are proposed to improve visibility and accessibility, making these items more appealing to consumers.

In **Poland**, lowering prices and providing promotions are identified as effective strategies to support the purchase of suboptimal foods. Educational campaigns and social media outreach are emphasised as ways to normalise their acceptance. Collaborations with influencers are seen as a means to enhance visibility and encourage wider adoption, particularly by addressing misconceptions and increasing consumer confidence.

3.3 Discussion of the Interviews

3.3.1 Conclusions from the analysis of the food value chain actors' interviews

The food value chain actors interview analysis revealed diverse approaches to addressing food waste across regions. In one country, stakeholders prioritise quality by repurposing byproducts, optimising ordering, and integrating surplus into new dishes, while others emphasise operational efficiency through small orders and promotions, reintegrating unsold products into production. In another region, actors manage waste from strict standards and short shelf lives by partnering with NGOs and digital initiatives to redistribute surplus. Producers transform suboptimal produce into value-added goods like juices and powders, with some exploring new methods for surplus greens. In yet another region, strategies include redistributing unsellable produce to charities through market-driven initiatives, redirecting nonmarketable fruits into juicing, and reusing surplus for staff meals. Discount programmes and collaboration with processors help create products such as jams and granola. Meanwhile, a strong focus on sustainability in another area sees stakeholders using technological tools for inventory tracking, repackaging items to extend shelf life, and innovating with dynamic pricing and upcycling leftovers. Across all regions, common strategies include transforming surplus into new products, donating to food banks, and offering discounts on imperfect items. Accordingly, challenges differ by region. For example, some regions face regulatory restrictions and consumer expectations, others contend with financial and infrastructure barriers, while additional challenges include consumer scepticism and processing costs. Generational differences and reliance on date labelling further complicate waste reduction. However, drivers such as increasing consumer awareness, advanced inventory tools, and cultural acceptance of imperfections support progress. Marketing efforts also vary, with some focusing on educational campaigns and awards, others emphasising sustainability branding, and many leveraging digital platforms and transparency to promote suboptimal goods. Together, these practices reflect a global commitment to reducing waste and fostering a sustainable food system. An overview of the food value chain actors interview analysis is presented in Table 6.

Table 6: Overview of the interviews results from the food value chain actors

Aspect	Similarities Across Regions	Differences by Region
Strategies	Repurposing surplus into new products, donating to food banks, offering discounts on imperfect items.	Some focus on byproducts and production optimisation, others on redistributing surplus or leveraging technology.
Barriers	Strict aesthetic standards, consumer resistance, logistical constraints.	Regulatory restrictions (Poland), financial challenges (Ireland), scepticism and processing costs (Greece, Spain), generational differences (Denmark).
Drivers	Consumer awareness of sustainability, use of technological tools, acceptance of imperfections.	Community outreach (Greece), sustainability branding (Spain), taste awards and retailer collaboration (Ireland).
Marketing	Leveraging discounts, educational campaigns, and sustainability narratives.	Emphasis on dynamic pricing (Spain), social media transparency (Denmark), charity outreach (Greece).
Use of Technology	Tools for inventory management and waste tracking (general).	Specific platforms like "Why Waste" (Denmark), "Too Good to Go" (Denmark, Spain).

Aspect	Similarities Across Regions	Differences by Region
Focus on Sustainability	Across all regions, sustainability is a key motivator.	Strong emphasis on branding and eco-conscious consumer engagement in Spain and Denmark.

3.3.2 Conclusions from the analysis of the advisors/researchers interviews

Advisors and researchers addressing food waste focus on understanding and mitigating its key drivers, exploring innovative strategies, and implementing marketing initiatives to promote sustainable practices. They examine how strict quality standards, short shelf lives, and misinterpretation of date labels lead to significant waste across different parts of the food value chain. Challenges such as overproduction, logistical inefficiencies, and limited infrastructure for repurposing surplus goods are also key areas of analysis. To address these issues, researchers highlight practices like fostering certifications for sustainable food management, enhancing inventory tracking systems, and encouraging the redistribution of surplus food through direct partnerships with retail and hospitality sectors. The integration of technology, such as mobile applications and digital platforms, helps to streamline redistribution efforts and engage consumers through discounts on surplus or near-expiration products. Transforming surplus food into value-added goods—such as soups, purees, or upcycled snacks—emerges as a central strategy for repurposing nonmarketable items. Despite progress, barriers such as regulatory restrictions, financial constraints, and consumer scepticism persist. Limited consumer awareness and infrastructure gaps further complicate efforts to reduce waste. However, the researchers emphasise that drivers like growing consumer demand for sustainability, EU directives, and public awareness campaigns provide momentum for systemic change. Collaborative efforts with NGOs, businesses, and policymakers are seen as crucial for overcoming these challenges. Marketing initiatives leverage storytelling and transparency to highlight the importance of reducing food waste. Campaigns often promote the transformation of surplus food into creative products, emphasise sustainability branding, and educate consumers about the value of imperfect items. Digital tools and platforms are employed to encourage consumer participation and facilitate the redistribution of surplus. Across their work, advisors and researchers stress the importance of integrating sustainability into all stages of the food value chain, combining practical solutions with public engagement to reduce food waste effectively. An overview of the advisors/researchers' interview analysis is presented in Table 7.

Table 7: Overview of the interviews results from the advisors/researchers groups

Aspect	Similarities Across Regions	Differences by Region
Strategies	Collaborative efforts to redistribute and repurpose surplus.	Certifications and tracking (Denmark); redistribution, apps (Greece); agriculture, markets (Ireland); upcycling bread (Poland).
Barriers	Logistical, regulatory, and awareness challenges.	High VAT, allergen policies (Denmark); tax issues (Greece); strict size standards (Ireland); economic, upcycling issues (Poland).
Drivers	EU regulations and sustainability awareness.	Consumer demand, EU rules (Denmark); partnerships, campaigns (Greece); government, retail collaboration (Ireland); zero-waste advocacy (Poland).
Marketing	Awareness, education, and sustainability campaigns.	Traceability, environmental focus (Denmark); social media, partnerships (Greece); surplus repurposing (Ireland); discounts, upcycled bread (Poland).

Aspect	Similarities Across Regions	Differences by Region
Use of Technology	Technology improves food management and engagement.	Inventory tracking (Denmark); mobile apps (Greece); crop management tech (Ireland); upcycling, Too Good To Go (Poland).
Focus on Sustainability	Sustainability driven by societal and regulatory demand.	Certifications, traceability (Denmark); food banks, redistribution (Greece); agriculture, surplus markets (Ireland); creative upcycling (Poland).

3.3.3 Conclusions from the analysis of the consumers' interviews

According to the interview analysis, consumers are becoming increasingly aware of suboptimal foods, which are often defined by deviations from conventional appearance or packaging standards but remain safe for consumption. Perceptions vary, with some viewing these products as practical and of high quality, while others remain influenced by cultural preferences for flawless produce or concerns about food safety. Educational campaigns and transparent communication have been highlighted as effective ways to reshape attitudes and improve acceptance. Cost savings and environmental consciousness are common motivations for purchasing suboptimal foods, with many consumers recognising their practical and economic value. However, barriers such as scepticism about expiration labels, concerns over spoilage, and biases against visually imperfect items continue to hinder wider adoption. While practical considerations like affordability and utility often outweigh aesthetic concerns, some consumers remain cautious, particularly with certain categories like meat products or items nearing expiration. Information transparency and trust are essential for improving consumer engagement. Clear labelling practices, reliable sourcing, and guidance on storage and usability are repeatedly emphasised as key factors in building confidence. Efforts to communicate the nutritional value, safety, and sustainability benefits of suboptimal foods are seen as critical to increasing their acceptance and addressing lingering doubts. Strategies to encourage consumer adoption include dedicated sections in stores, discounted pricing, and promotional campaigns that normalise the use of suboptimal foods. Social media and community outreach initiatives are also effective in raising awareness and reducing stigma. Collaborations with NGOs, influencers, and educational institutions have proven successful in promoting the environmental and economic advantages of these products, helping to foster a broader cultural shift toward their acceptance. An overview of the consumers' interview analysis is presented in Table 8.

Table 8: Overview of the interview results from the consumers

Aspect	Similarities Across Regions	Differences by Region
Awareness and Perceptions	Suboptimal foods are recognised as safe, with educational campaigns improving acceptance.	High trust, focus on fruits/vegetables (Denmark); nutritional value key, aesthetics a barrier (Spain); cultural bias for perfect produce (Greece); focus on affordability (Ireland); social/environmental benefits emphasised (Poland).
Motivations and Barriers	Cost savings and sustainability drive interest, while spoilage and labelling concerns hinder adoption.	Positive experiences, safety concerns for meat (Denmark); sustainability vs. freshness concerns (Spain); trust in suppliers, unclear labels (Greece); cost-effective, spoilage aversion (Ireland); savings and convenience, spoilage concerns (Poland).

Aspect	Similarities Across Regions	Differences by Region
Information and Trust Needs	Clear labelling and transparency on safety and storage are vital for consumer trust.	Safety education, focus on meat (Denmark); harvest/labelling info (Spain); clear labels, brand reliability (Greece); practical safety guidance (Ireland); safety/sustainability transparency (Poland).
Strategies for Awareness and Support	Discounts, campaigns, and dedicated sections help normalise suboptimal foods.	Supermarket sections, social media (Denmark); charity systems, education (Spain); cost-saving campaigns (Greece); bundles, school programs (Ireland); promotions, influencer outreach (Poland).

The interviews revealed a range of insights and strategies in tackling food waste of suboptimal foods, showcasing the diverse efforts of stakeholders across the food system. Building on these insights, the following section presents perspectives from a focus group discussion, offering a collective view on enhancing the business potential of suboptimal foods through targeted strategies, innovative solutions, and policy measures.

4. Focus Group Discussion

4.1 Methodology

The focus group discussion was conducted online on October 11th 2024, bringing together 15 participants from various sectors within the food supply chain. These participants, representing roles in research, advocacy, policymaking, retail, and innovation, offered diverse perspectives on improving the business potential of suboptimal foods. This variety ensured a holistic understanding of the topic, encompassing aspects of food production, distribution, and sustainability.

The session was supported by a PowerPoint presentation that provided participants with general background information on suboptimal foods, including marketing standards, opportunities, and strategies for promoting these products. Additional topics covered during the presentation included packaging, inventory management, logistics innovations, and practices for food recovery and redistribution. For each topic, a guiding question was posed to the group, inviting participants to share their insights and experiences.

A qualitative approach was employed, using open-ended questions to encourage participants to freely express their perspectives on the suboptimal foods market. This format allowed for the exploration of diverse viewpoints and rich, in-depth responses.

The data were analysed using a three-phase thematic analysis approach:

1. **Coding**: Participant responses were examined to identify keywords and patterns, leading to the development of a coding scheme that organised key attributes.
2. **Theme Development**: Broader themes were identified from the codes, addressing the research questions and highlighting key insights.
3. **Interpretation**: Themes were analysed in relation to the study's objectives, providing a deeper understanding of strategies to enhance the market potential of suboptimal foods.

This structured methodology ensured a comprehensive and nuanced analysis, shedding light on the challenges and opportunities associated with suboptimal foods across the food supply chain.

Table 9: Questions for the focus group discussion

Topics	Questions
Marketing Opportunities for Suboptimal Foods	Question 1: What do you think are the most promising markets for selling suboptimal foods (such as farmers' markets, supermarkets, online platforms, others)? What challenges or barriers do you see in accessing or expanding into these markets?
Marketing Strategies for Suboptimal Foods	Question 2: Which marketing strategies do you think are most effective for promoting suboptimal foods—discount pricing, attractive packaging, product design, in-store placement, or communication campaigns? What has worked in your experience?

Topics	Questions
Packaging, Inventory Management, and Logistics Innovations	Question 3: What are the biggest challenges in implementing new technologies (e.g., AI forecasting, durable packaging) for suboptimal foods, and what practical solutions or innovations could help overcome these?
Food Recovery and Redistribution	Question 4: What are the challenges in scaling this practice? Question 5: What are the main challenges in expanding these models?
Policy and Regulatory Support	Question 6: Which existing or new government policies (e.g., tax incentives, donation laws) could have the quickest impact in helping businesses recover and sell suboptimal foods?

4.2 Findings

The following sections summarise the main points raised by the participants, reflecting a broad consensus on effective approaches, common hurdles, and innovative solutions for enhancing the consumption and sale of suboptimal foods. These insights serve as a foundation for understanding how targeted interventions and policy measures can create a more efficient, resilient, and waste-conscious food system.

4.2.1 Promising markets for suboptimal foods

Participants identified several promising markets for suboptimal foods, noting that regional consumer preferences and specific challenges play a significant role. Online platforms, for instance, were highlighted as especially effective, particularly when they offer customisable order options that have increased consumer satisfaction and significantly reduced waste. Farmers' markets were seen as ideal in areas like Greece, where consumers tend to prefer natural-looking produce, viewing imperfections as a sign of organic quality. Supermarkets also hold potential, particularly when they feature discounted near-expiry items that attract both price-sensitive and eco-conscious customers. In Denmark, the catering sector emerged as a flexible market willing to accept imperfect produce, prioritising cost-efficiency over strict appearance standards. As one participant mentioned, “In Greece, people actually prefer fruits and vegetables with some imperfections. It makes them look more natural and closer to being organic.” Another participant described the success of online platforms, saying, “We saw food waste drop from over 10% to around 1% when we shifted to offering customisable orders. It lets customers choose exactly what they want, and that’s been really popular.”

4.2.2 Effective marketing strategies for suboptimal foods

Participants agreed that moderate discounts—around 30%—work well to attract consumers without diminishing perceived quality. Communication campaigns also play a significant role, with participants emphasising the importance of positioning suboptimal food as a socially responsible choice, encouraging consumers to align their behaviour with waste reduction goals. One participant cautioned that “discounts can

be effective, but we have to be careful. Too steep a discount can make consumers doubt the quality. A moderate reduction, like 30%, seems to strike the right balance." Another participant emphasised the role of education in building consumer trust: "Consumers need more than just a discount; they want information. Explaining why these foods are safe and nutritious can build trust and shift perceptions positively."

4.2.3 Technological and logistical challenges in implementing solutions

The adoption of new technologies, such as AI forecasting and biofilm packaging, presents challenges, particularly in terms of data accuracy and initial investment. Participants pointed out that accurate forecasting could significantly reduce food waste but only if it's based on reliable data; otherwise, it might exacerbate existing issues. Additionally, natural biofilm packaging was discussed as a promising, albeit experimental, solution for extending the shelf life of suboptimal foods. As one participant explained, "Accurate forecasting would be fantastic, but it's challenging to get reliable data. If the AI relies on poor data, it could actually worsen the problem." Another participant shared insights on biofilm technology: "We're exploring biofilms as a natural way to extend shelf life. It's a promising area, though we're pushing the limits of what natural preservation can achieve."

4.2.4 Challenges in scaling the use of suboptimal foods

Scaling the integration of suboptimal foods into mainstream markets faces several challenges, including regulatory constraints and supply consistency issues. In Denmark, strict labelling and traceability requirements can restrict market entry, while seasonal variations affect supply reliability. Participants recommended cooperative models, where small producers can pool resources, as a viable solution to address supply limitations. "In Denmark, regulatory standards can be restrictive, especially around labelling and traceability. This can complicate things for producers wanting to sell imperfect produce," noted one participant. Another added, "A cooperative model where farmers can pool resources could be a solution to meet quantity demands and bring more consistency to the market."

4.2.5 Challenges in expanding redistribution and repurposing models

Participants pointed out that funding, perception, and regulatory barriers are critical obstacles to expanding food redistribution and repurposing models. Sustainable funding is crucial for supporting social supermarkets and food banks, as it ensures they can balance waste reduction with maintaining dignity for recipients. Effective logistical coordination is also essential for the efficient collection and distribution of suboptimal foods. Participants were optimistic about the upcoming EU regulation changes, which could allow easier entry for suboptimal foods into mainstream markets. "Funding is always a challenge, especially for social supermarkets. And we also need to ensure recipients don't feel they're being offered substandard food," one participant noted, reflecting concerns about maintaining dignity in these programmes. Another participant highlighted logistical issues: "In Greece, voluntary work is heavily regulated, which complicates the logistics of food redistribution initiatives."

4.2.6 Policy recommendations for quick impact

Tax incentives and relaxed regulatory standards emerged as highly effective policy measures for supporting the sale and recovery of suboptimal foods. Participants referenced international examples, such as Australia's tax incentive policies, as adaptable models that could help encourage food recovery efforts. Additionally,

upcoming changes in EU standards to relax appearance requirements for suboptimal foods are expected to ease their entry into mainstream markets and promote wider adoption. “Tax incentives would make a real difference for businesses trying to recover and sell suboptimal foods. But the question is: how quickly can they be implemented?” one participant remarked, expressing concern over potential delays. Another participant saw the upcoming EU changes as a positive development, explaining, “Relaxing aesthetic standards could be transformative, allowing more suboptimal produce to reach consumers. The EU changes coming in 2025 are a positive step in that direction.”

4.3 Discussion of the Focus Group’s results

The focus group highlighted the potential of suboptimal foods to reduce waste through targeted market strategies, technological advancements, and supportive policies. Key channels like online platforms, farmers' markets, and supermarkets were identified as effective, especially when coupled with moderate discounts and consumer education to shift perceptions. However, successful implementation relies on reliable data, cooperative models, and regulatory flexibility. Policies like tax incentives and relaxed standards are also essential to facilitate broader adoption. Overall, a holistic approach combining consumer engagement, innovation, and policy support can make suboptimal foods a viable solution for a more sustainable food system. An overview of the focus groups results is presented in Table 10.

Table 10: Overview of the focus group results

Theme	Coding	Interpretation
Promising Markets for Suboptimal Foods	Online platforms, farmers' markets, supermarkets, catering sector	Tailored market strategies and flexible approaches can increase acceptance and reduce food waste.
Effective Marketing Strategies	Moderate discounts, consumer education, social responsibility, quality perception	Balancing price incentives with education builds trust and aligns behaviours with waste reduction.
Technological and Logistical Challenges	AI forecasting, data accuracy, biofilm packaging, investment costs	Technological advances require investment and collaboration to address initial implementation barriers.
Challenges in Scaling	Regulatory constraints, supply consistency, seasonal variations, cooperative models	Regulatory adjustments and cooperatives can enhance scalability and market access.
Expanding Redistribution Models	Funding challenges, perception issues, regulatory barriers, logistical coordination, EU regulation changes	Sustainable funding is critical for social supermarkets and food banks. Logistical challenges, such as regulated voluntary work complicate collection and distribution. Upcoming EU regulation changes offer hope for easier entry of suboptimal foods into mainstream markets.
Policy Recommendations	Tax incentives, relaxed standards, EU regulation changes	Policy changes can accelerate adoption; upcoming EU reforms are promising.

5. General Overview

In this section, the general overview from the literature review, the interviews and the focus group discussion results are presented. While the literature review was extensive, it is important to note the exploratory nature of the primary data collection undertaken, including the small number of interviewees and focus group participants. According to the results presented in Table 11 there is a diverse range of strategies to combat food waste, categorized into prevention, redistribution, and social interventions, each playing a critical role in addressing inefficiencies across the food supply chain. Prevention strategies, such as dynamic pricing, visual marketing, and consumer education, focus on improving the marketability of suboptimal foods. Moderate discounts, for example, appeal to budget-conscious consumers without compromising product value, while innovative packaging and labelling foster trust by emphasising quality and safety. Communication and awareness campaigns further educate consumers on the sustainable benefits of purchasing suboptimal foods and understanding date labelling. Regional differences highlight Denmark's emphasis on dynamic pricing and advanced supermarket sections, whereas Greece focuses on community-driven awareness and creative product placement. Additionally, logistics and inventory management technologies, such as AI forecasting, optimise the transport, storage, and sale of suboptimal foods, although cost and regulatory barriers persist in regions like Poland and Ireland. Redistribution strategies aim to repurpose food surplus into new products or channels, providing both economic and environmental benefits. Transforming imperfect produce into value-added goods like jams, juices, and snacks opens new markets while addressing waste at the source. Social supermarkets offer surplus food at affordable prices, improving accessibility for low-income communities, with Ireland leading in well-established models. Farmers' markets and digital platforms also serve as effective direct sales channels, with Greece favouring local markets and Denmark excelling in online platforms such as "Too Good To Go." Digital tools further enable efficient redistribution by connecting surplus food with consumers, businesses, and charities, although their adoption varies depending on technological and regulatory landscapes. Social interventions focus on mitigating food insecurity through structured programmes like food banks, donation initiatives, and digital platforms. Food banks play a pivotal role in redistributing surplus to shelters and underserved populations, with Ireland demonstrating a highly structured system. However, Greece and Poland face challenges due to informal networks and regulatory barriers, such as restrictions on voluntary work. Digital platforms not only facilitate the redistribution of surplus but also increase consumer awareness, with Denmark leveraging apps for seamless redistribution and Spain emphasising awareness campaigns. Strategic partnerships with donation organisations further enhance the efficiency of these interventions, ensuring that surpluses are directed to those in need while minimising waste.

Table 11: Overview of the strategies identified through the literature review, interviews survey and focus group discussion.

Strategy Class	Strategy Type	Key Insights	Regional Differences
Prevention	Pricing Strategies	Moderate discounts (e.g., 30%) attract budget-conscious consumers without reducing perceived value.	Greater reliance on dynamic pricing in Denmark; education-focused strategies in Greece and Poland.
	Visual Marketing and Display Strategies	Strategic displays increase visibility and appeal of suboptimal foods.	Denmark emphasises supermarket sections, while Greece highlights creative placement in local markets.

Strategy Class	Strategy Type	Key Insights	Regional Differences
	Packaging and Labelling	Attractive, informative packaging builds consumer trust and aligns with sustainability goals.	Spain and Ireland emphasise eco-friendly packaging; Greece focuses on clear labelling about safety and quality.
	Flexible Contracts	Contracts enable better management of supply chain variability.	Less prominent in regions focusing on direct sales or redistribution (e.g., Greece).
	Communication and Awareness	Consumer education on sustainability benefits and date labelling (e.g., 'best before' vs. 'use by').	Strong education campaigns in Greece and Spain; Ireland emphasises trust-building through direct consumer guidance.
	Product Design	Transforming imperfect products into attractive, functional options.	Poland focuses on creative upcycling (e.g., bread), while Greece emphasises traditional product transformations (e.g., jams, snacks).
	Logistics, Inventory Management, and Planning	Technologies like AI forecasting optimise food supply and reduce waste.	Denmark leads in adopting advanced logistics tools, while Poland and Ireland face higher regulatory or cost barriers to implementation.
Redistribution	Suboptimal Produce Transformation	Producing value-added items such as juices, jams, and snacks.	Denmark focuses on cost-efficient catering use; Greece prioritises local product value-addition.
	Social Supermarkets	Affordable access to surplus food for low-income communities.	Ireland has well-established social supermarkets; Greece faces regulatory challenges in scaling similar initiatives.
	Direct Sales Channels	Farmers' markets and online platforms reduce waste and support local economies.	Greece emphasises farmers' markets due to consumer preferences for 'natural-looking' produce, while Denmark excels in online platforms.
	Digital Platforms	Technology connects surplus food with consumers and redistribution partners.	Denmark relies on apps like 'Too Good To Go,' while Greece and Poland focus on agricultural and local redistribution tools.

Strategy Class	Strategy Type	Key Insights	Regional Differences
Social Interventions	Food Donation Programs	Donating food surplus to food banks, shelters, and charities.	Ireland excels in food bank operations; Greece faces regulatory barriers in voluntary work for food redistribution.
	Digital Platforms for Food Waste-related Social Interventions	Facilitating redistribution and increasing consumer awareness.	Denmark leverages apps for redistribution, while Greece and Spain are focused on raising consumer awareness through online campaigns.
	Food Banks	Critical for addressing food insecurity and reducing waste.	Ireland has structured food bank systems; Greece and Poland highlight informal networks and partnerships.
	Food Donation Initiatives	Strategic partnerships with organisations to redistribute surplus food.	Denmark focuses on efficiency, while Greece highlights the importance of community-driven initiatives to address logistical challenges.

The analysis provided a detailed overview of the key aspects influencing food waste reduction and the promotion of suboptimal foods across different regions (Table 12). Barriers are a significant challenge, with strict aesthetic standards, consumer resistance, and logistical constraints widely noted. These are compounded by regional factors such as regulatory restrictions in Poland, financial challenges in Ireland, scepticism about suboptimal produce in Greece and Spain, and generational differences in Denmark. These challenges highlight the importance of tailoring interventions to local conditions. Drivers for reducing food waste focus on consumer awareness of sustainability, the acceptance of imperfect produce, and the use of technological tools. While these are consistent across regions, specific approaches vary, such as community outreach in Greece, sustainability branding in Spain, and retailer collaborations in Ireland. These drivers demonstrate that consumer engagement and partnerships within the value chain are essential for success. Marketing strategies are another critical aspect, focusing on leveraging discounts, educational campaigns, and sustainability narratives. Regional approaches differ significantly: Spain emphasises dynamic pricing to attract price-sensitive consumers, Denmark prioritises transparency through social media, and Greece focuses on charity-driven outreach. These strategies underline the need for diverse approaches to align with regional consumer preferences and behaviours. The use of technology is pivotal, with tools for inventory management and waste tracking being widely adopted. Denmark leads in deploying innovative platforms like "Why Waste" and "Too Good To Go," which enhance efficiency and transparency in redistribution. By contrast, Greece and Poland are focusing on localised agricultural and redistribution tools, indicating different technological needs and adoption levels. A strong focus on sustainability unites regions, with sustainability serving as a key motivator across all areas. However, the emphasis on sustainability varies, with Spain and Denmark prioritising eco-conscious branding and consumer engagement, while other regions, such as Ireland, focus more on practical measures like redistribution through food banks and social supermarkets. Specific technological and logistical challenges include the need for investment in AI forecasting, improving data accuracy, and adopting

biofilm packaging to extend product shelf life. These technologies hold promise but require collaboration and investment to overcome initial barriers, particularly in regions with cost or regulatory constraints. Challenges in scaling redistribution and waste reduction practices include supply consistency issues, seasonal variability, and regulatory constraints. Cooperative models and policy adjustments, such as relaxing marketing standards, are seen as effective ways to enhance scalability and market access, though implementation varies by region. Expanding redistribution models is critical, particularly for supporting social supermarkets and food banks. Sustainable funding and logistical coordination remain significant hurdles, with challenges such as regulated voluntary work in Greece complicating efforts. However, upcoming EU regulation changes provide hope for broader adoption and easier integration of suboptimal foods into mainstream markets. Finally, policy recommendations focus on tax incentives, relaxed standards, and EU regulatory reforms to accelerate adoption. These measures are seen as transformative, with regions like Denmark and Ireland particularly optimistic about their impact.

Table 12: Overview of key aspects influencing food waste reduction and suboptimal food strategies identified through the interviews survey and the focus group discussion.

Aspect	Similarities Across Regions	Differences by Region
Barriers	Strict aesthetic standards, consumer resistance, logistical constraints.	Regulatory restrictions (Poland), financial challenges (Ireland), scepticism and processing costs (Greece, Spain), generational differences (Denmark).
Drivers	Consumer awareness of sustainability, use of technological tools, acceptance of imperfections.	Community outreach (Greece), sustainability branding (Spain), taste awards and retailer collaboration (Ireland).
Marketing	Leveraging discounts, educational campaigns, and sustainability narratives.	Emphasis on dynamic pricing (Spain), social media transparency (Denmark), charity outreach (Greece).
Use of Technology	Tools for inventory management and waste tracking (general).	Specific platforms like 'Why Waste' (Denmark), 'Too Good To Go' (Denmark, Spain).
Focus on Sustainability	Across all regions, sustainability is a key motivator.	Strong emphasis on branding and eco-conscious consumer engagement in Spain and Denmark.
Technological and Logistical Challenges	AI forecasting, data accuracy, biofilm packaging, investment costs.	Technological advances require investment and collaboration to address initial implementation barriers.
Challenges in Scaling	Regulatory constraints, supply consistency, seasonal variations, cooperative models.	Regulatory adjustments and cooperatives can enhance scalability and market access.
Expanding Redistribution Models	Funding challenges, perception issues, regulatory barriers, logistical coordination, EU regulation changes.	Sustainable funding is critical for social supermarkets and food banks. Logistical challenges, such as regulated voluntary work, complicate collection and distribution.

Aspect	Similarities Across Regions	Differences by Region
Policy Recommendations	Tax incentives, relaxed standards, EU regulation changes.	Policy changes can accelerate adoption; upcoming EU reforms are promising.

6. Conclusions

Food waste represents a critical global challenge with far-reaching consequences on the environment, economy, and society. It contributes significantly to greenhouse gas emissions, wastes valuable resources such as water, energy, and labour, and exacerbates food insecurity in many regions. Addressing this issue requires innovative, integrated, and collaborative approaches that span the entire food supply chain. Within the framework of the ROSETTA project, insights were drawn from multiple sources, including interviews with stakeholders across five countries (Denmark, Greece, Ireland, Poland, and Spain), a literature review, and a focus group discussion. Together, these diverse perspectives provided a comprehensive understanding of how to effectively reduce food waste while improving the business potential of suboptimal foods.

The findings highlighted the importance of robust prevention strategies as a first step in addressing food wastage. Discounting aesthetically imperfect foods and products close to their expiration dates was identified as a highly effective strategy, particularly appealing to value-conscious and environmentally aware consumers. Moderate discounts were found to strike the right balance between incentivising purchase and maintaining consumer trust in product quality. Additionally, creative in-store displays play a crucial role in increasing the visibility of these products, drawing attention to their value. Informative and attractive packaging was also highlighted as a game-changer, as it not only enhances the appeal of suboptimal foods but also educates consumers about their safety and nutritional value. Consumer education is central to changing attitudes and behaviours toward suboptimal foods. Campaigns that communicate the environmental and economic benefits of purchasing such foods are highly effective. For instance, educating consumers about the distinction between "best before" and "use by" dates can prevent unnecessary discarding of perfectly edible food. Relaxing marketing standards, which often emphasise visual perfection, was also recommended to increase the marketability of visually imperfect but entirely edible produce. These strategies collectively address one of the core barriers to reducing food waste which is consumer resistance.

Technology plays a vital role in enabling the efficient management of suboptimal foods. Advanced logistics and inventory management systems were identified as critical tools for optimising the transport, storage, and sale of these products. These technologies ensure that suboptimal foods reach consumers in a timely and cost-effective manner while minimising losses throughout the supply chain. Technology also has a role in redistribution. In addition, innovative packaging solutions, such as biofilm technology, extend the shelf life of products, allowing consumers to use them for longer periods and thereby reducing waste. AI-based forecasting systems were also discussed as a promising technology for aligning supply and demand, although challenges such as data reliability and high initial investment costs remain. The adoption of such tools requires not only technological advancements but also collaboration among stakeholders to standardise processes and share data effectively.

Redistribution strategies emerged as a critical complement to preventive measures. Transforming suboptimal produce into value-added products, such as juices, jams, and snacks, opens new market channels while simultaneously reducing waste. For instance, suboptimal fruits that might otherwise be discarded can be processed into high-quality, marketable products that cater to changing consumer preferences. Social supermarkets not only play a pivotal role by providing surplus food to low-income communities at affordable prices, but they also address both food waste and food insecurity. Direct sales through farmers' markets and online platforms further support local economies while reducing the environmental footprint associated with waste. Strategic partnerships with food donation organisations are key to ensuring that food surpluses reach those in need. Food banks, shelters, and community groups benefit from these collaborations, which help

address nutrition needs in underserved populations. However, challenges such as regulatory constraints, logistical hurdles, and funding limitations must be addressed to scale these interventions effectively.

The interviews conducted in Denmark, Greece, Ireland, Poland, and Spain revealed significant regional variations in how suboptimal foods are managed and perceived. For example, in Denmark, online platforms that allow customers to customise their orders have been highly effective, reducing waste by enabling consumers to select only what they need. Farmers' markets in Greece thrive on a cultural preference for natural-looking produce, where imperfections are often seen as a sign of organic quality. In the catering sector of Denmark, cost-efficiency takes precedence over aesthetic standards, making it a key market for suboptimal foods. Meanwhile, countries like Ireland and Poland face unique regulatory and financial challenges that require tailored solutions, such as improved labelling standards or financial incentives for businesses.

Despite the success of these strategies, several barriers remain. Strict aesthetic standards, logistical inefficiencies, regulatory constraints, and consumer resistance are common challenges across regions. For instance, Greece faces regulatory restrictions on voluntary work in food redistribution initiatives, while Denmark struggles with high VAT and traceability requirements for suboptimal foods. Ireland highlights the financial barriers to funding food banks and social supermarkets, whereas Poland grapples with the economic feasibility of upcycling. These challenges underscore the need for policy reforms and collaborative efforts among stakeholders. Upcoming EU regulatory changes, including relaxed marketing standards and tax incentives for businesses adopting food waste reduction measures, are seen as a promising step forward. These reforms could make it easier for suboptimal foods to enter mainstream markets and encourage wider adoption of waste-reduction practices.

Collaboration among stakeholders across the food supply chain is essential for the success of these strategies. Producers, retailers, policymakers, and consumers must work together to overcome barriers and implement solutions effectively. For instance, partnerships with food banks and donation organisations ensure surplus food is redirected to those in need, while effective marketing campaigns and dynamic pricing strategies can drive consumer acceptance. Investments in technology, such as AI forecasting and inventory management tools, further enhance scalability and efficiency.

Ultimately, the integration of prevention, redistribution, and collaboration strategies has the potential to significantly reduce food waste and unlock the business potential of suboptimal foods. This calls for collective action and a commitment to sustainability at all levels of the supply chain. Ongoing research and innovation are essential to developing new methods for waste reduction, addressing region-specific challenges, and promoting consumer acceptance of suboptimal foods. The results of this deliverable will contribute to the rest of WP2 activities, namely on i) the identification of alternative marketing models for the valorisation of food wasted due to marketing standards (Task 2.2); ii) the assessment of trade-offs between food waste reduction objectives of the identified models and objectives pursued by marketing standards (Task 2.3); and iii) the development of a digital toolkit to share assessment data, showcase good practices and facilitate networking (Task 2.3), as well as in the activities of other WPs.

7. References

Agarwal, K., & Singh, R. (2016). Food wastage—A global concern. National Conference on Advances in Food Science and Technology, 16, 125.

Akkerman, R., Buisman, M., Cruijssen, F., de Leeuw, S., & Haijema, R. (2023). Dealing with donations: Supply chain management challenges for food banks. International Journal of Production Economics, 262, 108926.

Alexander, C., Gregson, N., & Gille, S. (2013). Food waste. The Handbook of Food Research, 1, 471–483.

Aramyan, L., Grainger, M., Logatcheva, K., Piras, S., Setti, M., Stewart, G., & Vittuari, M. (2021). Food waste reduction in supply chains through innovations: A review. Measuring Business Excellence, 25(4), 475–492. https://www.emerald.com/insight/content/doi/10.1108/MBE-11-2019-0105/full/html

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

Aschemann-Witsel, J., Giménes, A., & Ares, G. (2020). Suboptimal food, careless store? Consumer's associations with stores selling foods with imperfections to counter food waste in the context of an emerging retail market. Journal of Cleaner Production, 262, 121252.

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

Barba, M., & Días-Ruis, R. (2015). Switching imperfect and ugly products to beautiful opportunities. In Envisioning a future without food waste and food poverty: Societal challenges (pp. 279–284). Wageningen Academic Publishers.

Barone, A. M., Donato, C., & Romani, S. (2021). Physically processing imperfect produce: The impact of prototypicality. Journal of Consumer Behaviour, 20(6), 1547–1561.

Beausang, C., Hall, C., & Toma, L. (2017). Food waste and losses in primary production: Qualitative insights from horticulture. Resources, Conservation and Recycling, 126, 177–185.

Bech-Larsen, T., Ascheman-Witsel, J., & Kulikovskaja, V. (2019). Re-distribution and promotion practices for suboptimal foods–commercial and social initiatives for the reduction of food waste. Society and Business Review, 14(2), 186–199

Berri, A., & Toma, L. (2023). Factors influencing consumer use of social supermarkets in the UK: A redistribution model providing low-cost surplus food. Cleaner and Responsible Consumption, 10, 100133.

Birkmaier, A., Imeri, A., Riester, M., & Reiner, G. (2023). Preventing waste in food supply networks-a platform architecture for AI-driven forecasting based on heterogeneous big data. Procedia CIRP, 120, 708–713.

Bolos, L. A., Lagerkvist, C.-J., Edenbrant, A. K., & Nayga, R. M. (2022). Consumer preferences for visually sub-optimal food: Role of information framing and personal goals. Resources, Conservation and Recycling, 184, 106426.

Calvo-Porral, C., Medín, A. F., & Losada-Lópes, C. (2017). Can marketing help in tackling food waste?: Proposals in developed countries. Journal of Food Products Marketing, 23(1), 42–60.

Cao, S., Gong, S., & Bai, L. (2023). Situational variables that affect consumers' suboptimal food purchasing behavior in China. British Food Journal, 125(1), 145–166. https://www.emerald.com/insight/content/doi/10.1108/BFJ-09-2021-1074/full/html

Cao, Y., & Miao, L. (2021). Consumer responses to suboptimal food products. Appetite, 163, 105205.

Castagna, A. C., Pinto, D. C., Mattila, A., & de Barcellos, M. D. (2021). Beauty-is-good, ugly-is-risky: Food aesthetics bias and construal level. Journal of Business Research, 135, 633–643.

Castro, C., Chitikova, E., Magnani, G., Merkle, J., & Heitmayer, M. (2023). Less Is More: Preventing Household Food Waste through an Integrated Mobile Application. Sustainability, 15(13), 10597. https://www.mdpi.com/2071-1050/15/13/10597

Chang, H.-H., Lu, L.-C., & Kuo, T.-C. (2024). Are discounts useful in promoting suboptimal foods for sustainable consumption and production? The interaction effects of original prices, discount presentation modes, and product types. Journal of Retailing and Consumer Services, 79, 103881. https://www.sciencedirect.com/science/article/pii/S0969698924001772?casa_token=sSVd-vNoELMAAAAA:-cw91ylx-TrcvcV9mTVW8BR1HSu23l-XLn9eLiEn2Xm8gUKqieAI8GEf_J8Q67vUuDSOyxrxxEU

Cicatiello, C., Secondi, L., & Principato, L. (2019). Investigating consumers' perception of discounted suboptimal products at retail stores. Resources, 8(3), 129.

Collart, A. J., & Interis, M. G. (2018). Consumer imperfect information in the market for expired and nearly expired foods and implications for reducing food waste. Sustainability, 10(11), 3835.

Cooremans, K., & Geuens, M. (2019). Same but Different: Using Anthropomorphism in the Battle Against Food Waste. Journal of Public Policy & Marketing, 38(2), 232–245. https://doi.org/10.1177/0743915619827941

Corrado, S., & Sala, S. (2018). Food waste accounting along global and European food supply chains: State of the art and outlook. Waste Management, 79, 120–131. https://www.sciencedirect.com/science/article/pii/S0956053X18304550

Crama, P., Shou, Y. H., & Wang, M. (2023). Impact of cosmetic standards on food loss. Available at SSRN 4452800.

Date marking and food waste prevention—European Commission. (n.d.). Retrieved 18 June 2024, from https://food.ec.europa.eu/safety/food-waste/eu-actions-against-food-waste/date-marking-and-food-waste-prevention_en

de Hooge, I. E. (2022). Promoting the imperfect: Marketing strategies to reduce product waste. Imperfections: Studies in Mistakes, Flaws, and Failures; Kelly, C., Kemper, J., Rutten, E., Eds, 103–128.

De Hooge, I. E., Oostindjer, M., Aschemann-Witsel, J., Normann, A., Loose, S. M., & Almli, V. L. (2017). This apple is too ugly for me!: Consumer preferences for suboptimal food products in the supermarket and at home. Food Quality and Preference, 56, 80–92.

de Hooge, I. E., van Dulm, E., & van Trijp, H. C. (2018). Cosmetic specifications in the food waste issue: Supply chain considerations and practices concerning suboptimal food products. Journal of Cleaner Production, 183, 698–709.

De Moraes, C. C., de Oliveira Costa, F. H., Pereira, C. R., Da Silva, A. L., & Delai, I. (2020). Retail food waste: Mapping causes and reduction practices. Journal of Cleaner Production, 256, 120124.

https://www.sciencedirect.com/science/article/pii/S0959652620301712?casa_token=aJOjpyS_bc0AAAAA:wvEeCAiv_rJKeFUdVBvrfmjSQi0Edr7SceC-OKchhbdyuLFMtG4am9yiLi_UYSd1kAFluQhk

Dias, M. L. das D. G. (2018). Creating a hybrid business model to generate economic and ecological value: The case of Fruta Feia Consumer Cooperative.

EatBy App. (n.d.). Retrieved 31 July 2024, from https://eatbyapp.com/

EFSA Panel on Biological Hasards (BIOHAS), Koutsoumanis, K., Allende, A., Alvares-Ordóñes, A., Bolton, D., Bover-Cid, S., Chemaly, M., Davies, R., De Cesare, A., Herman, L., Hilbert, F., Nauta, M., Peixe, L., Ru, G., Simmons, M., Skandamis, P., Suffredini, E., Jacxsens, L., Skjerdal, T., … Lindqvist, R. (2021). Guidance on date marking and related food information: Part 2 (food information). EFSA Journal, 19(4). https://doi.org/10.2903/j.efsa.2021.6510

Espigoladors | We fight to stop food waste and losses. (n.d.). Fundació Espigoladors © All Rights Reserved | Photos: © Jordi Flores, Glòria Solans, Rafael Coelho, Lucia Gulminelli, Arxiu Espigoladors. Retrieved 24 April 2024, from https://espigoladors.cat/en/

Farm to Fork Strategy—European Commission. (n.d.). Retrieved 8 June 2024, from https://food.ec.europa.eu/horisontal-topics/farm-fork-strategy_en

Felix, P. (2018). Data-driven retail food waste reduction: A comparison of demand forecasting techniques and dynamic pricing strategies [Master's Thesis, University of Twente]. https://essay.utwente.nl/76380/

Filimonau, V., & Gherbin, A. (2017). An exploratory study of food waste management practices in the UK grocery retail sector. Journal of Cleaner Production, 167, 1184–1194.

Food labels | EFSA. (n.d.). Retrieved 18 June 2024, from https://www.efsa.europa.eu/en/safe2eat/food-labels

Food loss and waste prevention—European Commission. (n.d.). Retrieved 18 April 2024, fromhttps://food.ec.europa.eu/horisontal-topics/farm-fork-strategy/food-loss-and-waste-prevention_en

Food wastage footprint full-cost accounting: Final report. (2014). Food Wastage Footprint.

Food waste in Greece. (n.d.). Retrieved 29 July 2024, from https://www.boroume.gr/en/food-waste-in-greece

Foodsavingalliancegreece – Food Saving Alliance Greece. (n.d.). Retrieved 21 June 2024, from https://foodsavingalliancegreece.gr/

Fragapane, S., & Mortara, A. (2022). The value of networks against food waste: The case of "Too Good To Go". Italian Sociological Review, 12(3). https://www.italiansociologicalreview.com/ojs/index.php/ISR/article/view/605

France's law for fighting food waste. (n.d.). Sero Waste Europe. Retrieved 30 June 2024, from https://serowasteeurope.eu/library/france-law-for-fighting-food-waste/

Ghaani, M., Cossolino, C. A., Castelli, G., & Farris, S. (2016). An overview of the intelligent packaging technologies in the food sector. Trends in Food Science & Technology, 51, 1–11.

Hartmann, T., Jahnke, B., & Hamm, U. (2021). Making ugly food beautiful: Consumer barriers to purchase and marketing options for Suboptimal Food at retail level–A systematic review. Food Quality and Preference, 90, 104179.

Harvey, J., Smith, A., Goulding, J., & Illodo, I. B. (2020). Food sharing, redistribution, and waste reduction via mobile applications: A social network analysis. Industrial Marketing Management, 88, 437–448. https://www.sciencedirect.com/science/article/pii/S0019850118302591?casa_token=idoiNs-FVpUAAAAA:K6rB6dBwbERySWp9PILM90ROW4iX6JoFoqOBd-V5xpWKr3RFnUFsdsxPcTYlnpGqYLQjRiHsefg

Heising, J. K., Claassen, G. D. H., & Dekker, M. (2017). Options for reducing food waste by quality-controlled logistics using intelligent packaging along the supply chain. Food Additives & Contaminants: Part A, 34(10), 1672–1680. https://doi.org/10.1080/19440049.2017.1315776

Huang, W.-S., Kuo, H.-Y., Tung, S.-Y., & Chen, H.-S. (2020). Assessing consumer preferences for suboptimal food: Application of a choice experiment in citrus fruit retail. Foods, 10(1), 15.

Hwang, S. M., & Kudrowits, B. (2022). When is a Potato Too Ugly?: Understanding the Complexity of Aesthetics in Produce Towards the Reduction of Food Waste. In G. Bruyns & H. Wei (Eds.), [ ] With Design: Reinventing Design Modes (pp. 260–275). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-4472-7_18

Imperfection Moves into the Frosen Aisles at Loblaw Stores. (n.d.). Retrieved 17 July 2024, from https://www.loblaw.ca/en/imperfection-moves-into-the-frosen-aisles-at-loblaw-stores/

Jalali, S., & Wohlin, C. (2012, September). Systematic literature studies: database searches vs. backward snowballing. In Proceedings of the ACM-IEEE international symposium on Empirical software engineering and measurement (pp. 29-38).

Joardder, M. U. H., & Masud, M. H. (2019). Causes of Food Waste. In M. U. H. Joardder & M. Hasan Masud, Food Preservation in Developing Countries: Challenges and Solutions (pp. 27–55). Springer International Publishing.

Kennard, N. J. (2020). Food waste management. Zero Hunger, 355–370.

Kessler, N. (2017). Chapter 787: Reducing Food Waste with Fresh Food Date Labeling Terminology. U. Pac. L. Rev., 49, 355. https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/mcglr49&section=24

Liu, P. (2009). Private standards in international trade: Issues and opportunities.

LOWINFOOD – Multi-actor design of low-waste food value chains through the demonstration of innovative solutions to reduce food loss and waste. (n.d.). Retrieved 20 June 2024, from https://lowinfood.eu/

MacRae, R., Siu, A., Kohn, M., Matsubuchi-Shaw, M., McCallum, D., Cervantes, T. H., & Perreault, D. (2016). Making better use of what we have: Strategies to minimise food waste and resource inefficiency in Canada. Canadian Food Studies/La Revue Canadienne Des Études Sur l'alimentation, 3(2), 145–215.

Makanjuola, O., Arowosola, T., & Chenyu, D. (2020). The utilisation of food waste: Challenges and opportunities. J. Food Chem. Nanotechnol, 6(4), 182–188. http://foodchemistryjournal.com/jfcn/articles/v6n4/jfcn-0100-oyenike-makanjuola.pdf

Marimuthu, S., Saikumar, A., & Badwaik, L. S. (2024). Food losses and wastage within food supply chain: A critical review of its generation, impact, and conversion techniques. Waste Disposal & Sustainable Energy, 1–https://idp.springer.com/authorise/casa?redirect_uri=https://link.springer.com/article/10.1007/s42768-024-00200-7&casa_token=lPS05bAWlwsAAAAA:_TskH0sfINPCgpAYcD5Sf7ICAg6hQvKf8fKw_D2CKSJOvgfF3gpleLrHcUBYc5tl8j1Wp_C-JDsBJJKJ4Q

Marjani, M.; Nasaruddin, F.; Gani, A.; Karim, A.; Hashem, I.A.T.; Siddiqa, A.; Yaqoob, I. Big iot data analytics: Architecture, opportunities, and open research challenges. IEEE Access 2017, 5, 5247–5261.

Michelini, L., Principato, L., & Iasevoli, G. (2018). Understanding food sharing models to tackle sustainability challenges. Ecological Economics, 145, 205–217. https://www.sciencedirect.com/science/article/pii/S0921800916308370?casa_token=PuFD-BRuYfsAAAAA:QEGH6A9sqJDohJooK40-kSX_Fy7xFtO5Qc9Yws03XmSSASrmgsegr3J-noL2owUb77Nj0cJsJPk

Mookerjee, S. (Sid), Cornil, Y., & Hoegg, J. (2021). From Waste to Taste: How "Ugly" Labels Can Increase Purchase of Unattractive Produce. Journal of Marketing, 85(3), 62–77. https://doi.org/10.1177/0022242920988656

Mullick, S., Raassens, N., Haans, H., & Nijssen, E. J. (2021). Reducing food waste through digital platforms: A quantification of cross-side network effects. Industrial Marketing Management, 93, 533–544.

Närvänen, E., Mesiranta, N., Saarijärvi, H., & Nevalainen, J. (2023). Examining consumer food waste through grocery retailers' customer data: Segments and practical implications. International Journal of Consumer Studies, 47(4), 1273–1290.

Nes, K., & Ciaian, P. (2021). Marketing standards for food products: A review of literature. Office of the European Union: Luxembourg. https://www.researchgate.net/profile/Pavel-Ciaian/publication/357718688_Marketing_standards_for_food_products_A_review_of_literature/links/61dcb75d4e4aff4a6432af8e/Marketing-standards-for-food-products-A-review-of-literature.pdf

Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., Labusa, T. P., Prince, G., Thesmar, H. S., & Yiannas, F. (2014). Applications and perceptions of date labeling of food. Comprehensive Reviews in Food Science and Food Safety, 13(4), 745–769.

NoWaste—Food Inventory List. (2021, November 16). App Store. https://apps.apple.com/us/app/nowaste-food-inventory-list/id926211004

Onyeaka, H., Tamasiga, P., Nwausoma, U. M., Miri, T., Juliet, U. C., Nwaiwu, O., & Akinsemolu, A. A. (2023). Using artificial intelligence to tackle food waste and enhance the circular economy: Maximising resource efficiency and Minimising environmental impact: A review. Sustainability, 15(13), 10482.

Oosterkamp, E., van der Sluis, A., van Geffen, L., Aramyan, L., & Bos-Brouwers, H. (2019). Cosmetic aspects in specific marketing standards for fruit and vegetables: Removing cosmetic aspects from the EU marketing standards: Implications for the market and impact on food waste. Wageningen Economic Research.

Parfitt, J., Barthel, M., & Macnaughton, S. (2010). Food waste within food supply chains: Quantification and potential for change to 2050. Philosophical Transactions of the Royal Society B: Biological Sciences, 365(1554), 3065–3081. https://doi.org/10.1098/rstb.2010.0126

Penalver, J. G., & Aldaya, M. M. (2022). The role of the food banks in saving freshwater resources through reducing food waste: The case of the Food Bank of Navarra, Spain. Foods, 11(2), 163.

Perreault, D. (2015). Selling unattractive food to decrease waste and encourage sustainable consumer behaviour in France: Lessons for Québec food retailers.

Pietrangeli, R., Hersberg, R., Cicatiello, C., & Schneider, F. (2023). Quality Standards and Contractual Terms Affecting Food Losses: The Perspective of Producer Organisations in Germany and Italy. Foods, 12(10), 1984. https://www.mdpi.com/2304-8158/12/10/1984

Poyatos-Racionero, E., Ros-Lis, J. V., Vivancos, J.-L., & Martines-Manes, R. (2018). Recent advances on intelligent packaging as tools to reduce food waste. Journal of Cleaner Production, 172, 3398–3409.

Puteri, B., Buttlar, B., & Jahnke, B. (2022). Take it or leave it? Investigating the ambivalence and willingness to pay for suboptimal fruits and vegetables among organic consumers in Germany. Frontiers in Sustainable Food Systems, 6, 934954.

Qi, D., Penn, J., Li, R., & Roe, B. E. (2022). Winning ugly: Profit maximising marketing strategies for ugly foods. Journal of Retailing and Consumer Services, 64, 102834. https://www.sciencedirect.com/science/article/pii/S0969698921004008

Raak, N., Symmank, C., Sahn, S., Aschemann-Witsel, J., & Rohm, H. (2017). Processing-and product-related causes for food waste and implications for the food supply chain. Waste Management, 61, 461–472.

Rep. Pingree, C. [D-M.-1. (2023, January 6). H.R.3159 - 118th Congress (2023-2024): Food Date Labeling Act of 2023 (2023-05-09) [Legislation]. https://www.congress.gov/bill/118th-congress/house-bill/3159

Ribeiro, I., Sobral, P., Peças, P., & Henriques, E. (2018). A sustainable business model to fight food waste. Journal of Cleaner Production, 177, 262–275.

Riesenegger, L., & Hübner, A. (2022). Reducing food waste at retail stores—An explorative study. Sustainability, 14(5), 2494. https://www.mdpi.com/2071-1050/14/5/2494

Roels, K., & Van Gijseghem, D. (2017). The impact of cosmetic quality standards on food losses in the flemish fruit and vegetable sector: Summary report. Department of Agriculture and Fisheries, 13.

Rohm, H., Oostindjer, M., Aschemann-Witsel, J., Symmank, C., L. Almli, V., De Hooge, I. E., Normann, A., & Karantininis, K. (2017). Consumers in a sustainable food supply chain (COSUS): Understanding consumer behavior to encourage food waste reduction. Foods, 6(12), 104.

Sadílek, T. (2021). Suboptimal food retail model in Csechia: Social super discount stores. International Journal of Social Economics, 48(11), 1646–1657.

Samotyja, U. (2022). Consumer understanding of the 'best before' and 'use by' dates. Scientific Journal of Gdynia Maritime University, 122, 82–92.

Schols, M., & Kulko, R.-D. (2022). Dynamic pricing of perishable food as a sustainable business model. British Food Journal, 124(5), 1609–1621.

Simões, J., Carvalho, A., & de Matos, M. G. (2022). How to influence consumer food waste behavior with interventions? A systematic literature review. Journal of Cleaner Production, 133866.

Skaf, L., Fransese, P. P., Capone, R., & Buonocore, E. (2021). Unfolding hidden environmental impacts of food waste: An assessment for fifteen countries of the world. Journal of Cleaner Production, 310, 127523.

Social Plate. (n.d.). Retrieved 21 June 2024, from https://www.socialplate.eu/en/project

Stangherlin, I. do C., Duarte Ribeiro, J. L., & Barcellos, M. (2019). Consumer behaviour towards suboptimal food products: A strategy for food waste reduction. British Food Journal, 121(10), 2396–2412.

Suher, J., Ssocs, C., & van Ittersum, K. (2021). When imperfect is preferred: The differential effect of aesthetic imperfections on choice of processed and unprocessed foods. Journal of the Academy of Marketing Science, 49(5), 903–924.

Symmank, C., Sahn, S., & Rohm, H. (2018). Visually suboptimal bananas: How ripeness affects consumer expectation and perception. Appetite, 120, 472–481.

The City of Milan Food Waste Hubs. (n.d.). The Earthshot Prise. Retrieved 24 April 2024, from https://earthshotprise.org/winners-finalists/city-of-milan/

Toma, L., Costa Font, M., & Thompson, B. (2020). Impact of consumers' understanding of date labelling on food waste behaviour. Operational Research, 20, 543–560.

Too Good To Go Date Labelling | Look-Smell-Taste. (n.d.). Retrieved 18 June 2024, from https://www.toogoodtogo.com/look-smell-taste

Treutwein, R., & Langen, N. (2021). Setting the agenda for food waste prevention–A perspective on local government policymaking. Journal of Cleaner Production, 286, 125337.

Tsalis, G. (2020). What's the deal? Consumer price involvement and the intention to purchase suboptimal foods. A cross-national study. Food Quality and Preference, 79, 103747. https://www.sciencedirect.com/science/article/pii/S0950329319302095?casa_token=KeBqG8iD_sQAAAAA:8Elk0S8H8kqI2ffHkfqii2c-QdfHreA-y6xfMHOrf5rSDa4KhHqemarN9ES5AUy4kFLiWWPAyBY

Turner, B. (2018). Ugly food and food waste redistribution. Taste, Waste and the New Materiality of Food Routledge. Https://Doi. Org/10.4324/9780429424502.

Uyar, H., Karvelas, I., Rizou, S., & Fountas, S. (2024). Data value creation in agriculture: A review. Computers and Electronics in Agriculture, 227, 109602.

Van Giesen, R. I., & de Hooge, I. E. (2019). Too ugly, but I love its shape: Reducing food waste of suboptimal products with authenticity (and sustainability) positioning. Food Quality and Preference, 75, 249–259.

Varese, E., Cesarani, M. C., & Wojnarowska, M. (2022). Consumers' perception of suboptimal food: Strategies to reduce food waste. British Food Journal, 125(1), 361–378.

wdm. (2018, October 30). How incentives could reduce food waste. IFCO Systems. https://www.ifco.com/how-incentives-could-reduce-food-waste/

Wohlin, C. (2014, May). Guidelines for snowballing in systematic literature studies and a replication in software engineering. In Proceedings of the 18th international conference on evaluation and assessment in software engineering (pp. 1-10).

Wonky Veg 5th anniversary. (n.d.). Retrieved 3 July 2024, from https://www.tescoplc.com/wonky-veg-5th-anniversary/

Woolworths Supermarket—Buy Groceries Online. (n.d.). Woolworths. Retrieved 17 July 2024, from https://www.woolworths.com.au/

8. Annex

8.1 Interviews consent form

ROSETTA GA 101136427 Funded by the European Union

INFORMED CONSENT FORM

Text in red colour contains guidelines for adjusting this template and should be deleted.

Text included in < > and/or highlighted with yellow should be replaced with content that is suitable to the context of each activity as well as to the organisation seeking to obtain the consent.

Who we are:

We are < Insert Partner Name > and we are contacting you in the framework of ROSETTA, a project funded by the European Union under the Horizon Europe Framework Programme for Research and Innovation. A detailed description on how ROSETTA handles personal data is presented in the project's Privacy Policy that is available on the web site of the project (https://rosetta-project.eu/).

Project:

ROSETTA - Reducing food waste due to marketing standards through alternative market access (GA Number 101136427).

Partner:

Organisation name: < Insert Partner Name >

Address: < Insert Partner Address >.

Phone: < Insert Partner Phone >.

E-mail: <Insert Partner Generic E-mail Address >

Responsible persons:

Please define roles suitable to the context of each activity and organisation.

You may delete the line referring to the Data Protection Officer if your organisation does not have one.

#	Role	Name	E-mail
1	ROSETTA Project Manager	<Insert name of project manager of your organisation>	<Insert e-mail of project manager of your organisation>
2	Interviewer	<Insert name of interviewer from your organisation>	<Insert e-mail of interviewer from your organisation>
3	Data Protection Officer	<Insert name of DPO >	<Insert e-mail of DPO >

Informed Consent Form Page 1 of 3

ROSETTA GA 101136427

Funded by the European Union

What do we need from you?

We need you to participate in this interview as part of the ROSETTA project in order to gain insights into the practical implementation of interventions and practices aimed at improving the business potential of suboptimal foods. Your input will inform project deliverables and foster sustainable solutions to reduce food waste, creating a more efficient food system.

The interview is expected to last for no more than < Insert number of minutes > minutes. We will take written notes and we will be making a video and/or sound recording of the interview.

To effectively carry out the activities of the interview, we need to process some of your personal data:

- Your contact details (full name, email, phone number);
- Your professional information (organisation, job position, field of expertise);
- Your experience and opinion on the subjects that will be discussed during the interview, which may be captured through video and/or voice recording.

Why do we need your data & what will we do with them?

We require your data to deepen our understanding of the issues addressed in the interviews. This interview is part of a research activity carried out as part of the ROSETTA project. Through qualitative analysis, we will examine and interpret the data to derive insights, which will be documented in the relevant deliverables of the ROSETTA project.

We also need to record your data to keep track of the activities and their results / outcomes. The project's deliverables that will be derived by these activities will not include your personal data or any other information that could identify you. Your personal data will remain on our written notes and records.

Your data may be shared with specific partners involved in the ROSETTA project who are engaged in the interview process to facilitate the creation of pertinent project deliverables. Furthermore, we are also obliged to grant access to your data to:

- EU officials such as our Project Officer for purposes related to project's evaluation;
- EU agencies and other authorities for the project's auditing purposes.

We would also be very happy if you gave us your consent to contact you in the future to ask you to participate in other project's activities (e.g. surveys, interviews, project events etc.) and also to inform you about the project's progress (e.g. by sending you a newsletter or similar messages).

How can you withdraw your consent?

You should know that you can withdraw your consent ***at any time*** by communicating either on the phone or by email with the responsible persons listed in the previous page. With regards to the informational messages and newsletters you can always opt out by simply clicking the link "Unsubscribe" or something similar included at the end of all the relevant messages.

ROSETTA GA 101136427

Funded by the European Union

I confirm that I have read the information above, and I hereby give my consent to the processing of my personal data needed for:

*(Please, tick the boxes below to confirm that you give us your consent for the respective subject. Any boxes left unticked mean that **you do not consent to the relevant subject**.)*

#	Consent Subject	Tick box
1	My participation in an interview that will be carried out as part of the ROSETTA project to gather insights into effective practices and interventions for increasing the business potential of suboptimal foods.	
2	My participation in future activities of ROSETTA	
3	Receiving newsletters and messages regarding ROSETTA activities	

Name of participant _____ Date _____ Signature _____

8.2 Food Value Chain Actors Interview Questionnaire

ROSETTA GA 101136427

Interview Introduction

DATE OF INTERVIEW_____

MODE OF INTERVIEW (FACE-TO-FACE, PHONE, TEAMS,…) _____

Thank you for agreeing to this interview and for your time today. I appreciate the opportunity to meet with you. My name is X and I represent [organisation's name] in the project of ***ROSETTA – Reducing food waste due to marketing standards through alternative market access****. The purpose of this interview is to gain further insights into the practical application of interventions and practices aimed at improving the business potential of suboptimal foods.*

By ***'suboptimal foods'*** *we mean food items that fall short of typical marketing standards of quality, often due to factors such as appearance (e.g., weight, shape, or size), expiration dates (close to expiry date), best before dates (close to or beyond the best before date), or packaging issues (e.g., torn wrapper, dented can). Despite these deviations, suboptimal foods remain safe and edible. However, their perceived imperfections may pose challenges in marketing and selling to consumers, making them a significant source of food waste.*

By ***'marketing standards'*** *we refer to a set of rules established to ensure that food products in the market consistently meet consumer expectations. These standards cover aspects such as the appearance and condition of the products, their classification, content, as well as packaging and labelling requirements.*

Before we start, we need to clarify a few practicalities.

As stated in the invitation, we will keep the answers anonymous and use it for research purposes. Since you are already a member of the local Multi-actor Innovation Platform (MIP) you have already signed a consent form for all corresponding activities, in which case we consider your consent applicable for this activity as well.

Is it OK with you that we record the interview? This will not be distributed but is a great help in writing the minutes and providing a correct replication of your statements.

Are there any questions or do you need any clarifications before starting the interview?

Now, we are ready to begin.

Part 1 | Opening (Warm-Up Question) | Duration: 2'

1. How aware are you of the concept of suboptimal foods, which may not meet marketing standards but are still safe to eat?

Now we will proceed with the main part of the interview which will last approximately 30'.

ROSETTA GA 101136427

[To the interviewer: here we need to understand the company/organisation's background, its core activities, and interviewee's specific role or responsibilities within the company.]

2. Has your company/organisation identified any instances of food waste caused by marketing standards? If so, can you provide examples?

_____

[To the interviewer: here we need to understand if the interviewee is aware of food waste caused by marketing standards in their company/organisation. And gather specific examples, such as if they throw away products due to damaged packaging, if they remove foods from shelves before their actual expiration date, if they throw away products that got damaged during transportation or storage, or if they discard slightly bruised fruits, varying-sized vegetables etc.]

3. What are the main reasons for the waste of suboptimal foods due to marketing standards in your company/organisation?

_____

[To the interviewer: this question supplements the previous one and aims to ensure that the interviewee provides specific reasons behind the waste of suboptimal foods in their company/organisation. For example, criteria set by retailers regarding food size and appearance, processors maintaining uniform appearance standards, preservation of brand image to prevent consumer perception of inferior quality, and implementation of freshness policies.]

Now we will proceed with the main part of the interview which will last approximately 45'.

Part 2 | Main part (Core Questions) | Approx. Duration: 45'

1. What current practices and interventions does your company/organisation implement to enhance the business potential of suboptimal foods and reduce food waste? Additionally, are there any practices currently under planning that have not yet been implemented, or have there been practices that were previously implemented but not continued and why?

_____

ROSETTA GA 101136427

[To the interviewer: here we need the interviewee to share the practices or initiatives they have in place, the initiatives they are planning to implement, or initiatives they implemented in the past but did not continue. This could include offering discounts on suboptimal foods to make them more attractive to price-sensitive consumers, using better farming methods to minimise damage that can result in suboptimal food produce, turning imperfect ingredients into new products, meals or dishes, implementing systems to track inventory, expiration dates, and what customers like, social actions such as sharing food with those in need, speaking up to governments to make better rules about food waste, educational campaigns etc.]

2. Could you elaborate on the economic viability and profitability of these practices and interventions aimed at improving the business potential of suboptimal foods?

[To the interviewer: here we need to learn about any possible cost-saving measures, revenue-generating opportunities, or other economic benefits associated with their efforts to reduce food waste and optimise the utilisation of suboptimal foods.]

3. What pricing strategies does your company typically employ for suboptimal foods, and how do these strategies contribute to their economic viability and profitability?

[To the interviewer: here we need details about the pricing approaches employed and elaborate on how these strategies contribute to the overall success of their business.]

4. What challenges do you identify when implementing practices and interventions aimed at enhancing the business potential of suboptimal foods?

[Note to interviewer: For example, they might mention challenges like when customers are hesitant to buy imperfect or surplus foods, when the company's culture doesn't prioritise utilising

ROSETTA GA 101136427

suboptimal ingredients, when market changes affect the demand for suboptimal products, and when the cost of reducing suboptimal food waste is too high.]

5. What barriers do you encounter when implementing practices and interventions aimed at enhancing the business potential of suboptimal foods?

_____

[Note to interviewer: For example, they might mention barriers such as regulations that make it difficult to donate or redistribute suboptimal foods and technology limitations in processing or preserving suboptimal foods.]

6. What drivers and enablers contribute to the effective implementation of these practices?

_____

[Note to interviewer: Here we need specific examples such as when customers ask for less wasteful options, it encourages the business to keep implementing food waste management practices. Additionally, when managers motivate everyone in the company to care about reducing food waste. Another example is employee training to waste less food and use suboptimal ingredients.]

7. What do you think are the perceptions of consumers/customers of suboptimal foods and what are their buying behaviours?

_____

[Note to interviewer: here we need to understand their perspective on business and consumer behaviour patterns regarding imperfect foods. For example, which products may be more appealing. If they have negative perceptions of ugly appearance of foods. Do they buy suboptimal foods on discounts? 'Does whether fruit and vegetables are sold loose or pre-packaged impact their appeal?',Also, 'do businesses prefer to buy a bunch of suboptimal foods all at once, or do they opt for smaller quantities?' For instance, 'do restaurants prefer buying lots of slightly bruised apples for pies, or do they prefer smaller, more frequent purchases?'.]

ROSETTA GA 101136427

buildings or equipment with others and working together to make new products. For example, maybe they share a warehouse with another company or team up with farmers to create new kinds of snacks using their suboptimal produce.]

Part 3 | Closing (Wrap-up Question) | Approx. Duration: 5'

1. What final thoughts, opportunities and suggestions would you like to share regarding the effective management of suboptimal foods and the reduction of food waste within the context of marketing standards?

_____

[Note to interviewer: here we need to ensure that the interviewee has the opportunity to summarise final thoughts from your discussion regarding the practical application of interventions and practices aimed at improving the business potential of suboptimal foods. Encourage them to provide us with any opportunities they see and to share any suggestions they believe are important for addressing food waste due to marketing standards.]

If there's anything else you'd like to share or discuss, please feel free to do so now. Thank you very much.

8.3 Consumers Interview Questionnaire

ROSETTA GA 101136427

Interview Introduction

DATE OF INTERVIEW_____

MODE OF INTERVIEW (FACE-TO-FACE, PHONE, TEAMS,…) _____

Thank you for agreeing to this interview and for your time today. I appreciate the opportunity to meet with you. My name is X and I represent [organisation's name] in the project of ***ROSETTA – Reducing food waste due to marketing standards through alternative market access****. The purpose of this interview is to gain further insights into the practical application of interventions and practices aimed at improving the business potential of suboptimal foods.*

By ***'suboptimal foods'*** *we mean food items that fall short of typical marketing standards of quality, often due to factors such as appearance (e.g., weight, shape, or size), expiration dates (close to expiry date), best before dates (close to or beyond the best before date), or packaging issues (e.g., torn wrapper, dented can). Despite these deviations, suboptimal foods remain safe and edible. However, their perceived imperfections may pose challenges in marketing and selling to consumers, making them a significant source of food waste.*

By ***'marketing standards'*** *we refer to a set of rules established to ensure that food products in the market consistently meet consumer expectations. These standards cover aspects such as the appearance and condition of the products, their classification, content, as well as packaging and labelling requirements.*

Before we start, we need to clarify a few practicalities.

As stated in the invitation, we will keep the answers anonymous and use it for research purposes. Since you are already a member of the local Multi-actor Innovation Platform (MIP) you have already signed a consent form for all corresponding activities, in which case we consider your consent applicable for this activity as well.

Is it OK with you that we record the interview? This will not be distributed but is a great help in writing the minutes and providing a correct replication of your statements.

Are there any questions or do you need any clarifications before starting the interview?

Now, we are ready to begin.

Part 1 | Opening (Warm-Up Question) | Duration: 2'

1. How aware are you of the concept of suboptimal foods, which may not meet marketing standards but are still safe to eat?

Now we will proceed with the main part of the interview which will last approximately 30'.

ROSETTA GA 101136427

Part 2 | Main part (Core Questions) | Approx. Duration: 20'

1. Have you ever purchased or consumed suboptimal foods? If so, what factors influenced your decision to do so?

2. What are your main concerns or barriers when considering purchasing suboptimal foods?

3. What information or assurances would make you feel more comfortable purchasing and consuming suboptimal foods?

4. Are there specific types of suboptimal foods that you would be more willing to purchase or consume than others? If so, why?

5. What do you think could be done to raise awareness and encourage more people to purchase and consume suboptimal foods?

Part 3 | Closing (Wrap-up Question) | Approx. Duration: 3'

1. Do you have any additional suggestions on how businesses or organisations can better promote and make suboptimal foods more accessible to consumers like yourself?

If there's anything else you'd like to share or discuss, please feel free to do so now. Thank you very much.

8.4 Advisors/Researchers Interview Questionnaire

ROSETTA GA 101136427

Interview Introduction

DATE OF INTERVIEW_____

MODE OF INTERVIEW (FACE-TO-FACE, PHONE, TEAMS,…) _____

Thank you for agreeing to this interview and for your time today. I appreciate the opportunity to meet with you. My name is X and I represent [organisation's name] in the project of ***ROSETTA – Reducing food waste due to marketing standards through alternative market access****. The purpose of this interview is to gain further insights into the practical application of interventions and practices aimed at improving the business potential of suboptimal foods.*

By ***'suboptimal foods'*** *we mean food items that fall short of typical marketing standards of quality, often due to factors such as appearance (e.g., weight, shape, or size), expiration dates (close to expiry date), best before dates (close to or beyond the best before date), or packaging issues (e.g., torn wrapper, dented can). Despite these deviations, suboptimal foods remain safe and edible. However, their perceived imperfections may pose challenges in marketing and selling to consumers, making them a significant source of food waste.*

By ***'marketing standards'*** *we refer to a set of rules established to ensure that food products in the market consistently meet consumer expectations. These standards cover aspects such as the appearance and condition of the products, their classification, content, as well as packaging and labelling requirements.*

Before we start, we need to clarify a few practicalities.

As stated in the invitation, we will keep the answers anonymous and use it for research purposes. Since you are already a member of the local Multi-actor Innovation Platform (MIP) you have already signed a consent form for all corresponding activities, in which case we consider your consent applicable for this activity as well.

Is it OK with you that we record the interview? This will not be distributed but is a great help in writing the minutes and providing a correct replication of your statements.

Are there any questions or do you need any clarifications before starting the interview?

Now, we are ready to begin.

Part 1 | Opening (Warm-Up Question) | Duration: 5'

1. Can you provide an overview of your organisation's profile, the expertise it brings to the study of marketing solutions for suboptimal foods, and your role within it? If you don't belong to any organisation, can you provide an overview of your relevant expertise?

   _____

ROSETTA GA 101136427

[To the interviewer: here we need to understand if the interviewee identifies any possible cost-saving and revenue-generating opportunities, or other economic benefits associated with the implementation of practices to reduce food waste and optimise the utilisation of suboptimal foods.]

3. From your perspective, what pricing strategies are effective in enhancing the business potential of suboptimal foods, and how do these strategies contribute to their economic viability and profitability?

[To the interviewer: This question aims to understand the interviewee's perspective on pricing strategies that work well for selling suboptimal foods. We also want to know how these pricing strategies help make suboptimal foods economically viable and profitable.]

4. Based on your experience and observations, what challenges do companies and organisations face when trying to reduce food waste of suboptimal foods?

[Note to interviewer: For example, they might mention challenges like when customers are hesitant to buy imperfect or surplus foods, when the company's culture doesn't prioritise utilising suboptimal ingredients, when market changes affect the demand for suboptimal products, and when the cost of reducing suboptimal food waste is too high.]

5. Based on your experience and observations, what barriers do companies and organisations face when trying to reduce food waste of suboptimal foods?

[Note to interviewer: For example, they might mention barriers such as regulations that make it difficult to donate or redistribute suboptimal foods and technology limitations in processing or preserving suboptimal foods.]

ROSETTA GA 101136427

6. In your experience, what drivers and enablers have you observed that contribute to the effective implementation of practices aimed at reducing food waste of suboptimal foods?

_____

[Note to interviewer: Here we need specific examples such as when customers ask for less wasteful options, it encourages the business to keep implementing food waste management practices. Additionally, when managers motivate everyone in the company to care about reducing food waste. Another example is employee training to waste less food and use suboptimal ingredients.]

7. What do you think are the perceptions of consumers/customers of suboptimal foods and what are their buying behaviours?

_____

[Note to interviewer: here we need to understand their perspective on business and consumer behaviour patterns regarding imperfect foods. For example, which products may be more appealing. If they have negative perceptions of ugly appearance of foods. Do they buy suboptimal foods on discounts? 'Does whether fruit and vegetables are sold loose or pre-packaged impact their appeal?',Also, 'do businesses prefer to buy a bunch of suboptimal foods all at once, or do they opt for smaller quantities?' For instance, 'do restaurants prefer buying lots of slightly bruised apples for pies, or do they prefer smaller, more frequent purchases?'.]

8. From your perspective, what practices could encourage consumers and businesses to purchase suboptimal foods?

_____

[Note to interviewer: When it comes to consumers, this could mean things like discounting food, or using social media, or signs in the store to convince people to give these foods a try. When it comes to businesses, strategies might include offering bulk discounts or wholesale pricing, tailoring product offerings, packaging sizes, or delivery schedules to align with the operational requirements of the business.]

ROSETTA GA 101136427

9. How do companies typically promote the specific practices or interventions they implement, such as through marketing campaigns, from your experience?

_____

[Note to interviewer: here we need to learn about the marketing strategies employed by companies/organisations to promote their practices or interventions based on interviewee's experience. Example: marketing campaigns, promotional leaflets, billboard advertising, TV commercials, internet promotions.]

10. From your experience what are the distribution channels used for suboptimal foods?

_____

[Note to interviewer: here we need to understand the distribution channels commonly used for suboptimal foods. This includes understanding the various channels, such as direct sales to consumers, partnerships with retailers, participation in farmers markets, collaboration with food banks etc.]

11. How important do you consider collaboration with different members of the value chain to be in reducing food waste due to marketing standards?

_____

[Note to interviewer: here we need to know how they see the importance of collaboration between various members of the value chain.]

ROSETTA GA 101136427

Part 3 | Closing (Wrap-up Question) | Approx. Duration: 5'

1. In your opinion and based on your expertise, what final thoughts, opportunities and suggestions would you like to share regarding the effective management of suboptimal foods and the reduction of food waste within the context of marketing standards?

[Note to interviewer: here we need to ensure that the interviewee has the opportunity to summarise final thoughts from your discussion regarding the application of interventions and practices aimed at improving the business potential of suboptimal foods. Encourage them to provide us with any opportunities and trends they see in this area, like new ways to sell or use suboptimal foods.]

If there's anything else you'd like to share or discuss, please feel free to do so now. Thank you very much.

8.5 Focus Group consent form

ROSETTA GA 101136427 Funded by the European Union

INFORMED CONSENT FORM

Who we are:

We are Agricultural University of Athens and we are contacting you in the framework of ROSETTA, a project funded by the European Union under the Horizon Europe Framework Programme for Research and Innovation. A detailed description on how ROSETTA handles personal data is presented in the project's Privacy Policy that is available on the web site of the project (https://rosetta-project.eu/).

Project:

ROSETTA - Reducing food waste due to marketing standards through alternative market access (GA Number 101136427).

Partner:

Organisation name: GEOPONIKO PANEPISTIMION ATHINON (AUA)

Address: IERA ODOS 75, ATHINA 11855, Greece

Phone: +30 210 529 4900

E-mail: k.kakavou@aua.gr

Responsible persons:

#	Role	Name	E-mail
1	ROSETTA Project Manager	Konstantina Kakkavou	k.kakavou@aua.gr
2	Focus Group Facilitator (1st)	Konstantina Kakkavou	k.kakavou@aua.gr
3	Focus Group Facilitator (2nd)	Marilena Gemtou	mgemtou@aua.gr
3	Data Protection Officer	Vangelis Mallios	vagelismallios@yahoo.gr

Informed Consent Form

Page 1 of 3

ROSETTA GA 101136427

Funded by the European Union

What do we need from you?

We need you to participate in this focus group as part of the ROSETTA project in order to gain insights into the practical implementation of interventions and practices aimed at improving the business potential of suboptimal foods. Your input will inform project deliverables and foster sustainable solutions to reduce food waste, creating a more efficient food system.

The focus group discussion is expected to last for no more than 60 minutes. We will take written notes and we will be making a video and/or sound recording of the focus group.

To effectively carry out the activities of the focus group, we need to process some of your personal data:

- Your contact details (full name, email, phone number);
- Your professional information (organisation, job position, field of expertise);
- Your experience and opinion on the subjects that will be discussed during the focus group, which may be captured through video and/or voice recording.

Why do we need your data & what will we do with them?

We require your data to deepen our understanding of the issues addressed in the focus group. This focus group is part of a research activity carried out as part of the ROSETTA project. Through qualitative analysis, we will examine and interpret the data to derive insights, which will be documented in the relevant deliverables of the ROSETTA project.

We also need to record your data to keep track of the activities and their results / outcomes. The project's deliverables that will be derived by these activities will not include your personal data or any other information that could identify you. Your personal data will remain on our written notes and records.

Your data may be shared with specific partners involved in the ROSETTA project who are engaged in the focus group discussion process to facilitate the creation of pertinent project deliverables. Furthermore, we are also obliged to grant access to your data to:

- EU officials such as our Project Officer for purposes related to project's evaluation;
- EU agencies and other authorities for the project's auditing purposes.

We would also be very happy if you gave us your consent to contact you in the future to ask you to participate in other project's activities (e.g. surveys, interviews, project events etc.) and also to inform you about the project's progress (e.g. by sending you a newsletter or similar messages).

How can you withdraw your consent?

You should know that you can withdraw your consent ***at any time*** by communicating either on the phone or by email with the responsible persons listed in the previous page. With regards to the informational messages and newsletters you can always opt out by simply clicking the link "Unsubscribe" or something similar included at the end of all the relevant messages.

ROSETTA GA 101136427

Funded by the European Union

I confirm that I have read the information above, and I hereby give my consent to the processing of my personal data needed for:

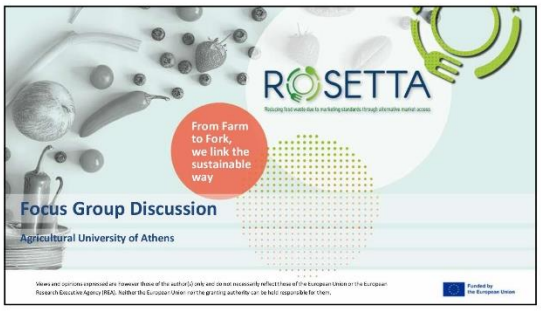
*(Please, tick the boxes below to confirm that you give us your consent for the respective subject. Any boxes left unticked mean that **you do not consent to the relevant subject**.)*

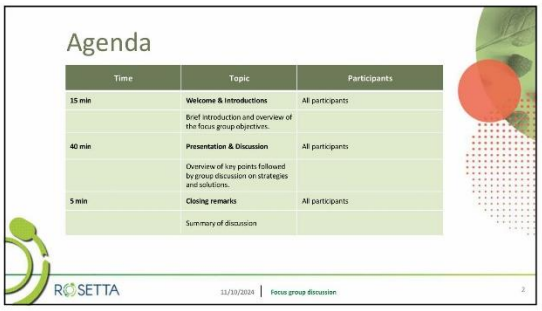
#	Consent Subject	Tick box
1	**My participation in the focus group discussion that will be carried out as part of the ROSETTA project to gather insights into effective practices and interventions for increasing the business potential of suboptimal foods.**	
2	**My participation in future activities of ROSETTA**	
3	**Receiving newsletters and messages regarding ROSETTA activities**	

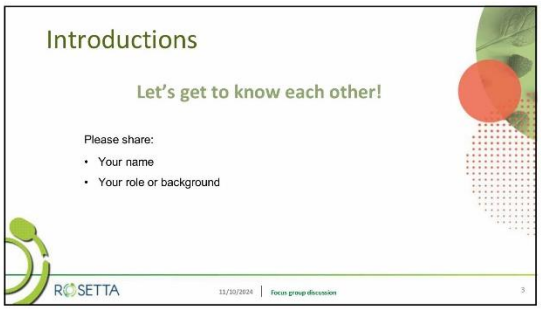
_____ _____ _____

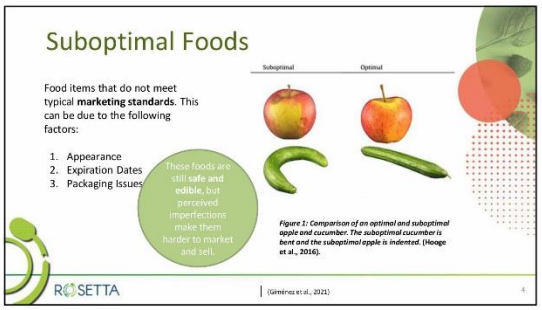
Name of participant Date Signature

8.6 Focus group presentation









Online marketplaces and e-commerce

- ✓ E-commerce platforms sell "ugly" or surplus produce **directly to consumers**, offering them a convenient way to buy at a discount.
- ✓ These services are typically subscription-based, delivering weekly boxes of suboptimal or surplus produce.

Figure 4: Too Good To Go platform (Denmark)

Figure 5: OLIO app

Catering services, cafes and restaurants

- ✓ Suboptimal foods used in soups, sauces, and smoothies where imperfections are unnoticeable
- ✓ Bulk purchasing for large events or catering

Example: ***Culinary Misfits*** *is a catering service based in Berlin, Germany, their project focuses on incorporating suboptimal food into their dishes.*

Marketing Opportunities for Suboptimal Foods

Question 1: What do you think are the most promising markets for selling suboptimal foods (such as farmers' markets, supermarkets, online platforms, others)? What challenges or barriers do you see in accessing or expanding into these markets?

2nd Topic: Marketing Strategies for Suboptimal Foods

ROSETTA

Marketing strategies

Pricing strategies	Packaging & Labelling	In-store placement & visibility
		

Product design	Communication campaigns
	

Marketing Strategies for Suboptimal Foods

Question 2: Which marketing strategies do you think are most effective for promoting suboptimal foods—discount pricing, attractive packaging, product design, in-store placement, or communication campaigns? What has worked in your experience?

3rd Topic: Packaging, Inventory Management, and Logistics Innovations

ROSETTA

Inventory control FEFO Strategy

Packaging technologies

- Packaging: Using durable materials and proper box stacking reduces damage during transport.
- Microbial control: Techniques like heat treatment, modified atmosphere packaging (removing oxygen), and freezing extend the shelf life of suboptimal foods.

Advanced Logistics Technologies: RFID, GPS, and AI

Advanced Logistics Technologies:

- Radio-Frequency Identification (RFID) and Global Positioning System (GPS) tracking enable **real-time monitoring** of suboptimal foods during transport and storage.
- **Real-time communication**: These technologies provide up-to-date information on product conditions, expiration dates, and locations, allowing suppliers and retailers to manage stock more effectively.
- By identifying near-expiry products, suppliers can facilitate **timely sales** or redistribution, reducing food waste.
- **Artificial Intelligence** (AI) in Food Logistics: AI-driven systems optimize the collection, transportation, and storage of suboptimal foods, ensuring they reach consumers while still fresh.

Advanced Logistics Technologies: RFID, GPS, and AI

Example: The **APPETITE Project** uses advanced AI-based forecasting techniques to better match supply with demand, reducing food waste in perishable food supply chains.

Packaging, Inventory Management, and Logistics Innovations

Question 3: What are the biggest challenges in implementing new technologies (e.g., AI forecasting, durable packaging) for suboptimal foods, and what practical solutions or innovations could help overcome these?

4th Topic: Food Recovery and Redistribution

ROSETTA

Transforming suboptimal produce into new products

Processing suboptimal food

- Imperfect produce is transformed into value-added products like juices, jams, sauces, and snacks.
- This increases the marketability and shelf life of foods that would otherwise be discarded due to marketing standards.



Transforming suboptimal produce into new products


misshapen apples


apple juice


blemished apricots


dried apricots

Transforming suboptimal produce into new products

Examples:

- Fundació Espigoladors (Spain) uses surplus produce to make jams, creams, juices, and sauces.
- Culinary Misfits (Berlin, Germany) uses imperfect produce to create sustainable dishes in their catering service.

Transforming suboptimal produce into new products

Question 4: What are the challenges in scaling this practice?

Social Interventions
a. Social Supermarkets (SSMs)

- Sell food surpluses and suboptimal products at up to 70% lower prices.
- Operate on a not-for-profit basis, making nutritious food affordable while cutting waste.
- Items include products close to expiration or with minor defects.
- Collaboration between retailers, manufacturers, non-profits, and government bodies.

Example:
Wefood *is one of the first social supermarkets in Denmark, appealing to all customer groups, pioneered the concept of selling suboptimal foods at very low costs.*

b. Food donation

- Redistributes edible but unsellable food (e.g., cosmetic defects, near sell-by dates).
- Partnerships with NGOs enable food distribution to food banks, shelters, and communities.
- Effective food donation requires coordination across retailers, manufacturers, and non-profits.

Example: ***Boroume*** *(Greece) is an NGO that rescues surplus food from restaurants, bakeries, supermarkets. Collaborates with the "Alliance for the Reduction of Food Waste" to redistribute food to charitable organizations.*

Social Supermarkets and food donation

Question 5: What are the main challenges in expanding these models?

5th Topic: Policy and Regulatory Support

ROSETTA

Policy and Regulatory Support

Tax Incentives (Italy):

- Businesses donating surplus food get tax reductions to offset transportation and storage costs, encouraging food donations and reducing waste.

Mandatory Food Donation (France):

- The Garot Law requires large supermarkets to donate unsold food to charities, preventing food destruction and supporting vulnerable populations.

Policy and Regulatory Support

Municipal-Level Food Recovery Programs:

- **Milan Food Waste Hubs (Italy)**: A city initiative recovering surplus food from supermarkets and canteens, redistributing 130 tons annually to NGOs for vulnerable citizens.
- **Impact**: Demonstrates how local governments can coordinate food recovery by partnering with businesses and non-profits.

Policy and Regulatory Support

Question 6: Which existing or new government policies (e.g., tax incentives, donation laws) could have the quickest impact in helping businesses recover and sell suboptimal foods?


ROSETTA
Reducing food waste due to marketing standards through alternative market access
freshis
DRAXIS
Food & Bio Cluster
safe
UNIMOS
universität wien
PEDAL
Q-PLAN
WHITE
CBS
Funded by the European Union


ROSETTA
Reducing food waste due to marketing standards through alternative market access
Thank you!
Visit: www.rosetta-project.eu
Contact us: info@rosetta-project.eu
Follow us: ROSETTA Project EU
Funded by the European Union

ROSETTA

Reducing food waste due to marketing standards through alternative market access

GA 101136427

Partners

ΓΕΩΠΟΝΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ
AGRICULTURAL UNIVERSITY OF ATHENS

freshis

DRAXIS

Food & Bio Cluster Denmark

MOCHNIK

Naturmælk
Det økologiske mejeri

PEDAL CONSULTING

safe
Safe Food Advocacy Europe
STRIVING FOR SAFER FOOD FOR EUROPEAN CONSUMERS

CBS COPENHAGEN BUSINESS SCHOOL
HANDELSHØJSKOLEN

EUCOFEL
FruitVegetablesEUROPE
UNIMOS
alliance

Χαλκιαδάκης
ΤΟ ΟΝΟΜΑ ΠΟΥ ΕΜΠΙΣΤΕΥΕΣΤΕ

universität wien

eagasc
Agriculture and Food Development Authority

ΠΟΛΥΤΕΧΝΕΙΟ ΚΡΗΤΗΣ
TECHNICAL UNIVERSITY OF CRETE

Q-PLAN INTERNATIONAL

WHITE

Visit: www.rosetta-project.eu
Contact us: mailto:info@rosetta-project.eu
Follow us: ROSETTA Project EU

Funded by the European Union