

ROSETTA

Reducing food waste due to marketing standards through alternative market access

D2.2 Alternative marketing models for suboptimal foods

TUC

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Abbreviations

Table 1: Abbreviations

AI	Artificial Intelligence
B2B	Business-to-Business
B2C	Business-to-Consumer
BMC	Business Model Canvas
CSR	Corporate Social Responsibility
ERP	Enterprise Resource Planning
ESG	Environmental, Social, and Governance
EU	European Union
FAO	Food and Agriculture Organization
FEFO	First Expired First Out
GPS	Global Positioning System
NGOs	Non Governmental Organisations
RFID	Radio Frequency Identification
SBMC	Sustainable Business Model Canvas
SDG	Sustainable Development Goals
TG2G	Too Good To Go
TLBMC	Triple-Layered Business Model Canvas
WP	Work Package
UNEP	United Nations Environment Programme

Executive Summary

This deliverable presents a strategic, actionable foundation for valorising suboptimal food products, such as those with cosmetic imperfections or near expiration, that are often discarded due to non-compliance with existing marketing standards. As such, this deliverable directly supports ROSETTA's goal of reducing food waste, improving market access for non-standard produce, and promoting a more sustainable, inclusive, and circular food economy.

Alternative marketing models were developed through a robust, multi-method approach that integrated findings from stakeholder interviews and focus groups (Deliverable 2.1), a literature review, and co-creation workshops conducted in five European countries. Each model was developed using the Sustainable Business Model Canvas, enabling a holistic framing across economic, social, and environmental dimensions. The identified market-based strategies that address food waste, promote sustainability, and support social inclusion, resulted in a comprehensive portfolio of eleven alternative marketing models:

1. Value-Added Product Transformation
2. Labelling Techniques
3. Pricing/Discount Models
4. Innovative Packaging & Custom Portion Sizes
5. Recipe Sharing for Reducing Food Waste
6. Date Label Education & Standardisation
7. Food Storage Best Practices
8. Preventive Solution (Education & Community Engagement)
9. Mobile Applications
10. Advanced Logistics & Inventory Technologies
11. Social Interventions

The models cover diverse domains including:

- Prevention (helping consumers adopt more sustainable consumption practices by making informed decisions)
- Redistribution (reallocating suboptimal food, which would otherwise go to waste, to produce high-quality, nutritious processed products)
- Social interventions (provide safe and nutritious food for low-income households)

A cross-model analysis reveals that many of these interventions can be adapted and scaled through private-sector investment, community-led efforts, or policy support. Moreover, several models can be combined to enhance their overall effectiveness. For example, pairing recipe suggestions with price discounting via a mobile application can increase consumer uptake and reduce waste at the retail level.

Each model contributes to the triple bottom line:

- Environmental benefits (e.g., reduced greenhouse gas emissions, land and water conservation, stemming from food waste reduction)
- Social benefits (e.g., enhanced food access, community empowerment, and healthier food for vulnerable populations)
- Economic benefits (e.g., cost savings, new revenue streams, and improved market responsiveness for suboptimal food)



Key challenges were also identified, including consumer behaviour change, coordination among stakeholders, infrastructure limitations, and digital literacy. Recommendations are provided for policymakers, businesses, and communities to address these challenges and support the successful implementation of models that valorise suboptimal food.

1. Introduction

The ROSETTA project aims to reduce food waste resulting from marketing standards by promoting innovative and sustainable strategies for the valorisation of suboptimal foods - products that are safe to eat but often discarded due to cosmetic imperfections, labelling issues, retailer requirements, or other standards. In this context, Work Package 2 (WP2) focuses on identifying, evaluating, and designing market-based solutions that can provide alternative access channels and incentives for these food categories, while also supporting environmental and social objectives.

Deliverable 2.1 focused on the analysis of existing interventions and good practices for marketing suboptimal foods to provide practical insights for food businesses, those responsible for marketing standards, and regulators, contributing to the development of more sustainable marketing practices in the food value chain. The scope was to provide a comprehensive overview of current practices and interventions that address the exclusion of suboptimal foods from mainstream markets. To achieve this, the deliverable combined a literature review, stakeholder interviews, and a focus group discussion to identify promising strategies across different stages in the supply chain. These strategies were categorized into three main domains: prevention, redistribution, and social interventions.

Building on these insights, this deliverable presents eleven innovative, evidence-based alternative marketing models that offer business potential for the valorisation of suboptimal food products, that are often discarded due to non-compliance with existing marketing standards. Operationalising the findings of D2.1, eleven alternative marketing models are designed using an adapted version of the Business Model Canvas framework, which incorporates social and environmental dimensions that are in line with ROSETTA's mission. The goal is to transform empirical and theoretical insights into actionable and replicable marketing models that can encourage consumers, organisations, businesses and policymakers to reduce food waste, while supporting effective and sustainable business solutions. The marketing models presented in this report span across a wide range of approaches, including digital innovations (e.g., mobile applications), retail-based interventions (e.g., pricing strategies and date labelling), logistics and inventory management tools, value-added transformation models, and community-driven redistribution systems.

The rest of the report is structured around three main sections. The Model development section outlines the academic and practical frameworks used to build the marketing models. The core section, Alternative Marketing models, presents eleven distinct models aimed at valorising suboptimal foods, grouped into three categories: prevention, redistribution, and social interventions. Each model includes detailed components such as value proposition, customer segments, key partners, and revenue streams. Finally, the Conclusions section synthesizes key findings, identifies cross-model insights and challenges, and offers strategic recommendations for businesses and policymakers seeking to implement or support these alternative models.

2. Process for model development

The methodology used to develop the eleven alternative marketing models in Deliverable 2.2 followed a structured, evidence-based, and participatory approach, in line with the objectives of Task 2.2 of the ROSETTA project. The aim was to formulate a viable and sustainable marketing blueprint that supports the incorporation of suboptimal foods into mainstream food systems. This process relied on both empirical insights gathered in Deliverable 2.1 and established theoretical frameworks from academic literature.

2.1 Frameworks on marketing models formulation and development

The development of effective marketing models is a critical task that aims to incorporate academic research into business strategy. Numerous methods have been proposed in the literature and have been utilized across disciplines to build marketing models that guide value creation, customer engagement, and sustainability. The review of the relevant literature identified the following methods for developing marketing models.

2.1.1 Deductive (theory-driven) methods

This approach employs theory-driven methods like the Marketing Mix (4Ps of Marketing: Product, Price, Place, and Promotion) (Borden, 2001), Porter's Five Forces that shape competition in an industry (Porter, 2008), or the Service-Dominant Logic (Vargo & Lusch, 2004), to structure value propositions and strategy assumptions. It then uses logical reasoning to develop a model that is applicable to a specific situation. Such an approach is common in conceptual papers, as it aims to propose theoretical advancements. For example, a researcher might use marketing mix to hypothesize how digitalization reshapes the traditional components of product, price, place, and promotion, and then collect and analyse data to support the hypothesis. Such models often serve as frameworks for hypothesis testing in empirical studies.

2.1.2 Inductive (data-driven) methods

This approach builds models from empirical data, allowing patterns and relationships to emerge from observations and developing theory from those patterns. Commonly used in qualitative research, this approach relies on grounded theory and thematic analysis to identify patterns and generate insights from textual data. Researchers conduct interviews, ethnographies, or content analyses to identify categories that form the basis for a new model. This is particularly useful in under-researched or dynamic contexts where little prior theory exists, such as emerging consumer behaviours within the concept of sustainable consumption.

2.1.3 Case study-based modeling

This approach involves analysing one or more real-world business cases to understand the success factors and underlying mechanisms behind specific marketing strategies. Models are derived through within-case analysis (deep diving into one case) and cross-case comparisons to identify potential patterns. The method is particularly valuable in applied fields, such as social marketing or marketing innovation, where practical implementation and contextual variations can drive a value proposition. Such an approach is widely used in business schools for theory-building based on actual business practices.

2.1.4 Business Model Canvas and Design Thinking approaches

The Business Model Canvas is a strategic analysis tool for visually structuring business models across nine interconnected components. Design thinking complements the model development process by focusing on iterative development based on user needs, in the context of creativity and innovation. Together, they support

the rapid prototyping of models, grounded in real-life problems and validated through stakeholder feedback. These methods are effective in innovative environments and are widely adopted in entrepreneurship and social enterprise development.

2.1.5 Participatory and co-creation methods

This approach engages stakeholders, such as consumers, producers, and policy actors, in the development of marketing models. Through workshops, experiential labs, and collaborative mapping exercises, this approach ensures the development of models that reflect local needs and realities. Co-design techniques such as empathy maps, persona development, and journey mapping, facilitate deep understanding of user needs and behaviours. These techniques are valuable in public sector marketing, and social innovation practices, where consensus and inclusivity are critical.

2.1.6 Simulation and System Dynamics modelling

This approach involves creating computational representations of marketing systems to predict behaviour under various complex system scenarios. System dynamics modelling allows researchers to explore feedback loops, time delays, and non-linear interactions among marketing actors and variables (e.g., price sensitivity, demand shifts). This method is particularly useful for testing strategic assumptions and forecasting long-term impacts.

2.2 The proposed approach

Following the above literature and the scope of Task 2.2, the Business Model Canvas (BMC) approach was selected as the principal modelling tool for formulation of the alternative marketing models, for several reasons. Firstly, the BMC offers a structured yet adaptable framework that effectively translates qualitative data into actionable business model components. This structured approach is particularly suitable for ROSETTA's ambition to transform insights from qualitative research into tangible strategic frameworks that promote the value of suboptimal foods. It facilitates describing marketing models by integrating evidence from Deliverable 2.1 (including good practices, consumer insights, retail constraints, and focus group findings) into its nine interconnected elements. Secondly, the BMC's design inherently encourages collaborative validation with stakeholders, fostering consensus, transparency, and practical relevance. This is crucial for developing models grounded in empirical insights. Finally, the BMC's versatility, visual clarity, and strong track record in innovation and sustainability contexts make it an ideal bridge between theory and practice, proving valuable insights for businesses, policymakers, and civil society actors. The original BMC consists of the following nine interconnected elements:

1. Value Proposition
Describes the core offering of the model and the value it creates for target customers.
2. Customer Segments
Identifies the specific groups the model aims to serve, differentiated by needs, preferences, and behavioural characteristics.
3. Channels
Outlines how the value proposition is delivered and communicated to customers.
4. Customer Relationships
Describes the types of relationships businesses establish with specific customer segments.

5. Revenue Streams
Details how the model captures value economically.
6. Key Activities
Identifies the essential tasks required for the value proposition to be implemented.
7. Key Resources
Lists the critical assets, both tangible and intangible, needed for the model to operate.
8. Key Partners
Defines the external organisations or actors that provide resources or perform key functions that make the business model work.
9. Cost Structure
Summarizes the main cost categories involved in delivering the model, including fixed, variable, and capital costs.

2.2.1 Literature on BMC approaches

Introduced by Osterwalder and Pigneur (2010), BMC has become one of the most widely adopted tools for visualizing and designing business models due to its simplicity, structured layout, and accessibility for diverse users. Several variations of the Business Model Canvas exist in the literature, the most important being:

1. Social Business Model Canvas (<https://www.socialbusinessmodelcanvas.com/>), which is a tool that includes additional elements that support the model's social impact such as: *Beneficiaries* (as part of customer segments), *User Value Proposition* and *Impact Measures* (as part of value proposition), *Surplus* (addresses how surplus resources are reinvested for social good), *Key Stakeholders* (alongside with Partners). It is tailored for social enterprises, non-for-profit organisations, and businesses that pursue social impact alongside profitability.
2. Sustainable Business Model Canvas (<https://www.case-ka.eu/index.html%3Fp=2174.html>), which is a tool that includes two additional elements, the *Eco-Social Costs* and the *Eco-Social Benefits*. This enhancement allows for the comprehensive evaluation of a business model's environmental and social impact, thereby embedding sustainability as a core criterion in its assessment.
3. Circular Business Model Canvas (<https://circulab.academy/circular-economy-tools/circular-canvas-business-models>), which is a tool where *Key Resources* are further split into *Natural Resources*, *Technical Resources*, and *Energy Resources*. It also includes the element of *Mission* and replaces *Customer Segments* and *Customer Relationships* with the elements of *Users & Contexts* and *Next Use* respectively. The tool focuses on product lifecycle, waste minimization, and renewable resources as the principles of circular economy.
4. Mission Model Canvas (<https://steveblank.com/2016/02/23/the-mission-model-canvas-an-adapted-business-model-canvas-for-mission-driven-organizations>), which is a model adapted to mission-driven organisations where the element of *Customer Segments* is replaced with *Beneficiaries*, the element of *Cost Structure* is replaced with *Mission Cost/Budget*, the element of *Channels* is replaced with *Deployment*, and the element of *Customer Relationships* is replaced with *Buy-in/Support*. This tool is particularly useful to non-profit or government agencies, that focus their strategies on delivering their mission rather than purely on profit making.

The SBMC tool expands beyond purely economic considerations to explicitly incorporate environmental and social dimensions, which are drivers of ROSETTA’s project mission. As presented in Table 2, the traditional BMC focuses mainly on how businesses create, deliver, and capture economic value. The SBMC, however, is based on the Triple Bottom Line framework which embraces the value of People, Planet, and Profit (Joyce & Paquin, 2016) to support business models that focus on operating sustainably and creating both social and environmental value. This is particularly important for the ROSETTA project, which addresses not only inefficiencies in food marketing models but also aims to tackle food loss and waste practices, enhance operational sustainability, and promote social equity. The SBMC enables the incorporation of ecological impacts, such as reduced emissions and diverted landfill waste, as well as social benefits, such as increased access to food for vulnerable populations. These capabilities are essential when developing models for food redistribution, awareness, and community engagement, ultimately delivering critical non-monetary value. Moreover, the SBMC supports lifecycle thinking and circular economy principles by explicitly considering inputs, outputs, energy sources, and system-wide impacts at all stages of a product life cycle, and supports ROSETTA’s project focus on upcycling, and food waste prevention. The framework’s visual clarity and stakeholder-oriented design also facilitates multi-actor collaboration, and effective communication and evaluation across sectors. This approach enhances the replicability, accountability, and legitimacy of the marketing model by making sustainability impacts visible, measurable, and communicable to diverse audiences.

Table 2: A comparison between Business Model Canvas and Sustainable Business Model Canvas

Component	Traditional BMC	Sustainable BMC
<i>Framework Basis</i>	Value creation, delivery	Triple Bottom Line: Economic, Environmental, Social
<i>Focus</i>	Profit-oriented	People, Planet, Profit
<i>Social Impact</i>	Optional or implicit	Explicitly addressed in a dedicated layer
<i>Environmental Impact</i>	Not explicitly considered	Core to design and value creation
<i>Stakeholder Scope</i>	Business-centric (customers, partners)	Multi-actor (communities, ecosystems, policy)
<i>Evaluation Metrics</i>	Financial viability	Sustainability and lifecycle impact

2.3 Alternative marketing models development methodology

The proposed marketing models were developed through a rigorous, multi-source methodology that integrated the empirical findings of ROSETTA Deliverable 2.1 with current academic research and strategic design tools (SBMC). Insights from the D2.1 literature review, as well as stakeholder interviews, and focus groups provided a rich evidence base for each model component. This integrated approach ensured that every element of the SBMC was theoretically grounded, practically oriented, and aligned with ROSETTA’s goals of reducing food waste by valorising suboptimal products. For example, consumer insights from D2.1, such as the importance placed on affordability and sustainability, were used to shape value propositions. Additionally,

findings showing that sustainability-focused branding increases consumer acceptance of imperfect produce helped validate those propositions. Similarly, evidence that dynamic pricing algorithms can cut retail food waste by over 20% guided the design of pricing/discount models¹.

2.3.1 Theoretical foundations from literature

Beyond empirical inputs, our marketing models drew extensively on recent academic and EU policy literature on food waste, sustainability, and business innovation. Key theoretical insights include:

Retail waste prevention: This research area focuses on understanding, evaluating, and improving strategies that reduce waste across the retail supply chain, through a combination of operational, technological, behavioural, and policy-driven interventions aimed at minimizing losses. Relevant research highlights store-level strategies (First Expired/First Out, dynamic pricing) as high-impact interventions (Lebersorger & Schneider, 2014; ReFED, 2018), provides insights on tech-enabled logistics optimization (Vorst & Snels, 2014), focuses on algorithmic pricing and its impact on waste and profitability (Scholz & Kulko, 2022), and discusses modern shelf-life extensions and loss reduction strategies (Reyes, 2023). Incorporating recent logistics and AI-based research enhanced the technological relevance and informed our “Pricing/Discount” and “Logistics/Inventory” models, demonstrating that these approaches align with cutting-edge retail practices. For instance, dynamic markdown algorithms have been shown to reduce grocery waste by ~20% while also boosting margins¹.

Supply chain perspectives: This research stream reflects the evolving complexities and challenges within global supply networks and includes sustainability, resilience, transparency, and the integration of advanced technologies. Mourad (2016), and Hebrok & Boks (2017) emphasise that food waste is a systemic issue requiring both upstream (production/processing) and downstream (retail/consumer) solutions. Sharma et al. (2025) showed how digital tools enable traceability and systemic waste reduction. The United Nations Environment Programme (UNEP) Food Waste Index Report (2024) focuses on measuring food waste, and provides country-level data to contextualize interventions. Bernardi et al. (2023) conducted an analysis of how circularity supports resilience in food systems. This expanded the systemic framing of interventions and connected the marketing models to global sustainability targets, such as the Sustainable Development Goal (SDG) 12.3 to halve global per capita food waste at retail and consumer levels, underscoring the need for multi-level approaches. This perspective, rooted in resilient supply/value chain thinking, informed the development of models that focus on value-added processing, and consumer-facing campaigns.

Digital and behavioural innovations: Recent studies highlight how mobile applications, data analytics, and gamification can effectively engage consumers in food waste reduction. Lim et al. (2025) conducted a meta-analysis of gamified digital tools applied to sustainability challenges, while Revenko & Revenko (2022) examined the potential risk of social exclusion stemming from digital interventions in food systems. Drawing on insights from behavioural economics (Thaler & Sunstein, 2008), we applied these insights to the Mobile Application and Recipe Sharing models. The aim was to strengthen the behavioural foundation of the design and highlight both the opportunities and the risks of digital engagement, as well as ensure a balanced approach to embedding nudges and feedback loops to that influence household behaviour. This is consistent with findings that technology-driven nudges are a growing trend in sustainability interventions. For example, tools like inventory trackers or game-like challenges have been shown to be promising in raising awareness and reducing food waste in pilot settings.

¹ <https://today.ucsd.edu/story/dynamic-pricing-could-cut-greenhouse-gas-emissions-from-landfills-far-more-than-organic-waste-bans>

Sustainable business model theory: Our models employ contemporary theories of sustainable business model innovation, which emphasise the integration of environmental, social, and economic value creation. A key framework guiding our approach is the Triple-Layered Business Model Canvas (TLBMC), introduced by Joyce and Paquin (2016), which ensures that the model aligns with broader sustainability goals and stakeholder value creation. In particular, we used the SBMC which expands the traditional business model canvas to explicitly incorporate ecological and social dimensions. Building on this foundation, we also drew from the work of Pieroni et al. (2021), who provide a comprehensive review of business model innovations for sustainability and circular economy, with specific focus on food systems. They highlight the necessity of integrating life-cycle thinking, closed-loop processes, and multi-stakeholder collaboration. These principles are embedded in our model designs. Related literature further reinforces these concepts, such as Bocken et al. (2019) who explore practical tools and case studies for designing sustainable business models across sectors, showing how to balance profitability with good social and environmental outcomes, offering a multi-level framework that guided our development of interventions targeting imperfect food valorisation and food waste reduction.

Consumer behaviour: Understanding consumer behaviour is key to effective marketing for sustainable consumption and food waste reduction. In addition to classic studies on consumer attitudes towards sustainability and food waste (e.g. Grunert, 2011), our approach incorporates recent research, such as Norton et al. (2024), who provide a segmentation framework that identifies drivers that shape consumer behaviour related to food waste. Underscoring the importance of tailoring marketing messages and interventions to specific consumer profiles, we designed our models to address the priorities of both eco-conscious and value-driven segments. Empirical studies, like Talia et al, (2019), identified consumer groups with distinct behaviours that lead to food waste, informing our targeted messaging, product placement, and incentive structures. Additionally, Stancu et al. (2016) showed how household planning, shopping, and knowledge influence food waste, reinforcing the need for educational and behavioural components in digital and in-store strategies of our models.

2.3.2 Derivation of SBMC elements

The SBMC elements were derived through an integrated process, combining insights from Deliverable 2.1, which summarizes the outcomes of stakeholder interviews, and focus groups, as well as a comprehensive review of recent academic and EU policy literature. This multi-faceted approach ensured theoretical rigor, contextual relevance, and alignment with sustainability principles for each marketing model developed.

Deliverable 2.1 provided the empirical basis, summarizing critical obstacles and enablers in the marketing of suboptimal foods, such as consumer perceptions of "ugly" produce, retail practices around near-expiry products, and supply chain inefficiencies, which shaped our development priorities. Stakeholder interviews with retailers, producers, and NGOs clarified practical constraints and opportunities (e.g., shelf-life management, logistics, regulatory issues) and generated concrete ideas such as employing flexible discount strategies and assigning new partnership roles. Furthermore, focus groups uncovered diverse consumer attitudes and motivations regarding suboptimal food choices, revealing segments such as price-sensitive, and environmentally conscious consumers. These qualitative insights directly guided the definition of customer segments and informed targeted marketing strategies. For instance, presenting imperfect foods with messages emphasizing sustainability or authenticity was found to significantly increase purchase likelihood, a key insight embedded in our marketing models. Finally, the literature review served a complementary and reinforcing role, offering a theoretical validation of the empirical findings by comparing them against established academic frameworks and prior research on consumer behaviour, food waste, and sustainable business models.

The rationale behind each element is described in the following:

Value Proposition: The models' value proposition integrates key themes reflecting both stakeholder needs and consumer preferences for affordability, sustainability, authenticity, and innovation (D2.1). We've synthesized these from direct consumer insights (such as demand for discounted pricing, environmental benefit, and culinary creativity) and academic literature. For instance, consumer research shows that transparent, sustainability-focused branding improves acceptance of suboptimal food (Van Giesen & De Hooge, 2019). Our approach also draws from insights on food-sharing platforms, such as the work of Amaral & Orsato (2023) who emphasise the value creation through environmental responsibility and surplus valorisation. Furthermore, recent consumer perception studies (Damberg et al., 2024) highlight the critical importance of transparency and trust in eco-friendly and circular products. These combined insights ensure the proposed models' value propositions are well-aligned with identified consumer preferences and market opportunities.

Customer Segments: Customer Segments are defined through a blend of empirical segmentation from D2.1 and established consumer typologies within sustainable consumption literature (e.g., Aschemann-Witzel et al., 2021; Norton et al., 2024). These studies highlight diverse consumer profiles based on motivations like price-sensitivity, eco-consciousness, and digital savviness, alongside behaviours such as planning and purchasing habits. This approach allows us to map segments like "Price-sensitive" and "Environmentally conscious" consumers directly to specific model use-cases, ensuring our models target relevant user groups (e.g., students, families) with tailored messaging and features. We've also paid special attention to inclusivity and digital access, incorporating insights from Revenko & Revenko (2022) to address the digital divide and its implications for equitable engagement in circular food systems.

Channels: Channel strategies focus on digital engagement and circular economy principles to maximize reach and inclusivity. Initially, we draw from recent literature highlighting the importance of platform-based and omnichannel approaches for sustainable food systems (e.g., Riesenegger & Hübner, 2022; Karmakar et al., 2023; Mattila et al., 2020). Subsequently, we integrate these insights with traditional retail and community-based channels, inspired by best-practice cases like digital marketplaces (e.g., Too Good To Go) and in-store discount shelves. Consumer shopping habits, gathered from focus groups (e.g., mobile application use, participation in community events), also inform our channel selection. For instance, models targeting technology-savvy segments leverage mobile applications and online platforms, while others utilize in-store signage. Ultimately, all channel choices reflect both consumer habits and operational fit.

Customer Relationships: Customer relationship strategies are built on insights from behavioural economics and stakeholder feedback. Drawing on nudge theory (Thaler & Sunstein, 2008), we prioritize interventions that foster trust and guide consumer behaviour. For instance, we integrated transparency and educational storytelling, like sharing the "story" of imperfect foods into our models. Evidence shows that emphasising sustainability or authenticity through such cues can significantly improve consumer perceptions and willingness to buy suboptimal foods (Louis & Lombart, 2018). We also included loyalty programs and gamification to encourage ongoing engagement (Vasconcelos et al. 2023). This approach aligns with emerging research on food waste prevention, as meta-analyses indicate that well-designed nudges and reminders can notably influence consumers to adopt food waste-reducing behaviours (Boulet & Lauren, 2024). Ultimately, each model's customer relationship element is designed to build trust, support behaviour change, and encourage long-term customer loyalty, consistent with recent findings in sustainability marketing.

Key Activities: Key activities for each model were identified by reverse-engineering (Akerdad et al., 2021) its value proposition and operational needs, as well as case study analysis. This involved listing the concrete tasks required to deliver the promised value, such as product development (for value-added product

transformation), or platform/application development (for mobile applications). To ensure these activities are both effective and feasible, we referenced well-documented case examples. For instance, Intermarché's "Inglorious Fruits and Vegetables" campaign in France showcased the impact of creative marketing, famously selling 1.2 tons of "ugly" produce per store in two days and boosting traffic by 24%. Similarly, the Spanish gleaning initiative Espigoladors² demonstrates value-added processing by harvesting unwanted crops and transforming them into jams and sauces. By incorporating such real-world examples, our list of key activities directly supports each model's value proposition through practical, day-to-day operations.

Key Resources: Key resources for each model were mapped by outlining essential tangible and intangible assets. This includes physical infrastructure (e.g., storage warehouses, refrigerated transport, retail space), digital infrastructure (e.g., mobile applications, data systems), and human capital (e.g., food safety experts, IT developers, marketing staff). We derived these needs from stakeholder input, aligning with sustainability research that highlights the need for robust supply-chain infrastructure and technology in food waste solutions. For instance, studies emphasise that food waste is a systemic issue requiring improvements both upstream and downstream, where investments in more efficient cold-chain logistics, inventory tracking, and traceability tools can significantly reduce spoilage (e.g., Babbitt et al., 2022; Akkerman et al., 2024; Lemma et al., 2014). These findings supported the inclusion of IT platforms and data capabilities as key resources. Additionally, building consumer trust was deemed essential for overcoming the stigma around "imperfect" foods. Hence, each model's resource list encompasses the facilities, technology, and expertise needed to effectively implement the business model, validated by both literature and stakeholders.

Key Partners: Key partners were identified through comprehensive value chain mapping (Task 1.2) and a review of related literature on multi-actor collaborations in sustainable food systems, which underscores the importance of such partnerships in sustainability innovation. Medina-García et al. (2022) highlight how multi-actor collaborations in food governance institutionalize cooperation, increase legitimacy, and accelerate learning and resource mobilization across diverse stakeholders. Following stakeholder theory (Freeman, 1984), we mapped essential actors across the food system, ranging from farmers, processors, and retailers to logistics providers, technology companies, local governments, and NGOs. For instance, a Value-Added Product Transformation model relies on partnerships with local farms (for suboptimal produce sourcing). These collaborations provide necessary resources, and operational expertise, while also offering pathways for scaling and long-term impact. Hence, the partnerships in each model are carefully selected to align with its mission, and support resource needs, reflecting best practices in collaborative, sustainable food systems.

Cost Structure: The Cost Structure was primarily derived from identified operational and strategic factors and was validated through stakeholder feedback and expert opinions on cost drivers, as gathered in D2.1. We accounted for direct operating costs (e.g., collection logistics, warehousing, platform maintenance), personnel costs, and marketing expenses (especially for consumer education campaigns). For instance, Espigoladors' innovation lab in Spain demonstrates a cost structure that specifically covers gleaning and processing imperfect produce into market-ready products. The insights gained regarding operational challenges, economic viability, marketing efforts, and technological investments were crucial for defining realistic and comprehensive cost profiles.

Revenue Streams: Revenue streams were designed by drawing on sustainable food business patterns and successful real-world cases, providing a tailored mix of income sources aligned with activities and target users, including direct business-to-consumer (B2C) sales (e.g., for reprocessed surplus foods or "ugly" produce), and subscription-based models for digital applications (e.g., the case of Too Good To Go (TG2G) that charges

² <https://espigoladors.cat/en/gleanings/>

partner businesses commissions). Other potential streams are sponsorships or advertising income (for mobile applications with educational content), donations (for community-driven social enterprises), and grants or public subsidies (particularly for models with strong social or environmental benefits). Each model's revenue approach aims at reassuring basic economic viability, while keeping offerings affordable for the respective target segments. This balance mirrors sustainable market practices, where many circular food ventures rely on hybrid revenue sources to remain financially resilient while delivering social value.

Eco-Social Costs: Eco-social costs were assessed using Life Cycle Sustainability Assessment (LCSA) principles, informed by stakeholder insights and relevant literature (e.g., Vittuari et al., 2023; Piras et al., 2018; Salemdeeb et al., 2022). We identified potential negative externalities that each model could generate, both environmental (e.g., increased packaging, additional transportation emissions, energy use in processing) and social (e.g., digital divide if solutions rely on smartphone apps, unintended labour burdens). Each model explicitly acknowledges which eco-social costs should be addressed, aligning with the precautionary principle in sustainable business design.

Eco-Social Benefits: Eco-social benefits were identified by drawing on sustainability frameworks from organisations like the Food and Agriculture Organisation (FAO) and the UNEP, qualitative data from focus groups that capture stakeholder values, and related literature (e.g., Vittuari et al., 2017). The primary benefit across all models is food waste reduction, i.e., directly preventing edible food from being wasted. This yields clear environmental gains (conserving resources, lowering emissions) and addresses a moral imperative, aligning with SDG 12.3 (halving per capita food waste by 2030). Beyond waste reduction, models facilitate food security and social relief by redirecting nutritious produce to vulnerable populations. They also build social value through consumer education (e.g., cooking workshops, awareness campaigns) and community engagement (e.g., gleaning programs offering volunteering/employment opportunities).

Table 3 summarizes how the marketing models were created, confirming that every part of the SBMC was backed by evidence and matched ROSETTA's commitment to sustainability.

Table 3: Business Model Canvas element methodological formulation

SBMC Element	Development Approach	Primary Sources	Derivation Logic
<i>Value Proposition</i>	Synthesised from consumer insights on pricing, sustainability, and health-related preferences.	Interviews, Focus Group, Literature (e.g., Damberg et al. 2024; van Giesen & de Hooge, 2019)	Reflects consumer demand for affordability, sustainability, and authenticity.
<i>Customer Segments</i>	Defined using psychographic profiles and empirical segmentation.	D2.1 Segmentation, Literature (e.g., Aschemann-Witzel et al., 2021; Norton et al., 2024)	Based on behavioural patterns and attitudes (e.g., “Price-sensitive”, “Environmentally conscious”) identified in Task 2.1 and consumer behaviour literature.

<i>Channels</i>	Identified from best practices and user preferences for food access	Case studies (e.g., Too Good To Go app); Focus Group feedback; Literature (e.g., Riesenegger & Hübner, 2022; Karmakar et al., 2023; Mattila et al., 2020)	Selected to match consumer habits and operational fit per model (e.g. online platform for tech-savvy users, in-store displays for traditional shoppers).
<i>Customer Relationships</i>	Developed from behavioural economics principles and stakeholder feedback.	Literature (e.g., Thaler & Sunstein, 2008), D2.1 Interviews, Recent studies (Vasconcelos et al. 2023; Boulet & Lauren, 2024)	Designed to build trust and loyalty through transparency, education, and nudges that support behaviour change.
<i>Key Activities</i>	Mapped based on value delivery needs, operational models, and stakeholder roles.	Internal analysis; Real-world examples (Intermarché campaign, Espigoladors gleaning)	Derived by reverse-engineering the model logic to ensure that every activity directly supports the value proposition and is grounded in proven practices.
<i>Key Resources</i>	Identified via stakeholder input, and sustainability research	Stakeholder Interviews, Literature (e.g., Babbitt et al., 2022; Akkerman et al., 2024; Lemma et al., 2014)	Covers all resources required to implement the model, informed by systemic waste reduction research.
<i>Key Partners</i>	Identified through value-chain mapping and multi-actor collaboration examples.	Task 1.2 Mapping, Stakeholder theory, Literature (e.g., Freeman, 1984; Medina-García et al., 2022)	Cross-sector collaboration through including critical partners for execution scaling to amplify impact and credibility.
<i>Cost Structure</i>	Derived from operational and strategic factors, validated through expert and stakeholder feedback.	D2.1 Stakeholder insights	Includes direct and indirect costs grounded in real-world examples, balancing financial feasibility and operational needs.
<i>Revenue Streams</i>	Inferred from model functions and delivery mechanisms, as well as successful cases.	Sustainable food business patterns, Real-world cases	Grounded in sustainable food market practices and financial feasibility.
<i>Eco-Social Costs</i>	Assessed using LCSA principles and informed by stakeholder insights and literature.	LCSA Principles, Focus Group, Sustainability Literature (e.g., Vittuari et al., 2023; Piras et al., 2018; Salemdeeb et al., 2022)	Considers potential negatives such as packaging waste, digital exclusion, and transport impacts.
<i>Eco-Social Benefits</i>	Derived from sustainability frameworks, focus group insights, and relevant literature.	FAO, UNEP, D2.1 focus groups, Literature (e.g., Vittuari et al., 2017)	Highlights food waste reduction, improved food security, community engagement, and social value

2.3.3 Validation and refinement of the marketing models

Following the construction of the first draft of the marketing models, a ROSETTA partners' review and feedback process took place. This involved a collaborative evaluation of each model by project consortium members, particularly use-case partners, to enhance its credibility, relevance, and practical utility, making use of the partner's expertise. This exercise helped in identifying overlooked practical considerations like regulatory barriers or technology limitations. The review tested each value proposition's alignment with its target segment, ensuring that key activities and resources could realistically deliver it within the given cost and partner structures. Any inconsistencies or gaps, such as missing partners for critical activities, were identified and resolved through revision. Partners also suggested enhancements, including incorporating local cultural factors into engagement strategies. This collaborative refinement stage was valuable for identifying overlooked risks and enablers, refining the articulation of customer relationships and delivery channels, and improving overall clarity and operational relevance. By integrating this feedback, each model became more contextually relevant, and operationally clear.

The models were further validated and refined by multi-actors of the use case pilots in Task 3.2. The five co-creation workshops conducted in Poland, Greece, Denmark, Spain, and Ireland validated the relevance and adaptability of the marketing models to local contexts. We used insights from the workshops to refine and enhance these marketing models, in order to improve feasibility, market appeal, sustainability impact, clarity, and scalability. Cross-cutting themes included emotional branding, consumer education, partnerships, and flexible revenue structures. There was a strong emphasis on social impact, environmental benefits, and technological integration. Updates generally focused on enhancing Value Propositions, diversifying Customer Segments, and enriching Channels and Customer Relationships.

Specific updates on each marketing model are described below:

Value-Added Product Transformation model

Key updates included an enhanced value proposition with an emotional "food rescue" narrative and commitment to zero-food-waste, while also ensuring complete traceability and transparency. Furthermore, customer segments were broadened to include corporate and institutional buyers, while channels were diversified by adopting sustainable formats, such as subscription boxes, online marketplaces, and in-store displays with QR codes for traceability. Customer engagement was deepened via storytelling, loyalty programs and co-creation opportunities. Operational enhancements added pilot batches to optimize product-market fit and emphasized quality control mechanisms. Revenue Streams expanded to B2B sales and sponsorships. Eco-social considerations were strengthened by employment opportunities in new product development, and potential consumer scepticism about suboptimal ingredients, or nutrition loss after processing.

Pricing/Discount models

While maintaining its *money and reduce food waste* value proposition, the model shifted emphasis to enhanced in-store execution, such as prominent shelf labelling and dedicated discount areas. As a result, key activities were enriched with curating discounted sections and introducing mixed bags of fresh suboptimal products at a discount price.

Recipe Sharing

The main updates concerned the potential social cost of consumers being unable to determine whether the products are still good enough and safe to eat.

Preventive solution (education & community engagement)

Key modifications to Customer Relationships included potential on-the-ground interactions like school programs and workshops, as well as "low-food-waste" loyalty programs. Key Activities were expanded to include on-site recipe demonstrations, interactive challenges, and partnering with local producers. Resources were broadened to include diverse partner networks. Revenue streams focused on government grants, and sponsorships. Eco-Social Benefits were enriched with social angles like promoting purchasing locally, improved nutrition, and supporting the circular economy.

Mobile Applications

The Value Proposition was broadened to include storage suggestions, while channels included in-store promotion via screens and QR codes on packaging. Customer Relationships were enriched with personalization, gamification, and feedback loops. Key Partners grew to include specific roles like recipe content providers. Revenue streams were diversified to include in-application advertisements, premium subscriptions, affiliate marketing, and sponsorships. Eco-social costs (e.g., carbon footprint, digital divide) and benefits (e.g., waste reduction, cost savings, awareness) were explicitly identified.

Advanced Logistics & Inventory Technologies

The model's value proposition was enhanced with traceability and transparency for raising consumer awareness. Customer segments were described in more detail. Channels emphasised direct engagement and integration with client Enterprise Resource Planning (ERP) systems. Key activities included collaborative forecasting, while access to real-time market and weather data was added as a resource for demand forecasting.

Social Interventions.

The model's value proposition was expanded to emphasise local empowerment, solidarity, and community resilience. Customer relationships were enriched through establishing systems for stakeholder recognition (such as certificates, Corporate Social Responsibility (CSR) reports, and visibility campaigns) and creating a community portal to share best practices and success stories, aiming to inspire and sustain long-term involvement. Key activities included daily collection, sorting, storage, repackaging, as well as legal and compliance work. Key Resources were extended with human resources for communication, coordination and sorting, as well as materials for repackaging of the food selected for redistribution. Revenue streams were positioned as contributing to improvements in CSR and Environmental, Social, and Governance (ESG) key performance indicators.

3. Alternative Marketing Models

Building on the empirical findings from Deliverable 2.1, the theoretical foundations, and the refinements outlined earlier, this chapter presents the eleven marketing models developed for the valorisation of suboptimal foods. Each model is structured using the SBMC, which captures both traditional business aspects and eco-social impacts, in full alignment with the sustainability objectives of the ROSETTA project.

The models are categorized according to the three strategic classes identified in Task 2.1:

- Prevention (helping consumers adopt more sustainable consumption practices by making informed decisions)
- Redistribution (reallocating suboptimal food, which would otherwise go to waste, to produce high-quality, nutritious processed products)
- Social interventions (provide safe and nutritious food for low-income households)

Each model is presented through its detailed SBMC elements, offering actionable pathways that can be adapted by stakeholders across the food supply chain.

3.1 Value-added product transformation

Belonging to the Redistribution class, this model refers to the processing of cosmetically imperfect items into value-added products such as juices, jams, and snacks. This model increases the marketability and shelf life of suboptimal produce, offering a sustainable and profitable solution to food waste. It involves close collaboration with farmers and processors to convert rejected produce into marketable upcycled products, aimed at consumer markets.

Gleaning is an example, where leftover crops are collected after harvest and are redirected to the processing industry for product transformation. For instance, the innovation lab by Fundació Espigoladors in Spain converts suboptimal food into products such as jams and sauces.

1. Value Proposition

Transforming Imperfect Produce into Perfect Products

We are on a food rescue mission, transforming cosmetically imperfect produce into a diverse range of branded, sustainable food products, such as juices, jams, sauces, and snacks. This offers eco-conscious consumers a nutritious and waste-reducing choice that supports sustainable farming, extends shelf life, and maximizes the value of produce that doesn't meet typical specifications. Committed to zero-food-waste, we ensure complete traceability and transparency across the supply chain.

2. Customer Segments

- *Environmentally conscious consumers* prioritising sustainability, ethical consumption, and food waste reduction.
- *Health-conscious consumers* seeking natural, nutritious, and minimally processed food products.
- *Retailers and food service providers* sourcing sustainable products to engage eco-conscious customers.
- *Consumers seeking convenience products* (further processed, ready-to-cook, or ready-to-eat).

- *Corporate clients* seeking sustainable gifts or CSR-driven procurement.
- *Schools and institutional buyers.*

3. Channels

- E-commerce website and mobile application for direct-to-consumer sales.
- Partnerships with grocery stores, specialty food markets, and food service providers.
- Partnerships with eco-subscription boxes and online marketplaces (e.g., platforms dedicated to sustainable products).
- Collaborations with food festivals, culinary events, and local food events.
- Social media marketing (Instagram, Facebook etc.) to share stories of upcycling and sustainability efforts.
- Farmers' markets with dedicated sections in supermarkets, tailored spaces to enhance product appearance, focusing on high quality.
- Incorporation of QR codes on packaging to provide access to origin stories, enhancing product transparency and consumer trust.

4. Customer Relationships

- Education and awareness-building around food waste reduction and sustainability.
- Storytelling about food waste with detailed product origin information.
- Product personalisation options and updates on new offerings.
- Community engagement through tasting events, campaigns, and demonstrations at food markets.
- User-generated content and reviews shared on social media.
- Loyalty or ambassador program for rewarding repeat customers and encouraging peer promotion.
- Co-creation opportunities (e.g., voting on new flavours or designs) for deepening emotional connection.

5. Key Activities

- Sourcing cosmetically imperfect produce from farms and implementing gleaning initiatives
- Developing and testing new product concepts through pilot batches, adapting them based on availability, consumer feedback, and regional preferences to optimize product–market fit.
- Refining product ideas in collaboration with local culinary professionals to ensure quality, relevance, and appeal.
- Marketing and promotional efforts to highlight eco-friendly, upcycled products
- Establishing a traceable and transparent supply chain from farm to product, with a strong emphasis on quality control mechanisms.

6. Key Resources

- Partnerships with local farms for suboptimal produce
- Production facilities for transforming produce into value-added products
- Expertise in food safety, processing, and recipe development
- E-commerce platform for online sales and consumer engagement
- Skilled team for marketing, logistics, and customer service

7. Key Partners

- Farmers and local agricultural associations to source imperfect produce
- Processing and production companies for efficient product transformation
- Food sustainability and environmental organisations for partnerships and advocacy
- Retailers and food service providers for product distribution
- Culinary experts and laboratories for testing and refining product concepts
- Universities or food innovation hubs for bridging knowledge gaps.

8. Cost Structure

- Cost of sourcing imperfect produce from farms and gleaning operations
- Production and processing costs for transforming produce
- Marketing expenses to reach target segments and raise awareness
- Storage, logistics and distribution costs for delivering products to market
- Platform maintenance for e-commerce and mobile applications

9. Revenue Streams

- Direct sales from e-commerce platform
- Sales through partnerships with grocery stores and specialty shops
- Bulk sales to food service providers and restaurants
- Potential subscription or bundle models for regular customers
- Private-label production for retailers and customized product lines for B2B clients.

10. Eco-Social Costs

Environmental:

- Increased energy use in food processing and the environmental footprint of packaging

Social:

- Food safety risks during processing
- Consumer scepticism about suboptimal ingredients or nutrition loss after processing

11. Eco-Social Benefits

Environmental:

- Food waste reduction through redistribution of cosmetically imperfect items.
- Resource conservation and lower greenhouse gas emissions
- Promotion of sustainable farming practices

Social:

- Local economic growth through collaboration with farmers
- Public health improvement through nutritious dietary choices
- Employment for people working on new products

Key Implementation Challenges:

- Operational barriers: Implementing this model requires significant processing infrastructure and coordination with farmers and processors. Additionally, ensuring food safety during the processing of suboptimal produce is critical to avoid any health risks.
- Market and logistical challenges: Developing a consistent supply chain of cosmetically imperfect inputs and finding suitable markets for the new value-added products can be challenging, as consumer acceptance must be earned for these upcycled products. Partnerships with farms are essential, and establishing these networks (e.g., gleaning programs, supply agreements) may require significant effort. There may also be upfront costs for production facilities and recipe development.

3.2 Labelling techniques

This model, part of the Prevention class, aims at increasing consumer acceptance of suboptimal foods through targeted labelling strategies. These include: (a) price badges highlighting affordability or taste, (b) sustainability or ethical labels appealing to conscious consumers, and c) anthropomorphised or "ugly" branding, such as Tesco's "Perfectly Imperfect".

1. Value Proposition

Enhancing the appeal of suboptimal foods through innovative labelling strategies that emphasize their affordability, quality, and sustainability, while fostering emotional connections with consumers.

2. Customer Segments

- *Environmentally conscious consumers* prioritising sustainability, ethical consumption, and food waste reduction.
- *Price-sensitive consumers* seeking budget-friendly food options.
- *Experiential consumers* who enjoy trying new foods and are receptive to innovative marketing campaigns.

3. Channels

- In-store shelf displays, and labels.
- In-store promotions through sample tasting.
- Online platforms and applications showcasing labelled suboptimal foods.
- Social media campaigns emphasising the benefits of suboptimal foods through creative imagery.

4. Customer Relationships

- Informing consumers about the quality and sustainability of suboptimal foods.
- Building emotional engagement through anthropomorphism and "ugly" labelling.
- Loyalty programs rewarding customers for purchasing suboptimal foods.
- Interactive experiences featuring online tutorials on utilising suboptimal foods, enhanced by consumer generated content.

5. Key Activities

- Developing visually appealing and creative labelling to highlight value, affordability, and sustainability of suboptimal products.
- Marketing campaigns to promote the purchase of suboptimal foods through in-store and online efforts.
- Gathering feedback on consumer preferences regarding labelling styles.

6. Key Resources

- Expertise in eye-catching label design.
- Consumer behaviour knowledge to optimise designs and messages.
- Marketing expertise for campaigns, promotions and brand building.

7. Key Partners

- Farmers and producers for sourcing imperfect produce.
- Marketing agencies for campaign development.
- Design firms for creating visually appealing labels.

8. Cost Structure

- Costs for the design and production of new labels.
- Marketing campaigns and in-store promotion costs.
- Costs of consumer surveys.

9. Revenue Streams

- Increased sales of suboptimal items that would otherwise be discarded.

10. Eco-Social Costs

Environmental:

- Higher material use for creating new labels.

Social:

- Potential consumer confusion due to excessive labelling use.

11. Eco-Social Benefits

Environmental:

- Food waste reduction by making products more appealing.
- Resource conservation and potential lower greenhouse gas emissions.

Social:

- Increased consumer awareness regarding imperfect food and its impact on food waste.
- Enhanced consumer empowerment and awareness of the importance of reducing food waste.

Key Implementation Challenges:

- Consumer perception risks: Clever branding like “ugly” characters may be engaging, but can also cause confusion or reinforce negative ideas about quality. Overly complex labels or messaging might confuse shoppers instead of convincing them. Also, if not executed tastefully, “ugly” branding could inadvertently reinforce negative perceptions. Ensuring that the message (quality and safety of the food) is clear and positive is essential to avoid misinterpretation.
- Adoption by retailers: Gaining widespread adoption of new packaging/labelling for suboptimal foods across retailers can be challenging, since they may be hesitant to adopt new labels without clear evidence of sales benefits. Some stores may be reluctant to allocate shelf space or invest in re-labelling products. Pilot programs (like Tesco’s “Perfectly Imperfect”) have shown success, but scaling such initiatives may face branding concerns from major retail chains.

3.3 Pricing/Discount models

Belonging to the Prevention class, this model regards offering discounts on cosmetically imperfect foods, or on foods nearing their expiration date that would otherwise be discarded, with the aim to attract price-sensitive customers.

Examples include Intermarché’s “Inglorious Fruits and Vegetables,” Walmart’s and Asda’s “Wonky Fresh Produce,” Woolworths’ “Odd Bunch,” and Loblaws’ “Naturally Imperfect”, all of which promote discounted imperfect items to reduce food waste and normalize consumer acceptance.

1. Value Proposition

Save money and the planet by enjoying perfectly good food at discounted prices.

Offering affordable, sustainable options for consumers by discounting suboptimal foods (e.g., cosmetically imperfect or nearing expiration), thereby normalising their purchase and reducing food waste.

2. Customer Segments

- *Environmentally conscious consumers* prioritising sustainability, ethical consumption, and food waste reduction.
- *Price-sensitive consumers* seeking budget-friendly food options (e.g., university students).

3. Channels

- Point-of-sale materials, shelf signage, and promotional displays at retail stores (e.g., a dedicated shelf could be placed in a specific area with a relevant announcement).
- Digital Platforms such as website, mobile applications, and email marketing highlighting available discounts.
- Social media and influencers campaigns.
- Partnerships with third-party applications and platforms like Too Good To Go for last-minute sales.

4. Customer Relationships

- Campaigns to inform consumers about the quality and value of suboptimal foods.
- Loyalty programs rewarding customers for frequent purchases of discounted suboptimal/imperfect items.

- Using customer feedback data analytics to refine suboptimal/imperfect discount strategies and offer personalized recommendations

5. Key Activities

- Effective pricing strategy development and implementation for suboptimal foods.
- Creating and executing marketing campaigns to promote the benefits of buying imperfect or near-expiry items.
- Tracking sales and consumer behaviour to optimise discount models and inventory management.
- Creation of a designated area inside (supermarket) stores.
- Provision of mixed bags of suboptimal products at a discount price.

6. Key Resources

- Data analytics tools to monitor sales data and consumer behaviour.
- Marketing expertise to create engaging campaigns.
- Digital platforms for managing online discounts and application-based promotions.

7. Key Partners

- Farmers and producers for sourcing cosmetically imperfect produce.
- Environmental organisations for promoting food waste reduction initiatives.
- Technology providers for developing solutions supporting discount promotions and last-minute sales.
- Consumer associations for raising awareness about food waste reduction.

8. Cost Structure

- Costs for designing and running discount-focused marketing campaigns.
- Costs for website, mobile applications, and data analytics tools to support discount models.
- Expenses for storing, managing and displaying discounted suboptimal food items.
- Costs associated with creating a dedicated space in stores for promoting discounted products.

9. Revenue Streams

- Increased sales of discounted items that would otherwise be discarded.
- Improved customer retention through consistent discount offerings.

10. Eco-Social Costs

Environmental:

- Potential over-purchasing due to discounted prices: Consumers may buy more than they need due to the reduced prices, ultimately leading to disposal at home, which shifts the problem from the retailer to the end user.

Social:

- Potential devaluation of suboptimal foods in the long term due to over-reliance on discounts.

11. Eco-Social Benefits

Environmental:

- Food waste reduction through increased sales of cosmetically imperfect and near-expiry food items.
- Resource conservation and lower greenhouse gas emissions

Social:

- Addressing food poverty by providing affordable, nutritious options for low-income consumers.
- Community empowerment through sustainable consumption and active engagement.

Key Implementation Challenges:

- Perceived value: If stores always sell imperfect food at a discount, customers might start to think that suboptimal foods are “second tier” or less valuable. Over-reliance on markdowns could devalue these foods in the long term. Retailers must balance promotions so that consumers appreciate the quality of imperfect items and not just the low price, to avoid undermining their intrinsic value.
- Operational constraints: Implementing discount programs (like separate “ugly food” sections or last-minute markdowns for near-expiry items) may require changes in inventory management (potentially digital tools or dynamic pricing strategies) to identify and mark down items nearing expiration in time. This can involve coordination with supply chain systems, including partnerships with applications like *Too Good To Go*.
- Financial trade-offs: Retailers might worry that offering discounts could cause customers to buy fewer full-priced items, reducing overall profits. It may take time for the increased volume of sales to compensate for the lower profit margin of discounted products.

3.4 Innovative packaging and custom portion sizes

This Prevention-class model focuses on reducing food waste through packaging innovations. It includes resealable or easier-to-empty packaging for improved usability, as well as smaller portion sizes to match household needs, helping consumers buy what they need and reduce spoilage.

1. Value Proposition

Offering sustainable, user-friendly packaging that reduces food waste through easy-to-use designs and portion sizes suited to different household types.

2. Customer Segments

- *Small households and single consumers* seeking convenient, portion-controlled options tailored to their needs.
- *Health-conscious consumers* seeking portion control and dietary goals.
- *Environmentally conscious consumers* prioritising sustainability, ethical consumption, and food waste reduction.
- *Food producers* seeking creative solutions to enhance sustainability, efficiency, and market appeal.
- *Retailers and food service providers* prioritising innovative packaging solutions that extend product shelf life and minimise waste.

3. Channels

- Supermarkets and grocery stores.
- E-commerce platforms for direct-to-consumer sales.
- Subscription-based meal delivery services.
- Vending machines
- Social media and digital marketing campaigns.

4. Customer Relationships

- Offering educational content on portion control, nutrition, and sustainability.
- Personalised customer support and feedback channels (e.g., product recommendations based on household size or preferences).
- Loyalty programs and rewards for repeat customers
- Community engagement through eco-friendly campaigns and waste reduction initiatives.

5. Key Activities

- Research and development of packaging designs and portion sizes (e.g., resealable and easily emptiable packaging designs).
- Customising product lines to include multiple portion sizes.
- Collaboration with retailers and online platforms to distribute and promote portion-sized options.
- Data analytics to understand consumer behaviour and optimise product offerings
- Marketing campaigns highlighting the convenience and sustainability of the model.

6. Key Resources

- Advanced packaging technology and materials.
- Data on consumer purchasing behaviours to optimise portion sizes.
- Expertise in food preservation techniques (e.g., for resealable packaging).
- Strategic partnerships with suppliers, retailers, and logistics providers.

7. Key Partners

- Packaging design and material suppliers specialising in sustainable and functional materials.
- Retailers and food producers willing to offer customisable portion sizes.
- Environmental organisations for collaboration on sustainability initiatives.
- Logistics providers for distribution of customized packaging options.

8. Cost Structure

- Product development and R&D costs for innovative product packaging.
- Investment in machinery for manufacturing portion-customised product lines.
- Marketing and awareness-building campaigns targeting eco-conscious consumers.
- Distribution and logistics costs for delivering tailored product lines.

9. Revenue Streams

- Direct sales through retail and e-commerce channels.
- Licensing fees for innovative packaging designs and technology.

10. Eco-Social Costs

Environmental:

- Increased material use for resealable and customised packaging, potentially increasing waste if not recyclable.
- Higher energy consumption for manufacturing smaller and resealable packages compared to traditional packaging.
- Higher carbon emissions due to increased logistics for distributing various portion sizes.

Social:

- Potential premium pricing for innovative packaging may limit accessibility for low-income households.

11. Eco-Social Benefits

Environmental:

- Food waste reduction at the consumer level through aligning portion sizes with consumption needs
- Development of sustainable, recyclable packaging materials contributing to a circular economy

Social:

- Improved consumer convenience and inclusivity for smaller households and individual consumers.
- Enhanced nutrition through smaller portion sizes that assist consumers in making healthier, more mindful food choices.

Key Implementation Challenges:

- Cost and accessibility: Resealable or tailored packaging costs more to produce, which can result in higher prices for consumers, potentially making these items too expensive for people on a tight budget, who might be the ones that benefit most from buying smaller portions.
- Supply chain complexity: Offering multiple portion sizes increases inventory complexity. It's difficult to predict how much of each size to stock in different places, and misjudging can ironically lead to more unsold products and waste. Companies need to deeply understand customer preferences to get the right mix of sizes. Upgrading production lines and ensuring consumer adoption pose financial and operational risks.

3.5 Recipe sharing for reducing food waste

This Prevention-class model encourages consumers to reduce food waste by repurposing leftovers and overripe ingredients, using recipe ideas and meal tips. For example, the *EatBy* app provides expiry reminders and recipe suggestions for foods nearing their expiration.

1. Value Proposition

Helping consumers reduce food waste by sharing practical, appealing recipes that turn leftovers and overripe foods into enjoyable meals.

2. Customer Segments

- *Environmentally conscious consumers* prioritising sustainability, ethical consumption, and food waste reduction.
- *Price-sensitive consumers* seeking budget-friendly food options.
- *Retailers and food service providers* (e.g, grocery stores, supermarkets, restaurants etc) aiming to enhance customer engagement and reduce food waste.
- *Consumers and communities* who enjoy cooking, experimenting with new recipes, and exploring innovative, waste-reducing culinary practices.
- *Environmental organisations* promoting sustainable food practices and waste reduction.

3. Channels

- In-store displaying of recipe cards, posters, and digital screens.
- Digital platforms such as websites, mobile applications, social media, and email marketing for sharing recipes and video tutorials.
- Product labels with QR codes linking to recipes or cooking tips.
- Workshops and events demonstrating creative uses for leftovers and overripe foods.

4. Customer Relationships

- Informing consumers about ways to repurpose food through recipes and meal ideas via educational campaigns.
- Creating online forums/groups for exchanging ideas on food reuse and encouraging consumers to share their own recipes.
- Personalised recipe suggestions based on customer preferences and purchase history.

5. Key Activities

- Developing and curating recipes for leftovers and overripe food that are easy to follow and appealing to customers.
- Designing marketing materials to promote recipes in-store and online.
- Partnering with chefs, food bloggers, and influencers to create engaging content.
- Evaluating the impact of recipe campaigns on consumer behaviour and food waste reduction.

6. Key Resources

- Expertise in recipe development and food sustainability.
- Partnerships with retailers and food influencers for broader outreach.
- Digital platforms for recipe sharing and community engagement.
- Marketing materials for in-store and digital campaigns.

7. Key Partners

- Food bloggers and influencers for promoting engaging content and reaching a wider audience.
- Retailers for implementing recipe-sharing campaigns in stores.
- Chefs for creating engaging recipe content.
- Environmental organisations for advancing food waste reduction initiatives.
- Technology providers for developing applications and digital tools for sharing recipes and tips.

8. Cost Structure

- Costs of developing and testing recipes.
- Expenses for marketing, printing materials, and running digital campaigns.
- Costs for collaborations with influencers and environmental groups.
- Expenses for developing and maintaining websites and applications for recipe sharing.

9. Revenue Streams

- Increased sales of ingredients tied to featured recipes.
- Enhanced customer loyalty through engaging and value-adding initiatives.
- Revenue from partnerships with food brands through sponsored content.

10. Eco-Social Costs

Environmental:

- Costs of printed recipe cards and promotional materials.

Social:

- Recipes may need to consider diverse dietary needs and cultural preferences to be widely accepted.
- Risk of some people not being able to determine whether the products are still good enough and safe to eat.

11. Eco-Social Benefits

Environmental:

- Food waste reduction through using leftovers and overripe ingredients.

Social:

- Cost savings for consumers through food waste reduction.
- Improved public health through promoting creative cooking and healthy eating habits.

Key Implementation Challenges:

- Engagement and behaviour change: Offering recipes doesn't ensure users will change habits. A major hurdle is maintaining long-term engagement; the content must remain updated and motivating. For broad usefulness, it needs to cater to diverse dietary preferences and cultural cuisines, as failing to do so could limit its overall impact.
- Measuring impact: It is difficult to directly measure the specific amount of food waste reduced through recipe sharing. This can complicate efforts to secure funding or justify the initiative's cost-effectiveness, as its return on investment is indirect (focused on food waste reduction and customer goodwill rather than immediate revenue). Furthermore, the model itself typically does not generate direct income unless it's tied to another product or service, often relying on existing marketing budgets or corporate social responsibility funds.

3.6 Date label education and standardisation

This Prevention-class model focuses on creating a standardised date labelling system that clearly distinguishes between “best before” (indicating quality) and “use by” (indicating safety) dates. It also includes public education to help consumers interpret these labels correctly, supporting informed decisions about food freshness and safety.

1. Value Proposition

Empowering consumers and businesses to make informed decisions on food safety and quality through standardised date labelling and public education, thereby reducing food waste and promoting sustainability.

2. Customer Segments

- *Consumers and households.*
- *Retailers and food service providers (e.g., grocery stores, supermarkets, restaurants etc).*
- *Food producers complying with labelling regulations.*
- *Policymakers and Regulators shaping food safety and sustainability policies.*
- *Charitable organisations redistributing near-expiry food to vulnerable populations.*

3. Channels

- Collaborating with policymakers to establish and enforce clear date labelling standards.
- Utilizing websites, mobile applications, and social media for consumer education and engagement.
- Retail partnerships for implementing clear labelling practices and customer guidance.
- Leveraging media and public relations to raise awareness and generate publicity.

4. Customer Relationships

- Providing easy to understand information on date labels and food safety through consumer education campaigns.
- Developing online tools and resources to help consumers make informed choices.
- Engaging with consumers via surveys and social media.
- Partnering with retailers to align messaging and offer training and support to reduce confusion.
- Engaging with policymakers to influence regulations and promote sustainable practices.

5. Key Activities

- Promoting transparent and uniform date marking on food products through partnerships with policymakers and stakeholders.
- Developing and implementing educational campaigns to promote understanding of "best before" and "use by" dates.
- Testing modified expiration messaging for products like dairy, improving usability while maintaining safety.
- Conducting consumer and partner surveys to gather feedback on consumer behaviour and label clarity.

6. Key Resources

- Expertise in consumer behaviour, education campaign development, and policy analysis.
- Partnerships with retailers and food manufacturers for implementation.
- Digital platforms for content dissemination and engagement.

7. Key Partners

- Policymakers and regulatory bodies for shaping and enforcing date label standards.
- Retailers and food service providers for best practices implementation and consumer engagement.
- Food manufacturers and producers for standardised labelling adoption.
- NGOs and environmental organisations for advocacy and education.

8. Cost Structure

- Research and development costs for standardised labelling systems.
- Costs associated with developing, running, and tracking campaigns.
- Partner collaboration costs with retailers and NGOs for joint initiatives and projects.
- Digital platform development and maintenance for education and surveys.

9. Revenue Streams

- Potential licensing fees of standardised label formats.
- Government or private funding for research, education, and policy initiatives.

10. Eco-Social Costs

Environmental:

- Increased resource use and carbon footprint from overproduction of labels due to increased messaging and labelling changes.

Social:

- Consumer confusion during transition may lead to initial misunderstanding about new date labelling standards.
- Increased costs for businesses to adjust to new labelling systems.

11. Eco-Social Benefits

Environmental:

- Reduced food waste through clearer labelling and improved consumer education that prevent premature disposal of food.
- Saving resources used in producing, packaging, and distributing food.

Social:

- Cost savings for consumers through the use of near-expiry but still-edible products.
- Enhanced consumer empowerment and awareness of the importance of reducing food waste.

Key Implementation Challenges:

- Industry coordination and costs: Changing how date labels are used requires extensive coordination among food producers, retailers, and regulators. This transition can be both costly and time-consuming for businesses, involving packaging redesigns and phasing out old stock. Smaller companies, in particular, may struggle financially or logistically to comply.
- Consumer confusion during transition: As new labels are introduced, consumers may initially be confused or resistant due to unfamiliarity. Misinterpretations can occur; for example, some might mistakenly view a "Best if used by" date as a strict safety cutoff, leading to continued food waste, while others might ignore a true safety date, raising food safety concerns. Overcoming established habits and beliefs about current date labels, where many tend to discard food too early, is a substantial task.
- Regulatory hurdles: Achieving uniform date labelling may require changes in laws or industry standards. However, legal alignment across jurisdictions is slow and complex. Concerns over liability may also deter companies from changing guidance if consumer misuse leads to health issues, even unintentionally.

3.7 Food storage best practices

This Prevention-class model promotes proper food storage through in-store displays, product labelling, and digital platforms. It educates consumers on best practices (such as using airtight containers, maintaining optimal refrigerator temperatures, and organizing storage) to extend food shelf life and reduce waste.

1. Value Proposition

Empowering consumers to reduce food waste and improve food safety by promoting effective storage practices through accessible tips, educational materials, and simple solutions.

2. Customer Segments

- *Households and individuals* looking to maximize the shelf life of their food and reduce food waste.
- *Retailers and food service providers* (e.g., grocery stores, supermarkets, restaurants etc) interested in extending product shelf life and reducing consumer-level spoilage of their products.
- *Environmental organisations* promoting sustainable food practices and waste reduction.

3. Channels

- In-store marketing through point-of-sale materials, shelf signage, and interactive displays providing storage tips.
- Product labels with storage instructions and QR codes linking to more detailed guidance.
- Online channels, including the organisation's website, dedicated mobile application, social media presence, and targeted email communications.
- On-site or online workshops and demonstrations educating consumers about food storage.

4. Customer Relationships

- Providing actionable storage advice via retail spaces and digital platforms for educational engagement.

- Encouraging consumer participation through interactive campaigns (e.g., social media challenges).
- Collecting feedback via surveys and social media to refine educational efforts.
- Collaborating with stores to implement best practices in consumer engagement.
- Leveraging technology to offer tailored storage tips.

5. Key Activities

- Developing clear, high-quality content on food storage techniques and best practices.
- Designing engaging campaigns to highlight the benefits of proper storage.
- Collaborating with retailers, manufacturers, and influencers to implement displays and distribute educational materials.
- Maintaining and updating the website and mobile application.
- Tracking user engagement and behaviour to optimise content and strategies.

6. Key Resources

- Food safety and storage expertise for content development.
- Partnerships with retailers and food producers for campaign deployment.
- Digital tools for creating and sharing educational content.
- Research data on consumer behaviour and storage practices.

7. Key Partners

- Retailers for distributing storage tips and engaging consumers.
- Food producers for providing product-specific storage advice.
- Influencers and bloggers for creating content and promoting best practices.

8. Cost Structure

- Educational materials and campaign creation costs.
- In-store deployment expenses for displays, labels, and staff training.
- Digital platform and application development and maintenance costs.
- Consumer survey expenses.

9. Revenue Streams

- Campaign support through government or private funding.
- Collaboration with food producers for product endorsement.

10. Eco-Social Costs

Environmental:

- Potential increase in materials and instruction labels.

Social:

- Difficulty in changing long-standing consumer habits related to food storage.

11. Eco-Social Benefits

Environmental:

- Food waste reduction through proper storage practices that extended product shelf life.

Social:

- Cost savings for consumers through food spoilage reduction
- Improved public health through promoting food safety and hygiene.

Key Implementation Challenges:

- Consumer Habit Change: Getting people to alter their daily food storage routines at home is difficult due to long-standing habits. Many consumers don't actively seek storage advice, so the model must proactively reach and engage them.
- Measurement of Success: As with the Recipe sharing model, it can be difficult to measure how much waste is reduced due to storage advice. Unlike products with sales data, quantifying the outcomes of educational efforts is difficult, making it harder to continuously justify the business investment. Additionally, conveying nuanced storage information for different foods without overwhelming consumers is a key challenge, as too much detail might simply be ignored.

3.8 Preventive solution (education & community engagement)

This strategy aims to prevent premature food discarding through education, community engagement, and practical solutions. It uses platforms such as culinary festivals, local food events, social media, and partnerships with local organisations to encourage sustainable food habits and waste reduction.

1. **Value Proposition:**

Empower consumers to make sustainable food choices by reducing food waste, supporting healthy diets, and strengthening local economies through accessible education, community initiatives, and practical guidance.

2. **Customer Segments:**

- *Environmentally conscious consumers* prioritising sustainability, ethical consumption, and food waste reduction.
- *Price-sensitive consumers* seeking budget-friendly food options.
- *Consumers and communities* who enjoy cooking, experimenting with new recipes, and exploring innovative, waste-reducing culinary practices.

3. **Channels:**

- Culinary festivals
- Food related local events
- Social media and digital marketing for engaging with target audiences
- Community partnerships with local organisations and influencers
- Media outreach and press releases to generate awareness

4. **Customer Relationships**

- Consumer engagement through educational workshops and cooking demonstrations
- Provision of recipes, tips, and educational materials through shops and online resources
- Interactions at schools with students and parents
- Collecting and analysing consumer feedback to improve offerings
- Incentivising repeat engagement and purchases through loyalty programs

5. **Key Activities:**

- Develop targeted communication campaigns
- Organize culinary events and demonstrations
- Conduct consumer testing and surveys
- Recipe development and testing
- Recipe demonstrations at shops
- Collaborate on sustainable nutrition education
- Coordinate with food safety authorities

6. **Key Resources:**

- Test kitchen spaces
- Chefs and culinary experts
- Recipes and educational materials
- Partnerships with key supply chain actors (e.g., retailers, cooperatives, alternative local markets)
- Marketing and design teams
- Data analytics tools for feedback

7. **Key Partners:**

- Local food markets
- Food industry partners (e.g., farms, suppliers)
- Chefs and nutritionists
- Community organizations, local government and food safety bodies

8. **Cost Structure:**

- Development of marketing campaigns
- Organization of events
- Recipe creation and testing
- Partnership and collaboration costs

9. **Revenue Streams:**

- Sponsorships from retailers and food brands
- Event entry fees or donations
- Grants or sponsorships for supporting educational components
- Potential sales increase from suboptimal food awareness

10. Eco-social costs:

Environmental:

- Resource use for campaigns, events, and community engagement materials.

Social:

- Diverse preferences and understanding may hinder consumer acceptance

11. Eco-social benefits:

Environmental:

- Food waste reduction through education and engagement

Social:

- Enhanced sustainable consumer behaviour and increased community awareness
- Improved local purchasing, nutritional value, taste appreciation, and circular economy engagement

Key Implementation Challenges:

- Engaging diverse audiences: Communities vary in cultural norms, language, and food preferences, making a one-size-fits-all approach ineffective. Campaigns must be tailored to resonate across different groups.
- Maintaining momentum: Social campaigns often see an initial burst of interest that can quickly fade. After a major event or media push, it's difficult to sustain enthusiasm and ensure people continue their waste-reducing behaviours. The risk is that without follow-up, the initial excitement doesn't translate into sustained change.

3.9 Mobile applications

This Prevention-class model leverages mobile applications to connect directly with consumers, offering personalised real-time alerts for products nearing expiration, as well as tailored guidance. These applications promote sustainable consumption by reducing household food waste and encouraging the use of suboptimal food.

1. Value Proposition

Helping consumers reduce food waste and save money through applications that track inventory and expiration dates, offer storage tips, and suggest recipes for food nearing expiry, fostering sustainable habits at home.

2. Customer Segments

- *Environmentally conscious consumers* prioritising sustainability, ethical consumption, and food waste reduction.
- *Households and individuals* looking to maximise the shelf life of their food and reduce waste.
- *Price-sensitive consumers* seeking ways to reduce food waste.

- *Technology-oriented consumers* using online platforms and applications for sustainable food purchases.

3. Channels

- Mobile application stores (e.g., Google Play, Apple App Store)
- Social media platforms for marketing (e.g., Instagram, Facebook, etc.) and newsletters.
- Partnerships with food sustainability organisations
- Blog articles, influencers, and online reviews
- In-store promotion (e.g., butcher shop screens, posters, and announcements inside the stores).
- QR codes on flyers and product packaging for application download.

4. Customer Relationships

- Personalisation of reminders and recipe suggestions based on users' preferences
- Regular updates to enhance user experience and add new features
- Feedback loops through in-application surveys or application store reviews
- Community engagement via social media and newsletters
- Gamification to enhance user participation, awareness, and behaviour change by making sustainable actions more interactive and rewarding

5. Key Activities

- Application development and maintenance
- Regular content updates (e.g., recipes, tips on food management)
- Data collection and analytics for improving features
- Customer support and feedback management
- Integration of the retailer's systems with the application.
- Adaptation of the retailer's systems and store checkouts, including modification of the coding of packaged products.

6. Key Resources

- Development team (e.g., software engineers, UX/UI designers)
- Recipe and food management databases
- Data analytics tools for user behaviour analysis
- Cloud storage for inventory data
- Marketing resources for user acquisition

7. Key Partners

- Recipe content providers
- Sustainability-focused organisations (to raise awareness)
- Partnerships with food retailers or grocery stores for promotional purposes
- Advertisers and sponsorships from eco-friendly brands

8. Cost Structure

- Application development and maintenance costs
- Marketing and user acquisition expenses



- Hosting and data storage costs
- Customer support and feedback management

9. Revenue Streams

- In-application advertisements
- Subscription-based model for premium features
- Partnerships with or sponsorships from eco-friendly brands
- Affiliate marketing through links to suggested products from suppliers
- Greater customer loyalty and new customer acquisition

10. Eco-Social Costs

Environmental:

- Higher carbon footprint due to increased energy consumption.

Social:

- Limited access for individuals without smartphones or stable internet may create accessibility barriers.

11. Eco-Social Benefits

Environmental:

- Reduced food waste through tracking expiration dates and suggesting recipes for soon-to-expire items.

Social:

- Cost savings for consumers through food spoilage reduction
- Increased environmental awareness and community discussions on sustainable practices.

Key Implementation Challenges:

- Digital divide: Not everyone has access to smartphones, or the skills needed to use applications. This means vulnerable groups, such as older adults or lower-income households looking to save money, might be left out due to a lack of devices or reliable internet connection.
- User engagement and retention: Many users download applications but fail to use them long-term. To sustain engagement, the application must be intuitive, consistently useful, and incorporate features like gamification, reminders, or loyalty rewards.

3.10 Advanced logistics and inventory technologies

Belonging to the Prevention class, this model involves the use of First Expired/First Out (FEFO) inventory management to prioritise products with shorter shelf lives, real-time tracking technologies like Radio Frequency Identification (RFID) and Global Positioning System (GPS) to monitor product conditions and enable timely sales or redistribution of near-expiry items, and Artificial Intelligence (AI)-based supply chain optimisation to further enhance efficiency in distributing suboptimal foods to consumers while maintaining freshness.

1. Value Proposition

Minimise food waste and improve product freshness through intelligent inventory management and supply chain optimization, fostering consumer confidence and operational efficiency with enhanced transparency and traceability.

2. Customer Segments

- *Retailers and food service providers* such as grocery stores, supermarkets, and restaurants.
- *Food producers and suppliers* seeking to valorise cosmetically imperfect output through forecasting and inventory management systems.
- *Logistics companies* responsible for the timely and cost-efficient movement of suboptimal food.

3. Channels

- Technology providers that offer digital solutions for inventory management and supply chain optimisation.
- Consulting firms offering expertise in supply chain technology and data analytics.
- Integration with ERP systems used by large retailers
- Direct engagement tools like a dedicated platform or dashboard to monitor performance.

4. Customer Relationships

- Technical support and customer training.
- Consulting services for optimising supply chain and inventory management.
- Transparency and trust in inventory management, including product freshness guarantees.
- Enhanced supply chain integration and coordination with suppliers and logistics providers.

5. Key Activities

- Implementing advanced monitoring technologies (e.g., RFID and GPS tracking) for real-time inventory tracking and management.
- Employing data analytics and AI to forecast demand and streamline operations.
- Implementing First-Expired/First-Out inventory management to prioritise near-expiry items.
- Product assortment optimisation to align supply with demand.

6. Key Resources

- Expertise in inventory and logistics technologies (e.g., RFID, GPS).
- Data analytics and AI capabilities for demand forecasting and assortment planning.
- Advanced logistics and technology infrastructure optimised with real-time tracking.
- Access to real-time market and weather data as a strategic input for demand forecasting.

7. Key Partners

- Technology providers for developing high-tech solutions.
- Retailers as stakeholders for implementing inventory management systems.
- Logistics firms for transportation and storage services provision.
- Food producers and suppliers for aligning supply with demand forecasts.

8. Cost Structure

- Technology development and maintenance costs for implementing RFID, GPS, and AI systems.
- Costs of employee training in advanced inventory and logistics practices.
- Infrastructure costs for logistics and storage facilities.
- Consulting expenses for expertise provision.

9. Revenue Streams

- Increased revenue from optimised sales of perishable food items.
- Reduced logistics and operational costs.

10. Eco-Social Costs

Environmental:

- Higher energy consumption associated with the operation of RFID, GPS, and AI systems.
- Increased environmental impact of technology equipment production.

Social:

- Potential challenges in implementing new technologies and streamlining processes.
- High initial investment costs for implementing high-tech solutions, which may limit accessibility for smaller enterprises.

11. Eco-Social Benefits

Environmental:

- Reduced waste of perishable food items.
- Resource conservation through efficient assortments and logistics.
- Lower carbon footprint, as optimised transportation reduces greenhouse gas emissions associated with supply chains.

Social:

- Enhanced food availability and distribution through better supply chain operations.
- Improved food security for vulnerable consumers

Key Implementation Challenges:

- High initial investment: Implementing advanced systems like RFID tracking, AI-driven demand forecasting, and sophisticated inventory management software entails significant upfront costs, including hardware (tags, sensors), infrastructure upgrades, and system customisation. This can be prohibitive for smaller enterprises.
- Technical and Organizational Complexity: Integrating new technology into existing supply chains constitutes a complex task. Technical issues include interoperability to ensure different systems can work together, maintaining accurate data, and ensuring data protection. Using technology to streamline processes may also require re-engineering existing workflows, leading to short-term disruptions and training needs.

3.11 Social interventions

This model focuses on social interventions such as partnerships between businesses and NGOs, digital platforms linking donors with charities, and municipal-led initiatives. These strategies redirect suboptimal food (e.g., cosmetically imperfect or near-expiry) to reduce both waste and hunger. CSR, often supported by tax incentives or legal frameworks, helps drive food donation efforts. Volunteer-led food banks and student-run projects enhance the reach of food recovery, contributing to systemic, community-based solutions aligned with food justice principles.

1. Value Proposition

Recover and redirect suboptimal foods (aesthetically imperfect or nearing expiration) to address food poverty and reduce waste by leveraging partnerships, digital platforms, municipal initiatives, and community-driven models, while also emphasising local empowerment and solidarity, aligning with food justice principles and building community resilience.

2. Customer Segments

- *Charitable organisations* like NGOs and food banks relying on suboptimal food donations.
- *Vulnerable households and individuals* facing food insecurity.
- *Retailers and food service providers* seeking to manage suboptimal food sustainably.
- *Local governments* facilitating food recovery and redistribution initiatives.
- *Volunteers and community groups* actively participating in food redistribution efforts.

3. Channels

- Direct food distribution through collaborations among businesses and NGOs.
- Digital platforms connecting donors (e.g., supermarket stores) with charities and beneficiaries (i.e., families and individuals facing food insecurity) to manage real-time food redistribution.
- Campaigns promoting volunteer participation and community awareness.

4. Customer Relationships

- Collaborating with businesses, NGOs, and local governments for network building.
- Volunteer participation motivation and food waste awareness raising.
- Using digital platforms for communication and coordination of food redistribution processes
- Establishing mechanisms for stakeholder recognition (e.g., certificates, CSR reports, visibility campaigns).
- Building a community portal to share best practices and success stories, inspiring and sustaining long-term involvement.

5. Key Activities

- Suboptimal food collection, sorting, selection and registration for redistribution.
- Storage and re-packaging of selected food for safer transportation.
- Digital platform development and maintenance
- Volunteer recruitment, training and coordination

- Coordination among stakeholders (e.g., the supermarket stores and the charitable organization) for food recovery and redistribution.
- Marketing campaigns for creating community awareness on food recovery and redistribution.
- Legal and compliance work (e.g., liability and food safety regulations)

6. Key Resources

- Human resources for communication, coordination and sorting.
- Materials for repackaging of the food selected for redistribution.
- Partnerships with the different stakeholders
- Technology expertise for digital platform development.
- Volunteer workforce.
- Logistics infrastructure for storage and transportation.

7. Key Partners

- Retailers and food suppliers for providing suboptimal food.
- NGOs and food banks for food redistribution.
- Digital platform developers.
- Local governments for funding and support.
- Logistics firms for transportation and storage services provision.
- Volunteers and local communities.

8. Cost Structure

- Costs for storage, re-packaging and transportation of redistributed food.
- Digital platforms development and maintenance costs.
- Volunteer recruitment, training, and supervision.
- Administrative costs for coordinating stakeholders.
- Campaign costs for promoting food recovery and redistribution.

9. Revenue Streams

- Government funding for food redistribution initiatives.
- Corporate social responsibility activities and solidarity from private organizations.
- Tax incentives for organisations donating suboptimal food.
- Private grants from foundations, firms, and crowdfunding campaigns.
- Improvement of the organisation's (e.g., supermarket chain) ESG (Environmental, Social, Governance) key performance indicators for sustainability.

10. Eco-Social Costs

Environmental Costs:

- Higher energy consumption for suboptimal food storage and refrigeration.
- Higher carbon emissions due to increased logistics for redistributing food.

Social Costs:

- High dependency on volunteers.
- Effective collaboration among diverse stakeholders can be challenging and resource-intensive.

11. Eco-Social Benefits

Environmental Benefits:

- Food waste reduction through redistribution of suboptimal foods.
- Enhanced conservation of food resources that would otherwise be wasted
- Promotion of sustainable retail practices

Social Benefits:

- Improved food security through providing nutritious food to vulnerable populations.
- Community engagement through volunteer-driven initiatives.
- Enhanced business-community relationships through corporate social responsibility initiatives.
- Increased awareness of food waste and sustainable consumption practices.

Key Implementation Challenges:

- Reliance on volunteers and goodwill: Many food redistribution programs depend heavily on volunteers and donated resources. Potential inconsistent availability of volunteers can disrupt operations. Similarly, food donations might not be steady, sometimes leading to oversupplies or shortages. Maintaining a reliable flow of both food and people could be a challenge.
- Stakeholder coordination: This model involves multiple actors (businesses, NGOs, government agencies, community organisations), often with differing goals, timelines, and legal obligations. Ensuring alignment and trust requires ongoing effort and efficient communication infrastructure.

3.12 Potential synergies among alternative marketing models

The eleven marketing models for suboptimal food valorisation offer significant potential for synergies that can amplify their individual and collective impact.

Pricing/Discount strategies can be paired with the *Recipe Sharing* model. A retailer can use discounts to encourage the purchase and use of suboptimal produce, and simultaneously provide recipe suggestions to ensure those items are consumed. For instance, offering banana-chocolate muffin recipe cards alongside overripe bananas.

The *Recipe Sharing* model can be integrated into the *Mobile Application* to enable real-time personalization, by suggesting recipes based on what users have purchased or what is close to expiry, improving engagement and perceived application utility, as well as reducing household food waste.

Labelling Techniques, such as branded storytelling, can enhance the perceived value of products from the *Value-Added Product Transformation* model, improving consumer acceptance and willingness to pay.

Labelling Techniques can also support the *Pricing/Discount* strategies, where informative labels can highlight the quality of discounted suboptimal foods, reinforcing their value beyond just price.

The *Pricing/Discount* model can be directly synergised with the *Mobile Application*, so that discounted products can be flagged using location-based alerts or in-application coupons, boosting their sales.

Advanced Logistics & Inventory Technologies can provide real-time data to facilitate early identification of near-expiration items, which can directly feed into *Social Interventions*, ensuring efficient supply with demand for donations, and facilitating timely redistribution.

The *Recipe Sharing* model can be integrated with *Preventive solutions*, where educational campaigns can promote the recipe platform as a practical tool for consumers to implement food waste-reducing behaviours.

A supermarket chain, for example, may integrate Pricing/Discount, Mobile Application, and Advanced Logistics & Inventory Technologies. In such a scenario, Advanced Logistics models will form the backbone that provides real-time data on stock levels, and items nearing their expiry date. These systems can use AI to predict demand and identify surplus, signaling which products are most likely to become wasted, with this information being directly fed into Pricing/Discount Strategies. Prices will be dynamically adjusted in real-time to offer appealing discounts on items identified as suboptimal or nearing expiry. The Mobile Application will act as the direct link to the consumer, notifying users about discounts, offering personalized deals, or even providing recipes to help them use the products.

3.13 Scalability, Replicability, and Need for Support

This section assesses the potential of each alternative marketing model to be scaled up or replicated in different contexts, as well as the types of support required to enable that process. The purpose is to determine not only whether the models work in their original context, but also whether they can be adopted by other stakeholders, regions, or supply chain actors under varying conditions.

Scalability refers to the model's ability to expand in scope within the same setting (e.g., expanding partnerships, reaching more consumers), without significant loss of efficiency and effectiveness. *Replicability*, on the other hand, involves the model's capacity to be applied successfully in different geographical (local or national) or organisational contexts, potentially facing different logistical, cultural, or regulatory environments. This assessment is crucial for transforming small pilot interventions into bigger, widespread changes in food waste reduction, informing future implementation pathways, policy recommendations, and innovation scaling strategies within the ROSETTA project. To evaluate the two dimensions, each model was analysed against criteria such as resource requirements, transferability of knowledge, infrastructure dependence, alignment with existing consumer behaviour, and degree of stakeholder coordination needed. Insights were gathered from stakeholder interviews, and co-creation workshops.

The eleven alternative marketing models may follow distinct expansion approaches, depending on market opportunities, community action, or government support. They can be grouped into three broad categories, with some inherently possessing high potential and others requiring more systemic support to succeed beyond their pilot settings.

3.13.1 Market-Driven Scale-Up

Some models have an intrinsic strong business potential and are hence attractive to private organisations. Market-driven scalability tends to accelerate when early adopters show success. For example, Meijer reported a 10% food waste reduction using the Flashfood application³, prompting adoption across other retail chains. Example models include:

- *Value-Added Product Transformation*: Upcycling surplus or cosmetically imperfect produce into saleable products (e.g., juices, sauces) may appeal to startups and SMEs, especially when tied to sustainability branding.

³ <https://www.specialtyfood.com/news-media/news-features/specialty-food-news/meijer-hits-food-waste-reduction-milestone/>

- *Pricing and Discount Strategies:* Already in practice in many retail settings, this model may boost sales of perishable items, requires minimal infrastructure, and is often supported by third-party applications like Too Good To Go.
- *Innovative Packaging and Custom Portion Sizes:* Mainly industry-driven research and development continues to design packaging solutions that extend product shelf life and optimize portioning to minimise waste. These innovations are market-ready and attractive to companies seeking competitive advantage through sustainability and consumer convenience.
- *Mobile Applications:* An application can bundle many functions, from tracking food inventory, to notifying users of discounted items, to suggesting recipes for soon-to-expire items, or even offering a direct donation link. These can also scale through a technology startup model.
- *Advanced Logistics and Inventory Technologies:* These systems are scalable through software vendors and logistics firms providing retailers with solutions for managing food supply chains efficiently.

3.13.2 Community-Led Efforts

Other models are naturally disseminated through NGOs, community organizations, local governments, and informal networks. These are often adaptable and inexpensive but may rely on volunteers and sometimes need initial funding. Open-source tools and digital platforms can significantly improve their reach and effectiveness. These include:

- *Recipe Sharing:* Digital platforms, blogs, and social media allow wide dissemination of content, especially when supported by influencers or non-profit actors.
- *Food Storage Best practices:* These can be implemented by local food cooperatives, municipal services, or volunteer-led initiatives.
- *Community Engagement events:* Events like the “World Disco Soup Day⁴” are low-cost, adaptable, and easily replicated with toolkits⁵ and local support.

3.13.3 Policy-Enabled Scale-Up

Some models require government policy or public sector help to be widely put into practice:

- *Date Label Education & Standardization:* Clarification between “best before” and “use by” dates typically requires legal changes and cannot be implemented by businesses alone.
- *Education Campaigns as Preventive Solutions:* Large-scale campaigns are often best coordinated by governmental agencies focused on health, environment, or food security.
- *Social Interventions:* While many food donations occur voluntarily, their scale and consistency often depend on government support, such as tax incentives, liability protections for donors, or mandated redistribution⁶.

⁴ <https://www.slowfood.com/events/world-disco-soup-day/>

⁵ <https://www.sustainablefoodplaces.org/news/disco-soup-toolkit/>

⁶ https://zerowasteurope.eu/wp-content/uploads/2020/11/zwe_11_2020_factsheet_france_en.pdf



The scalability and replicability of each model also depends on factors such as *Technological Readiness* (e.g., smartphone access and digital skills), *Infrastructure* (e.g., processing facilities, cold chains), and local *Culture*.

The most sustained and scalable impact might come from mixed strategies where businesses, governments, and communities work together. Public funding can help new companies start, while communities ensure local relevance and trust.

4. Conclusions

This report presents the development of eleven alternative marketing models for the valorisation of suboptimal food. The models were constructed using the Sustainable Business Model Canvas framework, enabling an integrated assessment of economic, environmental, and social value creation. This comprehensive approach was informed by empirical insights from stakeholder interviews and focus groups conducted in Task 2.1, literature reviews, and validation from five co-creation workshops, ensuring the models are both theoretically sound and practically relevant. The eleven models offer a robust portfolio of interventions designed to reduce food waste caused by marketing standards. Through targeting critical intervention points along the value chain, they cover a wide spectrum of approaches on three interconnected strategic domains:

- Prevention (helping consumers adopt more sustainable consumption practices by making informed decisions)
- Redistribution (reallocating suboptimal food, which would otherwise go to waste, to produce high-quality, nutritious processed products)
- Social interventions (provide safe and nutritious food for low-income households)

This multi-faceted strategy reflects the complex and systemic nature of food waste. It seeks to prevent waste at its source, recover what cannot be prevented, and shift behaviours to foster long-term change, improving food security, community engagement, and business-community relationships. The implementation of these marketing models aims to generate significant value beyond conventional financial metrics, contributing uniquely to the Triple Bottom Line, encompassing People, Planet, and Profit, as summarised in Table 4.

Table 4: Summary of Triple Bottom Line contributions of the alternative marketing models

Model	Environmental Benefits	Social Benefits	Economic Benefits
Value-Added Product Transformation	Food waste reduction, Resource conservation, Lower GHG emissions, Sustainable farming promotion	Local economic growth, Public health improvement, Employment creation	Increased sales of upcycled products, New revenue streams
Labelling Techniques	Food waste reduction, Resource conservation, Lower GHG emissions	Increased consumer awareness, Enhanced consumer empowerment	Increased sales of suboptimal items
Pricing/Discount Models	Food waste reduction, Resource conservation, Lower GHG emissions	Addressing food poverty, Community empowerment	Increased sales of discounted items, Higher customer retention
Innovative Packaging & Custom Portion Sizes	Food waste reduction (consumer level), Sustainable packaging development	Improved consumer convenience, Enhanced nutrition	Direct sales, Licensing fees
Recipe Sharing for Reducing Food Waste	Food waste reduction (leftovers/overripe)	Cost savings for consumers, Improved public health	Increased sales of ingredients, Enhanced customer loyalty, Sponsored content revenue
Date Label Education & Standardization	Reduced food waste (premature disposal), Resource saving	Cost savings for consumers, Enhanced consumer empowerment	Potential licensing fees, Government/private funding

Food Storage Best Practices	Food waste reduction (extended shelf life)	Cost savings for consumers, Improved public health (safety/hygiene)	Campaign support, Product endorsement collaborations
Preventive Solution (Education & Community Engagement)	Food waste reduction	Enhanced sustainable consumer behaviour, Increased community awareness, Improved local purchasing/nutrition	Sponsorships, Event fees, Grants, Potential sales increase
Mobile Applications	Reduced food waste (tracking/recipes)	Cost savings for consumers, Increased environmental awareness	In-app ads, Premium subscriptions, Affiliate marketing, Sponsorships, Customer loyalty
Advanced Logistics & Inventory Technologies	Reduced waste of perishables, Resource conservation, Lower carbon footprint	Enhanced food availability, Improved food security	Increased revenue from optimized sales, Reduced operational costs
Social Interventions	Food waste reduction, Resource conservation, Sustainable retail practices	Improved food security, Community engagement, Enhanced business-community relationships	Government funding, CSR/ESG KPI improvement, Tax incentives, Grants

The eleven marketing models should not be seen as isolated solutions, since they possess significant potential for synergistic combinations that can amplify their individual and collective impact. For instance, pricing and discount strategies can be effectively paired with recipe-sharing models, where a retailer can use discounts to sell suboptimal produce while simultaneously provide recipe suggestions (e.g., via recipe cards, app notifications, or QR-linked cooking videos) to ensure those items are consumed. This strategy, such as offering banana-chocolate muffin recipes alongside overripe banana sales, not only drives sales but also reinforces the message that imperfect food is valuable.

The scalability and replicability of the models vary, with their progression often following one of three distinct pathways, depending on market opportunities, community action, or government support.

- *Market-Driven Scale-Up* refers to models that exhibit strong business potential and are attractive to private investors and companies. Their scalability is often accelerated when early adopters demonstrate success.
- *Community-Led Efforts* include models which propagate organically through NGOs, community organisations, local governments, and informal networks. These are often adaptable and inexpensive to set up but may rely on volunteers and sometimes require initial funding.
- *Policy-Enabled Scale-Up* encompasses models that require policy support or public-sector facilitation for widespread implementation.

The successful implementation and scaling of these models are also significantly influenced by contextual factors such as Technological Readiness, Infrastructure, and local Culture, which highlights that a "one-size-fits-all" approach is unlikely to succeed, necessitating tailored strategies and local adaptations.

While each marketing model faces unique obstacles, a cross-cutting analysis reveals several barriers to effective food waste reduction. *Consumer Perceptions and Behaviour Change* concerns overcoming of the stigma associated with "ugly" or suboptimal foods, and changing deeply ingrained consumer habits (e.g.,

storage, date label interpretation, discarding leftovers) remains a significant challenge, where misinterpretation of labels, or over-reliance on discounts can inadvertently devalue suboptimal foods or shift waste from retail to the household level. Furthermore, implementing new practices, such as packaging redesigns, advanced logistics, or standardized labelling, requires substantial upfront investment in technology, infrastructure, and training, while gaining widespread adoption necessitates effective coordination among diverse actors (e.g., farmers, processors, retailers, logistics providers, regulators), which may involve complex legal and financial negotiations. The *Digital Divide* presents another significant barrier, as limited access to smartphones or stable internet, coupled with a lack of digital skills, can exclude vulnerable populations, while sustaining user engagement and retention for mobile applications may constitute an issue. Finally, measuring the impact of educational or behavioural change initiatives can be difficult, complicating the efforts to justify their cost-effectiveness or secure long-term funding. Many community-led initiatives also face challenges in maintaining momentum and consistent volunteer availability.

To collectively drive a more sustainable and waste-free food system, businesses and industry stakeholders should prioritise consumer-centric design and communication for suboptimal foods, foster cross-sector partnerships, develop hybrid business models, and embrace integrated technology solutions. Communities and consumers should actively participate in local initiatives, embrace "smart" food consumption, and utilise available digital tools and educational resources to improve food management skills. Finally, policymakers and regulators should adopt policies that harmonise date labelling standards, incentivise sustainable practices and infrastructure investment, and support multi-actor collaboration platforms.

While the development of the alternative marketing models followed a structured, evidence-based, and participatory approach, several limitations should be acknowledged. Although the SBMC provides a comprehensive structure, it may not fully capture the dynamic social, regulatory, and cultural variables that influence the real-world success of such models. Furthermore, the deliverable does not include quantified environmental or economic impacts, which would further strengthen business case scenarios.

Future work should focus on expanding collaboration with policy actors to embed the models into regional or national food waste strategies. Scaling these models should also be supported by policy incentives, open data sharing, and targeted communication strategies to shift consumer norms regarding suboptimal food. Additionally, future research could explore in more depth hybrid or merged models, combining elements from multiple approaches to address overlapping needs.

The results of this deliverable contribute to Task 2.3, which compares the waste reduction objectives of the eleven alternative marketing models developed, with the objectives pursued by marketing standards. They also inform the content of the digital toolkit developed in Task 2.4, where the alternative marketing models will be stored and presented in the form of an online catalogue. Furthermore, the marketing models are directly carried forward into WP3 for the design and operationalisation of pilot experiments (Task 3.1) and the co-selection of solutions (Task 3.2). They are then tested and validated in WP4, where their real-world performance and sustainability are assessed. Finally, the models feed into WP5, supporting the formulation of policy recommendations (Task 5.1) and replication guidelines (Task 5.2), and ultimately contributing to knowledge transfer and practice dissemination (Tasks 5.3 and 5.4).

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