BREADCRUMB

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DELIVERABLE 2.4

Case Study Plans - 3

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D2.4 – CASE STUDY PLANS – 3

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VERSION AND AMENDMENTS HISTORY

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0.1	13/01/2025	Anna Twarogowska, Rani Van Gompel, Sofie De man, Rachel Lemaitre	First draft ready for review
0.2	21/02/2025	Anna Twarogowska, Rachel Lemaitre	The second version after getting feedback and comments from the partners

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LIST OF ABBREVIATIONS

Abbreviation	Description
CS	Case study
D	Deliverable
F&V	Fruit and Vegetables
FMS	Food marketing standards
FSC	Food supply chain
FW	Food waste
GAP	Good Agricultural Practice
ID	Identification
IDI	In-depth Interview
IFS	International Featured Standard
M	Month
NA	Not applicable
T	Task
TBD	To be determined
WP	Work Package

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EXECUTIVE SUMMARY

This document is the final of three Case Study (CS) Plan Deliverables, designed to collect information and facilitate the monitoring process. It helps track progress, challenges, and changes related to key aspects such as supply chain stages, product mapping, objectives, the relevance of food marketing standards (FMS), data collection methods, and the project timeline. To monitor the work of all 16 CSs throughout the run of the T2.2 were asked to update a spreadsheet detailing their CS-related research activities within the project. This effort helped monitor progress toward objectives and facilitated collaboration between CSs—particularly those working on the same food commodities: fish, eggs, cereals, meat, fruit, and vegetables.

The main work of the CSs has been completed, as data collection concluded in October 2024 (M10), and the collected data has been analyzed by CS teams, supporting data processors, and data analysts. Summary reports from this analysis are presented in Deliverable D2.5, titled *"Case Study Estimates of FW Generated Due to Food Marketing Standards."*

This update summarizes the work completed by CSs and the key takeaways from the data collection process. It also highlights the involvement of CSs in other work packages (WPs).

A comparative overview of changes for each CS is provided to track progress against Deliverables D2.3 and D2.4.

More details on the CS Plans, as developed through T 2.2, are provided in the **Annex.** An updated product mapping overview can be found in Annex 2. However, the information in the table on product mapping, including the FW estimates, has not been updated, as the most recent reasoning and data is presented in D2.5.

Annex List :

- **Annex 1: (CS ID)** Contains key information about CS partners, the rationale behind product selection, and relevant food supply chain (FSC) stages.
- **Annex 2 (Product Mapping):** Provides a visual overview of selected food products, detailing FSC stages and regional aspects. It also includes an initial FW estimation to identify high-impact products and assess alignment with later results.
- **Annex 3 (CS Objectives):** Outlines research objectives, supporting CS partners in tracking progress and identifying common goals and differences across CSs.
- **Annex 4 & 5 (FMS Overview):** Annex 4 provides an overview of relevant FMS per CS, while Annex 5 categorizes FMS by commodity type.
- **Annex 6 (Data Methodology):** Lists all data collection methods used per CS.
- **Annex 7 (Timeline):** Provides an overview of data collection schedules.

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1 INTRODUCTION

1.1 BREADCRUMB Project Summary

As outlined in the Grant Agreement, the BREADCRUMB's goals are as follows: **"BREADCRUMB** aims to provide an **empirical evidence-based understanding of the purpose and nature of food marketing standards** and **their impact on Food Waste** *(FW)* **generation**, to propose **interventions that balance the objectives of reducing FW and other objectives of standards, and to help food chain actors increase the business potential of suboptimal foods".** (Grant Agreement, Part B, p.3/41)

The Grant Agreement defines the following **procedure** for the project: "(i) establish a holistic view of marketing standards and identify those with key relevance to FW generation; (ii) create evidence-based estimates of FW generated as a consequence of marketing standards; (iii) provide solutions that alleviate the negative impacts of marketing standards to FW, based on a valid understanding of the underlying mechanisms of FW generation and trade-offs with other objectives (re-balancing marketing standards); (iv) enhance the business potential of "sub-optimal" foods; (v) inform and guide food businesses, consumers, owners of standards and policy regulators on how to prevent/reduce FW related to marketing standards" (Grant Agreement, Part B, p.7/41) (Figure 1).

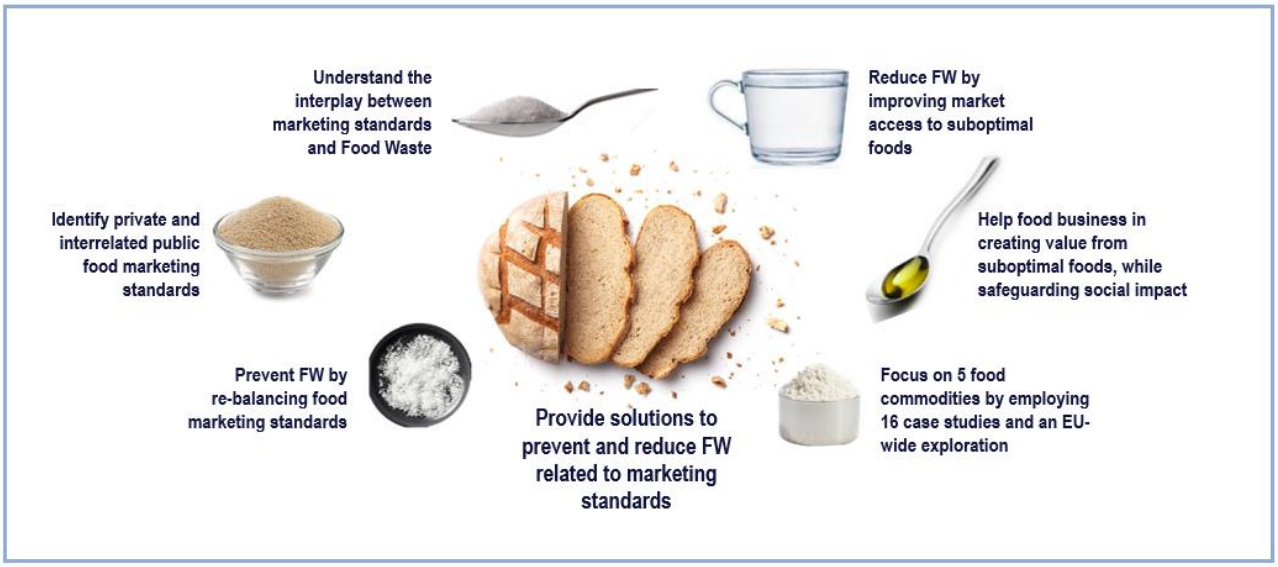

Figure 1: BREADCRUMB project at a glance (source: Grant Agreement, part B. pg5)

To achieve the goals and adhere to the project's methodological approach, BREADCRUMB will **utilise existing research** connecting marketing standards and FW, **create new evidence** on the impact of marketing standards on FW, **employ advanced modelling methods** to develop solutions that integrate behavioural and economic theories, **use research findings to assess the business potential of non-optimal but still edible food**, and incorporate research outcomes into **innovative products** (Grant Agreement, Part B, p.7/41) (Figure 1).

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1.2 Goals and Report Structure

This report focuses on Task 2.2, which outlines the planning, monitoring, and interaction of the case studies (CSs). This task is integral to the further development of T2.3, T2.4, WP3, and WP4, where data from these CSs will be analyzed and expanded upon.

In this report, D2.4: Case Study Plans-3, we update D2.3: Case Study Plans-2 This update is the third and last of the planned updates. In this update we will reflect on changes in the planning mainly related to product mapping due to challenges faced during the data collection. We will also reflect on the work done and the future, indicating the involvement of CS partners in other work packages, such as WP3 and WP4, which work goes beyond February 2025.

This report is organized into six main sections: **(1) Introduction, (2) Case Studies in General, (3) Insights into changes from previous Case Study Plan, (4) Reflection on work done, (5) Future work and (6) Conclusion.** In the **Annex**, more detailed information for each CS are outlined.

1.3 Interacting with Case Studies and Monitoring Process

As CS Coordinators, ILVO has established effective communication channels and monitoring mechanisms to ensure the progress of the CSs. A comprehensive plan was implemented to interact with and monitor CSs to facilitate their progress and address any challenges they encounter. To achieve this, we hold monthly meetings, which take place on the first Monday of each month. The meetings are split into two groups to ensure focus and productivity. Group 1 consists of CSs in the egg, fish, and meat sectors, while Group 2 comprises CSs in the fruit, vegetable, and cereal sectors. Each sector meeting lasts for 1.5 hours, allowing for updates, challenges, and relevant issues to be discussed within the respective sectors.

To encourage interaction between different CSs, we organize a ‘tour the table’ in each monthly meeting, allowing the case studies to give an update as well as to ask questions to enrich the discussion. These sessions enable the CSs to discuss progress, challenges, and ideas within smaller groups, promoting collaboration and knowledge exchange. These meetings provide a platform for comprehensive updates from coordinators, WP participants, and CSs, and foster discussions among CS partners across the sectors. Our meetings serve as a crucial part of our monitoring plan. By having regular interactions and updates, we can monitor the progress of individual CSs and identify any areas requiring additional support or intervention.
As the work of the CS partners in WP2 concludes, these monthly meetings will no longer continue from January 2025. However, open communication with CS partners is maintained. Should WP3 or WP4 require assistance in engaging with the CS partners, ILVO, as WP2 lead, will provide support. Additionally, if the CS partners need personalized support or face significant challenges, ILVO is available for one-on-one meetings upon request or whenever a more tailored approach is deemed necessary.

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The CSs' work for WP2 is complete as of February 2025 (M14). However, the CSs' input will still be needed for WP3, led by UNIBO, where the chosen CSs will play a crucial role in validating the model components, interactions, and the plausibility of the final scenarios. Additionally, the CSs will play a role in WP4, led by AINIA, where their input will be used to improve market access and business potential for suboptimal food. One task, T4.1 will focus on consumer acceptance and segmentation of suboptimal foods, scheduled between July 2025 and January 2026 (M19-M24). Another task, Task 4.4, will focus on marketing cues and how to change consumer attitudes toward suboptimal foods (January - September 2026 (M25-M33)). The CSs need to join meetings about these tasks to work together effectively.

2 CASE STUDIES IN GENERAL

In BREADCRUMB we investigate five distinct food commodities: cereals, fruit & vegetables, fish, meat, and eggs (Figure 2). This exploration is conducted through 16 diverse CSs, each serving specific purposes:

- **Informing on FMS**: BREADCRUMB aims to provide comprehensive information on both private and Member State FMS associated with the identified food commodities.
- **Estimating FW, as well as estimating FW due to FMS:** The project seeks to estimate the extent of FW caused by these FMS, contributing valuable insights into the associated wastage.
- **Analysing trade-offs:** BREADCRUMB endeavours to shed light on the trade-offs between FW reduction and other objectives linked to FMS, offering a nuanced perspective on the challenges and benefits.
- **Supporting model development and validation**: The CSs play a crucial role in supporting the development of agent-based and economic models. Additionally, they contribute to the validation of these models by providing real-world data and scenarios.
- **Co-creating recommendations**: BREADCRUMB actively engages in a collaborative process to co-create recommendations. These recommendations are geared towards preventing FW attributable to FMS and promoting increased market access for suboptimal foods.

Through this multi-faceted approach, BREADCRUMB aims to generate an understanding of the complexities surrounding FMS across these five commodities. The project strives not only to uncover challenges but also to collaboratively devise effective solutions for reducing FW and enhancing market access in the context of diverse food products.

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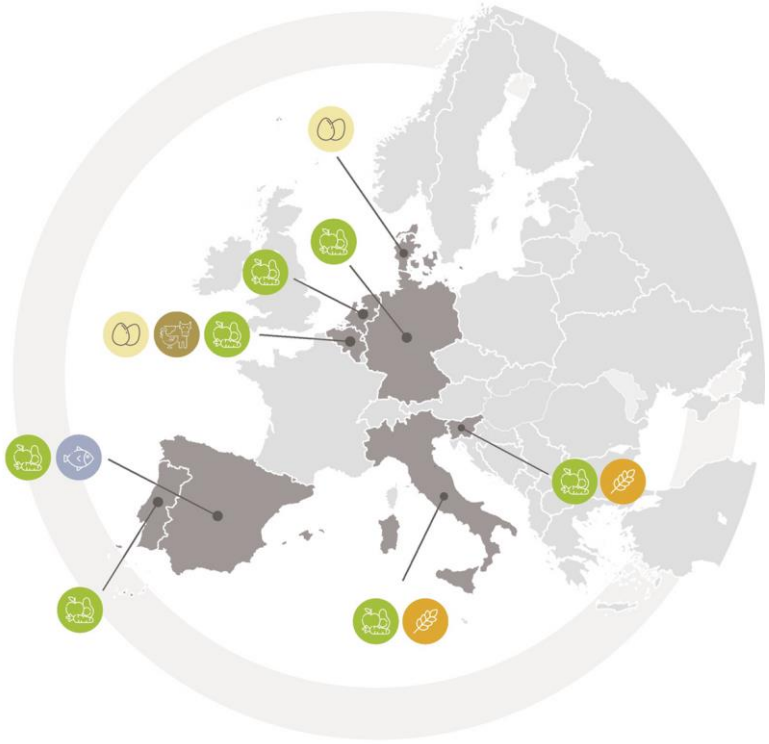

Figure 2: Geographical representation of the five food commodities

Table 1 provides an overview of the different CSs and their assigned codes.

Tabel 1 Overview of cases with their codes (for more information see part 3: insights into changes)*

Food commodity	Name and country	Code
Cereals	Natura Nuova – Italy	C.CS1.NN-IT
	Vila Natura – Slovenia	C.CS2.VN-SI
Eggs	LANDBURG AND FODEVARER – Denmark	E.CS1.LF-DK
	ILVO/ AVEC – Belgium_Europe (*)	ECS2.AVE_EU
Fish	OPPPB – Spain	F.CS1.Opp-ES
Fruit & Vegetables	Natura Nuova – Italy	F&V.CS1.NN-IT
	MC-MCH - Portugal	F&V.CS2.MC-PT
	Zelena Tocka – Slovenia	F&V.CS3.ZT-SI
	Mensana – Slovenia	F&V.CS4.Men-SI
	Lehman Natur- Germany	F&V.CS5.LN-DE
	Anecoop – Spain	F&V.CS6.Ane-ES
	ILVO – Belgium	F&V.CS7.ILVO-BE
	ILVO – the Netherlands	F&V.CS8.ILVO-BE_NL
Meat	FENEVIAN - Belgium	M.CS1.FEN-BE
	AVEC – Belgium_Europe	M.CS2.AVE-BE_EU
	FEBEV - Belgium	M.CS3.FEB-BE

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3 INSIGHTS INTO CHANGES FROM THE PREVIOUS CASE STUDY PLANS

3.1 Overview of changes

The adjustments conducted from October 2024 (M10) to February 2025 (M14) were primarily driven by the challenges faced by the CSs during the data collection process. These adjustments were mainly related to the chosen product or the stage of the FSC. Some of the CSs enhanced their data collection process by incorporating additional internal data. Additionally, to address the exclusion of certain products, they conducted extra interviews regarding other products or stages within the FSC. Most of the changes were dictated by the unavailability or unwillingness of participants to engage in interviews and surveys. This section details the changes implemented by CSs.

3.1.1 Cereals

Natura Nuova – Italy (C.CS1.NN-IT)

- Added soft wheat, wheat flour, corn, and soy to data collection.
- Excluded seitan, tofu, tempeh from data collection.
- Excluded distribution and retail from their data collection.

Vila Natura – Slovenia (C.CS2.VN-SI)

- Specified their product list, such as organic cereals (oat, wheat, spelt, barley), processed cereals (oat flakes, wheat flour, spelt flour).
- Added corn and pasta to data collection.
- Removed retail from the data collection.

3.1.2 Eggs

LANDBURG AND FODEVARER – Denmark (E.CS1.LF-DK)

- No changes

AVEC – Belgium_EU

***** Since AVEC primarily operates in the poultry meat sector and is not actively involved in the egg sector, its participation in this CS could potentially create a conflict of interest in certain circumstances. As a result, data collection for this CS was conducted at a later stage after excluding the scenario of conflict of interest. ILVO supported AVEC with the data collection process.

- AVEC and ILVO reached out to multiple egg producers and processors, including packaging stations across Belgium, the Netherlands, and Italy, and have planned and conducted the interviews to collect the data that will be used in further work of WP2.

3.1.3 Fish

OPPPB – Spain (F.CS1.Opp-ES)

- Added the data from retail for sardine, anchovy, fish and seafood.

3.1.4 Fruit and vegetables

Natura Nuova – Italy (F&V.CS1.NN-IT)

- Added fresh apples, pears, apricots, peaches, and plums to data collection.
- Added canned, dried fruit and smoothies to data collection.
- Removed retail from the data collection.

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MC-MCH – Portugal (F&V.CS2.MC-PT)

- Eliminated food service from the data collection.
- Removed bananas from data collection.
- Added apples and pears to data collection.

Zelena Tocka – Slovenia (F&V.CS3.ZT-SI)

- No changes

Mensana – Slovenia (F&V.CS4.Men-SI)

- Removed carrots and bell peppers from data collection.
- Added pumpkin Hokkaido, cabbage, and turnip to data collection.
- Focused on primary production, processing, and food service in data collection.

Lehman Natur- Germany (F&V.CS5.LN-DE)

- Added internal data from complaints and return

Anecoop – Spain (F&V.CS6.Ane-ES)

- Eliminated distribution and retail from their data collection.

ILVO – Belgium & the Nederlands (F&V.CS7.ILVO-BE ;F&V.CS8.ILVO.BE_NL)

- No changes

3.1.5 Meat

Fenavian – Belgium (M.CS1.Fen-BE)

- Added sausage and pate and others *(ready meals, head products, sliced raw salty products, beef fillet, meat loaf)*
- Added primary production, retail & other distribution stages of the FSC to data collection.

Avec – Belgium (M.CS2.AVE-BE_EU)

- Added processed products to data collection
- Added stages of primary production and retail to data collection.

Febev – Belgium (M.CS3.Feb-BE)

- Added fresh meat, meat preparations, mechanically separated meat, by-products
- Added stages of primary production and retail of FSC

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3.2 Summary of changes throughout CSs work

To offer a clearer and more comprehensive view of the CS Plans, we have created Table 2, outlining the key changes between CS Plans - 2 and CS Plans - 3.

Tabel 2 Overview of the changes that were implemented by CSs in CS Plans -2 and CS Plans -3.

Case Study	Changes in Case Study Plans -2	Changes in Case Study Plans -3
Natura Nuova – Italy (C.CS1.NN-IT)	- New objective for valorizing suboptimal food. - Started interviews and surveys early. - Included estimated %FLW.	- Added soft wheat, wheat flour, corn, and soy. - Excluded seitan, tofu, tempeh. - Excluded distribution and retail.
Vila Natura – Slovenia (C.CS2.VN-SI)	- Added retail and food service to FSC stages. - Removed IT tools for data collection.	- Specified product list (organic cereals: oat, wheat, spelt, barley). - Added processed cereals (oat flakes, wheat flour, spelt flour). - Added corn and pasta. - Removed retail.
LANDBURG AND FODEVARER – Denmark (E.CS1.LF-DK)	- Excluded surveys. - Included packing stations to FSC stages. - Provided estimated %FLW for eggs.	- No changes
AVEC – Belgium _EU	- Excluded due to possible conflict of interest. - ILVO will help collect data	- Conducted interviews and gathered data for the egg sector from producers and processors, including packaging stations.
OPPPB – Spain (F.CS1.Opp-ES)	- Added shrimp and bogue. - Included food service stage to FSC stages. - Added estimated %FLW.	- Added retail data for sardine, anchovy, fish, and seafood.
Natura Nuova – Italy (F&V.CS1.NN-IT)	- New objective for valorizing suboptimal food. - Removed focus groups. - Started interviews early.	- Added fresh apples, pears, apricots, peaches, plums. - Added canned, dried fruit, and smoothies. - Removed retail.
MC-MCH – Portugal (F&V.CS2.MC-PT)	- Removed processing and household from FSC stages. - Excluded surveys. - Started interviews early.	- Eliminated food service. - Removed bananas. - Added apples and pears.
Zelena Tocka – Slovenia (F&V.CS3.ZT-SI)	- Removed broccoli, cauliflower, carrot, pepper, pears, nectarines, peaches, and banana from the product mapping and added potato and onion. - Excluded households from FSC stages. - Removed IT tools.	- No changes

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Mensana – Slovenia (F&V.CS4.Men-SI)	- Removed pears, nectarines, peaches, bananas, and mandarins from the product mapping. - Added Primary Production, Processing & Manufacturing; Retail & other distribution - Removed IT tools.	- Removed carrots and bell peppers. - Removed carrots and bell peppers. - Focused on primary production, processing, and food service.
Lehman Natur-Germany (F&V.CS5.LN-DE)	- Delayed questionnaire development.	- - Collected additional internal data from complaints and retour
Anecoop – Spain (F&V.CS6.Ane-ES)	- Started interviews early.	- Eliminated distribution and retail.
ILVO – Belgium & the Netherlands (F&V.CS7.ILVO-BE; F&V.CS8.ILVO.BE_NL)	- Conducted interviews early.	- No changes
Fenavian – Belgium (M.CS1.Fen-BE)	- Added interviews for pre-processed meat.	- Added sausage and pate and others *(ready meals, head products, sliced raw salty products, beef fillet, meat loaf).* - Added primary production, retail & other distribution stages of the FSC to data collection.
Avec – Belgium_Europe (M.CS2.AVE-BE_EU)	- Added estimated %FLW and FW per year.	- Added processed products to data collection - Added stages of primary production and retail to data collection.
Febev – Belgium (M.CS3.Feb-BE)	- Added estimated %FLW. - Adjusted timeline for interviews and surveys.	- Added fresh meat, meat preparations, mechanically separated meat, by-products. - Added stages of primary production and retail of FSC.

More details on the CS Plans, as developed through T 2.2, are provided in the **Annex.** An updated product mapping overview can be found in Annex 2. However, the information in the table on product mapping, including the FW estimates, has not been updated, as the most recent data is presented in D2.5.

- **Annex 1: (CS ID)** Contains key information about CS partners, the rationale behind product selection, and the supply chain stages analyzed.
- **Annex 2 (Product Mapping):** Provides a visual overview of selected food products, detailing value chain stages and regional aspects. It also includes an initial food waste (FW) estimation to identify high-impact products and assess alignment with later results.
- **Annex 3 (CS Objectives):** Outlines research objectives, supporting CS partners in tracking progress and identifying common goals and differences across CSs.
- **Annex 4 & 5 (FMS Overview):** Annex 4 provides an overview of relevant FMS per CS, while Annex 5 presents FMS by commodity type.
- **Annex 6 (Data Methodology):** Lists all data collection methods used per CS.
- **Annex 7 (Timeline):** Provides a timeline that includes an overview of data collection schedules.

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4 REFLECTION ON WORK DONE

4.1 Data collection

From October 2024 (M10) to February 2025 (M14), CSs concentrated on completing critical tasks in the data collection phase. These tasks included uploading anonymized and cleaned interview transcripts to the BREAECRUMB project SharePoint and finalizing the reporting template for interviews. Additionally, CS teams collaborated closely with assigned data analysts to produce comprehensive summary reports, highlighting key findings and insights from the data. The final reports are discussed in D2.5. Table 3**Fout! Verwijzingsbron niet gevonden.** provides a detailed summary of the data collection methods. All CSs delivered their work on time, with any deviation from D2.3: CS Plans - 2 duly communicated. Complete tables with methods used by CS in the process of data collection can be found in Annex 6.

Tabel 3 Data Collection Summary by Case Study

Food commodity	Case Study	Data Collection Technique	
		Qualitative (IDI)	Quantitative (Survey)
Cereals	Natura Nuova (NN)	5	NA
	Vila Natura (VN)	5	NA
Eggs	Landbrug & Fodevarer (LF)	5	NA
Fish	OPPPB	5	NA
Fruits and vegetables	Natura Nuova (NN)	7	NA
	MC / MCH	8	NA
	Zelena Tocka (ZT)	16	NA
	Mensana	11	NA
	Lehman Natur (LN)	6	NA
	ANECOOP	8	NA
	ILVO – BE	5	NA
	ILVO – NL	5	NA
Meat	FENAVIAN	3	11
	AVEC	3	9
	FEBEV	4	19
Total		**96**	**39**

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4.2 Key findings

In this section, key results from the CS analysis and sense-making reports are presented. These outcomes highlight the impact of public and private FMS on FW generation. A comprehensive summary and discussion of the findings can be found in D2.5.

4.2.1 Cereals

Natura Nuova – Italy (C.CS1.NN-IT)

- Most public FMS in the cereal sector are intended to preserve the safety of the product, with no public FMS related to aesthetic characteristics identified.
- Private FMS primarily focuses on enhancing or enforcing stricter safety standards for products, though some also address quality and aesthetic criteria.
- Products not compliant with FMS are either being wasted or being repurposed for animal feed (with an economic loss).

Vila Natura – Slovenia (C.CS2.VN-SI)

- Variations in FW across cereals are influenced by compliance with private buyer-imposed FMS (e.g., Global GAP, protein content, cleanliness, and moisture levels) and public regulations (e.g., Gand Slovenian Cereals Quality Regulation).
- The most common reasons for FW include strict compliance with protein thresholds, moisture content, and cleanliness standards, all of which are heavily influenced by private FMS, whereas public FMS play a minor role in FW generation.
- Products failing FMS requirements are primarily sold for animal feed.

4.2.2 Eggs

LANDBURG AND FODEVARER – Denmark (E.CS1.LF-DK)

- The apparent consensus is that the FMS do not significantly contribute to FW; what is classified as waste primarily involves eggs that do not meet safety or saleable quality regardless of FMS (e.g. leaks, cracks, red spots on the eggs).
- Downgraded eggs (i.e. class B) cannot be sold in retail stores but are used for making egg products (e.g. bakery products), thus minimizing FW.
- However, there is a pressing need for industry dialogue on revising standards (e.g. washing of eggs, use of eggshells, shelf life) that could allow for greater flexibility in how egg products are categorized and marketed, ultimately minimizing FW and enhancing utilization.

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4.2.3 Fish

OPPPB – Spain (F.CS1.Opp-ES)

- Public FMS aim to enhance food safety, FSC efficiency, and sustainable natural resource exploitation, with legal frameworks addressing aspects such as legal sizes, minimum freshness, mandatory traceability and labelling, cold chain requirements, regulation of maximum quotas.
- Private FMS often build on public FMS, prioritizing shelf life and food safety by optimizing freshness, temperature, avoiding additives, while also promoting efficiency and sustainability through traceability, geographical origin, and preferences for size and species.
- Revalorisation of fresh fish is difficult due to short shelf life and logistic difficulties.

4.2.4 Fruit and vegetables

Natura Nuova – Italy (F&V.CS1.NN-IT)

- Primary producers do not measure FW as it is primarily presented by left-on-field products during harvesting.
- Distributers are generally reluctant to share FW estimates and tend to claim they do not generate FW.
- Stringent private FMS place additional demands on supply chain actors to meet specific criteria, increasing the risk of product rejection and FW generation.

MC-MCH – Portugal (F&V.CS2.MC-PT)

- Adhering to private FMS is often motivated by the need for market access and retailer requirements.
- Several companies reported significant FW due to strict public and private FMS. However, through careful planning, alternative solutions to valorise sub-optimal products and investing in appropriate varieties to meet client requirements, they manage to reduce FW.

Zelena Tocka – Slovenia (F&V.CS3.ZT-SI)

- The most common reasons for FW across the products discussed are tied to appearance, shape, quality, and freshness requirements enforced by public FMS, especially at the primary production and retail stages.
- During processing of F&V, FW occurs mainly due to operational inefficiencies, not FMS.

Mensana – Slovenia (F&V.CS4.Men-SI)

- FW at primary production stage is primarily driven by stringent public FMS focusing on appearance, size and freshness. Non-compliant products are often discarded, left on the field or diverted to secondary uses such as animal feed or composting. In contrast, during processing, FW stems mainly from operational inefficiencies rather than FMS.

Lehman Natur- Germany (F&V.CS5.LN-DE)

- Retailers generally specify complaints and food rejections in a relatively vague manner, without specific reference to any public or private FMS.
- Strict criteria and customer expectations across various products lead to high rates of rejection and spoilage complaints, significantly contributing to FW.

Anecoop – Spain (F&V.CS6.Ane-ES)

- Percentages of FW are influenced by various factors, including weather conditions, pest incidence and logistical challenges in allocating “ugly” fruit to the juice industry or selling second-grade categories.
- Strict retail-driven FMS result in high implementation costs and downgrading fruit to second category, causing significant fruit loss and reduced profitability. All respondents indicate that FMS, particularly

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private ones, are too strict and suggest the EU should educate consumers about buying "ugly" fruit through advertising campaigns.

ILVO – Belgium (F&V.CS7.ILVO-BE)

- Belgium has a strict auction system for fruit and vegetables. Around 85% of the strawberries are sold via the clock, while berries are only 5% sold via the clock. In a demanding market, that makes berries a free product to share and more attractive in promotions at the retail level.
- The public FMS (e.g., regulation 543/2011) set the baseline, while retail requirements often necessitate stricter private FMS. Each retailers uses different add-ons of these private FMS, which focus on social or environmental aspects. The most important private FMS are IFS and global GAP.
- Breaks in the cold chain during transport, particularly in air-freighted items such as asparagus or beans, frequently lead to spoilage. Products exposed to improper temperatures lose shelf life and face higher rejection risks.

ILVO - the Netherlands (F&V.CS8.ILVO.BE_NL)

- Rejection of vegetables produce occurs at various stages in the food supply chain, often driven by cosmetic standards, retail demands, and logistical constraints.
- Public FMS sets the baseline, while private FMS are stricter because of retailer requirements. The add-ons of these private FMS are more focused on social and environmental aspects.

4.2.5 Meat

FENAVIAN – Belgium (M.CS1.FEN-BE)

- Companies adhere to various public (e.g., regulation 1308/2013) and private (e.g., BRC, IFS) FMS, which focus on food safety, quality, and traceability. These FMS are critical for market access and reputation but add significant costs.
- Compliance with stringent FMS often results in FW, particularly during production transitions.
- The most common method for managing FW is its use in animal feed

AVEC –Belgium_Europe (M.CS2.AVE-BE_EU)

- Both public and private FMS are extensively implemented across the poultry sector, safeguarding food safety, quality, and sustainability. While this compliance is vital for market access, it also results in increased costs and complexity.
- Adhering to specific FMS leads to FW, particularly when stringent FMS are in place. Practices like downgrading rejected products or selling them at reduced prices are common methods, yet they often result in inefficiencies.

FEBEV – Belgium (M.CS3.FEB-BE)

- Compliance with both public and private FMS are important for market access. While combining multiple FMS broadens reach and aligns with diverse consumer quality and safety expectations, it also increases costs, logistical challenges, and product downgrading, thus raising FW.
- FMS often lead to product downgrading due to additional criteria which reduces marketability. Strict regulatory requirements and delays in food safety testing further contribute to FW.

4.3 Challenges and limitations

Once data collection was completed, each CS was asked to present the challenges and limitations they encountered during the process. These are mostly related to participant motivation, data quality, and the clarity of data definitions. First, CSs indicated that motivation to participate in interviews, fill out surveys and share data was limited. Contributing factors include timing of the data collection (during the summer period), the

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length and complexity of the surveys (such as subject matter/context of the project), no direct return on investment upon participation, and a reluctance to share FW data. Additionally, FW is not considered a priority for certain companies, which in turn diminishes the interest in tracking and reporting FW data. Moreover, when data regarding FW was provided, many companies lacked precise information or a clear understanding of the causes of FW. This made it challenging to determine the extent to which FW could be attributed to certain FMS.

Several limitations regarding the quality of the collected data were addressed by the CSs. A key concern was the reliance on self-reported data, which may introduce various biases to the obtained data. For instance, some producers claimed to have no FW, raising questions about whether this topic is considered sensitive. Respondents may provide answers they believe are expected or socially acceptable, rather than accurately reflecting their actual practices. Alternatively, such claims may highlight a misalignment between the definition of FW within the BREADCRUMB project and how it is perceived by industry actors, as it was observed that certain ambiguities in the phrasing of the questionnaire led to challenges in interpretation. Specific questions, such as those regarding "subsequent distribution for human consumption" or "quantity sold according to standard," were difficult to understand, which may have further hindered the accuracy of the responses. A significant effort was required to ensure stakeholders fully understood the objectives and context of the BREADCRUMB project.

Furthermore, one CSs also noted that language barriers in interview transcriptions could have influenced the quality of the collected data. Overall, these limitations resulted in incomplete or less reliable data, thus not being able to evaluate the full impact of FMS on FW. Nevertheless, the collected data provides a valuable insight into current FMS and FW estimates across various food commodity sectors.

4.4 Practical recommendations for future case study data collection

- **Define the common goal of CS data collection**: It is vital to ensure clear communication between CS and adherence to a shared conceptual framework to maintain consistency and clarity across CS and non-CS project partners. Definitions, key terms and goals must be explicit and understandable to all parties involved. If possible, focus on one objective and don't try to gather too much data.
- **Link data collection method(s) to objectives**: To ensure the effectiveness and relevance of data collection, it is essential to align the chosen methodology with the research objectives. For exploratory research, qualitative methods like in-depth interviews are most suitable, whereas quantitative methods like simplified surveys are preferable to test specific hypotheses.
- **Make surveys less dense and simplify expectations**: Ensure that questionnaires are concise and easy to complete, focusing on the most essential questions that align with the research goal. Clearly communicate what is required from the respondents to minimize the perceived complexity.
- **Optimal timing for data collection**: Within this project, data collection during summer months resulted in a low response rate and difficulties in motivating participants to share data and complete interviews. Therefore, it is crucial to take into account the industry specific timelines and avoid high-demand seasons.
- **Identifying the appropriate profile of respondents**: It's important to acknowledge that not everyone has access to the information required for the research. Some interviewees lacked comprehensive knowledge regarding FMS, resulting in less reliable data. Future efforts should prioritize consulting duality department experts to enhance data quality and adopting a more personal approach. For instance, encourage potential respondents to forward the questionnaire or interview invitation via email to others who might have the necessary knowledge.
- **Aligning data cleaning and analysis with research objectives**: Adequate time must be allocated for the data cleaning and analysis process, ensuring it aligns with the overarching research objectives. Standardized procedures for these steps across all CS partners facilitate seamless integration of data

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later on. This consistency enhances the reliability and validity of the data, supporting the overall project structure and coherence.

5 FUTURE WORK

The CS partners' work for WP2 concludes in February 2025 (M14) with the submission of reports detailing the data collection process. However, their involvement in the project will continue, as their knowledge and expertise remain essential for the activities in Work Packages 3 (WP3) and 4 (WP4).

In WP3, the CS partners will play a pivotal role in validating model components, interactions, and the plausibility of final scenarios. Their input will be particularly critical for T 3.2, which focuses on modeling the interactions between FMS and FW generation, as well as T 3.3, which examines the trade-offs between reducing FW and achieving other objectives. Both tasks are scheduled to begin in March 2025 (M15) and conclude in November 2025 (M23). The CS partners' insights will also be vital for T 3.4, which aims to develop and evaluate alternative solutions to mitigate the negative effects of FMS on FW while balancing trade-offs. T 3.4 will commence in November 2025 (M23) and conclude in September 2026 (M33).

In WP4, the CS partners will contribute to efforts aimed at improving market access and business opportunities for suboptimal food. Their involvement will be crucial for several tasks, starting with Task 4.1. The selection of products in each category to be studied will be based not only on Task 1.4 but also on insights from D2.3 and 2.4. Consequently, collaboration with the CS partners will be necessary to validate conclusions on product selection. Their input in Task 4.1 will be invaluable, as they possess the deepest knowledge of their respective products. In addition to their role in Task 4.1, the CS partners will play a key role in consumer acceptance and segmentation tasks under Task 4.2, scheduled between July 2025 and December 2025 (M19–M24). They will also contribute to Task 4.4, which focuses on designing marketing strategies to shift consumer attitudes toward suboptimal foods. Active participation in meetings and collaboration across these tasks will be vital to achieving the objectives of WP4 and ensuring the effective integration of suboptimal foods into the market.

This continued involvement of the CS partners ensures a seamless transition from data collection to model validation and strategy development, supporting the overarching goal of reducing FW and fostering sustainable food systems.

6 CONCLUSION

D2.4 marks the final iteration of the CS updates, summarizing the progress and refinements made throughout the project. While not significantly different from D2.3, this report provides further detail on the second egg CS (ECS2.AVE_EU) and notes the adjustment of data gathering in some CSs (part 3). Data collection has now been completed, and the gathered information is being processed and analysed. Results of these analyses will be presented in D2.5 and D2.6, providing deeper insights into the impact of FMS on FW in the different commodities. This deliverable reflects the culmination of the CS work in WP2, laying the groundwork for future analyses and ensuring a seamless transition to upcoming tasks in WP3 and WP4. The lessons learned during this phase will guide continued efforts to reduce FW and explore strategies for sustainable food systems.

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7 ANNEX

7.1 Annex 1: Case Study ID

Within the project, we are currently managing a total of 16 CSs, of which 15 are operational, as outlined in Section 3.1.2 regarding eggs. These CSs include two focused on cereals, one dedicated to eggs, one on fish, eight covering fruits and vegetables, and three related to meat.

Tabel below offers a comprehensive overview of the BREADCRUMB CSs, detailing key information such as the name, website, location, primary contacts, the rationale for each CS, and the relevant stages of the FSC. This summary serves as a valuable resource for our project partners, facilitating efficient communication and providing insights into our collective efforts to reduce FW.

Cereals	
C.CS1.NN-IT	
Case study information	Name: NATURA NOUVA Website: Home - Natura Nuova (natura-nuova.com) Location: Italy
Logo	
Primary contact	Simone Prospero
Rationale of the case study	The choice of products included in the product mapping is due to their fresh nature compared to other cereal-based products produced by NN. The short shelf life of these products (3 weeks to 1 month) poses a problem in meeting retailers' demands for the remaining shelf life of the product when delivered to the supermarket. These standards oblige NN to deliver the product almost immediately after production; batches that have a residual shelf life that allows them to be sold in full, but do not meet the retailer's standard, are often rejected. This translates into important economic impacts for the company, and in cases where products cannot be donated to social canteens, also into environmental impacts.
Stage(s) of the value chain where food waste occurs	Processing & Manufacturing Retail & other distribution (wholesale)
C.CS2.VN-SI	
Case study information	Name: VILA NATURA Website: Vila Natura - Bio dobrote iz prleške ravnice (vila-natura.si) Location: Slovenia

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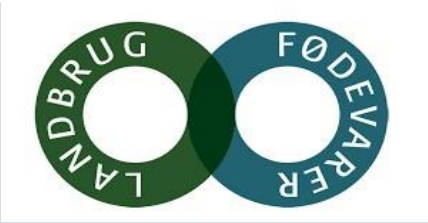
Logo	
Primary contact	Marko Slavic Sasa Straus
Rationale of the case study	Quantities do not contribute significantly to the economic losses, but as we are also farmers, we do not like to see the product go to waste, so we want to reduce FW as much as it is possible.
Stage(s) of the value chain where food waste occurs	Primary production Processing & Manufacturing Retail Food service
Eggs	
E.CS1.LF-DK	
Case study information	Name: LANDBURG AND FODEVARER Website: Landbrug & Fødevarer (lf.dk) Location : Denmark
Primary contact	Jørgen Nyberg Larsen
Logo	
Rationale of the case study	L&F is part of the egg commodity. We provide insight and data on the FMS used in the egg sector in Europe (EU). We would like to analyse FW to document that the waste due to handling of this edible product along the chain and due to the EU FMS is as low as we think, as well as to propose alternatives to reduce the FW and put a higher value to the products in question by increasing valorization. Look at the potential of the rejected products due to FMS. We have chosen to focus on the supply chain on the stage from the barn to the processing (egg packing station) /egg product factory.
Stage(s) of the value chain where food waste occurs	Primary production Processing Packing station

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ECS2.AVE_EU	
Case study information	Name: AVEC Website: Association of Poultry Processors and Poultry Trade in the EU countries (avec-poultry.eu) Location: Belgium Name: ILVO Website: https://ilvo.vlaanderen.be/nl/ Location: Belgium
Primary contact	Nadia Khaldoune (AVEC) Rani Van Gompel (ILVO)
Logo	
Rationale of the case study	This case study focuses on analysing food waste in the egg sector, aiming to gain a comprehensive understanding of waste generation across the value chain—from primary production to packaging. To ensure alignment with project objectives, ILVO and AVEC have agreed to collaborate, combining their respective expertise to enhance the quality and scope of the case study. Through this partnership, the case study aims to provide a clearer overview of food waste generation within the egg sector, covering all stages from primary production to packaging.
Stage(s) of the value chain where food waste occurs	Primary production Processing Packing station
Fish	
F.CS1.Opp-ES	
Case study information	Name: OPPPB Website : https://opeixblau.com/ Location: Spain
Logo	
Primary contact	Marta Felip

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Rationale of the case study	The CS chosen for the fish commodity, mainly oily fish but including also lean fish. The scope of this CS is along the whole supply chain but especially on primary production because key FMS affect this stage, and all the stages involved in the fish value chain can be found purchasing at this level through short food supply chain. Fish FMS create FLW in primary production stages, especially for edible but not commercial species. Despite the low ratio of FLW in fish compared to other food products the interest in this CS is motivated by the huge economic and nutritional impact of fish losses and waste. The main idea is to reduce all the avoidable FLW in this stage and to better understand the elasticity and main factors affecting fish FMS to be able to manage the market expectations. Also, the disposal of these fish residues is complicated. If they are returned to the sea, they can cause an increase in available biomass, affecting the equilibrium of the ecosystem. Nevertheless, the main problem with FLW disposal is the loss of high nutritional value for human consumption, as well as other potential uses such as pharmaceutical or the feed industry. Nowadays we are in a scenario where feeding the world is becoming more complex, especially when it comes to animal food products and high-quality nutrients such as unsaturated fatty acids and proteins. Avoiding FLW and increasing the efficiency of the fish value chain need to be addressed.
Stage(s) of the value chain where food waste occurs	Primary production Retail & other distribution Food service
Fruit and vegetables	
F&V.CS1.NN-IT	
Case study information	Name: NATURA NUOVA Website: Home - Natura Nuova (natura-nuova.com) Location: Italy
Logo	
Primary contact	Simone Prospero
Rationale of the case study	The choice of products included in the product mapping is due to the availability of data already held by the company and the ease with which other data can be collected through interviews, focus groups and other methods. Furthermore, the products were selected because they are those that mainly derive from short supply chains and thus NN can easily get in touch with primary producers and distributors. The FW that occurs for these products generates economic losses and environmental impacts common to all other fruit purees regardless of taste,

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	so we believe that they can be taken as an example and then expand the results to other products as well.
Stage(s) of the value chain where food waste occurs	Primary production Processing & Manufacturing Retail & other distribution (wholesale)
F&V.CS2.MC-PT	
Case study information	Name: MC – MCH Website: MC | Food Retail Market Leader in Portugal - MC (sonae.pt) Location: Portugal
Logo	
Primary contact	Rita Silva
Rationale of the case study	There is significant FW occurring along the food value chain what has an impact on the environmental, economic and social aspects. The rationale used to determine the fruit and vegetables for CS were based on the following criteria: • Products highly affected by FMS, • Products with relevant FW, • Ability to gather data from as many stages of the food value chain as possible. • Economic relevance in MC/MCH. 1. Tomatoes - Significant FW in the primary production due to handling and sensitivity. 2. Carrots - FW highly associated with private FMS (shape, cracks, calibre); 3. Citrus fruit (orange) - Tight private FMS and production highly affected by climate change (drought), leading to a decrease in the availability of this fruit in Portugal; 4. Lettuce - Very susceptible to FW creation in retail due to high perishability; 5. Bananas - Fruit that is not much regulated by public FMS but highly regulated by private FMS. Fruit with high economic potential. 6. Red fruit - High FW creation in primary production and retail due to the need for very careful handling and very perishable fruit with short shelf life.
Stage(s) of the value chain where food waste occurs	Primary production Retail & other distribution (wholesale) Restaurants & food services
F&V.CS3.ZT-SI	

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Case study information	Name: ZELENA TOCKA Website: Location: Slovenia
Logo	
Primary contact	Aleksandra Kocet Sasa Straus
Rationale of the case study	In the product mapping we include the products that are the most perishable and are usually rejected by consumers because of over-ripeness. The products don't contribute significantly to economic losses. But we want to contribute to surplus valorisation and to lower FW. We include thus those products that are the most perishable and are usually rejected. As we increase cooperation with the farmers, the important factors for FW are FMS related to cosmetic requirements on our entry point. As we want farmers to reduce, we would like to increase awareness on this point, especially for the consumer. "Ugly food" contributes largely to economic loss and to the volume of FW.
Stage(s) of the value chain where food waste occurs	Primary production Processing & Manufacturing Retail & other distribution (wholesale) Restaurants & food services
F&V.CS4.Men-SI	
Case study information	Name: MENSANA Website: https://www.mensana.net/restavracija-kafeterija Location: Slovenia
Logo	
Primary contact	Sanja Zelko Sasa Straus
Rationale of the case study	In our restaurant/food services, we have chosen to focus our CS on fruits and vegetables that we procure and require in the largest quantities for the preparation of composite meals. This decision was driven by several key factors. • These products significantly contribute to economic losses within the supply chain. By concentrating on the most-used items: 1. Green lettuce 2. Tomatoes 3. Potatoes

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	4. Apples 5. Onions We aim to tackle the areas where interventions can have the most substantial economic impact. • These items represent the most significant contribution to our FLW volumes. Given their high usage, the waste generated is proportionately larger, thus prioritizing them allows us to address the bulk of our FLW and create more impactful waste reduction strategies. • Problematic disposal is a concern. These commonly used products, when wasted, pose challenges in terms of disposal, which can lead to severe environmental problems due to their volume and biodegradability factors. We have categorized our fruits and vegetables into individual groups. We have separated green lettuce, tomatoes, and potatoes as they are used in the highest volumes, resulting in the greatest amount of food waste. All other vegetables fall under a general category of 'other vegetables.' For fruits, apples have been singled out due to their high procurement volume, with all other fruits being grouped under 'other fruits.' Due to their substantial contribution to FW, we will address these isolated products – green lettuce, tomatoes, potatoes, and apples – individually in our waste reduction efforts.
Stage(s) of the value chain where food waste occurs	Primary production Processing and manufacturing Retail and other distribution Food service
F&V.CS5.LN-DE	
Case study information	Name: LEHMANN NATUR Website: https://www.lehmann-natur.com/en/ Location: Germany
Logo	lehmann natur ORGANIC PRODUCER
Primary contact	Marc Stracke
Rationale of the case study	1. Limes • Most of the limes purchased by LN are cultivated on small farms in Columbia. If the farmers can only sell the limes with a special size and special colour, the income is not sufficient to survive. It is necessary to find alternative marketing channels for small limes which are out of the standard costumer specification. The local (public) market is not sufficient. • Most significant contribution to FLW volumes: Are the chosen product(s) responsible for a substantial portion of FLW volumes?

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	• The FLW rate at LN warehouse is 2,04 %. In addition, the limes which were not exported are directly wasted in Columbia. • Problematic environmentally severe disposal. But “only” used for energy recovery, so at lower level of the “food use hierarchy”. 2. Lemons • Main FLW is contributed by green lemons and small lemons. German supermarkets normally purchase yellow limes in their shops and avoid selling green limes. Green lemons are treated with ethylene to achieve yellow coloring. This is cost and energy intensive. Selling green lemons would be of higher value. Lemons are an important product throughout the year. • Problematic environmentally severe disposal. But “only” used for energy recovery, so at lower level of the “food use hierarchy”. 3. Tomatoes • Tomatoes of small size are sorted out directly on the farms. Furthermore, pre-packed “Rispentomaten/stem tomatoes” must be sorted out, if the tomatoes are not fixed at the stem. It is costly to separate the tomatoes from paper and plastic. There are no marketing channels for small tomatoes. • Tomatoes are an important product throughout the year. FLW at LN 3,09%. • Problematic disposal: Separation of tray, plastic foil and tomatoes e.g. for disposal is costly. 4. Peppers • There are no marketing channels for small sized peppers, only local markets. • Most significant contribution to FLW volumes: peppers are also an important and main product for customers throughout the year. • Problematic disposal: Separation of plastic foil and peppers e.g. for disposal is costly. 5. Cucumbers • Contribution to economic losses: FMS for cucumber are strict. The potential to sell short or crooked cucumbers is low. Most of the ugly cucumbers are directly sorted out in the greenhouses. In addition, the rejection rate of light yellow and weak cucumbers is high. • Most significant contribution to FLW volumes: cucumbers are an important product throughout the year. FLW at this stage at LN is about 4,05 %. Problematic disposal: No big problems. Most of the cucumbers LN sells are packed loose. Only in the summer months, LN purchases the cucumbers with plastic foil. The disposal is costly because LN must separate cucumber and plastic.
Stage(s) of the value chain where food waste occurs	Primary Production Retail & other distribution (wholesale)

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F&V.CS6.Ane-ES	
Case study information	Name: ANECOOP Website: Anecoop, la primera empresa hortofrutícola del mediterráneo Location: Spain
Logo	
Primary contact	Maria Miranda
Rationale of the case study	In our CS We have chosen following fruits: 1. Clementines, 2. Mandarins 3. Orange and 4. Kaki/Persimmon These products are very important for our organization and have important economic losses due to FW. In addition, we are able to obtain a lot of data about quality FMS and their relationship with FW
Stage(s) of the value chain where food waste occurs	Primary production Retail & other distribution (wholesale)
F&V.CS7.ILVO-BE	
Case study information	Name: ILVO Website: https://ilvo.vlaanderen.be/nl/ Location: Belgium
Logo	ILVO Flanders Research Institute for Agriculture, Fisheries and Food
Primary contact	Rani Van Gompel
Rationale of the case study	The F&V.CS7-BE was conceived to supplement the other F&V CSs, especially on soft fruits in the Breadcrumb project. In addition to the economic potential of the soft fruits such as raspberries, blueberries, and strawberries in Belgium, and their contribution to FLW generation, the supplementary nature of this CS is centred mainly on the provision of more data on soft fruits in Belgium. More so, the stages in the supply chain (primary production, processing and manufacturing, and retail and distribution) targeted are such that, the data collected will fill the void of expected data from other F&V CSs in other member states countries.

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Stage(s) of the value chain where food waste occurs	Primary production Processing & Manufacturing Retail & other distribution (wholesale)
F&V.CS8.ILVO.BE_NL	
Case study information	Name: ILVO Location: Netherlands
Logo	ILVO Flanders Research Institute for Agriculture, Fisheries and Food
Primary contact	Rani Van Gompel
Rationale of the case study	The F&V.CS8-BE_NE was conceived to supplement the other F&V CSs, especially on vegetables in the Breadcrumb project. Considering the importance and relevance for creation of FW of the particular vegetables we have decided to work with: 1. Tomatoes, 2. Bell Peppers 3. Lettuce In addition to the economic potential of the above-listed vegetables in the Netherlands, and their contribution to FLW generation, the supplementary nature of this CS is centred mainly on the provision of more data on vegetables in the Netherlands. More so, the stages in the supply chain (primary production, processing and manufacturing, and retail and distribution) targeted are such that, the data collected will fill the void of expected data from other F&V case studies in other member states countries.
Stage(s) of the value chain where food waste occurs	Primary production Processing & Manufacturing Retail & other distribution (wholesale)
Meat	
M.CS1.FEN-BE	
Case study information	Name: FENAVIAN Website: Fenavian | Nationale federatie van vleeswarenmakers, Fédération Nationale des Fabricants de Produits de Viandes Location: Belgium
Logo	FENAVIAN
Primary contact	Anneleen Vandewynckel

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Rationale of the case study	The CS of Fenavian is about processed meat, of all kinds of species: as well as beef, pork, and poultry. We process meat for the Belgian market, but also for quite a lot of other European countries. Our members are working with an incredible number of FMS. We will first give a thorough overview of the multitude of marketing schemes with which our companies are confronted, these are mostly private schemes. We will clearly categorize all the existing FMS and describe the difficulties they cause. Key problems are that these FMS schemes are not sustainable, cause more FW, and consequently a lot more problems on various aspects for our companies, such as economic losses. In terms of economic losses, the cost is high. We are talking about financial losses, but also production capacity loss, increase of inefficiency (waste of energy, water, raw material, waste generation, etc.) and loss of human resources to name a few. We will try to come up with figures in tons and euros. There is no added value in terms of quality or food safety. We will map what happens with the FW by focusing on our main products in different processing categories: chicken filet (our main product in volume in the poultry category), cooked ham (main product in the cooked products/pork), salami (fermented) and bacon (dried/smoked/baked).
Stage(s) of the value chain where food waste occurs	Processing & Manufacturing
M.CS2.AVE-BE_EU	
Case study information	**Name**: AVEC **Website:** Association of Poultry Processors and Poultry Trade in the EU countries (avec-poultry.eu) **Location:** Belgium
Logo	
Primary contact	Nadia Khaldoune
Rationale of the case study	AVEC is part of the CS for meat (poultry). We provide insight into and data on the FMS used in the poultry sector in Europe (EU/national/private schemes). We would like to analyse the impact of the downgraded products from a FW point of view because they do not fulfil the standards or market access requirements, as well as proposed alternatives to reduce FW and valorise the products in question. We have chosen to focus on 3 products: 1. Whole chicken 2. Breast fillet 3. Legs

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	Those products are the most representative of the poultry sector and the products the most sold and consumed in Europe. The breast fillet is the cut with the highest value and will therefore trigger the highest losses from an economic point of view.
Stage(s) of the value chain where food waste occurs	Processing & Manufacturing
M.CS3.FEB-BE	
Case study information	**Name**: FEBEV **Website**: Febev **Location**: Belgium
Logo	
Primary contact	Michael Gore
Rationale of the case study	FEBEV is part of the CS for meat (beef/pork). The purpose is to provide an overview of the main FMS used in the cattle industry in Belgium (national & private schemes). Cattle as part of quality standards can be downgraded because they don't fulfil specific criteria such as weight, colour, etc. Further in the manufacturing process there is also an interest in specific cuts leaving specific parts of the carcass unexploitable and therefore downgraded into standard production or low-grade manufacturing processes. Another question mark is the downgrading because of legal requirements such as category 3 and 2 materials because they are declared unfit for human or animal consumption. Our focus will be placed on three specific products, the carcass itself, the front and hind quarter, and prepacked products. The biggest downgrading we believe is in the initial part of the production process from farm to cutting plant.
Stage(s) of the value chain where food waste occurs	Processing & Manufacturing

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7.2 ANNEX 2: Product Mapping

The BREADCRUMB project focuses on five commodity groups: cereals, eggs, fish, fruits & vegetables, and meat. A key task for each CS was to identify their product portfolio through a product mapping exercise. This involved selecting products that are crucial for the sector/company in terms of production and economics, and that have significant environmental and economic impacts, specifically products affected by FMS and contributing to increased FW creation. The cereal CS from Italy, in their product mapping, indicated Tofu and Tempeh (both soy-based), in addition to Seitan (wheat-based). These plant-based products are very relevant for their business, and they are facing similar issues with all of them. Therefore, they decided to include Tofu and Tempeh in their mapping. The product mapping information collected by each CS enables better collaboration between CSs working on the same product but at different stages of the FSC or in different countries.

In Case Study Plans-3, a few of the CSs decided to exclude or replace some of the products they had initially indicated in Case Study Plans-1&2. This was mainly due to challenges encountered during the data collection process. The overview below presents the current state of product mapping.

A comprehensive overview of the product mapping was prepared for each commodity group including graphical representations of the FSC stages , geographical coverage, and the names of the CS partners.

PRIMARY PRODUCTION	PROCESSING	DISTRIBUTION	RETAIL	FOOD SERVICE

CEREALS

Wheat/ Wheat flour	SI/ IT		IT	X	X
	VILA NATURA	VILA NATURA	X	X	X
	NATURA NUOVA	NATURA NUOVA	NATURA NUOVA	X	X
Oat/ Oat flakes	SI		X	X	X
	VILA NATURA	VILA NATURA	X	X	X
Spelt/spelt flour	SI		X	X	X
	VILA NATURA	VILA NATURA	X	X	X
	X	X	X	X	X
Barley	SI		X	X	X
	VILA NATURA	VILA NATURA	X	X	X

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Corn	SI	IT	IT	X	SI
	VILA NATURA	X	X	X	VILA NATURA
	X	NATURA NUOVA	NATURA NUOVA	X	X
Soy	IT	IT	IT	X	X
	NATURA NUOVA	NATURA NUOVA	NATURA NUOVA	X	X
Pasta	X	X	X	X	SI
	X	X	X	X	VILA NATURA

EGGS

Eggs (shell)	DK/ BE/ NL/ IT		X	X	X
	LF	LF	X	X	X
	AVEC/ILVO	AVEC/ILVO	X	X	X

FISH

Sardine	SP	X		SP	
	OPPPB	X	OPPPB	OPPPB	OPPPB
Anchovy	SP	X		SP	
	OPPPB	X	OPPPB	OPPPB	OPPPB
Shrimp	X	X	SP	X	SP
	X	X	OPPPB	X	OPPB
Bogue	X	X	SP	X	X
	OPPPB	X	OPPPB	X	X
Alatxa	X	X	SPAIN	X	X
	OPPPB	X	OPPPB	X	X
Fish and seafood	X	X	SPAIN	X	X
	X	X	X	OPPPB	X

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FRUIT

Apples	SI/PT	SI	IT	SI/PT	X
	ZELENA TOCKA	ZELENA TOCKA	X	ZELENA TOCKA	X
	MC	MC?	X	MC	X
	NATURA NUOVA	X	NATURA NUOVA	X	X
	X	MENSANA	X	X	X
Pear	PT/IT	X	IT	X	X
	MC	X	X	X	X
	NATURA NUOVA	X	NATURA NUOVA	X	X
Apricots, Peach	IT	X	IT	X	X
	NATURA NUOVA	X	NATURA NUOVA	X	X
Plums	IT	X	IT	X	X
	NATURA NUOVA	X	NATURA NUOVA	X	X
Lime	Colombia	X	X	X	X
	LEHMANN NATUR	X	X	X	X
Lemon	SP	SP	GER	X	X
	LEHMANN NATUR	LEHMANN NATUR	LEHMANN NATUR	X	X
Citrus Fruit	SP/PT	SP	X	PT	X
	ANNECOOP	ANNECOOP	X	X	X
	MC	X	X	MC	X
Kaki	SP	SP	X	X	X
	ANNECOOP	ANNECOOP	X	X	X
Berries (Raspberry, Strawberry, Blueberries)	PT/BE	X	BE	PT/BE	X
	MC (Raspberry)	X	X	MC (Strawberry)	X
	ILVO	X	ILVO	ILVO	X
Fruit puree/ fruit smoothies/ canned fruit/ dries fruit	X	IT	X	X	X
	X	NATURA NUOVA	X	X	X

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VEGETABLES

Bell Peppers	ISR/NL	NL	ISR	X	X
	LEHMANN NATUR	X	LEHMANN NATUR	LEHMANN NATUR	X
	ILVO	ILVO	X	ILVO	X
Cucumbers	SP	X	SP	X	X
	X	X	LEHMANN NATUR	LEHMANN NATUR	X
Lettuce	PT/SI/NL	NL	NL	PT	X
	MC	X	X	MC	X
	MENSANA	X	X	X	X
	ILVO	ILVO	X	ILVO	X
Tomatoes	SI / PT /SP/NL	NL	SP/NL	SI /PT /NL	X
	ZELENA TOCKA	X	X	ZELENA TOCKA	X
	MENSANA	X	X	X	X
	MC	X	X	MC	X
	LEHMANN NATUR	X	LEHMANN NATUR	X	X
	ILVO	ILVO	X	ILVO	X
Zucchini	SI	SI	X	SI	SI
	ZELENA TOCKA	ZELENA TOCKA	X	ZELENA TOCKA	X
	X	MENSANA	X	X	MENSANA
Onion	SI	SI	X	SI	SI
	ZELENA TOCKA	ZELENA TOCKA	X	ZELENA TOCKA	X
	X	MENSANA	X	X	MENSANA
Potatoe	SI	SI	X	SI	SI
	ZELENA TOCKA	ZELENA TOCKA	X	ZELENA TOCKA	X
	MENSANA	MENSANA	X	X	MENSANA
Pumpkin Hokkaido	SI	X	X	X	X
	MENSANA	X	X	X	X

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Cabbage	SI	SI	X	X	X
	MENSANA	X	X	X	X
Turnip	SI	X	X	X	X
	MENSANA	X	X	X	X
Carrot	PT	X	X	PT	X
	MC	X	X	MC	X

MEAT

Poultry meat	BE	BE	X	BE	X
All Chicken	AVEC	AVEC	X	AVEC	X
Breast filet	AVEC	AVEC	X	AVEC	X
Legs	AVEC	AVEC	X	X	X
Processed products	AVEC	AVEC	X	X	X

Bovien	BE	BE	BE	BE	X
Carcass	FEBEV	FEBEV	FEBEV	FEBEV	X
Fresh meat	FEBEV	FEBEV	FEBEV	FEBEV	X
Mechanical separated meat	X	X	FEBEV	FEBEV	X
Meat preparations	X	FEBEV	X	X	

Meat Products	BE	BE	BE	BE	X
Chicken Filet	Fenavian	Fenavian	Fenavian	Fenavian	X
Cooked Ham	X	Fenavian	Fenavian	Fenavian	X
Salami	X	Fenavian	X	Fenavian	X
Bacon	X	Fenavian	Fenavian	X	X
Sausages	X	Fenavian	X	X	X
Pate	X	Fenavian	X	X	X
Others	X	Fenavian	X	X	X

Each CS was asked to complete a product mapping document to gather information about their selected products. This document is divided into two sections: **product information and impact assessment**. In the product information section, general details about the products are provided, including:

- Type of product
- Packaging
- Seasonality
- Common reasons for rejection at reception
- Rejection rate (subjective opinion of the CS partner)
- Data availability

The impact assessment section focuses on each CS partner's experiences and internally gathered data. CSs were asked to provide:

- Type of product

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- Estimated percentage of FLW based on their experience (considering all reasons, not just FMS)
- Estimated absolute amount of FLW (in tons or kg) occurring in their company
- Current disposal/valorization route
- Estimated environmental impact

These questions aimed to better understand the relevance of the chosen products, leading to more effective actions during the CSs' work. Additionally, some questions provided important insights into the role of FMS in creating FW.

The table below presents detailed information on product specifics and impact assessments conducted by the case studies.

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Cereals

C.CS1.NN-IT

Product information

Type of Product	Packaging	Seasonality	The most common rejection reasons	Rejection rate	Data availability
1. Tofu	Yes, plastic food trays surrounded by cardboard.	Year-round	Too short shelf life regarding the retailer requirements (private standards).	Medium	Partial
2. Tempeh	Yes, plastic food trays surrounded by cardboard.	Year-round	Too short shelf life regarding the retailer requirements (private standards).	Medium	Partial
3. Seitan	Yes, plastic food tray surrounded by cardboard.	Year-round	Too short shelf life regarding the retailer requirements (private standards).	Medium	Partial

Impact assessment

Type of Product	Estimated % FLW	Estimate Absolute amount of FLW (tons or kg)	Current Disposal/valorisation route? *(e.g. Energy, feed, re-use for consumption)*	Estimated Environmental impact?	Remarks
1. Tofu	0,33%	1,1 t (packaging irregularities) 0,8 t (short shelf life)	Trashed, donation to social canteens.	Medium	
2.Tempeh	1%	0,5 t (packaging irregularities) 0,15 t (short shelf life	Trashed, donation to social canteens.	Medium	
3. Seitan	1.6%	1,5 t (packaging irregularities)	Trashed, donation to social canteens.	Medium	

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		1,7 t (short shelf life)			
C.CS2.VN-SI					
Product information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1.Wheat	Yes	Year-round	Grain: Due to organic production, the grain can be smaller. The customer rejects it due to lack of knowledge about organic production.	Medium	Partial
2. Flakes	Yes	Year-round	Small oat grains are slightly darker in colour after flaking. The client refuses it due to fear that it is a foreign body in the flakes. Additional cleaning of the flakes is necessary - we get a second class of flakes which we use for flour or animal feed.	Low	Partial
3. Oat - unshelled	Yes	Year-round	Due to the darker colour of the grain, which is the result of the weather conditions before the harvest, the customer has doubts about contamination with mycotoxins. There are complaints and rejections.	Partial	Partial
4.All organic cereals and processed cereals	Yes	Year-round	Due to the retailers requirements for longer period of use from processing – 10 to 12 months contamination with storage pests occurs, especially in the summer months on store shelves. There are rejections from both customers and	Medium	Partial

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			stores. Although the raw material is still adequate in terms of quality.		
5.All organic cereals and processed cereals			After harvest, all grains are cleaned of weeds and residues, and calibrated to the appropriate size specific to each grain or seed. In the cleaning process, small grains remain, which are not suitable for further processing for pre-packaged organic products. Due to the partially underdeveloped market for organic animal feed, this part of the grain is thrown away.	Medium	Partial
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption, etc.)*	**Estimated Environmental impact?**	**Remarks**
1.Wheat	0.005 %	500 kg yearly	In case of rejection, we offer or use for animal feed.	Medium	
2.Flakes	0.005 %	1000 kg yearly	In case of rejection, we offer or use for animal feed.	Medium	
3.Oat - unshelled	0.05 %	100 kg yearly	In case of rejection, we offer or use for animal feed.	Medium	
4.All organic cereals and processed cereals	0.05 %	1500 kg yearly	In case of rejection, we offer or use for animal feed.	Medium	

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5.All organic cereals and processed cereals	1.5 %	15000 kg yearly	Bio-waste	Medium	
Eggs					
E.CS1.LF- DK					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1. Egg (shell)	Yes	Year- round	Table eggs can be 'discarded' because of big cracks, dirty eggs, too small or too big. Normally a big part of those discarded eggs will go to the egg product factories to be processed into a range of products for human consumption. The egg product factories also use a huge number of 'normal' eggs.	Low	Partial
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
1. Eggs (primary producer)	0.36%	280kg/week	Pet food	Low	

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2. Eggs (product factory for 2023)	0.000518% based on medium-sized egg 68g	23+184=207tons/ year	184tons go to pet food and 23tons goes for energy	Low	23 ton is from egg shells and other 184tons is due to breaking and others. One of the biggest factories in Denmark (total processing 400million eggs in 2023)
ECS2.AVE_EU					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1. Egg (shell)	Yes	Year- round	TBD	TBD	TBD
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
1. Eggs (primary producer)	TBD	TBD	TBD	TBD	

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2. Eggs (processing and packaging)					
Fish					
F.CS1.Opp-ES					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1.Anchovy	Yes, in wooden or plastic boxes.	Year-round: Except for months of biological stoppage imposed by the Ministry of State they usually are two or three months at the end or beginning of the year.	Large quantity of fish offered (more than permitted).	Low	Comprehensive
2. Sardine **(e.g., sardinella aurita)**	Yes, in wooden or plastic boxes.	Year-round: Except for months of biological stoppage imposed by the Ministry of State they usually are two or three months at the end or beginning of the year.	Large quantity of available fish.	Low	Comprehensive
3.Shrimp	Yes, in wooden or plastic boxes.	Year-round: Except for months of biological stoppage imposed by	Quality requirements	Low	

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		the Ministry of State they usually are two or three months at the end or beginning of the year.			
4. Bogue	Yes, in wooden or plastic boxes.	Year-round: Except for months of biological stoppage imposed by the Ministry of State they usually are two or three months at the end or beginning of the year.	Size standards (especially smaller catches), rapid spoilage potential, and off-flavors from its gut bacteria if not handled quickly.	Low	
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
1. Anchovy			It's either thrown away or sold at a very low price. Attempts have been made to donate it to hospitals, schools, or similar institutions, but it hasn't been successful because those places operate with forecasts made days in advance, which disrupts their organizational plans.		
2.Sardine			It's either thrown away or sold at a very low price. Attempts have been made to donate it to hospitals, schools, or	Low	

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			similar institutions, but it hasn't been successful because those places operate with forecasts made days in advance, which disrupts their organizational plans.		
3.Shrimp					
4.Bogue					
Fruit and Vegetables					
F&V.CS1.NN-IT					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1. Apple puree	Yes. It can be a pouch (doypack) or an aluminium tray (100% recyclable) depending on retailers' requirements.	Year-round. Natura Nuova receives the fruit during the ripening season and stores it in cold storage. Later, when necessary, the fruit is processed into puree throughout the year. Thus, the company works with seasonal raw material, but thanks to the storage and	Packaging irregularities, and shelf-life requirements.	Medium	Partial

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		processing methods it is able to treat the fruit as raw material all year round.			
2. Pear puree	Yes. It can be a pouch (doypack) or an aluminium tray (100% recyclable) depending on retailers' requirements.	Year-round. Natura Nuova receives the fruit during the ripening season and stores it in cold storage. Later, when necessary, the fruit is processed into puree throughout the year. Thus, the company works with seasonal raw material, but thanks to the storage and processing methods it is able to treat the fruit as raw material all year round.	Packaging irregularities, and shelf-life requirements.	Medium	Partial
3.Plum puree	Yes. It can be a pouch (doypack) or an aluminium tray (100% recyclable) depending on retailers' requirements.	Year-round. Natura Nuova receives the fruit during the ripening season and stores it in cold storage. Later, when necessary, the fruit is processed	Packaging irregularities, and shelf-life requirements.	Medium	Partial

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		into puree throughout the year. Thus, the company works with seasonal raw material, but thanks to the storage and processing methods it is able to treat the fruit as raw material all year round.			
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorization route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
1. Apple puree	1.2%	130.9ton	Trashed Donated to social canteens	Medium	
2. Pear puree	0.6%	12.8ton	Trashed Donated to social canteens	Medium	
3.Plum puree	0.14%	0.89ton	Trashed Donated to social canteens	Medium	
F&V.CS2.MC-PT					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**

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1.Tomatoes	No	Year- round	• Abnormal external humidity; • Cracks; • Dehydration; • Softness; • Shape defects; • Non-compliant; • Colouring (too green).	Medium	Comprehensive
2.Carrots	No	Year- round	• Dehydration; • Soft and bendable; • Cold damage ; • Cracks; • Shape defects.	High	Comprehensive
3.Lettuce	No	Year- round	• Foot oxidation; • Leaves with browned tips; • Leaf defects.	Medium	Comprehensive
4.Bananas	No	Year- round	• Colour ; • Over-ripeness; • Epidermal defects (scars); • Cold damage; • Bruising.	High	Partial
5.Red Berries	Yes	Seasonal	• Scars; • Deformation; • Discolouration; • Over-ripeness; • White spot > 1/10 of the total surface area.	Medium	Comprehensive
6.Citrus Fruit (Oranges)	No	Year- round	• Colour not compliant; • Peel thickness not compliant; • Green colour on more than 1/5 surface; • Shape defect.	High	Comprehensive
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**

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1.Tomatoes	~ 20%	~ 22 451 kg	**1) Zero waste range:** About 40% of fruit and vegetable production in the field is wasted. To combat this problem in its shops, Continente has launched the Zero Waste range, made up of fruit and vegetables that would otherwise be wasted in the field and which Continente is giving a new chance. Products with small imperfections that in no way detract from their quality or flavour. By buying these items you are helping to reduce food waste. **2) Donating surplus food:** Continente shops have been reusing and redistributing food for 27 years. -To charitable organisations and animal welfare associations. -With employees in the social areas of the shops and warehouses. To date, more than 29.8 million euros in surpluses have been donated. **3) Pink labels:** For more than 10 years, these labels have been communicating a price reduction in Continente shops for products approaching their sell-by date. This system avoids wastage and at the same time offers	High	

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			economic benefits to the customer. **4) Zer0% Waste boxes:** With the aim of helping to reduce food waste, various projects have been set up that work from the production process to the final consumption of products, to the creation of circular economy products, which made it possible to avoid more than 54M€ of waste in 2022. In 2022, all Continente, had Zero Waste boxes in place, preventing fruit and vegetables from being wasted. These boxes contain a range of fruits and vegetables with imperfections at a reduced price.		
2.Carrots	~ 2,1%	~ 37 702 kg	**1) Donating surplus food** (as describe above) **2) Pink labels** (as described above) **3) Zer0% Waste boxes** (as described above)	Medium	
3.Lettuce	~ 7,2%	~ 387 362 kg	**1) Donating surplus food** (as described above) **2) Pink labels** (as described above) **3) Zer0% Waste boxes** (as described above)	Medium	

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4.Bananas	~ 22 %	~ 1 538 112 kg	**1) Donating surplus food** (as described above) **2) Pink labels** (as described above) **3) Zer0% Waste boxes** (as described above) **4) Jams and chutneys:** In order to avoid wasting tonnes of surplus food, Continente has created jams & chutneys, made from end-of-life fruit and vegetables. These exclusive Continente products are distinctive not only because of the principles of Circular Economy and sustainability on which their process is based, but also because they are the first of their kind to be launched by a retail chain. **5) Panana:** Panana is a cake made from surplus bananas that no longer have commercial value because they are too ripe. Panana has a moist texture and a sweet, characteristic banana flavour, making it an excellent choice for snacking. This product makes it possible to rescue more than 80,000 bananas every year that would otherwise go to waste, giving the surplus fruit a new destination. **6) Single Bananas**	High	

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			Loose bananas are one of the items with the highest percentage of waste in our shops. One of the main reasons is that consumers break the bunches and leave loose bananas, which therefore become less appealing to buy. But we still find "single" bananas attractive! To reverse this situation and sensitise consumers to the fight against food waste, we are offering these loose bananas in a single basket.		
5. Red Berries (strawberries, blueberries, raspberries, blackberries)	~ 10,5 %	~ 16 512 kg	**1) Donating surplus food** (as described above) **2) Pink labels** (as described above) **3) Zer0% Waste boxes** (as described above) **4) Jams and chutneys** (as described above) **5) Balsamic vinegar** made from strawberries and raspberries **6) Fruit juices** made from red berries	High	
6.Oranges	~ 4,1 %	~ 209 597 kg	**1) Donating surplus food** (as described above) **2) Pink labels** (as described above) **3) Zer0% Waste boxes** (as described above) **4) Jams and chutneys** (as described above)	Medium	

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F&V.CS3.ZT-SI					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1.Fruit vegetables (tomato and zucchini)	No	Year-round	• Over-ripeness; • III category.	Medium	
2. Potato	No	Year-round	• Sprouting • Rot or decay • Damage • Green skin	Medium	
3.Onion	No	Year-round	• Sprouting • Rot or decay • Poor skin quality	Medium	
4.Apples	No	Year-round	• Over-ripeness; III category.	Medium	Comprehensive
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (kg)**	**Current Disposal/valorization route? (e.g. Energy, feed, re-use for consumption)**	**Estimated Environmental impact?**	**Remarks**
1. Fruit vegetables (especially tomato and zucchini)	<1	440	Partially valorisation new product	High/Medium	
2. Potato	<1	200	Disposal	Medium	
3.Onion	<1	100	Disposal	Medium	
4.Apples	<1	200	Partially valorisation new product	Low	
F&V.CS4.Men-SI					

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Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1.Lettuce	In the restaurant no packaging; for delivery plastic packaging	Year-round	• Freshness; • Cleanliness; • Variety of vegetables.	Low	Partial
2.Tomato	In the restaurant no packaging; for delivery plastic packaging	Year-round	• Taste; • Freshness; • Colour.	Low	Partial
3.Potato	In the restaurant no packaging; for delivery plastic packaging	Year-round	Variety of vegetables	Low	Partial
4.Other vegetables (carrot, peppers, onion, zucchini)	In the restaurant no packaging; for delivery plastic packaging	Year-round	• Texture; • Taste; • Colour; • Quality.	Low	Partial
5.Apples	In the restaurant no packaging; for delivery plastic packaging	Year-round	• Variety of vegetables; • Quality; • Size; • Texture; • Taste; • Colour.	Low	Partial
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of**	**Current Disposal/valorisation route? (*eg. Energy,***	**Estimated Environmental impact?**	**Remarks**

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		FLW (tons or kg)	*feed, re-use for consumption*)		
1.Lettuce	15%	15 kg per week	Disposal	Medium	
2.Tomato	5%	2,5 kg per week	Disposal	Low	
3.Potato	10%	50 kg per week	Disposal	Medium	
4.Other vegetables (carrot, peppers, onion, zucchini)	15%	67,5 kg per week	Partly re-use for other products (making vegetable spices, for re-use in other food products), partly disposal.	Low	Mostly re-use
5.Apples	3%	1,80 kg per week	Party re-use for compote, desserts, partly disposal.	Low	Mostly re-use
F&V.CS5.LN-DE					
Product information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1. Limes	Yes. In nets to 500g or loose, trays packed with 4 limes.	Year-round Origin is Columbia, availability throughout the year. Furthermore Spain and Brazil.	• Size; • Colour; • Brown spots.	Medium	Comprehensive
2. Lemons	Yes. In nets to 500g or loose.	Year-round Origins are Spain, Italy and Dom. Rep. Furthermore Columbia, Peru, South Africa	• Size; • Colour; • Brown spots; • Sour rot (fungi); • Mold	Medium	Comprehensive

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3.Tomatoes	Yes. In 500 g paper trays with plastic foil, loose.	Year-round Main origins: Netherlands, Spain and Italy Furthermore Marocco, France.	• Size • Colour • "tomatoes on stem"	Medium	Partial
4.Peppers	Yes. 500g plastic bag or loose	Year-round Main origin is Netherlands, Spain and Israel. Furthermore Marocco, France.	• Size	Medium	Partial
5. Cucumbers	Yes. Loose	Year- round Main origins Netherland, Spain. Furthermore Bulgaria, Greece.	• Colour; • Weakness Blossom; • Rot; • Mold.	High in summer	Partial
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
1. Limes	2,04%	40.000 kg	• Energy • Feed	High	Container transport via sea.
2. Lemons	1,64%	30.500 kg	• Energy • Feed	High	Container transport via sea.
3. Tomatoes	3,09%	90.700 kg	• Energy • Feed	Medium	
4. Peppers	3,37%	83.000 kg	• Energy • Feed		
5. Cucumber	4,05%	90.800 kg	• Energy		

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			• Feed		
F&V.CS6.Ane-ES					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1. Orange	Yes	Seasonal	• Decay/rot; • Rind blemish /breakdown; • Softness; • Rind blemish (wind scratches, trip, etc.) • Green colour	High	Comprehensive
2.Clementines	Yes	Seasonal	• Decay/rot; • Rind blemish /breakdown; • Softness; • Rind blemish (wind scratches, trip, etc.) • Green colour	High	Comprehensive
3.Mandarin (satsumas and hybrids)	Yes	Seasonal	• Decay/rot; • Rind blemish /breakdown; • Softness; • Rind blemish (wind scratches, trip, etc.) • Green colour	High	Comprehensive
4.Kaki (Persimmon)	Yes	Seasonal	• Softness • Rind blemish (wind scratches, trip, etc) • Flesh browning • Green colour	High	Comprehensive
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorization route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**

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1.Orange **2.Clementines** **3.Mandarin (satsumas and hybrids)**	20%	60.000.000 kg	Juice	High	
4.Kaki (Persimmon)	30%	40.000.000 kg	A very little quantity of juice and animal food		
F&V.CS7.ILVO-BE					
Product information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
Blueberries	Yes	July to September	Ripeness, shape irregularities (too small, too large, misshapen, colour, surface), damages (physical, mechanical), diseases (fungal, …), improper packaging, ..	High	
Strawberries		Mid-April to mid-October			
Raspberries		June to October			
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (kg/year)**	**Current Disposal/valorization route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
Blueberries	10%	24 568,25 kg/year	If needed goes to class 2 or 3 (for frozen fruits or juices) otherwise for energy	High	Amounts of a producer
Strawberries		95 385 kg/year			
Raspberries		46 539,5 kg/year			
F&V.CS8.ILVO-NL					
Product information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**

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Bell pepper	Depending on the client requirement	Summer to early fall (June to October in temperate climates)	- Shape and size deformities - Blemishes and scars - color defects - soft spots or wrinkles - rot or mold - pest damage	TBD	Amounts of producer (maybe a processor)
Tomatoes	Depending on the client requirement	Summer to early fall (July to September in temperate climates)	- cracking, splitting - uneven ripening - scarring and blemishes - blossom-end rot - pest or disease damage	TBD	Amount of producer (maybe processor)
Lettuce	Depending on the client requirement	Spring and fall (March to May and September to November in temperate climates)	- wilting - discoloration - pest damage - rot or mold - contamination with dirt, sand or chemicals	TBD	TBD
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorization route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
Bell pepper	TBD	TBD	If needed goes to class 2 or 3 (for frozen fruits or juices) otherwise for energy	high	Amounts are estimates from separate companies, in different part of the supply chain
Tomatoes	TBD	TBD			
Lettuce	TBD	TBD		TBD	
Meat					
M.CS1.FEN-BE					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**

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1. Chicken Filet	Yes. Packaging B2B and B2C.	Year-round	• Cut/slicing losses: bad slices, different colours of slice; • Texture; • Meat quality; • Meat defaults; • Production faults.	The rejection rate is depending on the reason.	Comprehensive
2. Cooked Ham	Yes. Packaging B2B and B2C.	Year-round	• Cut/slicing losses: bad slices, different colours of slice; • Texture; • Meat quality; • Meat defaults; • Production faults.	The rejection rate is depending on the reason.	Comprehensive
3. Salami	Yes. Packaging B2B and B2C.	Year-round	• Cut/slicing losses: bad slices, different colours of slice; • Texture; • Meat quality; • Meat defaults; • Production faults.	The rejection rate is depending on the reason.	Comprehensive
4. Bacon	Yes. Packaging B2B and B2C.	Year-round	• Cut/slicing losses: bad slices, different colours of slice; • Texture; • Meat quality; • Meat defaults; • Production faults.	The rejection rate is depending on the reason.	Comprehensive
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**

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1. Chicken Filet	10%	Research needed	• Re-use • Further processing • Energy • Export	Medium	To be studied. Results will be very interesting.
2. Cooked Ham	10%	Research needed	• Re-use • Further processing • Energy • Export	Medium	To be studied. Results will be very interesting.
3. Salami	10%	Research needed	• Re-use • Further processing • Energy • Export	Medium	To be studied. Results will be very interesting.
4. Bacon	10%	Research needed	• Re-use • Further processing • Energy • Export	Medium	To be studied. Results will be very interesting.
M.CS2.AVE-BE_EU					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1. All chicken	Yes	Year-round	• Animal by-product categorization into category 2 instead of category 3 as per Regulation (EC) No 1069/2009. • Grading as classes A/B of the poultry carcasses and cuts as per regulation 543/2008 on marketing standards for poultry meat.	Low	Partial
2.Breast filet	Yes	Year-round	• Animal by-product categorization into category 2 instead	Low	Partial

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			of category 3 as per Regulation (EC) No 1069/2009. • Grading as classes A/B of the poultry carcasses and cuts as per regulation 543/2008 on marketing standards for poultry meat.		
3. Legs	Yes	Year-round	• Animal by-product categorization into category 2 instead of category 3 as per Regulation (EC) No 1069/2009. • Grading as classes A/B of the poultry carcasses and cuts as per regulation 543/2008 on marketing standards for poultry meat.	Low	Partial
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
1.All Chicken	Research needed	Research needed	• Standard production • Pet food • Further processing	Low	We encountered a lot of challenges acquiring the FW data. We are currently trying different methods to get
2. Breast fillet	Research needed	Research needed	• Standard production • Pet food • Further processing	Low	

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3. Legs	Research needed	Research needed	• Standard production • Pet food • Further processing	Low	this information.
M.CS3.FEB-BE					
Product Information					
Type of Product	**Packaging**	**Seasonality**	**The most common rejection reasons**	**Rejection rate**	**Data availability**
1.Carcass	No	Year-round	• Weight; • Conformation; • Quality; • Downgrading into cat. 3; • Presence of E.*coli* STEC; • Sarcosporidiosis.	High	Partial
2.Front/hind quarter	No	Year-round	• Weight; • Conformation; • Quality; • Yield.	Medium	Partial
3.Prepacked beef	Yes	Year-round	• Labelling; • Weight.	Medium	
Impact Assessment					
Type of Product	**Estimated % FLW**	**Estimate Absolute amount of FLW (tons or kg)**	**Current Disposal/valorisation route?** *(e.g. Energy, feed, re-use for consumption)*	**Estimated Environmental impact?**	**Remarks**
1. Carcass	We learned from data collection that is very difficult for companies to collect specific data. Also, in our sector a lot of the decisions to downgrade products	In 2023 we had 45 8459 cattle slaughtered. The average weight of a carcass can be estimated at 450kg. So we estimate the FW (10%) for	• Standard production • Pet food • Further processing	Low	

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	from fit for human consumption HC to CAT3 is related to the market situation. Sometimes a product is more valuable as CAT3 (petfood, …) then as Fit for HC. For carcasses we get some results between **10 – 12% for** beef slaughterhouses **It is very company specific.**	cattle carcasses in 2023 on **20360,7 ton**			
2. Front/hind quarter	In our sector a lot of the decisions to downgrade products from fit for human consumption HC to CAT3 is related to the market situation.	149 ton cutting losses 674 ton bones (specific data one company)	• Standard production • Pet food • Further processing	Low	

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	Sometimes a product is more valuable as CAT3 (petfood, …) then as Fit for HC. From the moment we speak about technical parts the food loss is way less than in the previous chain (slaughterhouses) here we see FW in the bones, organs and fat. **This is company specific** We have received specific data from 3 companies (beef cutting plants) Average 0.12 - 1,5% for fat and organs and up to 9% for bones.				

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3.Prepacked beef	Here we mainly speak of losses due to returns from B2C customers. These are mostly customer-specific requirements at the root. **At this moment we cannot provide specific data about these.**	These are mostly customer-specific requirements at the root. **At this moment we cannot provide specific data about these.**	• Standard production • Pet food • Further processing	Low	

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7.3 ANNEX 3: Objectives

Establishing clear objectives in the BREADCRUMB is indispensable for steering the research with purpose and precision.The Table below provides the objectives of the different case studies. These objectives ensure that the study remains focused on its intended goals. Clearly stated objectives facilitate effective communication among the project partners and other stakeholders, fostering a shared understanding of the case study's purpose. This, in turn, enhances decision-making, problem-solving, and the overall quality of the case study by ensuring that efforts are directed toward relevant and meaningful outcomes.

7.3.1 Common Goals

The primary common goal across the CSs is the valorization of suboptimal food, aiming to reduce FW by finding ways to utilize food that does not meet standard market criteria due to visual imperfections, shelf life, or other factors. Many case studies focus on understanding and evaluating the impact of FMS, both private and public, on FW creation. This involves:

- **Collecting Data on FW**: Gathering detailed information on food waste resulting from FMS.
- **Proposing Recommendations**: Developing strategies to mitigate the negative impacts of FMS on FW.
- **Quantifying FW**: Estimating the amount of FW and understanding the reasons behind it.
- **Improving Market Access**: Suggesting changes to existing standards or practices to enhance market access for suboptimal foods.

7.3.2 Differences

Despite the similarities, some objectives differ across the CSs. Main differences can be observed in:

- **Specific Objectives:**
  - Some CSs focus more on the FMS and reduction of FW.
  - Others concentrate on impacting market practices and increasing transparency throughout FSC.
  - Certain CSs, especially in the fishing sector, aim to improve the economic profit of sector.
- **Regulatory Contexts:**
  - CSs from different countries have unique objectives based on their specific regulatory and market contexts. For example: The Danish egg CS focuses on EU-level standards, while the the Slovenian CSs emphasize local FMS.

This diversity highlights the tailored strategies needed to address FW across different commodities, products, and regions.

Case study partner	Objectives
Cereals	
C.CS1.NN-IT	• Reduce food waste related to suboptimal foods (visual packaging irregularities) • Reduce food waste related to shelf life • Identify strategies for suboptimal food valorisation

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C.CS2.VN-SI	• Collect information about existing marketing standards (private and public), which are in place in Slovenia. • Collect data on food waste resulting from these marketing standards. • Valorise suboptimal food.
Eggs	
E.CS1.LF-DK	• To evaluate the impact of EU marketing standards on food waste. • To quantify the downgraded products from a food waste point of view (because they do not fulfil the standards) at EU level. • To propose alternatives/recommendations to reduce the food waste and put a higher value to the products that are rejected for the market.
ECS2.AVE_EU	• To understand the broad view of food marketing standards in the egg sector in Belgium, Italy and the Netherlands. • To provide estimates of food waste related to egg production and egg processing food marketing standards in Belgium, Italy and the Netherlands.
Fish	
F.CS1.Opp-ES	• Improve the economic profit of fishing. • Co-create recommendations on preventing food waste due to marketing standards and to enhance market access for “suboptimal” foods. • Reduce the avoidable waste fraction of high nutritional value products. • Establish acceptance scales for the different FMS to detect the allowance ratio and its direct effects of FW creation. • To better understand fish FMS and its effects (on FW?) along the value chain.
Fruit & Vegetables	
F&V.CS1.NN-IT	• Reduce food waste related to “suboptimal” food (visual packaging irregularities). • Reduce food waste related to shelf-life. • Identify strategies for suboptimal food valorisation
F&V.CS2.MC-PT	• Identify different causes of food waste in the supply chain. • Quantify food waste. • Understanding the relationship between food waste and private marketing standards. • Minimise the negative impacts of private marketing standards in food waste.
F&V.CS3.ZT-SI	• Collect information about existing food marketing standards (private and public), which are in place in Slovenia. • Collect data on food waste resulting from these marketing standards. • Valorise “suboptimal” food.

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F&V.CS4.Men-SI	• Collect information about existing food marketing standards (private and public), which are in place in Slovenia. • Collect data on food waste resulting from these standards. • Validation of “suboptimal” food.

F&V.CS5.LN-DE	<u>General objectives</u>
	
	• Providing estimates of the amount of FLW for products resulting from marketing standards to illustrate the urgency and inspire action.
	• Better understanding of the underlying reasons for setting up private marketing standards.
	• Identifying and discussing solutions to increase market access of nowadays non-conformity fruit and vegetable products, e.g.:
	  ○ limiting product shipping with impacts on overall food waste creation;
	  ○ better exchange between industry and wholesale / retail to facilitate use of returned products;
	  ○ change price labelling to facilitate selling by weight instead of by piece.
	
	<u>Specific objectives</u>
	
	• Contribute to the discussion by providing FW estimates on 4-5 fruit and vegetable products in own operations and client relations.
	• To improve market access of specific aesthetically non-conformity fruit and vegetables (e.g. green lemons and yellow limes) thanks to: a) changed motivation and buying behaviour of end-consumers, and b) additional marketing and use channels for surplus / returned products.

F&V.CS6.Ane-ES	• Providing estimates of the amounts of FLW for products resulting from marketing standards (oranges, clementines, satsumas mandarins, and hybrids) and kaki (persimmon). • Better understanding of the underlying reasons for setting up private marketing standards.
F&V-CS7.ILVO-BE	• To understand the broad view of marketing standards in the soft fruits sector in Belgium. • To provide estimates of food loss and waste related to all relevant soft fruit marketing standards in Belgium.
F&V-CS8.ILVO.BE_NL	• To understand the broad view of marketing standards in the vegetable sector in the Netherlands. • To provide estimates of food loss and waste related to all relevant vegetables (bell peppers, tomatoes, and lettuce) marketing standards in the Netherlands.
Meat	
M.CS1.FEN-BE	• Describing the field of marketing standards in meat sector, categorisation.

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	• Impact assessment of the multitude of marketing standards on our companies. • Mapping/quantifying food waste, and specifically the link with marketing standards. • Identify opportunities to broaden the possibility of added value (certificated) products entering the consumption space. • Raise awareness, informing owners of marketing standards and companies how to improve the system.
M.CS2.AVE-BE_EU	• To evaluate the impact of private, Member State and EU-specific poultry marketing standards on food waste. • To quantify the downgraded products from a food waste point of view (because they do not fulfil the standards or market access requirements) at EU level. • To propose alternatives/recommendations to reduce the food waste and valorise the products above in question.
M.CS3.FEB-BE	• Identify to what extent products that do not meet marketing standards through the beef supply chain are downgraded and what proportion this represents of the market. • Identify to what extent regulatory decisions impact product downgrading, and hence not being able to commercialise these and therefore creating food waste. To what extent can this be avoided or is it inherent to the production system? • Seek opportunities to provide more transparency within the supply chain allowing a better usage and a smaller amount of downgrading through alignment of supply and demand.

7.4 ANNEX 4: Food Marketing Standards

FMS constitute a group of rules, regulations and guidelines put in place to ensure the fair and transparent promotion, presentation, and labelling of food products in the market. In the European Union, these established rules touch product characteristics and other requirements that must be met for both EU-produced and imported products to enter the EU market. These FMS are categorized into specific directives that address different aspects of food marketing, including quality, size, and labelling requirements etc. for different food items.

7.4.1 Categories of FMS

The categories of FMS outlined in Regulation (EU) 1308/2013 within the scope of the BREADCRUMB project include the following:

- technical definitions, designation and sales descriptions
- classification criteria, e.g. grading into classes, weight, sizing, age and category
- indication of species, plant variety, animal race or commercial type
- presentation, labelling, packaging, marking, year of harvesting
- criteria such as appearance, consistency, conformation (shape/structure), product characteristics, percentage water content

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- specific substances, e.g. quantitative content, purity, identification
- type of farming and production method (sustainable production)
- coupage (combinations) of must and wine
- frequency of collection, delivery, preservation and handling, conservation methods/temperature, storage and transport
- indication of place of farming/origin
- restrictions on the use of certain substances and practices
- specific use.

These FMS play a pivotal role in maintaining consumer confidence and satisfaction, promoting fair competition among stakeholders involved at the same level of the supply chain, and facilitating the free movement of goods within the EU.

Across all commodities, there is a strong emphasis on maintaining high quality and safety standards through proper labelling, packaging, and products handling.
Many standards directly influence FW, particularly these related to appearance, consistency, and shelf life.
Both private and public standards require strict adherence to regulations, impacting how products are processed and marketed.

7.5 ANNEX 5: Key categories of FMS per commodities

This section highlights the most relevant FMS categories for each commodity. Each commodity has unique standards based on its characteristics and market requirements. Additionally, different countries have specific regulations that affect how these standards are implemented and enforced. The table below provides detailed insights into FMS and their impact on various food sectors, along with the estimated importance and relevance of specific FMS categories as assessed by CS partners.

7.5.1 Cereals

Key Categories of FMS:

- **Classification Criteria**: Importance of quality criteria for baking properties, (Vila Natura – Slovenia); product specification – vegan/vegetarian products (Natura Nuova – Italy)
- **Presentation and Labelling**: Packaging in a protected atmosphere, marking the origin of raw materials.
- **Farming and Production Methods**: Organic and conventional production.
- **Origin**: Raw materials must originate in Europe to avoid GMO contamination.
- **Restrictions on Substances and Practices**: In organic production, the use of chemicals for storage pests is not allowed.
- **Handling and Preservation**: Maintaining the cold chain is crucial for plant-based products to ensure their quality and safety.

Case Study Differences:

- **Natura Nuova – Italy**: Emphasizes packaging and maintaining the cold chain for plant-based products.
- **Vila Natura – Slovenia**: Focuses on quality criteria for baking properties, the importance of variety, and restrictions on certain substances and practices.

7.5.2 Eggs

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Key Categories of FMS:

- **Technical Definitions**: Clear definitions for cracked or dirty eggs.
- **Classification Criteria**: Grading equipment settings for dirty table eggs.
- **Labelling and Packaging**: Compulsory labelling of production type, weight, and size.
- **Farming Methods**: Definitions for different production types (e.g., free-range, organic).
- **Place of Farming and/or Origin**: Mandatory stamp on every egg.

7.5.3 Fish

Key Categories of FMS:

- **Classification Criteria**: Freshness and size indicators.
- **Species and Commercial Type**: Regulations on allowed species and minimal size.
- **Labelling and Packaging**: Mandatory information for labels, homogeneity in batch size.
- **Collection Frequency, Delivery, Preservation, Handling, Storage, and Transport**: Higher quantities necessitate more rigorous standards, particularly for oily fish species, to ensure quality and safety throughout the supply chain.

7.5.4 Fruit & Vegetables

Key Categories of FMS:

- **Technical Definitions**: Compliance with product characteristics in specifications.
- **Classification Criteria**: Size, shape, and appearance standards.
- **Labelling and Packaging**: Mandatory references and protected origin.
- **Farming Methods**: Criteria for pesticide use and organic certification.

Case Study Differences:

- **Natura Nuova – Italy**: Emphasizes packaging in a protected atmosphere and controlled hygienic conditions.
- **MC-MCH – Portugal**: Focuses on compliance with technical data sheets and classification criteria, particularly for carrots and apples.
- **Zelena Tocka – Slovenia**: Highlights the importance of uniform appearance and water content, especially for lettuce.
- **Mensana – Slovenia**: Stresses the rejection of unsuitable varieties and quality, particularly for lettuce and apples.
- **Lehman Natur – Germany**: Deals with issues related to the size and acceptance of organic products, such as green lemons and yellow limes.
- **Anecoop – Spain**: Focuses on aesthetic defects, size, and color as main factors contributing to rejection.
- **ILVO – Belgium**: Emphasizes compliance with technical data sheets for soft fruits like raspberries and blueberries.
- **ILVO – the Netherlands**: Focuses on technical definitions and classification for tomatoes, lettuce, and bell peppers.

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7.5.5 Meat

Key Categories of FMS:

- **Classification Criteria**: Specific criteria for the classification of beef and poultry carcasses.
- **Presentation, Labelling, and Packaging**: Compliance with obligatory marketing standards and voluntary labelling for specific products.
- **Species and Commercial Type**: The impact of different breeds and production methods on the final product.
- **Frequency of Collection, Delivery, Preservation, and Handling**: Ensuring food safety and traceability through proper handling, storage, and transport.

Case Study Differences:

- **FENEVIAN – Belgium**: Emphasizes the importance of appearance, consistency, and conformation in meat processing.
- **AVEC –Belgium_ Europe**: Focuses on the absence of definitions for certain poultry cuts and the impact of grading as classes A/B on food waste.
- **FEBEV – Belgium**: Highlights specific criteria for beef classification and the impact of voluntary labelling for Belbeef products, including the significance of the Belgian Blue breed.

Cereals		
C.CS1.NN-IT		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Classification criteria	Selected products are produced for vegetarian and vegan customers.	9
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be applied in relation to packing centers	Selected products must be packaged in a protected atmosphere and under controlled hygienic conditions.	9
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	The packaging may swell if the cold chain is not respected (related to category 7).	7
The type of farming and production method	Clients ask for products obtained from organic or conventional produced cereals.	7
The place of farming and/or origin	The raw material must originate in Europe (mainly Italy) to avoid GMO contamination.	9

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Restrictions as regards the use of certain substances and practices	There are limitations on the type and quantity of additives that can be used during the process.	7
The conditions governing the disposal, the holding, circulation and use of products	The cold chain during transport, storage, and sale of the product must be respected to ensure the quality characteristics of the product.	9
C.CS2.VN-SI		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
The species, plant variety or animal race or the commercial type	**Wheat** • It is necessary to consider quality criteria or baking properties. If the wheat does not meet the criteria of the baking industry, the consumer will reject the flour from this wheat. However, we can use wheat with poorer baking properties, for example for flakes, cakes, breadcrumb. • There is no legislation on cereal quality for the baking industry, but there are requirements of the baking industry (protein content, sedimentation, falling number and hectolitre weight). • For milling products, the national regulation in place is **Regulation on the quality of cereal products**, mainly about the classification of cereal products and minimum quality of hulled grain, minimum quality criteria of grinding products, prepared cereal products, pasta and dough. • For bakery products national legislation has **Rules on the quality of bakery products[1],** which do not address specific cereal requirements, but mainly bread types and other bakers' pastry and their water content.	9
The presentation, labelling linked to obligatory marketing	• Marking the origin of raw materials (Agriculture Slovenia). In organic	9

[1] Pravilnik o kakovosti pekovskih izdelkov (pisrs.si)

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standards, packaging, rules to be applied in relation to packing centres	production-processing, the origin of the raw material is important to the consumer. • Labelling of allergens, gluten. • Labelling of health claims - only if this is supported by analysis of the basic raw material. • Labelling applicable to raw material traceability.	
Substances used in production	• Natural presence of gluten • In the production process, natural additives are used to stabilize the processed raw material or enhancers of certain quality characteristics. In organic production only natural additives are allowed according to Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products[2]	5
The type of farming and production method	• Organic production • Plant production • Minimal tillage	6
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	• Weekly orders • Weekly packing plan on the packing lines. • Weekly deliveries to smaller organic shops, public institutions, bakeries - own means of transport. • Pallet delivery to a larger retail chain, rental transport. • Control of the temperature regime in our own warehouse - temperature and relative humidity, control daily (rules on the quality of cereal products state that it could adversely affect the quality of the milled products (if they are stored together with other milled products?) and organic regulation state that organic products should be separated from non-organic). • Preservation of the basic raw material in the summer months by vacuuming and CO2.	6

[2] Regulation - 834/2007 - EN - EUR-Lex (europa.eu)

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Restrictions as regards the use of certain substances and practices	• In organic production use of chemical for storage pests is not allowed.	9
Eggs		
E.CS1.LF-DK		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Technical definitions	• The absence of a clear definition of a 'cracked' or a 'dirty' egg can cause discussions with the control authorities and lead to more food waste. • On the other hand we have clear definitions on the different sizes of eggs. Likewise for the durability.	2
Classification criteria	Looking at eggs in different part of the EU there is definitely a huge difference in how you have to set the grading equipment to discard dirty table eggs.	8
The species, plant variety or animal race or the commercial type	*Gallus gallus*	
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be applied in relation to packing centers	We have had compulsory labelling of production type, weight and/or size for many years, and it works well.	
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	• Table eggs are an edible product, and you are not allowed to change that. • There is an exception in the new marketing standards where you are allowed to store eggs next to 'smelly' substances like garlic or truffles, which should make the eggs taste like those substances.	1
The type of farming and production method	There are clear definitions for eggs from enriched cages, barn eggs, free range eggs and organic eggs.	

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The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	• You have to collect the eggs at least once a day and they have to be kept at a constant temperature. • In Denmark we also have a national law demanding a cool chain from the farm all the way to the consumer.	
The place of farming and/or origin	Mandatory stamping on every egg.	
Restrictions as regards the use of certain substances and practices	Eggs are an edible product therefore there are strict restrictions on the use of certain substances. • The exception being point 5. • They are allowed to wash eggs on the packing stations in Sweden – (and maybe also in the Netherlands).	
The conditions governing the disposal, the holding, circulation and use of products	Regulated by law.	
ECS2.AVE_EU		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Technical definitions	TBD	
Classification criteria	TBD	
The species, plant variety or animal race or the commercial type	TBD	
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be applied in relation to packing centers	TBD	
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	TBD	
The type of farming and production method	TBD	

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The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	TBD	
The place of farming and/or origin	TBD	
Restrictions as regards the use of certain substances and practices	TBD	
The conditions governing the disposal, the holding, circulation and use of products	TBD	
Fish		
F.CS1.OPPPB-ES		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Classification criteria	Regulation (EC) No 2406/96. Available criteria for classifying product's quality with freshness and size (weight and length) as indicators.	7
Indication of species, animal race, the commercial type	EU Regulation No 1379/2013 and No 1380/2013. Available list of allowed and not allowed species; its minimal size.	9
	Some species do not have human consumption due to preferences, so it goes to other uses becoming FW (ex. *Sardinella aurita*).	8
	Some species have higher demand and lower availability in the market, so their price and acceptance are higher than for others. Ex. Angle fish.	8
Presentation, labelling, packaging rules	EU Regulation No 1379/2013:	9

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	1. Control of labelling --> Mandatory information for labels. 2. Homogeneity in batch size and freshness.	
Appearance, consistency, conformation, characteristic	As Regulation (EC) No 2406/96 indicates, parasites are allowed, but their presence can have a direct effect, such as lowering prices or producing food waste at any stage along the value chain.	7
	Rigor mortis status is a key factor for price but also for FW, especially for oily fish. Oily fish in rigor mortis at first sale has a lower price or is wasted due to a very relative lack of freshness.	6
	Lack of integrity in the individuals, such as missing parts or wounds, cause FL and FW despite being in non-edible parts. Bigger individuals have more acceptance for skin damages or missing parts than smaller ones.	8
	Ventral part consistency especially for lean fish. For FAO zone 37 (Med) the fish is commercialised with the viscera, and the integrity of the ventral part is crucial as a quality indicator.	6
Standards on the type of farming and production method	Purse sein is less invasive and harmless than trawling for the individuals, so the FL related to the loss of integrity is directly related to the extraction method. It also requires better appearance for purse sein catches, producing FW if the fish state is not near to perfection.	5
Collection frequency, delivery, preservation, handling, storage and transport	Homogeneity in batches is required not only as a regulation but also as a private FMS along the whole value chain.	7
	The amount of ice in the box is an indicator of good cold chain and better quality. Presence of ice in boxes can produce FW since the product is then more likely to be rejected.	5
	Quantity of fish per box: If the box is full, the fish in the bottom part likely will have damages due to squashing. This fish will	4

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	be wasted, or sometimes the whole box is wasted. This is important especially between distributors and retailers.	
	Quantity of fish in the market: More quantity, more demanding FMS for all the species, but specially for oily fish.	9
Indication of the place of farming and or origin	Aquaculture fish has less food loss (FL) and less FW along the value chain, but since consumers prefer fish from fisheries, at retail stage aquaculture fish is more sensible (sensitive?) to FW.	3
Restrictions as regards substances and practices	Use of sulphites to improve appearance and increase freshness. This substance is commonly used in crustaceans, but some retailers also apply it. Its excessive use can cause FW because of food safety issues / concerns.	
Fruits and Vegetables		
F&V.CS1.NN-IT		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of FMS (1= lowest, 9= highest)**
The technical definitions	The product characteristics must comply with the information in the data sheet.	9
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be applied in relation to packing centers	Selected products must be packaged in a protected atmosphere and under controlled hygienic conditions.	9
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	The packaging of the product during transport may undergo visual changes that alter its consistency but not its functionality.	9
The type of farming and production method	The type of farming affects the product e.g. organic, conventional or baby food	9
Shelf-life requirements	Shelf-life limits result from private contracts with retailers requiring a minimum shelf-life.	8
F&V.CS2.MC-PT		

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FMS categories	Impact in the context of the case study? Example.	Importance of the FMS (1= lowest, 9= highest)
The technical definitions	Technical definitions (specs) are the tool used to monitor the profile of the product that was initially negotiated with the supplier, being composed of legal requirements and business requirements. Fruit and vegetable suppliers must deliver products in accordance with the technical data sheets provided by MC. Ex: If a supplier delivers a product that doesn't comply with the technical data sheet, the product is rejected at the warehouse (at the reception of the product).	9
Classification criteria	The classification criteria, such as caliber, are part of the negotiated standards that must be met because they imply their availability to the consumer. If they don´t match this classification criteria, they can be rejected or follow another route of valorisation.	9
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be applied in relation to packing centers	All mandatory references, including protected origin, are inspected by the warehouse quality teams upon reception of the product. If the product does not have the information required by law in terms of labelling and packaging, it is rejected at the warehouse.	9
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	This MS highly impacts carrots and apples. Most carrots and apples are rejected because they don´t have the size or shape to meet consumers' expectations.	9
The type of farming and production method	There are established criteria for the use of pesticides and regular analyses are carried out to check compliance. If non-compliance is found, the product is rejected, and food waste is generated as a result.	9

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	Ex: Bio certification and Zero Residue Certification are relevant standards for fruits and vegetables.	
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	Compliance parameters of temperature throughout the supply chain (including transportation) as well as good handling practices in stores, avoiding, for example, product massification are highly important aspects that are monitored and audited. For tomatoes, lettuce and red berries, collection, delivery, preservation and handling, the conservation methods highly affect the quality of the product and can create food waste in these products. Ex: Inadequate handling of tomatoes and red berries during collection and in stores can contribute to food waste. Inadequate preservation and temperature methods in lettuce highly contribute to Food Waste.	9
Quality Standards	Quality standards include parameters for sensory, microbiological, and physicochemical evaluation, which are monitored throughout the year. Some of these parameters are legal requirements, while others are agreed upon with suppliers. Ex: If the fruit does not meet Brix requirement it can be rejected	9
F&V.CS3.ZT-SI		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
The technical definitions	The product is rejected on the entry point if it is not of suitable quality.	8
Classification criteria	The product should be suitable based on 3 class.	8
The species, plant variety or animal race or the commercial type	The species needs to be uniform and have the allowed weight for each class. This is difficult for some varieties.	7

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Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	Important especially for the product that needs to be uniform in appearance for each of the classes. Water content is important for lettuce / to keep lettuce fresh on the shelf. In the MS there is only the requirement that the lettuce is fresh and that it is free of abnormal external moisture.	5
The type of farming and production method	We labelled organic products separately. The amount of organic in our retail is very small, so it does not contribute significantly to FW generation.	6
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	Time of delivery is important, to ensure freshness.	8
Restrictions as regards the use of certain substances and practices	Slovenian legislation needs to be followed, as fewer protection means are approved in Slovenia / fewer protection means are approved than in EU.	8
F&V.CS4.Men-SI		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
The technical definitions	Type, variety or quality. Example: The lettuce or apple is rejected if it is not a suitable variety and quality.	9
The species, plant variety or animal race or the commercial type	Customers reject special peach variety.	9
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	If the lettuce is not fresh and contains low percentage of water (we reduce this waste with high criteria when delivering the lettuce to customers); if the fruits do not contain enough water.	7
The type of farming and production method	Organic production	8

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The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	Time of delivery (from transport to the customer), distance to the customer, temperatures.	9
Restrictions as regards the use of certain substances and practices	Customers do not have information about the origin of F&V.	1
F&V.CS5.LN-DE		
FMS categories	**Impact in the context of the case study? Example.**	**Estimate the importance of the FMS (1= lowest, 9= highest)**
Classification criteria	LN only sells in class II because organic products are mostly smaller, and it is often not possible to sell in class I.	5
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be applied in relation to packing centers	All labels of packed goods must comply with the obligatory marketing standards. If a label is incorrect and does not meet the requirements of EU legislation the goods are rejected by the customer.	7
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	• Products are often too small or too big. • Problems in selling yellow limes. • No acceptance for green lemons. Green lemons are not an indication that the fruit is not ripe. • Too small fruit often has less juice content and does not meet the requirements within regulations. • This is caused by too small differences in day and night temperatures. • Cucumbers are often too weak in summer months.	9
Substances used in production	All organic products and covered by EU regulation.	2
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	Product's individual temperature and storage conditions (obliged by a consumer standard) are necessary for product quality and shelf-life.	

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Restrictions as regards the use of certain substances and practices	• Substances used post-production (e.g. anti mold or conservation of citrus peel). • Limes and lemons: Conservation with wax or anti-mold substances are forbidden for organic citrus fruits. As a result, the shelf life is shorter compared to conventional products.	7
F&V.CS6.Ane-ES		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	These are the main factors contributing to FW: • Aesthetic defects: wind damage, pests; • Size; • Colour.	9
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	To extend marketing season and to meet customer demands about frequency in our deliveries can produce FW.	7
Restrictions as regards the use of certain substances and practices	Restrictions in some pesticides provoke more pest attacks and more FW.	7
F&V.CS7.ILVO-BE		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Technical definition	Technical definitions (specs), composed of legal requirements and business requirements, are the tool used to monitor the profile of the product that was initially negotiated between producer and retailer. Soft fruit producers must deliver products in accordance with the technical data sheets provided by retailers E.g.: If a producer delivers a product that doesn't comply with the technical data	

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	sheet, the product is rejected at the warehouse (at the reception of the product).	
The species, plant variety or animal race or the commercial type	A list of plant varieties of raspberries and blueberries are mentioned in the specs. If producers are not delivering raspberries from this specific list, they are declined by the retailer	
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	Important especially for soft fruit that needs to be uniform in appearance for each of the classes (e.g. size of strawberry or raspberry).	
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	Compliance parameters of temperature throughout the supply chain (including transportation) as well as good handling practices in stores. For soft fruit collection, delivery, preservation and handling, the conservation methods highly affect the quality of the product and can create food waste in these products. E.g.: Inadequate handling soft fruit during collection and in stores can contribute to FW.	
F&V.CS8.ILVO-NL		
FMS categories	**Impact in the context of the case study? Example.** *for Tomatoes, but we are also working on lettuce and bell pepper*	**Importance of the FMS (1= lowest, 9= highest)**
Technical definition	Technical definitions (specs), composed of legal requirements and business requirements of lettuce, belle pepper or tomatoes, are the tool used to monitor the profile of the product that was initially negotiated between producer and retailer E.g. from the UNECE-norms for tomatoes (FFV-36): This standard applies to tomatoes of varieties (cultivars) grown from Solanum lycopersicum L. to be supplied fresh to the consumer, tomatoes for industrial	

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	processing being excluded. Tomatoes may be classified into the following commercial types: • "round"; • "ribbed"; • "oblong" or "elongated"; • Cherry/cocktail tomatoes (miniature varieties) of all shapes.	
Species, plant variety or animal race or the commercial type	The species needs to be uniform and have the allowed weight for each class. This is difficult for some varieties.	
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	Tomatoes are classified in 3 classes: extra (superior quality), I (good quality, free of cracks and visible greenbacks, …), and II (satisfy the min. requirements). Each of these classes, different appearance rules and consistency rules apply.	
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	Tomatoes must be packed in such a way as to protect the produce properly. The materials used inside the package must be clean and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, particularly paper or stamps bearing trade specifications, is allowed, provided the printing or labelling has been done with non-toxic ink or glue. Stickers individually affixed to the produce shall be such that, when removed, they neither leave visible traces of glue nor lead to skin defects. Information lasered on single fruit should not lead to flesh or skin defects. Packages must be free of all foreign matter	
Meat		
M.CS1.FEN-BE		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS**

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		(1= lowest, 9= highest)
Technical definitions	Ingredients, additives raw materials, tests, processing instructions.	2
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	Very important aspects of meat processing as people want uniform products, but meat is not a uniform raw material of course.	9
The species, plant variety or animal race or the commercial type	The number of race/varieties of raw materials and the impact on the products, production methods, ingredients.	7
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be applied in relation to packing centers	Packaging, labelling, marketing.	5
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	Very important, food safety wise, and traceability is also of great importance.	7
Substances used in production	Ingredients, additives etc.	4
Type of farming and production method	Organic, conventional	2
The place of farming and/or origin	Viande d'origine Francaise, Red tractor (UK)	7
M.CS2.AVEC-BE_EU		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Technical definitions	The absence of definition for certain poultry cuts in the current Regulation 543/2008 on marketing standards for poultry meat weighs into the food waste balance. For examples: feet and paws are not defined while there is a potential market for those products that are safe for human consumption.	2

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Classification criteria	Grading as classes A/B of the poultry carcasses and cuts as per Regulation 543/2008 on marketing standards for poultry meat has one of the main impacts in the case study along with the animal by-products categorization as per Regulation (EC) No 1069/2009 laying down health rules for animal by-products and derived products not intended for human consumption, and the strict categorization of by-products as category 2 (instead of category 3 offering higher valorisation solutions for products).	8
Criteria such as appearance, consistency, conformation, product characteristics and the percentage of water content	As per Regulation 543/2008 on marketing standards for poultry meat, products not compliant from a water protein content should bear a specific warning statement (labelling). Such statement would de-valorise the product (as it would not sell) while still safe for human consumption and most important, compliant from a principle of 'non-added' water standpoint. However, the sector and EU authorities are informed that the current thresholds listed in the Regulation are outdated.	
M.CS3.FEB-BE		
FMS categories	**Impact in the context of the case study? Example.**	**Importance of the FMS (1= lowest, 9= highest)**
Classification criteria	Specific criteria apply for the classification of beef: Meat Market Observatory[3] Regulation 2006/1183[4] BelBeef[5]	**8**
The species, plant variety or animal race or the commercial type	The type of animal predominantly raised for meat production is the Belgian Blue.	**9**
The presentation, labelling linked to obligatory marketing standards, packaging, rules to be	Specific (voluntary) labelling applies for Belbeef product.	**7**

[3] Classification of carcasses of bovine animals aged eight months or more (europa.eu)
[4] Regulation 2006/1183 - EC scale for the classification of carcasses of adult bovine animals (codified version) - EU monitor
[5] Documents | Belbeef

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applied in relation to packing centers	Labelling requirements are also detailed in EU and national legislation[6]	
The frequency of collection, delivery, preservation and handling, the conservation method and temperature, storage and transport	These can have an impact, yet they are minor compared to the above-mentioned downgrading options; specific restrictions apply for bovine.	**5**
Restrictions as regards the use of certain substances and practices	These are included in the marketing standards. Their impact is not so great compared to the other downgrading options. Specific restrictions apply for bovine.	**4**
Bovine		
Substances used in production	Specific restrictions apply.	**2**
Type of farming and production method	Specific restrictions apply.	**3**
The place of farming and/or origin	The marketing of Belgian blue is predominantly a local (national) market.	**6**
Restrictions as regards the use of certain substances and practices	Specific restrictions apply.	2

[6] Etikettering van rundvlees | EUR-Lex (europa.eu)

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7.6 ANNEX 6: Data collection methodology

The CSs employed a variety of data collection methods across different commodities and stages of the FSC, see Tables below. Interviews were the most commonly used method across most CSs to gather information at various stages. Additionally, surveys were frequently employed, utilizing software tools like LimeSurvey and Google Forms, while some data were gathered through in-person, face-to-face meetings. The fish case study partner, OPPPB, supported by CREDA, also organized workshops to facilitate data collection and train fishermen on how to accurately complete the surveys. In contrast, two of the case studies (MC and L&F) chose not to use surveys, as stated in CS Plan -1, and compensated by conducting more interviews. Both Natura Nuova and Lehmann Natur indicated the use of internal IT tools to help collect both quantitative and qualitative data. Initially, all Slovenian case studies had planned to use the DIH AgriFood traceability system and customized tools for data collection, but they have since decided not to continue with these systems for future data collection efforts.

In D1.1 Data Protocol, several examples were outlined, including interviews, surveys and observational studies. These guidelines helped ensure that partners had a clear framework for selecting the most appropriate methods for their contexts. Each CS partner was required to specify which data collection methods they planned to use, along with details about the stages of the food chain where data collection would take place, whether at production, processing, distribution, retail, or consumption stages.

To ensure consistency across all CSs, all partners received support in validating their data collection instruments. This included thorough reviews of interview guides, survey questionnaires, and other tools, ensuring that questions were clear, relevant, and capable of eliciting the necessary information. This validation process was essential not only for improving the quality and reliability of the data but also for aligning the methods across different case studies, ensuring comparability and coherence in the data sets.

CEREALS

	C.CS1.NN-IT	C.CS2.VN-SL
Software used for survey	Collection without software (a form was given to the interviewee to collect quantitative data)	NA
Primary production	NA	• In-depth interviews • Desk research
Processing & Manufacturing	• Interviews • IT tools (management control materials) • Survey	• In-depth interviews • Desk research
Retail & other distribution (wholesale)	• Interviews • IT tools (management control materials)	NA

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EGGS

	E.CS1.LF-DE	ECS2.AVE_EU
Primary production	• Interviews	• Interviews
Processing & Manufacturing	• Interviews	• Interviews

FISH

	F.CS1.Opp-ES
Software used for surveys	Collection without software
Primary production	• Surveys or semi-structure interviews • Training to fill out survey
Retail & other distribution (wholesale)	• Surveys or semi-structure interviews • Training to fill out survey

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FRUIT & VEGETABLES

	F&V.CS1.NN-IT	F&V.CS2.MC-PT	F&V.CS3.ZT-SI	F&V.CS4.Men-SI	F&V.CS5.LN-DE	F&V.CS6.Ane-ES	F&V.CS7.ILVO-BE/ F&V.CS8.ILVO-BE_NL
Software used for survey	Collection without software (a form was given to the interviewee to collect quantitative data)	NA	NA	NA	NA	NA	NA
Primary production	• Interviews • IT tools	• Internal data • Interviews	• In-depth interviews • Desk research	• In depth interviews • Desk research	• Interviews • Quantification methods, e.g. internal managing system / weigh products	• Interviews	• In-depth interview
Processing & Manufacturing	• Interviews • IT tools	NA	• In-depth interviews • Desk research	• In depth interviews • Desktop research	NA	• Interviews	• In-depth interviews
Retail & other distribution (wholesale)	• Interviews • IT tools	• Internal data	• In-depth interviews • Desk research	• In depth interviews • Desk research	• Quantification methods, e.g. internal managing system / weigh products	• Compliant Sheets	• In-depth interviews

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					• B2B complaint managing tool		
Restaurants & food services,	NA	• Internal data • Interview	• In-depth interviews • Desk research	• In depth interviews • Desk research	NA	NA	NA
Household / Consumers	NA	NA	NA	NA	NA	NA	NA

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MEAT

	M.CS1.FEN-BE	M.CS2.AVE-BE_EU	M.CS3.FEB-BE
Software used for survey	Lime survey	NA	Google forms
Processing & Manufacturing	• Surveys • Meeting with companies • Interviews	• Interviews • Surveys • Contact members	• Interviews • Surveys • Contact members
Retail & other distribution (wholesale)	• Surveys • Meeting with companies • Interviews	NA	NA

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7.7 Annex 7: Timeline

The timeline offers a comprehensive visual representation of the scheduled actions for data collection across the 16 different CSs (Table below). This timeline not only outlines the specific periods during which data collection will take place but also provides insight into how these activities are distributed across the first 14 months of the project. Given the importance of timely data availability for subsequent analysis in other work packages (WPs), a clear and structured timeframe was established for data collection and pre-processing. The careful planning of this timeframe also helps mitigate delays and ensures a smooth flow of information between the different stages of the project.

In this update, most of the CSs indicated changes in their timelines. However, these changes primarily reflect an earlier start to the preparation and data collection processes.

Cereal	Data collection method															
	C.CS1.NN-IT															
	Internal data		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Internal meeting to understand already available data			X											
	2	Collection of internal data								X	X	X	X			
	3	Collection of internal private food marketing standards for the selected products								X	X	X	X			
	4	Data pre-processing													X	
	In-depth Interview (IDI)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire						X								
	2	Questionnaire developed							X							
	3	Interview implementation								X	X	X	X			
	4	Data pre-processing (cleaning, transcription, anonymization)													X	
	Surveys		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the survey						X								
	2	Survey developed							X							
	3	Survey implementation								X	X	X	X			
	4	Data pre-processing													X	
	C.CS2.VN-SI															
	In-depth Interview (IDI)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire				X	X	X								

	2	Questionnaire developed							X	X	X					
	3	Starting interviews									X					
	4	Completing interviews (all data collected)											X			
	Desk research		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Desk research				X	X	X								
	2	Data collected											X			
Eggs	**E.CS1.LF-DK**															
	Interviews		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire			X	X	X									
	2	Starting interviews						X	X	X	X					
	3	Completing interviews								X	X	X				
	4	Data processing									X	X				
	5	Filling the reporting template										X				
	ECS2.AVE_EU															
	Interviews		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire													X	X
	2	Starting interviews													X	X
	3	Completing interviews														X
	4	Data processing														X
	5	Filling the reporting template														X
Fish	**F.CS1.Opp-ES**															
	Survey		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire				X										
	2	Questionnaire developed					X	X								
	3	Starting data collection							X							
	4	Completing data collection (all data collected)								X						
	5	Data pre-processing (cleaning, transcription, anonymization)									X	X				
	In-depth interview		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	In deep interviews to better design the questionnaire				X										
	Workshop		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**

	1	Validating data (M15)														
Fruit And Vegetables	**F&V.CS1.NN-IT**															
	Internal data		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Internal meeting to understand already available data			X											
	2	Collection of internal data								X	X	X	X			
	3	Collection of internal private food marketing standards for the selected products								X	X	X				
	4	Data pre-processing													X	
	In-depth Interview (IDI)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire						X								
	2	Questionnaire developed							X							
	3	Interview implementation								X	X	X	X			
	4	Data pre-processing (cleaning, transcription, anonymization)													X	
	Surveys		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the survey						X								
	2	Survey developed							X							
	3	Survey implementation								X	X	X	X			
	4	Data pre-processing													X	
	F&V.CS2.MC-PT															
	In-depth Interview (IDI)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire						X								
	2	Questionnaire developed								X						
	3	Interview implementation								X	X					
	4	Completing interviews (all data collected)									X	X	X			
	5	Data pre-processing (cleaning, transcription, anonymization)										X	X			
	Internal data		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Collection of internal data (1/1/23 to 31/12/23) on food waste creation (value and kg) in selected Fruits and Vegetables								X						

	2	Collection of internal private food marketing standards for the selected products								X					
	3	Data pre-processing													X
	F&V.CS3.ZT-SI														
	In-depth Interview (IDI)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire				X	X	X								
	2	Questionnaire developed							X	X	X					
	3	Starting interviews									X					
	4	Completing interviews (all data collected)											X			
	Desk research		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Desk research				X	X	X								
	2	Data collected											X			
	F&V.CS4.Men-SI															
	In-depth Interview (IDI)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	A first draft of the questionnaire				X	X	X								
	2	Questionnaire developed							X	X	X					
	3	Starting interviews									X					
	4	Completing interviews (all data collected)											X			
	Desk research		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Desk research				X	X	X								
	2	Data collected											X			
	F&V.CS5.LN-DE															
	Internal data collection		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Internal meeting CEO, QM, Key accounts, to review the available internal data on the chosen products, to assess possibilities to take more detailed notes of return reasons and specific FMS involved.			X											
	2	Collect reclamation assessments				X	X	X	X	X	X					
	3	First analysis for potential adjustments to the collection					X									
	4	Monthly analysis of reclamation assessments						X	X	X	X	X				

	5	Organise weighing of chosen products in own warehouse (idea: 4-6 days) -packaging vs food -alternative marketing channels for human consumption -energy/feed destination						**X**	**X**	**X**	**X**	**X**				
	6	Data pre-processing													**X**	
	Interviews with suppliers		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Identification of relevant suppliers (idea: 2 per chosen product each 1 hour)			**X**											
	2	A first draft of the questionnaire together with ILVO; VLTN; CREDA & UNIBO and other CSs				**X**										
	3	Questionnaire developed together with ILVO; VLTN; CREDA & UNIBO and other CSs						X								
	4	TBD: Potential translation into Spanish by LN / CSCP / PNO / CRE						X								
	5	Establishing contacts to interviewees							**X**							
	6	Starting interviews						**X**								
	7	Completing interviews (all data collected)											**X**			
	8	Data pre-processing (cleaning, transcription, anonymization)													**X**	
	Interviews with customers (from customers)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Identification of relevant retail costumers (for each chosen product 1 retailer)					**X**									
	2	A first draft of the questionnaire (incl. asking for feedback on potential solutions, possibility to engage in WP4 activity)								**X**	**X**					
	3	Questionnaire developed								**X**	**X**					
	4	Starting interviews										**X**				
	5	Completing interviews (all data collected)											**X**			
	6	Data pre-processing (cleaning, transcription, anonymization)													**X**	
	Survey with end consumers		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**

	1	Contact to retail customers for their initial cooperation (see step 4)									X					
	F&V.CS6.Ane-ES															
	In-depth Interviews		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Questionnaire developed				**X**	**X**	**X**	**X**	**X**						
	2	Starting interviews							**X**	**X**						
	3	Completing interviews (all data collected)								**X**	**X**					
	4	Data pre-processing (cleaning, transcription, anonymization)									**X**					
	Obtention of customer perspective through Complaint Sheets as a vision of consumers' acceptance		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Complaint sheet developed				**X**	**X**	**X**								
	2	Complaint sheet delivery and data collection							**X**	**X**	**X**					
	3	Data pre-processing (cleaning, transcription, anonymization)									**X**	**X**	**X**	**X**		
	F&V.CS7_ILVO-BE and F&V.CS8.ILVO-BE_NL															
	In-depth Interview (IDI)		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Contact of stakeholders (processing and manufacturing, retail and distribution/wholesale) and for the IDI				**X**	**X**									
	2	First draft of IDI questions developed					**X**									
	3	Review of first draft of IDI questions by partners						**X**								
	4	Working on feedback from draft IDI questions and second draft developed						**X**								
	5	Confirmation and planning of IDI				**X**	**X**	**X**	**X**							
	6	IDI questions fully developed and accepted by WP leads							**X**							
	7	Conducting IDIs							**X**	**X**	**X**					
	8	IDIs conducted									**X**					
	9	IDI records transcribed									**X**					
	10	Data pre-processing done + reported									**X**	**X**				

Meat	**M.CS1.FEN-BE**														
	Surveys		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Thorough research of the field, mapping the problems and situation	X	X	X	X	X									
	2	Draft questions					X	X	X							
	3	Starting survey							X	X	X	X				
	4	Processing data										X	X	X		
	5	Reporting													X	X
	Interviews/meeting with companies		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Draft goals and questions		X	X	X	X									
	2	Planning and performing meetings, interviews and workgroups					X	X	X	X	X	X				
	3	Processing data										X	X	X		
	4	Reporting													X	X
	M.CS2.AVE-BE															
	Interviews		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Draft interview question			X	X										
	2	Starting interviews							X	X	X					
	3	Completing interviews										X	X	X		
	4	Data pre-processing													X	X
	Surveys		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Draft survey questions			X	X										
	2	Starting surveys							X	X	X					
	3	Completing surveys										X	X	X		
	4	Data pre-processing													X	X
	M.CS3.FEB-BE															
	Interviews		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Draft interview question					X	X								
	2	Starting interviews								X	X					
	3	Completing interviews									X					

	4	Data pre-processing								X	X					
	Suveys		**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**M13**	**M14**
	1	Draft survey questions			X	X										
	2	Starting surveys							X	X						
	3	Completing surveys								X	X					
	4	Data pre-processing								X	X