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## Overview

### The need

Quantifying food loss and waste (FLW) and its causes allows for more targeted and effective food waste interventions. Moreover, to effectively meet targets a good understanding of the current FLW situation is essential.

In the region of Catalonia, in Spain, the public company that has competencies over the waste generated and managed (the Waste Agency of Catalonia [ARC]), recognise the need to quantify the current FLW situation.

### The solution

Following a 2016 study, promoted by ARC, workshops identified the peaches and nectarines (PN) sector as a good starting point to carry out whole supply chain FLW quantification. ARC hired the Center for Agro-Food Economy and Development (CREDA-UPC-IRTA) to implement the quantification, which was carried out between September and December 2017. The quantification analysed FLW across a number of different lifecycle stages of the PN supply chain.

### The benefit

The project highlighted the causes and areas of FLW across the PN supply chain and proposed seven targetted food waste reduction objectives as a result. These included, for example, increasing knowledge and awareness of FLW along the supply chain and promoting transparency and traceability of FLW.

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# Food waste along the food supply chain: A case study of Spanish peaches and nectarines

REFRESH project quantifies supply chain food loss and waste (FLW) of peaches and nectarines (PN) in Catalonia

In Spain, both waste and food-related competencies are transferred to the Autonomous Communities. In Catalonia, the Waste Agency of Catalonia (ARC-Agència de Residus de Catalunya) is the public company that has competencies over the waste generated and how it is managed. Two of ARC's main objectives are to promote the minimisation of waste and reduce its environmental risk.

## Background

In Catalonia, there is a programme titled "The Catalan General Waste and Resource Management and Prevention Programme 2013-2020" (PRECAT20) which encourages waste reduction across all sectors.

Two objectives included in PRECAT20 are:

- 4b.1. Halving food waste from 2010 levels by 2020 in retail, hospitality and households**
- 4b.2. Establishing, by the end of 2018, food waste reduction objectives for the primary and agri-food sectors, as well as wholesale distribution**

In attempts to meet these objectives, ARC has been heavily involved in numerous projects, including: consumer campaigns, improvements to food waste measurement, preparation of food waste reduction action plans and the subsidising of prevention projects for local authorities and non-profit organisations. Notably, in 2016, ARC promoted a methodological



protocol to quantifying food waste in the primary sector, agri-food industry and wholesale sector in Catalonia. The study included, amongst other exercises, participation (workshops) from food sector stakeholders, who identified the potential sectors in which food waste could start to be quantified.

## What was the solution?

One sector that was highlighted during the workshops was the fruit sector. In particular, peaches and nectarines (PN) were listed as a good starting point to carry out whole supply chain food loss and waste (FLW) quantification. PN were selected due to four criteria:

- **Production:** The fruit sector represents 42% of primary production and 10% of the cultivated land used for human consumption in Catalonia. PN represent 44% of total fresh fruit production and also represent the largest proportion of fruit and vegetable exports.
- **Economic:** The fresh fruit sector represents around 40% of final primary production in Catalonia. It is one of the most relevant sectors in terms of economic value.
- **FLW:** PN are highly perishable and consequently there are significant levels of losses and waste.
- **Willingness of the sector:** key stakeholders from the PN sector showed their willingness to collaborate in the quantification.

Following conclusions from the workshops, ARC decided to carry out a FLW quantification for the PN sector, for 2017, in Catalonia. The ARC hired the Center for Agro-Food Economy and Development (CREDA-UPC-IRTA) to implement the quantification, which was carried out between September and December 2017.

The project was made up of two teams:

- A monitoring and evaluation team, responsible for overseeing project progress, which included individuals from the Department of Prevention and Resources Efficiency, and the Subdirectorate General of Food Inspection and Control of the Ministry of Agriculture, Livestock, Fisheries and Food.
- A research team which included a lead researcher and two consultants, all from CREDA.

The main objective of the project was to quantify food losses and food waste across different lifecycle stages in the PN sector, e.g. primary production, retail and wholesale. The secondary objectives were to:

1. Provide a FLW estimate which could be used as a baseline for future food waste interventions
2. Propose potential FLW prevention targets aligned with objective 4b.2 of PRECAT20
3. Identify the main causes of FLW in the analysed stages to propose more targeted waste reduction interventions

## Implementation

Prior to quantification, the scope of the study was determined (Table 1).



Table 1 - The scope of the FLW quantification study

Parameter	Description
The FLW (Food loss and waste) definition employed	FUSIONS definitional framework. Thus food waste was defined as “food and inedible parts of food removed from the food supply chain” to be recovered or disposed (including - composted, crops ploughed in/not harvested, anaerobic digestion, bioenergy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)” (Östergren et al., 2014). As inedible part of fruits, pits of peaches and nectarines were included as food waste.
Vocabulary used	Food waste has a negative overtone in its use in Catalan (malbaratament alimentari equals to food shrinkage) or Spanish (desperdicio alimentario). Therefore, we used a more neutral terminology during the stakeholders’ consultation. Based on previous experience, we used the expression “amount of PN that were managed as waste” for all stages except for the primary production, where it was adapted to “amount of PN left in the field when the fruit was ready to harvest”.
Year	2017
Types of produce	peach, nectarine, flat peach and flat nectarine
Lifecycle stages (Figure 1)	primary production, wholesale at origin, transformation industry, wholesale at destination and redistribution (charity distribution).
Geography	Region of Catalonia
Supply Chain	the main peaches and nectarines supply chain was examined. Thus, alternative production systems and marketing systems, such as organic, agro-ecologic, short-supply chain and, also, the secondary processing industry (jams, cuttings, etc.), were excluded from the analysis. Also, it is important to remark that all PN entering the Catalan PN food supply chain (FSC) at any stage are considered imports, while all PN shipped out of Catalonia at any FSC stage are considered exports.

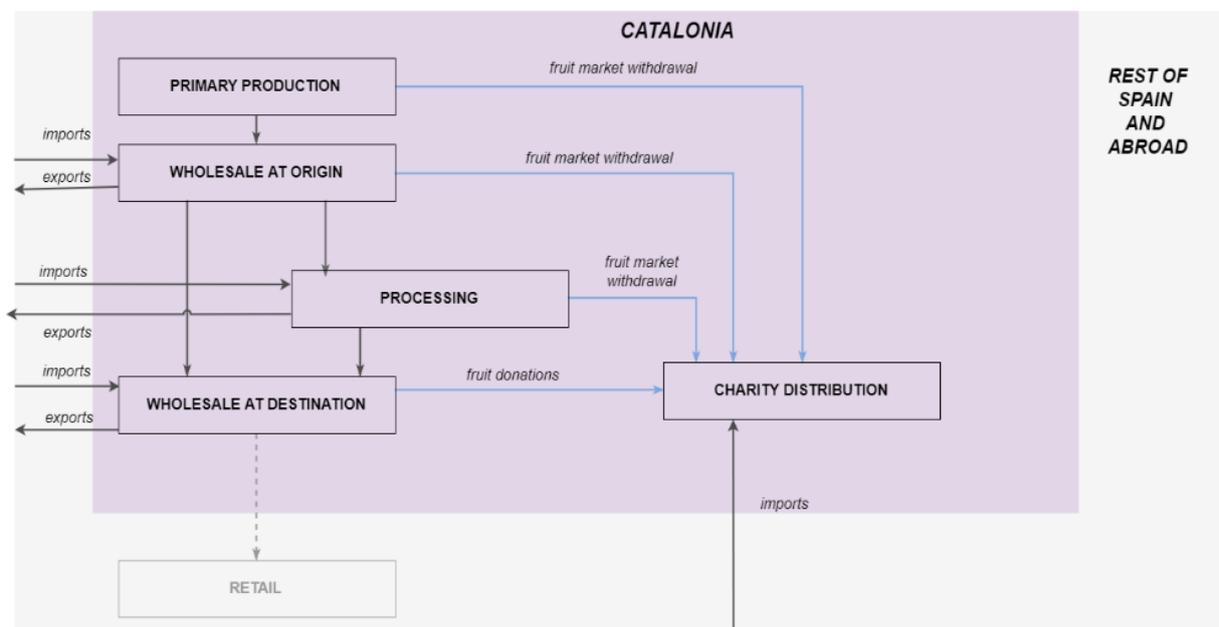
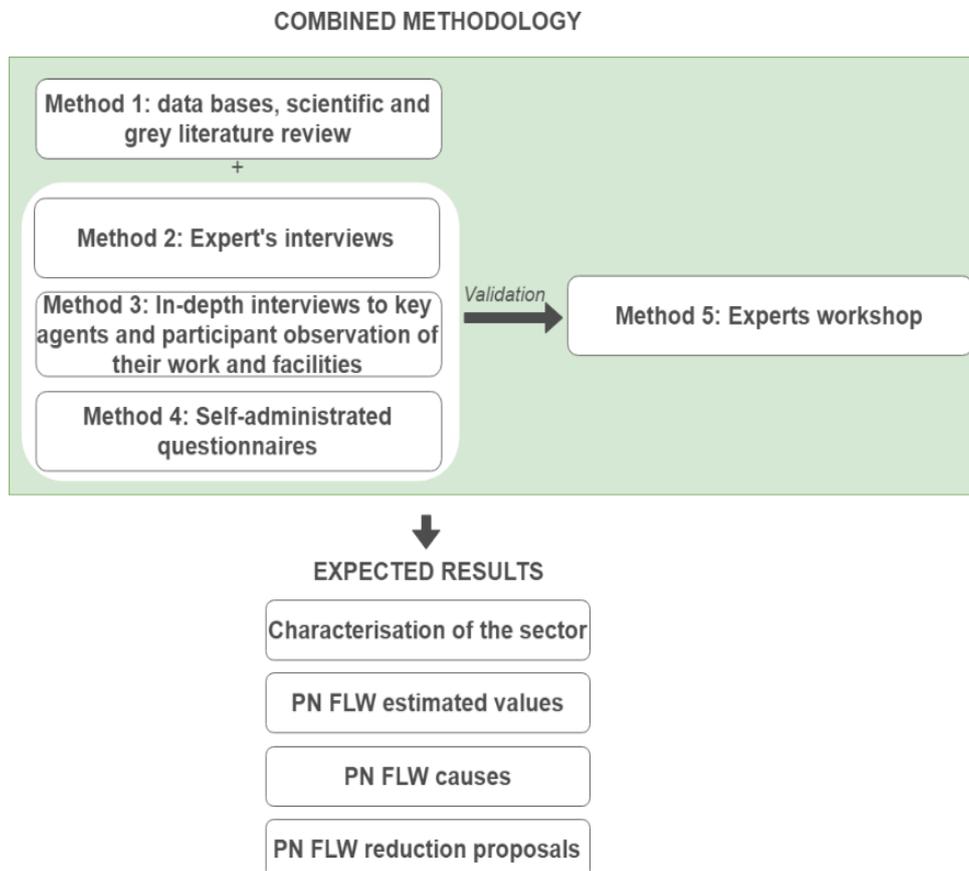


Figure 1 - Peach and nectarine food supply chain stages analysed in the study



In order to quantify PN FLW, a combined methodology was used (Figure 2).



*Figure 2 - Mixed methodology applied to the study*

In particular, five different methods were implemented:

- (i) secondary databases and review of scientific/grey literature to characterize, analyse the sector and get qualitative and quantitative data on PN production;
- (ii) experts' interviews to characterize the sector and its stakeholders, and get qualitative and quantitative information from the PN food supply chain (n=11);
- (iii) in-depth interviews to key agents and participant observation of their work in their facilities of the different FSC stages to obtain direct information on FLW generation, its causes and possible solutions (n=15 companies and organizations representatives from the sector);
- (iv) surveys to gather quantitative information on inputs/outputs and FLW PN volumes according to their origin and destination, and finally (n=15 companies and organizations representatives from the sector);
- (v) "experts workshop" (Figure 3) to validate the results (n=8).



Figure 3 – Experts workshop to validate the results

## Outcomes

The main findings from the study were that PN FLW percentages vary between 1.3% and 8.6% depending on FSC stage. This was mainly due to overproduction and its consequential market saturation (Figure 3). This was characterised by overproduction and an insufficient demand, and led to the perceived value of PN to drastically decrease. In many cases for the primary sector, it was not profitable to harvest the fruits, since the cost was higher than the revenue. Consequently, farmers left part of the harvest in their fields.

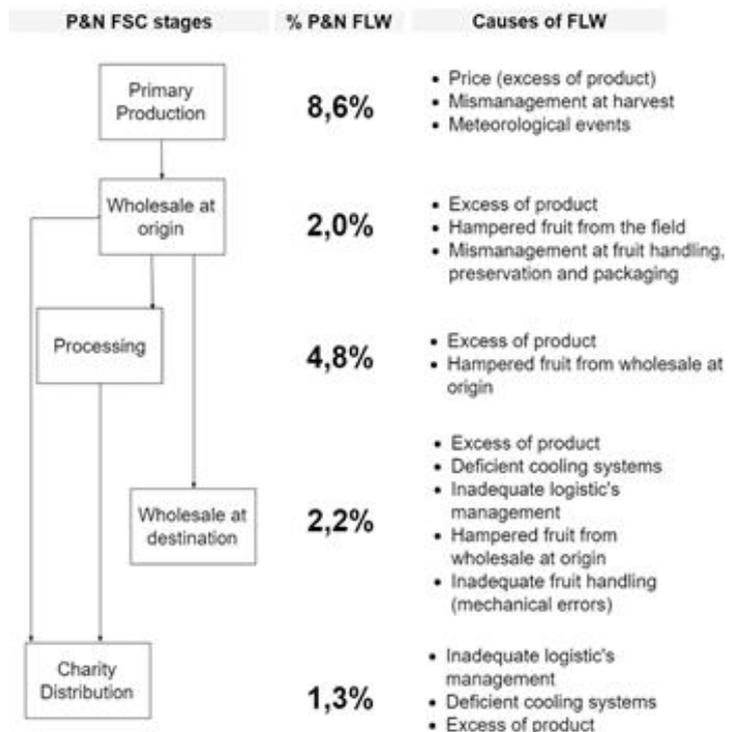


Figure 3 - PN FLW percentages and their main causes per FSC stage



The overproduction situation had consequences in the following stages, since as much harvest as possible was transferred to later stages in the supply chain. This meant that most of the time fruits were in a more hampered state than expected due to long periods stored in previous FSC stages. Moreover, specific actors in the wholesale at destination (stock markets and sales offices) and charity distribution had deficient cooling systems and presented an added difficulty to logistically manage the large amounts of product received, which in many cases were already in an advanced state of ripeness (leading to a shorter shelf life).

In regards to total food loss and waste, this was estimated at 53,317 tonnes (Table 2). However, it should be noted that 2017 was an exceptional year regarding food production, therefore it would be inaccurate to extrapolate findings to other years.

Table 2 – Estimated tonnes and percentage of food loss and waste by lifecycle stage

Stage	Input P&N (t)	Imports (volume and percentage) (t) (%)	Exports (volume and percentage) (t) (%)	Food loss and waste (%)	Food loss and waste volume (t)
Primary production	406,525	0 (0%)	0 (0%)	8.6	34,961
Wholesale trade origin	464,453	92,890 (20%)	340,255 (79%)	2.0	9,140
Transformation Industry	161,611	85,841 (53%)	59,769 (79%)	4.8	7,757
Wholesale trade destination	65,667	42,814 (65%)	-/- <sup>(a)</sup>	2.2	1,445
Redistribution	1,047	36 (3.5%)	-/- <sup>(a)</sup>	1.3	13.6
<b>TOTAL</b>					<b>53,317</b>

<sup>(a)</sup> Exports out of Catalonia not considered in the Wholesale at destination and redistribution as they are out of the scope of the study

## Thoughts for the future

Following analysis, specific objectives to mitigate the current food waste situation in the PN sector were proposed. The seven objectives and their specific tasks were derived from the expert discussions and data evaluation.

**Objective 1: Increase knowledge and awareness regarding food losses and food waste along the food supply chain.**

- 1.1. Food losses and food waste awareness campaigns directed to professional and worker personnel of companies in the agri-food sector
- 1.2. Technical seminars, within PATT (technological dissemination) seminars to increase food sector professionals and disseminate best practices on food waste prevention and reduction



- 1.3. Implement specific courses on food waste to professionals of the agri-food sector to provide them multiple tools and strategies to integrate within companies procedures and policies.
- 1.4. Develop practical guidelines to prevent and reduce FLW

### **Objective 2: Promote transparency and traceability of FLW among all actors of the agri-food chain.**

- 2.1 Periodic studies to know FLW evolution in the PN sector
- 2.2 Promote distinguishing “edible food waste” from the organic food waste in the Waste Catalog, therefore specifying “edible food waste” in the waste statistics (DARIs and DARIGS)
- 2.3 Improve data bases regarding commercialisation volume at each stage of the supply chain, as well as regarding prices, costs, among other values.

### **Objective 3: Increase the value of food.**

- 3.1 Develop campaigns to increase local PN consumption among different sectors of the population. Making emphasis on the specific characteristics of the Catalan fruits such as proximity, the organoleptic properties or the integrated systems of production.
- 3.2 Campaigns at the selling points to increase consumer awareness about the value of food.
- 3.3 Pilot studies on how to incorporate the ecological footprint of fresh fruits, converted into monetary value (€) within supermarkets and food stores which sells local produces in order to increase consumer’s awareness.

### **Objective 4: Promote the improvement of the professional performance of the workforce throughout the food chain.**

- 4.1 Training days to improve the professionalization of the workforce in the sector (especially those in direct contact with fruit manipulation such as harvesting, handling, packaging etc. Consider the collaboration of the sector (associations, labour unions, etc.)

### **Objective 5: Promote the cross-cutting responsibility of all actors of the food supply chain.**

- 5.1 Promote a stable platform to define voluntary agreements among different stakeholders to specify measures to share the impact of food losses and food waste

### **Objective 6: Facilitate fruit recovery, which was not able to sell but could still be consumed, in all stages of the food supply chain.**

- 6.1 Establish a gleaning programme for the primary sector
- 6.2 Carry out a technical study at the wholesale markets to develop food waste collection and management systems that allow the food waste quantification and the redistribution to social entities of the food still edible.

### **Objective 7: Promote research, innovation and good practices**

- 7.1 R+D awards on food losses and food waste prevention practices.



## References

Östergren et al. (2014). *FUSIONS Definitional Framework for Food Waste*. Retrieved from [https://www.eu-fusions.org/phocadownload/Publications/FUSIONS Definitional Framework for Food Waste 2014.pdf](https://www.eu-fusions.org/phocadownload/Publications/FUSIONS%20Definitional%20Framework%20for%20Food%20Waste%202014.pdf)