A Food Loss Solution from a B2B Perspective for the Catalan Market

Laura Maria Carnerero Requena

Sara Joana Carvajal López

Marina Moreno Marín

Tutor: Ainhoa Crespán Martínez

Project Code: ECI02

Academic Year: 2020-2021

Degree: International Business Economics

General Index

Index of Figures

Index of Tables

ACKNOWLEDGEMENTS

We would like to begin our paper by first expressing our gratitude to Ainhoa Crespán Martínez, our tutor for this project and professor of International Strategic Management course, for her unconditional support and guidance throughout the journey, her valuable feedback and time.

We also want to make a special mention to Míriam González and Alfred Vara from the *Agència de Residus de Catalunya*, Rocío Abella from *TooGoodToGo* and Albert Riera from *La Fageda;* who devoted a share of their time to meet us, providing helpful information.

Last but not least, we would like to thank all the other businesses that responded to our phone calls and explained to us their current practices on food loss, answering our questions and doubts and sharing their concerns and needs on the topic.

0. ABSTRACT

The present end-of-degree paper explores the gap on food loss initiatives currently existing in Spain. It first gives an overview of the overall situation with a theoretical framework analyzing the Spanish food loss and waste market. After that, it focuses on the food loss concept and the present situation in the country, to find that there is potential for an innovative idea to increase circularity regarding food wastage at the first stages of the food chain. Finally, with the idea that food scraps for one party can be a resource for another, it develops a business model centered in Catalonia. Finally, it shows that with the right resources and capabilities, a network of cooperation and collaboration can be established among agents at the beginning of the food chain, and that this collaboration could be facilitated through a platform aiming at connecting businesses to positively impact themselves, society and the environment.

Key words: food loss, B2B platform, circular economy, Catalonia, resources, network, food chain

1. INTRODUCTION

"There is only one planet Earth, yet by 2050, the world will be consuming as if there were three" [1].
(United Nations, 2020)

One third of all the global food produced, valued in 1$ trillion of money, is lost or wasted every year (FAO, 2013). At the same time, 822 million people are suffering from undernourishment every day. And not only hunger is one of the quandaries, but climate change, food security and water management. The current food system is annually wasting 1.3 billion tons of food, 350 m3 of water, generating 3.3 billion of tons of greenhouse gas emissions and depleting unnecessary sources of energy (in the harvest, processing, transport and storage) for food that is being spoiled all along the food chain (FAO, 2013 & Gobierno de España).

Considering that the world population is expected to increase by 2 million people in the next 30 years, something has to be done very urgently or otherwise the situation will soon be no longer sustainable (FAO, 2019). The world needs to look beyond the take-make-waste extractive industrial model and generate sustainable economic activities by introducing circularity in businesses. Here is where our action takes place. We are three purpose-driven International Economic Business students who aim to make a real impact in our region, Catalonia, while developing our final end degree paper.

The purpose of our project is to first, show that food waste occurring at the end of the food chain (distribution & retail and consumption) is already being tackled by many organizations both public non-profit and private; and thus, it's time to focus the attention on the food loss taking place in the first stages of the food chain (production, handling & storage and processing & packaging), which accounts for 39% in Spain and is yet not properly covered by any market solution.Secondly, inside the food loss market, we want to show that food scraps are a resource, not a waste; and therefore, there exists a potential exchange between food processing businesses: the leftovers and surplus of one can be the raw materials for another business.

To do so, we are going to analyse whether some type of innovative business model, addressing the current needs of the industry, could become a game changer to fight against organic waste at the beginning of the food chain, generating value for businesses, the society and the environment.

[1]The EU's new Circular Economy Action Plan adopted in March 2020 starts with this sentence.

1.1. Methodology

The methodology we will follow in our final year project will be the following one. First, we will do a theoretical analysis using secondary sources where we will explain why food loss and waste is an important and urgent issue in the 21st century. Moreover, we will study the food supply chain; highlighting the difference between food loss and food waste depending on the stages, what type of food commodities are lost or wasted on each stage and we will study the current food loss and waste market in Spain, probing that the food loss market is uncovered.

Secondly, we will center the attention on the food loss industry in Spain, where first, we will detail the meaning of a few relevant concepts around food loss; and then, we will study how current manufacturers deal with their food losses. On the one hand, we will study it at the Spanish level using a recent government research (i.e. a secondary source) and on the other hand, we will study it at the Catalan level, where we are going to interview several Catalan companies in the agro-food industry to get to know first-hand their current concerns and needs (i.e. primary information source).

Thereafter, we will present our business model idea proposal, a market solution for the Catalan food loss market. Next, we will carry out a strategic analysis that will be summarized in a SWOT matrix, to understand if our business idea has or not market potential taking into account our internal capabilities and the external environment. Last but not least, we will formulate several strategic ideas in a TOWS matrix that will help us conclude if finally, our business model idea proposal is viable and feasible to develop in the current market.

1.2. Limitations

Throughout our project we have faced several limitations that are worth mentioning. On the one hand, when doing our study of the food loss market, we found there was very little data; and the one available, was neither homogeneous nor consistent among several sources. The part where we struggled the most was to find the exact percentage of food loss and waste in each stage of the supply chain. However, in the food waste market we did find a lot of information.

On the other hand, when doing our field research contacting several Catalan businesses, many of them didn’t respond either because they thought we were their competitors wanting to obtain information about their internal processes or due to confidentiality issues. On repeated occasions, the most we got was an email address to which we sent our questions and never received an answer.

2. THEORETICAL FRAMEWORK

2.1. The current relevance and urgency of the topic

Last March 11th 2020, the government of Catalonia stepped forward passing the Law 3/2020 *"Food Loss and Wastage Prevention"*[2] (Parlament de Catalunya, 2020); the first law approved in Spain to regulate the issue. Nevertheless, unlike some other laws launched by other European countries, such as Italy or France, whose aim is focused at redistributing food surpluses, the Catalan law is a pioneer since it attempts to prevent food losses at origin and reduce the food wastage all along the supply chain. Some of the regulations established in this law are that companies taking part in activities related to the food industry (including NGOs) must arrange a prevention plan of food loss and food waste, should collect and inform of their food wastage and follow the hierarchy of priorities in case of having food surplus (e.g.: use the non edible food waste for industrial, compost or biogas purposes before burning or throwing it away). Although it is currently advisable to follow such regulation, it will not be compulsory until 2023. (Normativa Llei 3/2020, Gencat).

Additionally, also last year, Barcelona participated for the first time in the Circular Economy Club (CEC) whose vision is that every city of the world functions and thrives inside the planetary limits through a circular economy, by reducing residues. One of the four working areas within the *Barcelona Circular City* project is the food and beverage sector; considered to be one of the main challenges to tackle by developing strategies and actions to bring Barcelona to circularity (Circular Economy Club, 2021). Likewise, this 2021, the city of Barcelona is the worldwide capital of sustainable food as it will be holding the 7th summit of the Milan Urban Food Policy Pact (MUFPP) in October. This pact is a non-binding international protocol with the objective of tackling food related issues at urban level (MUFPP, 2015). It intends to develop concrete working tools, acknowledging that cities have a major responsibility in terms of designing sustainable food systems, since they are hosting over half of the world's population and it is expected to increase.

All in all, our final year project aims to contribute to the fulfillment of the Sustainable Development Goals (SDGs) set by the United Nation Member States by 2030. We specifically target the SDG 12, which intends to ensure sustainable consumption and production patterns. More concretely, aim to develop a strategic plan that could help to achieve the attainment of the objective 12.3, which aims to "*halve per capita the global food waste at the retail and consumer levels and reduce food loss along production and supply chains"* (United Nations, 2015). Moreover, our plan is also aligned with the EU Directive 2018/851, which requires member states to send out a clear call for action to reduce wastage with specific national programs (Ellen MacArthur Foundation, 2020).

[2] Llei 3/2020, de l'11 de març, de prevenció de les pèrdues i el malbaratament alimentaris. Available at http://cido.diba.cat/legislacio/9926941/llei-32020-de-l11-de-marc-de-prevencio-de-les-perdues-i-el-malbaratament-alimentaris-departament-de-la-presidencia

2.2. Analysis of the food supply chain

The food supply chain is the process of how food ends up on your plate, which includes all the different stages that food goes through along this path (Ghamrawy, 2019). There exists a substantial difference between food waste and food loss that is worth highlighting for our paper.

On the one hand, **food loss** refers to the decrease in the quantity and quality of food that occurs from harvest and production up to (not including) the retail level. Hence, it encompasses the food that is discarded, incinerated or disposed along the supply chain including the harvest, slaughter, production, processing and distribution stages. (FAO, 2019 & Parfitt et al., 2010).

On the other hand, **food waste** refers to the decrease in the quantity and quality of food occuring at the retail and consumption level due to retailers' and consumers' behavior. It is edible food appropriate for human consumption that is discarded or left to spoil for different reasons: because it is close or beyond to the "best-before" date, because it does not meet the shape, size or color standards, or because it is simply unused or left over by households and other eating establishments (FAO, 2019; Parfitt et al., 2010 & HLPE, 2014).

Figure 1 below shows the different stages that constitute the food supply chain, and whether the food remainders derived from each part belong either to food loss or food waste.

Figure 1*: *Loss and waste of food along the food supply chain. Source: Own Elaboration from the FAO data, 2018.

According to the FAO (2016), in developed countries, 40% of food waste occurs at the retail and consumer level. This implies that the remaining 60% is food loss occurring at the initial stages of the supply chain.

In Figure 2, it is detailed the worldwide food loss and waste occurring in the value chain. We can observe that in the stages of Production and Handling & Storage, food losses are the highest ones in volume, amounting to 500 and 350 million tons of losses per year, respectively. Moreover, it is worth highlighting for our further analysis that fruits and vegetables are the most lost and wasted food commodity.

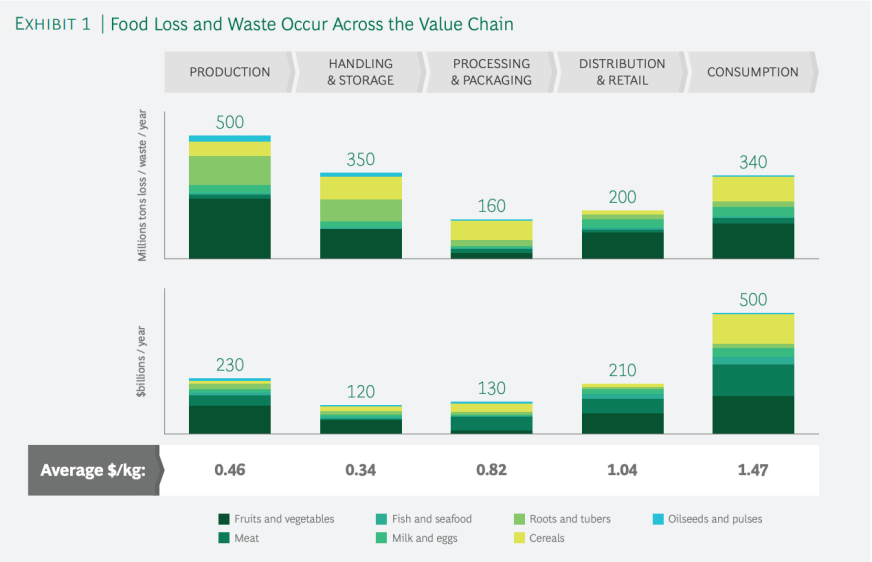

Figure 2**:** *Worldwide Food Loss and Waste across the Food Supply Chain.* Source: FAO (2011); FAOSTAT database; BCG FLOW model (2015).

2.2.1 Why is food lost or wasted? Analysis of the food supply chain by stages and by commodities

Food is lost or wasted due to different reasons. It depends (1) on the type of commodity and (2) on the specific stage of the food chain we are in. Table 1 summarizes the main causes of why food is either lost or wasted, by stages (from the production to consumption) and by type (whether it is a vegetable or an animal product).

	Vegetables commodities and products	**Animal commodities and products**		
		Meat	**Fish**	**Dairy**
Production	Losses due to natural causes: Plagues, climate incidents, crop diseases. Losses due to human causes: inefficiencies, bad machinery conditions, spillage during harvesting or crop sorting.	Losses due to animal deaths and/or diseases.	Losses due to discards during fishing.	Losses due to dairy cow sickness.

Handling and storage	Losses due to spillage and degradation during handling, storage and transportation between farm and distribution.	Losses during transportation and storage.	Losses due to spillage and degradation during icing, packaging, storage and transportation	Losses due to spillage and degradation during transportation between farm and distribution.
Processing	Losses due to spillage and degradation during industrial or domestic processing (e.g. juice production, canning and bread baking). Losses may occur when crops are sorted out if not suitable to process or during washing, peeling, slicing and boiling or during process interruptions and accidental spillage.	Losses due to trimming spillage during slaughtering and additional industrial processing.	Losses due to industrial processing such as canning, smoking or shaping.	Losses refer to spillage during industrial milk treatment and milk processing to produce cheese and yoghurt.
Distribution	Losses and waste in the market system, at wholesale markets, supermarkets, retailers and wet markets (e.g.: unsuitable packaging, improper cooling, bumps or falls of the merchandise, discard of products with very close expiration or consumption dates).			
Consumption	Losses and waste during consumption at the household level (poor planification of purchasing, ignorance between the difference of "date of expiry" and "preferential consumption" and poor preservation).			

Table 1: *Types of loss or waste by stage and according to the origin of the food.* Own elaboration from Cleva Delgado & Casares Ripol (2017, pg. 18) and FAO (2011).

2.3. Overview of the food loss and waste market in Spain

Overall, Spain is the 7th country of the EU that wastes the most food, wasting up to 7.7 tons of food per year (Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, 2021). The following table, Figure 4, summarizes the most relevant initiatives and businesses within Spain that are tackling the food loss and waste problem.

Initiative/Business	Its mission
Espigoladors, Buruxka	Harvesting fruits and vegetables that do not accomplish the market standards to donate or transform them. A remarkable element is that they employ people at risk of social exclusion. They also have a store where they sell jam made of the harvested fruits and vegetables.
Refood	Treatment and selective collection of food products that do not fit for human consumption to produce energy, organic fertilisers and fuel.

Indulleida	Production of by-products (such as aromas and extracts) from fruits and vegetables that cannot be sold because of a food surplus or because they are not fit for human consumption.
Nutrició Sense Fronteres.	Nutrició Sense Fronteres is a non-for-profit organization located in Barcelona that through the project *Barcelona Comparteix el Menjar, distributes* the food leftovers from supermarkets, restaurants, caterings and hotels to social entities.
Donations to Banc d'Aliments, Creu Roja, Nevera Solidària, Pont Alimentari, etc.	Several businesses decide to donate their food surpluses to non-profit organizations. For instance, 32.7% of the total fresh products that receive Banc d'Aliments is donated by companies in Mercabarna. Since 2002, Mercabarna has a warehouse for the collection, sorting and distribution of surplus fresh food (Mercabarna, 2020)..
TooGoodToGo	After having conducted an interview with a B2B manager of the company, TGTG is an intermediary between businesses having food surplus and the final consumer through an online app marketplace. It allows consumers to save food and pay ⅓ of its price and businesses to not lose money and recover their investment cost. Their main objective is to avoid food waste at the retail and household level.
Encantados de Comerte, Phenix	Both initiatives have the same purpose as TooGoodToGo, to fight against food waste, but adding a social aim. They tackle the problem from four different perspectives: to give a second life to food surplus from supermarkets at a reduced price for final consumers, to donate food to associations and charities, to do composting and to donate the leftovers that are not edible for human consumption for animal feeding.

Table 2: *Initiatives/businesses tackling the food loss and waste problem*. Source: Own elaboration.

From the table above, we are going to categorize, in Figure 3, the main initiatives and businesses all along the food supply chain that are dealing with food loss and food waste. Hence, it will help us to gather a global view of the current business scope of each organization and to identify the stages where an impact is being made and the ones that are uncovered.

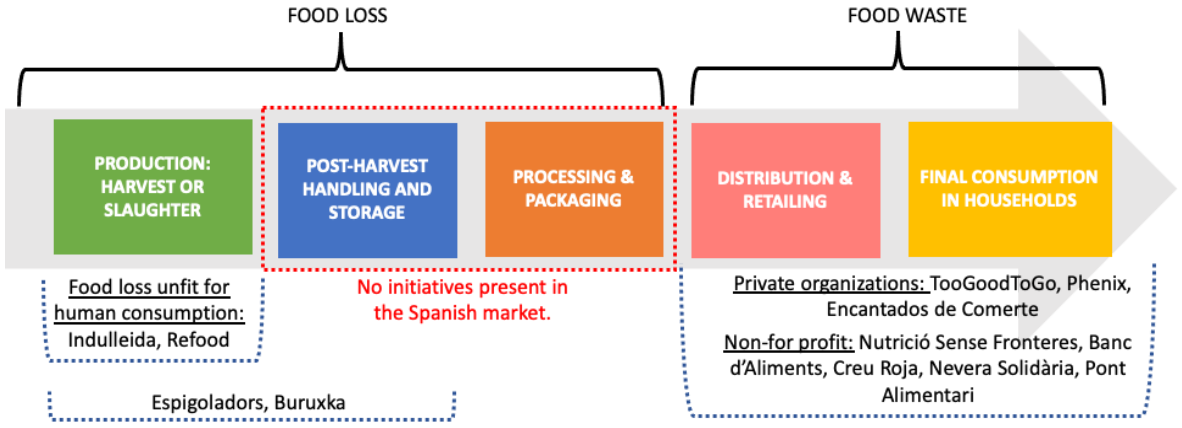

Figure 3: *Summary of the main initiatives carried out in Spain to fight against the food loss and waste problem*. Source: Own elaboration.

From the figure above, we can clearly observe that current businesses in Spain are centered on fighting against food waste occurring at the end of the supply chain, between the retail and the household stages. However, there is a lack of initiatives in the Post-harvest Handling & Storage and Processing & Packaging stages. Thus, it is the food waste problem that is being principally tackled and not the food loss issue. The reason behind it could be the lack of food loss data, as until very recently, businesses haven't been obliged to report their food losses but this doesn't imply they don't incur in losses. Consequently, since we have not seen many businesses or initiatives tackling the food loss problem from an external perspective, in the following section, we aim to investigate what the Spanish agri-food industry is doing with the food loss occurring during their procedures.

3. THE CURRENT FOOD LOSS INDUSTRY IN SPAIN

Coming up next, and following our reasoning above, we are going to center our approach in the food loss industry in Spain.

3.1. Relevant Concepts in Food Loss

Depending on whether food remainders eventually lead to a profit or a loss, we can differentiate between by-product, food residues and surplus as represented in Figure 4. **By-products** are substances generated along the production process, which are not finished products but are sensitive to be reused or commercialized (e.g.: orange rinds). Hence, we refer to the term by-product whenever an economic profit can be obtained in exchange. On the contrary, **food residues** are the substances generated during the production process that entail some economic loss since are not devoted for any other use and are eventually thrown away. Furthermore, some food can also be wasted, not because it is a leftover, but because it has not been used for different reasons (because of poor planning, changes in consumer behavior, etc) and it is neither used nor commercialized. We refer to these products as **surplus**, and the most common ways of managing it is to donate it, revalue it or waste it (Informe del Desperdicio Alimentario en la Industria y en la Distribución en España, 2020).

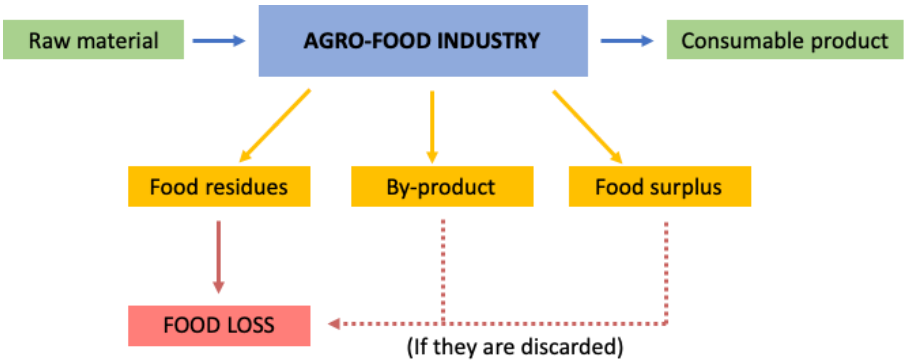

Figure 4: *The type of food loss in the Agro-Food Industry.* Source: Own elaboration

Nevertheless, there exists a hierarchy included in the article 4 of the EU Directive 2008/98 (EU, 2008), that establishes the priorities to follow when discarding food, sorting from the most to the least preferred option regarding the environmental footprint that each alternative entails (see Figure 5). Prevention and redistributing food for human consumption is the most preferred option, followed by redistributing it for animal consumption. Next, it is advisable to recycle and compost, and finally, as a last resource, it is recommended to incinerate and dispose of it in a landfill.

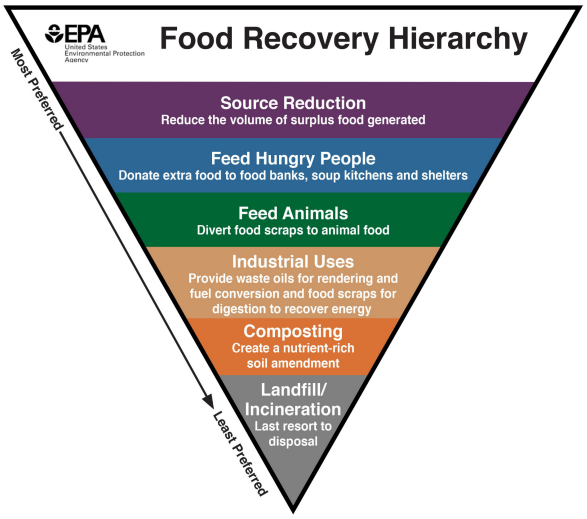

Figure 5: *Pyramid of Food Waste Recovery.* Source: United States Environmental Protection Agency

3.2. How do current manufacturers manage their food losses?

3.2.1. Analysis at the Spanish level

The Spanish Ministry of Agriculture, Fishing and Food conducted a research in collaboration with Valora Consultores and AECOC (one of the biggest Spanish associations of producers and distributors that connects agents from all along the value chain) to estimate food wastage, its economic impact and how food industries in Spain behave with by-products and food residues (Informe del Desperdicio Alimentario en la Industria y en la Distribución en España, 2020).

The sample gathered data from the year 2018 and included a total of 90 businesses, from which 76 were **food producers**, from which 35 were top producers and 41 were smaller businesses[3], and 14 were **food distributors**. However, for the focus of our project, we will mainly study how food manufacturers deal with the food loss they have.

[3] Examples of Spanish food producers participating in the study: Bimbo, Casa Tarradellas, Campofrío, Danone, Conservas Calvo, El Pozo Alimentación, Europastry, Hero España, Pepsico, etc.

From the companies that participated in the study, 50,67% did not provide any monetary value of the losses derived from food wastage. This could be either because (1) companies are not measuring the economic impact of such losses or because (2) they do not want to share such information.

Those companies that did provide the information market annually around 4 million tonnes of finished food products and, among this quantity, they incur a food loss whose value is around 24 million €. From that, the study estimates that the monetary value of losses equals 0,0057€ per kg or liter of food produced. Furthermore, 70,83% of companies declare to have internal strategies aiming to tackle food wastage and 51,39% also declare to be collaborating with other players of the food chain with shared strategies in order to reduce the prevention and reduction of such losses.

As we previously mentioned, food losses can be divided into food surplus or food residues. Regarding the food surplus, 53% of the surveyed companies donate to NGOs the food surplus that is edible for human consumption. However, to revalue the rest of the food surplus, they mainly allocate it to animal feeding. Then, regarding the food residues companies have, 70% of it is allocated to anaerobic digestion and composting while 14% is managed by waste agents.

All in all, given that some of the biggest companies in the Spanish agro-food industry participated in the study, the data extracted from it could seem very representative, however, since just 50% of the sample responded, the actual value of food losses being incurred by the Spanish businesses might be significantly higher. Moreover, this also reinforces the idea that there are many businesses that are not yet quantifying the food losses they produce periodically. Thus, there exists a lack of data that misrepresents the actual quantity and economic value of food loss that is being discarded by manufacturers in the agro-food industry.

3.2.2. Analysis of the Catalan market

3.2.2.1. Our research interviewing businesses

After having analyzed the food loss and waste market at the Spanish level, we have identified that there is a gap in a specific part of the food supply chain, regarding food loss, which seems not to be covered by any of the main private and public organizations stated in Section 2.3. Moreover, going more in depth in this food loss market analysis, the study developed by the Spanish government not only showed that there was a lack of data regarding quantification of food losses but also, a huge economic impact derived from those.

Bearing in mind this reflection, we believe that there might be a potential for developing a service similar to TooGoodToGo but focused on the first stages of the food supply chain in our region,

Catalonia. Nevertheless, before developing our business idea, we have interviewed existing food businesses in the Catalan market to know whether they are conscious about the food losses they periodically have and the mechanisms to deal with them. With this analysis, we aim to identify if there is a real need, not yet covered, to address the food loss problem from a B2B perspective.

3.2.2.2. The methodology followed

The methodology followed to select the interviewed companies has been the following. First, we assumed that depending on the extension of the company, their resources and capabilities differ. Hence, we have selected both small and medium-large companies in the Catalan agro-food industry, aiming at having an overall view of how they cope with their food losses. Second, we have developed a pool of open questions (see Annex 1), so that our talks were open discussions to deeply understand the extent to which each business is concerned with the issue. We wanted to know their individual reality, given that companies within the same sector have different internal processes.

The type of information we wanted to find out from the interviews was: the type of raw materials companies need in their production processes, the quantity of food surplus they have, the type of by-products resulting from processing, their food residues, how they manage them and the derived costs and benefits.

3.2.2.3. Main findings of the interviews

In order to maintain the anonymity of the businesses, we are obliged not to mention the names of some of the interviewed companies (see Annex 2 for further reference of the interviews and the information compiled from them). Overall, we could see how, indeed, the concern for the food losses produced varies depending on the size of the company and their available internal resources and capabilities. While bigger companies tend to integrate circularity in their processes and reuse the majority of their by-products, among smaller companies the tendency differs from one another.

Firstly, we interviewed four companies whose main raw materials are **fruits and vegetables** to produce juices, jams, compotes and canned food. Only one of the four is taking advantage of the by-products derived from their production, by selling those to a by-product waste manager, which also provides the transportation means. From the other three companies, one of them believes it is not worth giving a second life to their by-products because it assumes that it will incur high transportation costs. The other company itself was reusing internally a by-product but was not aware of the potential that this by-product could have in the market for other businesses. And finally, the third company was so far doing composting but lastly, was considering selling their by-products for the production of biogas.

Secondly, we interviewed a company in the **meat industry** and found out that most of the food loss is already a resource for other companies. They mainly sell their by-products for animal feed production to companies that pay a small amount per kilogram.

Thirdly, in the **dairy sector**, we interviewed La Fageda, one example of how circularity can be applied to businesses. The by-products obtained in their production process are used as resources either for their own business or for other ones.

Last but not least, we discovered that Damm, a company in the **beer industry**, has established a circular production system in their internal processes too. One element worth highlighting from these two big companies, Damm and La Fageda, which have fully integrated a recovery process from its by-products is that both complement each other. Damm raw materials to produce the beer serve as feed for cows in La Fageda. Likewise, other by-products obtained from the beer production process are used to irrigate the crops.

3.2.2.4. Conclusions of our analysis

Overall, we found out that there is a potential for the recovery of by-products if businesses connect and communicate with each other. All manufacturers in all food industries generate food losses in their processes, but the level of concern and responsiveness varies. The general pattern is that companies do composting with their by-products and just a few of them have realized they could obtain a profit if they partnered with other companies.

4. OUR BUSINESS MODEL IDEA PROPOSAL

Having seen there exists an uncovered need among companies to communicate with each other regarding the food losses they generate, we have come up with the idea of developing a business proposal to tackle the food loss problem in the Catalan market from a B2B perspective.

Our inspiration comes from an interview we had with two managers from the *"Agència de Residus"* of Catalonia, through which we became aware of Residu Recurs. It's a project that intends to boost the exploitation of industrial resources within businesses, fostering the reusability and recycling of waste and avoiding that useful resources end up being thrown away in landfills. It was launched in 1992 but since it isn't intuitive to use and it is relatively outdated, its reach is almost non-existent. Nevertheless, we thought the core idea of this platform was interesting and could be adapted to the current needs of society, helping businesses to become more circular by both reducing and recycling its food loss and waste.

To do so, we are going to follow the *Platform Business Model Canvas* (see Annex 3 for a template of the model), an adaptation of the Business Model Canvas specially addressed to platform businesses. This model is a strategic management tool used *"to describe and analyze platform business models based on their value propositions and the ways they produce and sell goods or services" (Wadhwani, Lubinski & Viebig, 2020)*.

4.1. Core idea

Our platform is a two-sided marketplace that connects different producers, manufacturers and, broadly speaking, businesses in Catalonia at the beginning of the food chain. It arises as a solution to reduce food loss from a B2B perspective, where the core idea is that the food scraps or waste of a company can be the resource of another one, thus, reaching a win-win solution. Additionally, users will be motivated to join the platform because it will provide them economic, social and/or environmental value.

Our digital platform will consist of an app for the phone and other electronic devices, which will allow companies to publish their food loss (either surplus, by-products or food residues), the quantity offered and the distribution/shipment conditions. There will be two differentiated players, the suppliers and the buyers. The type of products that could be offered by businesses would be (1) food products that are overproduced or over ordered, (2) products that do not meet specific standards of image/packaging/labelling and (3) by-products that result of the production process and may be used for human consumption (e.g. fruit pulp) or not (e.g. meat leftovers), but could still be re-used by another company within any industry (e.g. cosmetic, energy or hygiene industry).

Apart from classifying the products, the app will have some searching filters (e.g. distance and product category) and several functions, such as an internal chat to enable negotiations and effective communication between parties. These filters and product categories will facilitate sellers to get rid of food losses while buyers will easily find and acquire a resource they need.

4.2. User segments and value proposition

Parties will be able to categorize the type of exchange depending on the nature of the product and their particular needs. Therefore, the value proposition of the platform can and often will vary for each user, as it can be seen in Table 3, depending on the core exchange (1) Resource per money, (2) Resource per resource, (3) Resource per "cost saving" (e.g. avoiding disposal costs) or (4) Donation.

SELLERS	USER SEGMENT	The party that generates a food loss or has a food surplus that can be a potential resource for another party in the market.
	VALUE PROPOSITION	• Economic benefits, when the food waste or surplus is sold. • Cost savings, in terms of transport, distribution and recycling costs. • Corporate image benefits: they incur a CSR practice with which they contribute to build a circular economy. • Fiscal incentives.
BUYERS	USER SEGMENT	The party that needs a food resource or by-product for their production process.
	VALUE PROPOSITION	• Economic benefit: they have savings when obtaining a resource at a lower price than in the market. • Fast-paced and dynamic marketplace, being daily updated.

Table 3: *User segments and value propositions.* Source: Own elaboration

Regarding the revenue model, the cost for joining the platform will be 0. The idea is to incentivize companies to fight against food loss, encouraging them to be food loss avoidants. Suppliers, who are the subsidized side, will have 0 cost to post their food waste products on the platform. The monetization of the platform will take place once it reaches a critical mass and will consist in creating a transport network to be the intermediary between both segments.

4.3. Network effects

As a platform business, it will increase in value the more users sign up for it. The effects of an additional user signing up for the platform are the so-called network effects. There are two types of network effects: same-side (e.g. the effect of an additional seller on sellers) and cross-side network effects (e.g. effect of an additional seller on buyers), and those can be either positive or negative (Parker et al., 2016, chapter 2).

Same-side network effects		**Cross-side network effects**	
Sellers	Buyers	Sellers	Buyers
(+) An additional seller on the platform makes it more attractive and trustful and thus, it increases its value. Thus, the higher the number of users and therefore, the amount of resources offered, the more value the platform has.	(+) An additional buyer on the platform is beneficial for other buyers as it can attract more sellers to offer their resources and thus, it may become easier to find the resource you need.	(+) An additional seller on the platform can be positive for buyers as it will be easier for them to find what they are looking for.	(+) An additional buyer on the platform can be positive for sellers as there is a higher chance of selling their resources.

(-) Higher competition among sellers on prices if they offer the same food resource.	(-)Possible competition with another buyer for the same limited resource.	-	-

Table 4: *Network effects.* Source: Own elaboration

5. STRATEGIC ANALYSIS OF OUR BUSINESS MODEL

5.1. External analysis

5.1.1. PESTLE analysis

Coming up next, we are going to carry out a generic analysis of the environment through a PESTLE analysis where we can identify the opportunities (O) and threats (T) of the generic environment. The best interest of the environment is to reduce the food waste and loss, thus, any opportunity would be that one aligned with the interest.

Political	**O**	The Spanish government is going to approve a law against food waste in 2021 as part of a revolutionary innovation for healthy and sustainable food systems. (Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, 2021).
	O	The *"Ministerio de Agricultura, Pesca y Alimentación"* is developing, since 2013, a strategy called *"Más Alimento, Menos Desperdicio"* to create impactful changes and raise awareness. (Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, 2021).
Economic	**T**	The average consumption of a Spanish household in food and drinks is 1.716,27 € per capita each year, that is to say a total of 689,52 kg or l. Out of this total amount, the food wasted every year in Spain has a value of 3,000 million €, where each person wastes 179 kg or l of food annually. Nevertheless, households' waste solely represents 42% of the food wastage in Spain. Apart from this, there is also a 39% that occurs in the production stage, 14% in the retail industry and 5% in the distribution stage. (Informe del Consumo Alimentario en España, 2020).
Social	**T**	Currently, the *Federación Española de Bancos de Alimentos (Fesbal),* serves 1.8 million people seeking food aid. The situation has worsened as a result of the Covid-19 crisis, which has transformed into a social and economic crisis given the quantity of unemployed people with no income. (Efeagro, 2020).
	O	The Government tries to raise social awareness by developing social campaigns such as 2021 *"Aquí no se tira nada",* an extensive program of promotional actions that try to sensitize and guide consumers on how to avoid and reduce food waste (Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, 2021).

	O	76% of the Spanish population has changed its consumption habits in order to mitigate the effects of climate change. It is an opportunity for our platform because those suppliers and buyers participating will be more interested and willing to become food loss avoidants (Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente, 2021 & ThisIsTheRealSpain, 2020). Moreover, Spanish companies are increasingly aware of their social and environmental responsibility. Sustainability is among the 10 CSR trends for 2021 in Spain, where companies commit themselves to take a firm step in sustainability (Pérez, 2021).
Technology	**O**	Considering the current technological era, artificial intelligence (AI) can be a new ally, as incorporating it to production and industrial processes may improve planification or avoid mistakes on machinery (e.g.: packaging, handling of food, etc), thus, reducing food loss and waste (AECOC, 2019). It would be a threat for our platform because without food loss our business idea has no potential, but it's an advantage for the food loss market, whose best interest is to reduce food loss the maximum possible.
Legal	**T**	At the national level, Spain has not approved any law yet.
	O	In Catalonia, last March 2020 was approved the Law 3/2020 about the *"Food Loss and Wastage Prevention"* (Normativa Llei 3/2020, Gencat). As a result, companies will have to adapt to new legislation and account for the food losses they produce.
Environment	**T**	Spain wastes up to 7.7 tons of food per year, being the 7th country of the EU that wastes the most food. The United Nations (UN) warns that only food waste causes 10% of greenhouse gases. The impactful environmental consequences of food loss and waste at worldwide level are 1.3 billion of tonnes of wasted food, 350km3 of wasted water, 1.4 million of ground hectareas wasted, 3.3 billion of tons of CO2 emissions (FAO, 2013 & Gobierno de España).

Table 5: *PESTLE Analysis of the Spanish Food Loss Reuse Market*. Source: Own elaboration.

5.1.2. <u>The B2B Catalan food loss reuse market: 5 forces Porter's analysis</u>

In the following model, we are going to analyse the profitability of the food loss industry in the Catalan market based on 5 different forces: the negotiation power of the buyers, the negotiation power of suppliers, the current rivalry, the threat of new entrants and the threat of substitute products.

We will analyse it from a B2B perspective, being our business model idea in the center of the 5 Porter's analysis, where we will also identify the existing opportunities (O) and threats (T) in the food loss industry for our business. In our analysis, the **industry** will be the B2B food loss reuse market of Catalonia. The **suppliers** of this industry are the generators of food loss (i.e. the producers and manufacturers in the food chain having a waste in their production or procuring processes), while the

buyers are the users of food loss (i.e. businesses needing an organic resource for their production process, reusing the waste of another company). Last but not least, the **substitutes** are those alternative ways in the industry that cover the same need as our platform. Depending whether the power of each force is either low, medium or high, we will colour it in green, orange or red, respectively.

Degree of rivalry (LOW)	**O**	The degree of rivalry in the food loss industry is low, since there is just one public institution from the Generalitat de Catalunya called *ResiduRecurs*. It's a platform managed by the *Agencia de Residus* that allows all types of industries to exchange all types of by-products and raw materials. It's a very general platform not solely focused on food, that is very obsolete and unknown by many businesses. Thus, it's not effective, it's not really working nowadays.
	T	As it could be seen in the analysis of the food loss industry in Catalonia (section 3.2.2.), several private agreements exist between companies and by-product waste managers taking away part of the business (i.e. one-to-one negotiations).
Potential of new entrants into the B2B food loss industry (MEDIUM)	**T**	After having carried out an interview with the *Agencia de Residus de Catalunya,* we are aware that there is an upcoming B2B platform not solely focused on food loss, that has been presented for subsidy last April and if so, the idea would be developed from September 2021 onwards.
	T	TooGoodToGo has a current business segment in which they work with manufacturers and wholesalers. Although it is still dealing with food waste, they could extend this business towards a B2B perspective and thus, cover food loss.
	T	Similar B2B food loss digital platforms exist in other countries such as FoodMaven or SpoilerAlert in the USA that might expand soon.
Power of suppliers (HIGH)	**O**	There are a lot of potential sellers on the market (suppliers are not concentrated) because most of the companies in the food industry produce food losses.
	T	Based on our interviews carried out in section 3.2.2., we assume that there is a high degree of forward integration in big companies while low degree in SMEs, because a big company may have the resources to integrate and reuse by-products or food surplus and thus, avoid the need of selling them to third parties. Hence, the threat of forward integration is high and suppliers have a high negotiating power.
	O	Low switching costs for suppliers as they can sell their food by-products and surplus to any company and therefore, may switch to our platform if the conditions are more beneficial.
Power of buyers (MEDIUM - LOW)	**T**	The needs of buyers are so specific that they need to buy a very specific food loss, and thus, the match might be difficult between producer and buyer.
	O	Low threat of backward integration, if a company needs a by-product as a resource, they will have to buy the whole raw material and manipulate it to obtain it, which will imply higher costs.
	O	Low switching costs if product and negotiation characteristics are similar. For instance, buyers obtaining a resource outside the platform may be willing to switch to our platform if they can obtain the same resource from another

		business inside the platform with a more beneficial agreement.
Threat of substitute products (MEDIUM)	**T**	Composting/recycling management companies.

Table 6: *5 forces Porter's Analysis of the Catalan food loss reuse market*. Source: Own elaboration.

5.2. Internal analysis

5.2.1. Our resources and capabilities

To study the potential of our business idea, it's important to analyze the relevant resources and capabilities we internally have, because in case we launch the platform, it will be managed by ourselves and it is crucial to identify our own assets in order to exploit them (See Figure 12 below).

RESOURCES			**CAPABILITIES**
TANGIBLE	INTANGIBLE		
We don't have any financial nor physical tangible resources.	Human resource	Others	Good communicators and persuasive skills. Team-work and leadership capacities.
	We have contacts with tech knowledge (know-how). We are motivated and concerned about current sustainability issues. We have an innovative business platform idea.	Organizative sources: Multilingual women and good planners. Technological sources: Platform accessible to everyone.	

Table 7: Our internal resources and capabilities. Source: Own elaboration.

5.2.2. Value chain analysis

Now, we are going to analyze which activities or functions in our digital platform will add value to the business idea while covering customer needs. To begin with, the primary activities that will add value to our digital platform would be, first, our **operations** activities; which will be mainly the exchange of food loss between companies: the waste of one will be the resource of another one. Secondly, since our platform business will increase in value the more users sign up for it, within **marketing and sales**, we will create communication campaigns and put into practice our persuasion skills to capture the most clients. The more suppliers publishing their food loss products, the more buyers will be attracted to join and the more food loss will be saved. Finally, given the new law approved last March 2020 in Catalonia around food loss and waste, from now on, companies will need to have a quantification of

all the food loss they annually generate. This need will be covered by our **platform service**, since once companies register and use the platform, they will be able to automatically download a report that provides them with their food losses statistics: quantity and type of food loss generated/reused, the cost savings they got and an estimation of the tax deduction they could have.

Regarding the support activities adding value, the main one will be the **technology development**, that is to say, the technological support. This will be the **key success factor** of our platform, together with its **design**. It must be an intuitive platform easy to use and accessible to everyone, for both small, medium and large companies.

5.3. Summary: SWOT analysis

In this section, we are going to conduct a SWOT analysis where we will summarize the main internal characteristics (the weaknesses and strengths of our platform proposal) and the external situation (threats and opportunities of the Catalan food loss market).

INTERNAL	**STRENGTHS**	**WEAKNESSES**
	- Innovative business platform idea. - Motivated and purpose-driven graduates, concerned about current sustainability issues. - Multilingual women with an entrepreneurial mindset. - Good communicators with persuasion skills. - Capacity of creating and leading a multidisciplinary team. - Informatic engineer contacts that could help us with the platform software development. - Platform accessible to everyone.	- Lack of economic resources. - Missing knowledge in the agro-food industry. - Lack of expertise on how to manage a business and the steps to develop it from scratch. - Non-existence brand reputation. - Ease to replicate our business model proposal.
EXTERNAL	**OPPORTUNITIES**	**THREATS**
	- Businesses trend towards sustainability: their participation in our platform benefits their corporate image. - Increasing society's consciousness on the importance of moving towards a more circular economy, resulting in a change of consumption habits. - Laws against food waste are going to be	- By-products waste managers expertise in dealing with companies that could take advantage of our platforms to expand their network. - Unknown potential of the business (as there is lack of data). - B2B platforms overseas that might expand soon.

	a near future reality. In Catalonia it has already been approved and companies will have to adapt to the new regulation requirements. As a result, there will be more data available on food loss generated by the industry.	- Strict food regulations regarding products for human consumption. - Potential of TooGoodToGo as a new entrant to the food loss market and be successful due to its known reputation.

Table 8: *SWOT analysis*. Source: Own elaboration.

Overall, we can see that at an external level, there is potential for the platform mainly because the food loss reuse market is growing in urgency. Up to now, there is a lack of data concerning the food losses that businesses incur as they were not obliged to report them. But from now on, given that food loss and waste legislation will be enforced soon, companies will have to compile data regarding the organic losses they periodically generate. Even if at an external level there are also some threats, from our point of view opportunities outweigh them. Nevertheless, at an internal level, we acknowledge that our weaknesses stated prevail over our strengths.

6. FORMULATION OF STRATEGIC IDEAS

6.1. TOWS MATRIX

Having conducted an internal and external analysis of the market and our business idea, and being aware of the strengths, weaknesses, opportunities and threats we are facing; we are going to develop a TOWS matrix to assess, create and compare the best strategic ideas that could be undertaken.

		INTERNAL FACTORS	
		Strengths (S)	Weaknesses (W)
EXTERNAL FACTO	Opportunities (O)	**(SO) OFFENSIVE STRATEGY: Development and launch of the platform** We have an innovative business platform idea together with the appropriate developers, which could be launched and goes hand in hand with the new law in Catalonia against food loss.	**(WO) REORIENTATION STRATEGY: Creating a sense of community around food loss.** There's a society's consciousness trend towards a circular economy, and although we don't have brand reputation, companies in the industry are eager to get involved in socially responsible actions. Thus, society's preoccupation and consciousness outweighs our lack of reputation if we create a sense of community through social networks right after launching our platform.
		(ST) DEFENSIVE STRATEGY: Alliance with an existing international player. Given that we have	**(WT) SURVIVAL STRATEGY** **1) Partnership with current rivalry** Since we lack the expertise and there are already experienced by-product waste agents in the market, we can partner with them to

R S	Threats (T)	outstanding convincing skills, we are multilingual women, concerned with the food loss problem in our territory and local (meaning that we hold a valuable knowledge of the Spanish culture and contacts), we can ally with an existing international player. The aim would be to convince them to expand to Catalonia in order for us to manage their platform in our region.	develop our business platform idea. This would allow them to expand their network while benefiting from our business and strategic mindset. **2) Food loss label to identify sensitive producers** Given the difficulty of matching sellers (by-product producers) and buyers (by-product users) due to the heterogeneity of the food market, developing the platform may not succeed. A more viable option could be to develop a labelling system that recognizes companies behaving responsible in managing its food losses (i.e. reusing their by-products in several ways) through an auditing system (a type of BCorp certificate for food loss avoidants).

Table 9: *TOWS matrix*. Source: Own elaboration.

After having stated all the possible strategies, we are going to select the best alternative to implement according to four different criteria:

- **Strategic fit:** whether the strategy goes hand in hand with the mission, vision and values of the business.
- **Adequate** to the current situation, taking into account the internal and external analysis summarized in the SWOT matrix (Section 5.3.)
- **Feasible:** whether resources and capabilities to carry out the strategy are available.
- **Acceptable:** whether it is accepted by all the relevant stakeholders (i.e. interest groups).

Taking into account the whole strategic analysis we have carried out in Section 5, we will score each strategy from 0 to 10, 0 being the lowest punctuation and 10 being the highest one.

	SO: Development and launch of the platform	**WO: Creating a sense of community around food loss.**	**ST: Alliance with an existing international player.**	**WT: Partnership with current rivalry**	**WT: Food loss label to identify sensitive producers**
STRATEGIC FIT	10	10	10	10	10
ADEQUATE	6	6	8	9	5
FEASIBLE	4	6	6	7	5
ACCEPTABLE	8	7	7	6	7
TOTAL POINTS	28	29	31	**32**	27

Table 10: *Selection of the best strategy to implement.* Source: Own elaboration.

6. CONCLUSION

The present end of degree paper has served as a way of researching a current global issue that we, three International Economics students, are concerned with. Our initial purpose was to develop a meaningful project having a real impact in our region, Catalonia, and we believe that we have achieved it with the proposal of our platform.

Through our study of the food loss and waste market, we found out that there is a lot of research and incurred actions around the problem of food waste but a lack of information and initiatives regarding food loss. In the latest, the data obtained from different sources was not clear nor homogenous, and each study extracted its own findings. The only common point among studies was that food loss and waste is a current and urgent issue at its peak; and that drastic actions should be taken. Thus, the main drawback of our project has been the inability to contrast data in secondary sources to study the real potential of the food loss market in Spain. For this reason, we decided to do a field research by interviewing first-hand several Catalan companies to get to know whether they quantify and manage their food losses. This is how we noticed there is not any effective market solution yet covering the Catalan food loss reuse market.

After our business model platform proposal and its strategic study, we realized it has an external market potential although we lack the key internal resources and capabilities needed to develop it. Thus, having in mind the SWOT analysis and our digital platform proposal, we draw, using a TOWS matrix, different strategies that could be implemented. The final analysis, based on a scoring scale, is presented in Table 10, which shows that the strategy we should implement is our first survival strategy proposed; to partner with the current rivalry in the market. From our standpoint, it is a viable strategy not only to help companies in Catalonia mitigate their organic wastage but also to help them track their food losses adapting to the recent Catalan law.

All in all, partnering with current by-product waste managers, our digital platform could become a reality, as they could provide the market knowledge and economic resources, while we could contribute with our entrepreneurial mindset, motivation, software developers and most importantly, the present research and innovative business market solution.

7. BIBLIOGRAPHY

Aquí no se tira nada. Más alimento, menos desperdicio. Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente (n.d.). https://www.menosdesperdicio.es/nuestra-estrategia/estrategia-2017-2020.

Circular Economy Club. (2021). (rep.). *Barcelona Circular City*. https://e1b7019c-a8c8-4faf-804b90cb2be21b23.usrfiles.com/ugd/e1b701_f6432d25e52f483c88a710845709b4d4.pdf

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions. A new Circular Economy Action Plan For a cleaner and more competitive Europe. COM/2020/98 final. https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF

Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance). PE/11/2018/REV/2. ttp://data.europa.eu/eli/dir/2018/851/oj

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance). OJ L 312, 22.11.2008 http://data.europa.eu/eli/dir/2008/98/oj

Ellen MacArthur Foundation, 2020. The EU's Circular Economy Action Plan: Setting the world's largest single market on a transition towards a circular economy. https://www.ellenmacarthurfoundation.org/assets/downloads/EU-Case-Study-june2020-EN.pdf

FAO, 2019. Pacto de Política Alimentaria Urbana de Milán. Marco de Monitoreo. http://www.fao.org/3/ca6144es/CA6144ES.pdf

FAO. 2011. Global food losses and food waste – Extent, causes and prevention. Rome. http://www.fao.org/3/i2697e/i2697e.pdf

Food Recovery Hierarchy. 2020, December 31. https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy

Ghamrawy, M. 2019. Food loss and waste and value chains – Learning guide. Cairo, FAO. http://www.fao.org/3/ca5312en/ca5312en.pdf

Global Food Issues, 2015. Marketline Case Study. Food waste, fish stocks, and food security. Reference Code: CI00001-XXX. Publication Date: October 2015.

IA para combatir el desperdicio alimentario. (2019). AECOC. https://www.aecoc.es/innovation-hub-noticias/ia-para-combatir-el-desperdicio-alimentario/.

Informe del Consumo Alimentario en España. Alimentación en España: Producción, Industria, Distribución y Consumo. 23ª edición (2020). Mercasa. https://www.mercasa.es/media/publicaciones/281/AEE_2020_web.pdf

Informe del Desperdicio Alimentario en la Industria y la Distribución en España (2020, December). Ministerio de Agricultura, Pesca y Alimentación (MAPA). https://menosdesperdicio.es/documentos/informe-del-desperdicio-alimentario-en-la-industria-la-distribuci%C3%B3n-en-espa%C3%B1a-2020-mapa

Kaza, Silpa; Yao, Lisa C.; Bhada-Tata, Perinaz; Van Woerden, Frank. 2018. What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050. Urban Development;. Washington, DC: World Bank. World Bank. https://openknowledge.worldbank.org/handle/10986/30317

La inseguridad alimentaria (2020, December 30). Efeagro Información agroalimentaria. Agro. https://www.efeagro.com/noticia/inseguridad-alimentaria-no-tener-comida/.

Mercabarna lluita contra el malbaratament alimentari (2020). Mercabarna. (n.d.). https://www.mercabarna.es/responsabilitat-social/lluita-contra-el-malbaratament/.

Ministerio de Agricultura, Pesca y Alimentación., Gobierno de España. (n.d.). Más alimento menos desperdicio. https://menosdesperdicio.es/definiciones-cifras/cifras

Ministerio de Agricultura y Pesca, Alimentación y Medio Ambiente. Ley sobre desperdicio alimentario. https://www.mapa.gob.es/es/prensa/ultimas-noticias/luis-planas-el-gobierno-aprobar%C3%A1-este-a%C3%B1o-la-ley-sobre-desperdicio-alimentario/tcm:30-560841.

MUFPP, 2015. Urban Milan Food Pact Policy Pact. https://www.milanurbanfoodpolicypact.org/wp-content/uploads/2020/12/Milan-Urban-Food-Policy-Pact-EN.pdf

Normativa Llei 3/2020. Gencat.
http://agricultura.gencat.cat/ca/ambits/alimentacio/malbaratament-alimentari/normativa/

Parker, G., Alstyne, M. V., & Choudary, S. P. (2017). Platform revolution: How networked markets are transforming the economy and how to make them work for you. New York: W. W. Norton & Company.

Parlament de Catalunya, 2020. Law 3/2020, of 11 March, on Food Loss and Wastage Prevention.
http://agricultura.gencat.cat/web/.content/04-alimentacio/malbaratament-alimentari/enllacos-documents/fitxers-binaris/202_00001_12_Llei-malbaratament-alimentari_EN.pdf

Pérez, H. (2021, January 20). *RSC en España*. Compromiso Empresarial.
https://www.compromisoempresarial.com/rsc/2021/01/10-tendencias-rsc-2021-espana/.

R. Daniel Wadhwani, Christina Lubinski, Christoph Viebig, 2020. Platform Startups: Launching Online Marketplaces. Publication Date: October 31, 2020.

Sustainable consumption and production – United Nations Sustainable Development. United Nations. (n.d.). https://www.un.org/sustainabledevelopment/sustainable-consumption-production/.

United Nations Environment Programme, 2021. Food Waste Index Report 2021. Nairobi.
https://wedocs.unep.org/bitstream/handle/20.500.11822/35280/FoodWaste.pdf

76% of the spanish population have changed their habits in order to help combat climate change. (2020, 2 december). ThisIsTheRealSpain.
https://www.thisisthereallspain.com/en/spain-in-the-world/sustainability/76-of-the-spanish-population-have-changed-their-habits-in-order-to-help-combat-climate-change/

8. ANNEXES

ANNEX 1: *Pool of open questions used to interview companies of the agri-food sector in Catalonia*

- What type of raw materials do you need for your production processes? Is there some raw material that you struggle to find?
- What type and quantity of organic residues do you generate annually?
- How do you manage your by-products and surplus? Do you donate them, reuse them or incinerate them?
- What are the costs associated with discarding food residues or giving them a second life?
- Do you think that your by-products/surplus could be a resource for another company?

ANNEX 2: *Summary of the interviews' responses from companies in the Catalan agro-food sector*

Company size & Location	**Type of product**	**Summary of the interview**	**Key findings and uncovered needs**
Small company in Lleida	Juices, cereals, canned food.	They need mainly fruits and vegetables as raw material for their production process. They have their own crops but when they need large quantities because they expect a higher demand, they buy the raw materials from external suppliers. As one of their main products is canned food, which is a non-perishable product, they generally do not have food losses of finished products as those can be sold in other seasons. They generate three type of food loss: 1. Food surplus: they have around 2-3% of food surplus of their raw materials (of fruits and vegetables) when they overestimate sales. For instance, they usually have a surplus of table olives from which they extract its oil every 2 years. This oil is not edible for human consumption but it serves for their own machinery maintenance. 2. By-products: Pulp of fruits and vegetables that are composted and destined for animal feeding.	They have large quantities of table olives and although currently they use it in their internal processes, they believe it could have further potential and sell it to external parties. The food surplus they have from fruits and vegetables due to a lack of accuracy in their demand planning mixed with unexpected changes in demand, could be sold to other parties.

Small company in Barcelona	Natural and ecological juices	Their raw materials are fruits, vegetables and roots (e.g. ginger, carrots). Since they produce natural and ecological juices without preservatives, they need their raw materials to be in perfect state.This is something their raw materials suppliers already know and provide them with fruits and vegetables in good quality. Therefore, they don't have any shrinkage of raw materials. Moreover, as they produce daily they try to adapt to current demand. In the juices industry, those juices that are pasteurized can contain up to 30% of rotten fruits, because with the additives they contain, the flavour is counteracted. However, in this specific company, juices are 100% natural that is why they can only contain fresh raw materials. Depending on the raw material, they squeeze it or press it. The pressed juices with fruits such as strawberries do not produce residues (e.g. pulp) because they use the whole fruit. Whereas, in the squeezed juices they have food residues that account for a ⅓ of the amount of raw materials used. This ends up being a by-product that is recycled. For instance, they squeeze oranges, from which they obtain as a food residue: the peels. To recycle it, they sell it to an external individual that pays them approximately 10 cents per kg of orange peel and picks up this by-product with its own means of transport and it is used to produce animal feed. The only food loss they have is in their finished juices, where sometimes they have a surplus due to a lack of planification or changes in demand. Their natural juices have a relatively short expiration date, of approximately 30 days. What they do is to donate it to organizations such as Phenix or TooGoodToGo or to the sanitary personnel during the Covid-19 pandemic.	The waste management of this company shows the potential that a by-product such as orange peels might have and the potential economic exchange it involves. It shows that an important element of this exchange is the logistics and the means of transport (which in this particular company is facilitated by an external individual, but it may be the case that another similar company in the same industry does not have access to somebody able to do it). This company could perfectly discard the orange peels they have, but it's much more beneficial for them if they can sell it and obtain a profit for it. We would like to do so at a large scale.
Medium company in	Fruits Compotes	To produce their fruit compotes, they mainly need as raw materials fruits and vegetables from their own crops. The main fruits they produce are pears and apples. Depending on the	They believe their

Girona		time of the year, they have more or less food surpluses of raw materials. For instance, in July they tend to have a higher food loss, as these are the last apples and pears left from that year's harvest and might have been already collected for a long time. Then, in August, new fruits are harvested and thus, it's the time of the year where they have less raw material losses. The pears and apples that are not in good quality are not used to produce their fruit compotes given that it could significantly diminish the quality of their final product and it could also cause an excess of mycotoxin patulin, which is a toxic natural substance, among others. Thus, they are selected and discarded prior to the production process. All their organic residues (raw materials, by-products such as peels and seeds) are used for composting. The cost of managing these food losses is equal to the transport cost of bringing these residues to the composting plants. They are considering the option of selling or giving the by-products they generate. For instance, to companies that produce biogas from the fruit peels, peduncles and seeds. Regarding the food surplus they have from finished goods, they donate it to the *Banc d'Aliments*.	by-products could have a second life, that is to say, it could serve as a resource to producers of biogas, among other uses. Moreover, we can see from the food surplus they usually have in July, that a part of it could be reused before discarding it. If they expect every year to have incurred pears and apple losses by this season, they could sell it in advance in the market to other businesses that might need them as a resource.
Small company in Tarragona	Jam	They produce jams, thus their main raw material is fruits. Annually, they generate 2 tonnes of organic residues, which mainly comes from citrics in the form of peels and seeds. For instance, by the end of the season and depending on the harvesting, they usually have, solely from lemons, 50kg of peels. They allocate it to their own animal feeding or composting. Although they consider that their suproducts could be reused to produce essential oils, what keeps them apart from doing so is the transport cost they might face.	They acknowledge that their current food losses could be avoided by selling or providing them to essential oil producers. The handicap they find on this exchange is which party provides the means of transport, as they believe it could result in having more costs than benefits.

Medium company in Girona	Pork meat	The raw material they use are pigs. Their organic residues are mostly meat by-products (grease and bones), which are all used for animal feed production. In 2020, they produced a total amount of 2.756.000 kg of by-products. These by-products are sold to companies who need them as a resource and thus, pay a small amount per kilogram collected. Their remaining food waste is managed by residue managers with whom they work and thus, in this case, they have to be paid by the company to take the residues away. There is waste that due to the production process and type of business is inevitable to produce and on the other hand, the fact of being a food sector and comply with very strict health standards, as they can not reuse materials or change them for more sustainable materials. For instance, water from the treatment plant for cleaning or the use of recycled or compostable packaging material.	Most of the food loss a company in the meat industry has, is the resource of another company.
Large company in Girona (La Fageda)	Dairy products (yogurts and ice creams), desserts and jams	80% of their products are yogurts and desserts whose best before date is 35 days. Given that there is a small margin of time, retailers are very demanding and they return the products to the factory when the date is approaching. This creates a lot of stress logistically speaking. Those returned products that have not reached the best before date (and thus, are still okay for human consumption) are either sold in the store of the cooperative at a lower price, or donated to entities such as Banc d'Aliments or Caritas. In contrast, those products that can not be consumed by humans are allocated to animal feeding. One of the main raw materials they use is milk, which they get from self-supply (they own cows) and they are also associated with a cooperative that owns 5 farms. Moreover, they produce 100 tonnes of jam per year. To do so, they buy fruits from several suppliers and with the resultinfruits residues they do composting. An interesting fact is that for their cows' feeding, they use a by-product known as husk, which they get from Damm. They are the clear example of a company having a circular process, because all the food	This company of the dairy sector is the clear example of the potential exchange that might occur in the fight for food loss in the agro-food market. It's a company producing by-products that can be the resource of another company, and at the same time, they are the ones using a by-product of another company as a resource. It's a company that has established a circular production system. They are

		residues they produce are reused for another internal process or recycled. For instance, they own a water treatment plant and they also do composting used for their own crops.	concerned with the importance of recycling, reusing and reducing their own waste.
Large company in Barcelona (Damm)	Beer	99% of the raw materials of this company are reused internally or by other companies in the market. For instance, during beer production, barley and rice are boiled and filtered to obtain the beer. From the boiled rice and barley, husk is obtained, a by-product that is devoted to animal feeding and sold to farms, such as La Fageda. In 2019, 100.000 tones of husk were reused. Thus, 100% of their organic waste is repurposed as animal feed. Another by-product obtained at the final stage of the filtering of the beer is used to irrigate their own crops.	Damm is another example of a company that has established a circular production system in their internal processes.

ANNEX 3: *Stage 1 From The Platform Business Model Canvas, by* Christina Lubinski and Christoph Viebig