

Article

Making Food Rescue Your Business: Case Studies in Germany

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Abstract: Initiatives of the European Union in the context of food waste running governmental and nonprofit campaigns strive to reach waste reduction goals. The study investigated entrepreneurial business models in the arena of food waste in Germany with a multiple case study research approach. Business entrepreneurs seek to reduce waste through its monetarization. After the initial identification of close to all current entrepreneurial businesses, ten entrepreneurs in retail, processing, and food service were interviewed to determine barriers and challenges to the models' success and analyze their motivation to start these businesses. The most important barriers constituted logistical problems regarding supply as well as marketing; and the need for close collaboration with suppliers constituted another important challenge. Their motivations combine sustainability-oriented goals with a profit goal. To scale up, an increase in collaboration and data exchange is needed across the supply chain.

Keywords: food waste reduction; saving food; social business; research case study; sustainable entrepreneurship

1. Introduction

Worldwide, about a third of all food produced, which amounts to 1.3 billion tons per year, does not go into consumption by people [1]. For the EU, estimates amount to 50% loss of edible food, ranging from 89 [2] to 143 million tons per year [3]. Germany and the other EU countries agreed to halve food waste at the retail and consumer levels by 2030, as well as reduce food losses along the food production and supply chains [4]. The total food loss across the supply chain in Germany amounts to 18.7 million tons per year [3], at least half of which is avoidable. The avoidable share of food lost along the chain is the subject of this study and is called 'food waste'.

Aside from the economic loss caused by food waste, its environmental and social impacts cause avoidable damage and societal discussion. Land, water, and energy use involved in producing food that will not be consumed reduces biodiversity and contributes to loss of species [1]. Furthermore, unnecessary carbon emissions contribute to climate change. In addition, the societal discussion centers around the ethical aspects of food waste: Food goes to waste while at the same time people suffer from food poverty, food insecurity, and hunger [5–8].

Most studies estimate that the largest share of food waste accumulates at the household level [9,10]. For Germany, the share is estimated at 59% ([11], p. 184). However, this estimate excludes the production level, despite the fact that quality specifications at the retail level lead to much of the food produced and harvested not reaching human consumption [12]. In addition, some products suitable for consumption are never harvested and, therefore, do not even reach the supply chain [13,14]. The

share of waste in processing is estimated at 17% ([11], p. 184) and also, at least in part, attributed to quality specifications at the retail level, including best-by-date requirements, and particularly, the production of store brands, which cannot be sold to other chains or donated to charitable organizations or agriculture. Another 17% of food waste occurs at hospitals and other large-scale consumers, which leaves retail directly responsible for only 7% ([11], p. 184). As several studies in Germany [15], and also in other European countries such as the UK [16], Spain [17] and Sweden [18] show, the narrow focus on the consumer level falls short of addressing the food waste problem.

Paragyropoulou et al. (2014) [6] proposed a framework for a food waste hierarchy based on the European waste hierarchy consisting of five levels, where the top level, prevention, constitutes the most desirable option and the bottom level, disposal, constitutes the least desirable option. Several prior studies have focused on the second-best option, the reuse of surplus food for human consumption, for instance, redistribution to people in need to overcome food insecurity [19–21]. The present study also focuses on the reuse of surplus food, also called ‘food rescue’.

There are two basic approaches to reuse, monetary and nonmonetary approaches. In nonmonetary approaches, businesses collaborate with nonprofit organizations on a donation basis, without the exchange of money for surplus food (and other articles). The nonprofit organizations involved, e.g., food banks or food-sharing operations [21–25], distribute donated items to either people in need, in the case of food banks, or members of the organization as well as interested others, in the case of food-sharing operations. In monetary approaches, the redistribution of the surplus takes place through identifying and developing (secondary) markets, typically in the form of business models. Another monetary approach is marketing of flawed items (e.g., damaged packaging, a few days to best-by date) through regular retail at a reduced price [26,27]. The present study addresses the reduction of food waste through business models building on food rescue. In these entrepreneurial business models, food items discarded as food waste at one stage of the supply chain are then used in a product, or as part of a service, and sold for profit [28]. In addition to the profit motive, environmental and social goals can play a role for the entrepreneurs involved, including education and raising awareness in the broader society [12,26]. The study sought to identify entrepreneurial business models in Germany, identify their approaches to the reduction of food waste, as well as barriers and challenges to the models’ success, and analyze the entrepreneurs’ motivations to start the business.

Entrepreneurial business models building on food rescue can be analyzed in the context of sustainability-oriented business models as well as social businesses, where challenges existing in society are addressed through a business idea or innovation [29]. Sustainability-oriented business models seek a balance between economic, social, and environmental concerns [30]. According to Hahn et al. (2018), whether or not an entrepreneurial business should be considered as sustainability-oriented can be determined based on the motivation of the entrepreneurs [31]. Entrepreneurs of sustainability-oriented businesses strive to contribute to improving human wellbeing and the overall state of social and environmental factors [32]. Still, without economic success, the longevity of the business cannot be sustained [29].

The goal of increasing the sustainability of the food supply chain is pursued through a business model [33]. The core idea is to develop a business model specifically in the context of food rescue, which combines efforts to reduce waste and to save food while generating profits [25,26]. The value proposition of the business model is based on value creation from surplus through new or different uses of a resource, i.e., the surplus food [33–35]. Furthermore, a problem hidden from public view, food waste, is brought to the attention of the broader society and at the same time, environmental and social contributions are provided. Several examples have been analyzed in prior research, including social supermarkets in Austria [36] and the selling of fruits and vegetables with visible imperfections outside of traditional marketing channels in Portugal [37], and in classical retail in Germany [15]. The first two of these are presented below to serve as examples, and for comparison with the results of the present study. Due to also using an entrepreneurial approach, these cases are more suitable to comparison

than marketing through traditional channels, because the current study focuses on entrepreneurial business models, not on integrated models.

Social supermarkets in Austria provide infrastructure and serve as a marketing venue for food no longer considered suitable for sale in traditional retail [36]. Industry and retail donate the surplus or flawed food items, which are then offered at significantly reduced prices in social supermarkets. Only socially disadvantaged people and people threatened by food poverty are allowed to shop at social supermarkets. Fruta Feia (ugly fruit) is a nonprofit cooperative business in Portugal, which buys fruits and vegetables from producers that were not accepted by traditional retailers due to visible imperfections. The produce is sold directly to associated consumers at a reduced price. The initiative started in the capital city, Lisbon, and was then expanded to the second largest city, Porto [37]. In addition to the environmental and social aspects addressed by the other project, Fruta Feia strives to support local or regional consumption and, due to its cooperative format, transparency of business conduct.

Both prior cases are dedicated to secondary markets, which build on food rescue. They target the use of food surplus by selling it directly to consumers, either consumers in need [36] or consumer members [37]. While including directly-to-consumer approaches, the present study broadened this approach by including other types of entrepreneurial businesses, namely, processing and food service. While social supermarkets seek donations [36], Fruta Feia strives to pay producers for their products [37]. The current study also includes businesses employing both kinds of approaches, taking donations and striving to pay for products. As the socioeconomic and legal situation in Germany differs from the situation in the two prior cases, and Germany is a much larger country, it can be expected that barriers and challenges will differ. Therefore, additional understanding of which barriers need to be overcome and which challenges need to be addressed to decrease food waste and increase sustainability results from analyzing such businesses in Germany, as well as from including other types of businesses. Furthermore, the current study was also able to look at the motivations of entrepreneurs through using a multiple case study approach and, accordingly, contribute to better understanding of, and potentially promoting, sustainability-oriented entrepreneurship.

2. Materials and Methods

Founding entrepreneurial businesses building on food rescue is a relatively recent phenomenon in Germany, with few businesses successfully established in different arenas of business activity. Therefore, the study employed a qualitative case study approach to allow an analysis of these businesses in the process of development [38,39]. Case study research and other qualitative research approaches are used in various social science disciplines and have been used more frequently in agribusiness research since the 1990s [40]. The present study employed a multiple case study approach, because it was expected that different business models can use surplus food as a resource. Furthermore, multiple case studies allow the researcher to explore differences between cases [41–43]. The multiple case study as a research approach seeks to both replicate findings across cases as well as identify differences between groups of cases and peculiarities of individual cases. This is facilitated through a process of constant contrast and comparison.

The specific method used was the in-depth interview method with entrepreneurs and co-entrepreneurs in the field of food rescue in Germany. After identifying current businesses in the field of food rescue through internet research (search engines, social media, and a targeted governmental website), these businesses were grouped according to their main business activity in retail, processing, and food service (Table 1). The goal of the purposeful sampling technique for acquiring participants was to cover all three business arenas and to include different marketing channels (directly to consumers (B2C), to other businesses (B2B); stationary, online) as well as both male and female co-entrepreneurs. Most businesses were founded by more than one individual, but only one individual was interviewed for each participating business. If more than one individual was available from the same business, the co-entrepreneur with the longest involvement was interviewed.

Table 1. Overview of business entrepreneurs and co-entrepreneurs interviewed.

Business Activity	Description of Activity	Interviewees
Retail	Marketing of previously discarded food items through own physical shop or own online portal	2 male entrepreneurs, 1 male co-entrepreneur 1 female co-entrepreneur
Processing	Processing of previously discarded food items into food products; sale through marketing partners or own online portal	3 male entrepreneurs, 1 female entrepreneur
Food service	Processing of previously discarded food items; sale through own gastronomy outlet or catering	1 male co-entrepreneur, 1 female co-entrepreneur

Overall 20 such businesses were identified, ten retailers, six processors, and four food service operations. The data collection continued until all business arenas were covered with a minimum of two interviewees each, and the resulting sample represented monetary approaches to the reuse of surplus food in Germany according to the criteria set (Table 1).

Overall, 16 businesses were contacted. Two did not respond after repeated contact attempts, two were not available for an interview, and another two cancelled the scheduled interview. All interviews were carried out between July and September 2018 by the first author. Of the ten interviews, nine were carried out via telephone and one in person at the workplace of the interviewee. Interviews took between 40 and 110 min and were audio-recorded. The interview guide included seven thematic sections with two to three main questions each. The sections addressed entrepreneurs' motivation; arena of the business and marketing strategies; structure of the business and collaboration; differences from other approaches to food rescue; contributions to the reduction of food waste; sustainability; as well as expectations and plans for the future (see Appendix A). Each main question included several supplementary subquestions, to be asked only if the main questions led to insufficient answers. The order of the questions followed the flow of the interview. The interviewer was trained by one of the co-authors, and the interview guide was tested and adapted before the actual interviews.

The audio recording of each interview was transcribed verbatim in full. As the first step to analysis, the type of transcript depends on the objectives of the study and the intended type of analysis [44]. Because the analysis intended to focus on the semantic content of the interviews, a simple transcript without nonverbal expressions and smoothing of spoken language into standard German was chosen. The transcription software f4 (Version 5.70.2) was used.

Based on the transcripts, the recursive qualitative content analysis followed the steps of carefully reading each interview, open coding of individual interviews, and comparing and contrasting of interviews and codes several times until the final inductive code system was established through deletion, addition, summary, and changing of codes. After this process of selective and axial coding, codes were grouped into categories, and the final analysis was completed on the category level (see Table 2 for an example of a category with codes, and excerpts from the interviews). By embedding excerpts from interviewees' own words in the final manuscript, researchers give the research participants a voice in the outcomes while contributing to the credibility—and transparency—of the research. In essence, the use of text excerpts provides the audience with additional insights into the coding process by illustrating how codes associated with particular categories or themes in the data were defined during the analysis process. An inductive analysis approach was chosen due to the limited knowledge on entrepreneurial businesses in food rescue at the current time [45]. Results were anchored in specific statements during each interview and can be traced to their sources in the data [46]. Data management and detailed analysis were supported by the use of the qualitative data analysis software Atlas.ti (Version 8.2.32).

Table 2. Examples of codes for the category “Motivation for starting the business” with excerpt examples from interviews.

Code	Excerpts
Active contribution to the reduction of food waste Motivation to actively rescue food that would otherwise be discarded dominant; economic objectives secondary	<p>“The main goal that I want to always rescue more food did not change at all, that has always stayed the same” (Retail co-entrepreneur, female, B2C, stationary).</p> <p>“I believe the objective of a social enterprise is somehow, to make itself unnecessary in the end; and to make sure that then the market will function more like normal in quotation marks. That means, if at some point [name of retailer] or everybody else sells their misshaped vegetables fully normally and no farmer must discard them, then we can also look for a different occupation, but that is probably still ways off” (Retail co-entrepreneur, male, B2B, online).</p>
Economic anchor of activity to reduce food waste Wish to combine saving food that would otherwise be discarded with long-term profitability	<p>“From the beginning our wish was to say [. . .], one likes most to eliminate the problem completely, but at the same time we wish to anchor what we created in this system, in which we exist economically, too” (Processing co-entrepreneur, male, B2B and B2C, online).</p> <p>“We want to do something that does good. But [. . .] everybody must earn a living for himself and if we can do that with something that is fun and also creates a benefit for others, then we naturally like it even better and do it with more energy” (Food service co-entrepreneur, male, B2C, stationary).</p>
Profit through saving food Economic motivation dominant; motivation to rescue food that would otherwise be discarded secondary	<p>“It is not the case that we, [. . .] that the intention was [. . .] to say okay, I want to simply stop food waste. It is, I am saying this in full clarity, [. . .] an ordinary business goal” (Retail entrepreneur, male, B2C, stationary).</p> <p>“Well, from the beginning it was always also a goal, to lead an economic enterprise that is profitable, naturally. I do not do this out of solely altruistic motives” (Processing co-entrepreneur, male, B2B and B2C, online).</p>

Footnote: marketing directly to consumers (B2C), marketing to other businesses (B2B).

3. Results and Discussion

During the past two decades, different individuals and advocacy groups have started a number of projects to reduce food waste in Germany. The projects differ in emphasis and objectives. The focus of the present study was on monetary approaches and stand-alone business models, which differ from nonprofit organizations in that they integrate a profit goal in their pursuit. They also differ from integrated models, where waste reduction is combined with a traditional pre-existing business. The entrepreneurial businesses included in the present study were founded specifically in the context of addressing food waste.

While businesses were initiated all over Germany, most initiatives started in large cities, with a hotspot in the capital city of Berlin. The businesses participating in the present study were founded between 1999 and 2017; most of them in the last quarter of this period. As is to be expected, the youngest businesses are smaller and less likely to make a profit at the time of data collection. The business currently redirecting the most food towards further use is the oldest of the businesses analyzed. The entrepreneurs come from different backgrounds; very few had prior experience in the food industry. The number of employees is typically small, with one to seven people (not counting the entrepreneurs). Some of the businesses work with volunteers in addition to regular employees, which increases the number of people involved to over 50 in some situations.

The entrepreneurs differentiated between food items that are rather easy to (re)introduce into the food system and others that are difficult to acquire or handle. At the start of the supply chain, at the production level, and at the wholesale level, surplus items are available in large quantities and easily

acquired. Furthermore, “easy” items are processed and packaged products with a best-by date, which are consumable for a much longer time. “Difficult” items include highly perishable products, e.g., meat and other products with an expiry date; store brands, which are not allowed to be sold elsewhere; and very large producers or processors that do not want to share information on their surplus and have little interest in collaborating. Consequently, the food items most frequently redirected to further use are produce and products with a best-by date, whereas the most negative impacts of food waste stem from meat and milk products (see also [12]). According to the entrepreneurs interviewed, the largest amount of food can be rescued by retail businesses, because no additional ingredients are necessary, compared to food service and processing. Planning and reusing larger quantities are most difficult in food service, whereas processing is in the middle, as it also requires additional ingredients, but can be scheduled more easily.

Entrepreneurs depend on other businesses, where surplus food occurs, to collaborate by either donating or selling the surplus items, at a significantly reduced price, as inputs to their businesses. Items are either picked up by the entrepreneurs or delivered by logistics partners of the collaborators. Some of the entrepreneurial businesses organize the harvest of produce that would otherwise be left in the fields. Over time, these trust-based collaborations grow into mutual dependence. The collaborators benefit financially through additional sales, which is the case for agricultural producers, and through saving disposal costs, which is the case in retail and processing. As in a British study focusing on the food waste of traditional retailers [16], the entrepreneurs in this study perceive ethical benefits and image improvements for their collaborators; the former in the case of bakeries and agricultural producers and the latter in the context of sustainability-oriented mission statements, e.g., in retail. Agricultural producers who are directly in contact with food and food production show a higher motivation than other supply chain actors to bring food items to their originally intended use, which is human consumption (see also [47]).

“For the farmers, it is a bit different. They, well, I believe they are upset; I rather believe they are rather happy if their food does not go to waste. [. . .] Indeed some of the farmers, they still say, no, they do not want anything [referring to payment]; others, they have a completely different, clear idea what they want to have now. We then pay that to them” (Retail co-entrepreneur, female, B2C, stationary).

Except in the retail arena, bringing surplus food items back into the food system does not necessarily result in lower consumer prices, because additional resources are used to accomplish the goal of rescuing food. Volunteer work can reduce prices, because volunteers donate their worktime. Collaborators must negotiate a “fair” price and agree on it either for each transaction or for a period of working together. One of the reasons for larger operations not to collaborate is the additional time needed for managing the surplus [16,47]; they would, therefore, need to be paid at least the equivalent of the resulting extra personnel costs. Due to the additional resources needed, the final price of a rescued food item may be higher than the shelf price, especially considering quality characteristics. However, in the case of processing and food service, additional ingredients and services also increase the value of the product.

With regard to consumers, social media presence and media reporting on businesses addressing food waste through reuse and redistribution contribute to a wide reach. In the case of stationary businesses, e.g., in retail and food service, customers usually come from nearby. For business-to-business, e.g., processors and online vendors, including those who use a combination of stationary and online sales, the reach can expand throughout Germany. The results differed from the findings of Hooge et al. (2017) that younger consumers are more likely to buy such products [48]; the entrepreneurs’ customers include people wishing to support the reuse concept and sustainable consumption in all age groups. However, the entrepreneurs communicate the background of their businesses in varying intensities. The retailers among the entrepreneurs perceive the lower price of the rescued food items as their main draw; processors and food service entrepreneurs think their customers appreciate the taste and quality of the products for a healthy diet, as well as the reuse concept.

“Many families that like to show their children how the vegetables really look like. Well, [. . .] we also have a lot who find it somehow great because they can do something against food waste when they buy from us; and [. . .] also people in need who do not have so much money” (Retail co-entrepreneur, female, B2C, stationary).

“Some are likely rather motivated by indulgence and the others are likely rather motivated a bit by being part of it” (Food service co-entrepreneur, male, B2C, stationary).

“I believe many are a bit afraid of it, because they have a somehow difficult notion of what to expect, if they order ‘misshaped’ vegetables. But for the customers who have somehow tried it, the major share of the customers then did become regulars who order permanently from us” (Retail co-entrepreneur, male, B2B, online).

Entrepreneurs in the retail arena differ from social supermarkets [36] insofar as they do not require proof of neediness from their customers and they differ from initiatives requiring membership, such as Fruta Feia [37], meaning they are accessible to everybody, resulting in a broader potential customer base. Their customers include price-conscious shoppers accepting products near the best-by date or with visible imperfections. The acceptance of such imperfections is higher for consumers with more environmental or ecological interests [15,26]. Furthermore, acceptance can be strengthened through additional customer information [26]. Another group of customers is willing to spend more money to contribute to food rescue. Different from integrated models within traditional retail chains, these businesses offer only rescued products. Accordingly, customers do not compare the products directly with regular products. Conversely, entrepreneurs in the arena of processing and food service usually set a price point similar to traditional products. Consumer acceptance, therefore, depends on the accompanying message. Topics like sustainability and climate neutrality have positive connotations and can contribute to the buying decision (see also [27]).

3.1. Barriers and Challenges

Entrepreneurs building their businesses on food rescue share some barriers and challenges, but some challenges also differ depending on the arena of business (Table 3). The biggest perceived challenges concern logistics. The acquisition of the inputs appears to be difficult since these inputs were treated as waste in the past.

Logistics challenges require the development of new structures and also result in increased costs. Processors need to purchase additional inputs, since it is rather difficult to acquire sufficient quantities of surplus food in a regular manner, given that the market for surplus food is still small. Processing is not economically viable under a certain minimum size. For retailers and food service providers, working with surplus items entails higher risks, because they cannot predict which products will be available in which quantities and, therefore, are not able to guarantee continuous supply to their customers (see also [19]). Similarly, these challenges are present in social supermarkets as they rely on donations from major retailers [34]. By contrast, within a business model such as Fruta Feia with a cooperative structure, it can be expected that these challenges are less intense and risks can be mitigated, as various growers contribute to the project [37].

Table 3. Perceived barriers and challenges of building a business based on food rescue with excerpt examples from interviews.

Barrier/challenge	Excerpt
Logistics Efforts needed and difficulties in acquiring the food; logistical barriers	<i>"It is just difficult to use such a resource that you cannot just order today to be used tomorrow. Well the whole logistics, the procurement, that is more demanding"</i> (Processing co-entrepreneur, male, B2B and B2C, online).
Customers Difficulties with customer communication and with ensuring customer acceptance	<i>"If, for now, you have only two products and these are inexpensive, that is not enough. The customers need a certain variety, so that it is worth for him to come"</i> (Retail entrepreneur, male B2C, stationary).
Contribution to food rescue Indirect contribution to food waste reduction through influencing large operations	<i>"If I reflect now, what kind of an influence does this have on the corporates [. . .] you could, if you are completely negative, say "Yes, now we have found another place where we can load off our overproduction and we do not need to change our behavior at all"</i> (Retail co-entrepreneur, female, B2C, stationary).
Sustainable growth Difficulties to ensure sustainability simultaneously with business growth	<i>"Well, a very difficult challenge is to continue to try to be sustainable in all fields and despite of this to grow, because it has a lot to do with costs and a lot to do with the fact that naturally you need lot of time to look into it so intensely, to compare and so on and so forth"</i> (Food service co-entrepreneur, male B2C, stationary).
Entrepreneurial risk Necessity to take risks when founding a business and to grow	<i>"Well, perhaps you can manufacture something from it, that you get to the point where as an entrepreneur you must take more risks. [. . .] Well growth also brings challenges with it"</i> (Processing co-entrepreneur, male, B2B and B2C, online).

Footnote: marketing directly to consumers (B2C), marketing to other businesses (B2B).

Customer-related barriers include lack of acceptance because of a limited choice (see also [28]) and expectations regarding the overall sustainability of the business. Furthermore, selling produce directly to consumers in a retail business still requires meeting quality standards, including sufficient freshness. Food service providers struggle with providing a restaurant-like atmosphere. To accomplish economically viable businesses, these barriers must be overcome. However, retailers also have the advantage of the possibility for direct communication with consumers. For food service providers, direct communication with customers can also help to explain the limited choice, whereas processors work mostly through social media. Several entrepreneurs are unsure how to reach customers and how to contribute to behavioral changes in the broader society, which is part of their founding idea. These issues may not have occurred in any of the business models presented in the prior literature. The nature of social supermarkets and the targeted consumer group, namely, people in need, does not imply a communication challenge, because such opportunities are commonly communicated by authorities when consumers register for social welfare. Consumers using social supermarkets must provide formal evidence of need [36]. For Fruta Feia, there should not be communication problems or problems to reach consumers, because the project spread from major cities and a cooperative structure with multiple actors is involved [37].

In addition, many entrepreneurs strive to contribute to the reduction of food waste not only through their own business, but through initiating wider changes across the supply chain. However, many of them are not sure whether they do make a positive contribution overall. Similarly, Lebersorger and Schneider (2014) identified little interest by traditional actors to sell their surplus to third parties [49]. In addition, retailers typically have an interest to sell more and, therefore, cause consumers to buy more than needed through presentation and other measures, which contribute to food waste [12].

Several entrepreneurs feel that they need to grow their businesses to become or stay economically viable. They perceive it as difficult to find the right balance between ecological and social goals on one side and economic goals on the other [16,31]. As many of the entrepreneurs are young and most have no entrepreneurial experience, the entrepreneurial risk is also perceived as a challenge. That challenge is intensified by the need for a minimum size and for growth. In general, risk tolerance is positively related to the motivation to start a business [50]. Furthermore, the complexity of the business increases by adding social and environmental goals to the economic goals. These results are in contrast to initiatives such as social supermarkets and Fruita Feia. Social supermarkets serve a niche market dedicated to a specific target audience (people in need), while Fruita Feia has a broader audience through their broader membership system. These forms of specification and partnership may explain why, in contrast to the interviewed entrepreneurs, actors involved in Fruita Feia and in social supermarkets are unlikely to deal with these forms of pressure.

Entrepreneurs typically do not perceive themselves as competing either with each other, especially not across business types, or with nonprofit organizations such as food banks or food-sharing operations, but rather as complementary. They believe that their businesses are necessary to reduce food waste, because nonprofit organizations cannot cover everything and cannot rescue all the food that may be discarded. Compared to food-sharing operations, the entrepreneurs see their advantages in being able to work with professional shipping and transportation, using larger amounts, and being a more reliable partner for collaborators and consumers. In addition, the entrepreneurs can reach a broader population than the users of food-sharing operations (see also [22]). Compared to food banks, entrepreneurs can use some excluded products, such as products containing alcohol; have a broader reach because they do not require proof of neediness; and can offer payments to collaborators. There is some overlap of the stand-alone business models, especially in retail, with integrated initiatives by retail chains, which are currently playing an increasing role in Germany.

3.2. Entrepreneurs' Motivations

When the participating entrepreneurs contemplated founding a business building on food rescue, they started with different motivations. For considering food rescue as a business, three clusters of entrepreneurs were identified in the present study (see also Table 2), based on the dominance of either the goal to actively contribute to the reduction of food waste or the profit goal, or both goals being equally relevant to the entrepreneurs (Figure 1).



Figure 1. Entrepreneurs' motivation.

To the first cluster of entrepreneurs, the reduction of food waste is more important than the economic success of their businesses. These entrepreneurs seek additional value contributions to society as a whole, for example, through increasing awareness of food waste and its negative impacts on the environment. Their main goal would be accomplished if their businesses were no longer needed. The second cluster seeks to connect economic success with food waste reduction, to increase the sustainability of waste reduction through anchoring it in economic goals. In their businesses, they seek to combine rescuing food with building a profitable enterprise. These entrepreneurs see the balance of sustainability and profit as a long-term business model. For the third cluster, the economic goal of founding a successful, profitable business is dominant. While food waste is reduced in the course of pursuing their business activities, the reduction of food waste is, at most, a secondary goal. Due to the differing motivations of the entrepreneurs, not all can be identified as social entrepreneurs or sustainability-oriented entrepreneurs [31]. However, even the third cluster contributes to increased resource efficiency from the viewpoint of the broader society, through reducing food waste in the course of pursuing their profit goals [33,34].

While the exact balance of the goal to reduce food waste and the profit goals differ for the participating entrepreneurs, there are some further related factors. Businesses working with volunteers are more likely to fall into the first cluster, i.e., reducing food waste is most important to them. The second cluster with profit as an anchor to make waste reduction sustainable is most common among the participating processors. These businesses often sell to other businesses and have less direct contact with consumers. If they sell through a stationary shop with personal consumer contacts, they tend to engage in awareness raising and, thus, contribute to society. Entrepreneurs with a mainly economic motivation (cluster three) identified food waste as a resource and decided to use that resource as a springboard to realize their goal to become entrepreneurs. Awareness raising, beyond drawing attention to the food waste problem by their existence, is not part of these entrepreneurs' goal set.

Not only do the participating entrepreneurs differ regarding how important environmental and social goals are for them, their understanding of sustainability and how it can be reached varies. The range of environmental motivations starts with the obvious contribution of reducing waste disposal by using surplus food as a resource. On the next level, entrepreneurs think more broadly about saving resources not only through saving food items, but also in packaging and transportation, and through continuing reflection about their businesses' processes and decisions. On the final level, attention is given to not creating food waste within their own businesses by reducing storage, processing, and distribution only on demand, as well as timely use of any surplus within the business.

Social motivation and the contribution to solving society's problems takes different forms. Operations with physical outlets, especially retailers, consider it important to provide a pleasant atmosphere and foster exchange. Working with volunteers not only contributes to providing the products or services in a less expensive manner and, therefore, reducing food waste further but also provides sensible contribution opportunities to the volunteers. Some entrepreneurs also work with welfare organizations to connect social work with agriculture, food industry, and nutrition. These practices and motivations correspond with the case of social supermarkets in Austria [36]. The aspect of educating consumers, which has been touched upon above in the context of raising awareness for food waste, is also more intensely pursued by some entrepreneurs. Through presentations, setting up information booths, and other initiatives, they actively communicate food waste related issues to their customers as well as the broader public with the goal to convince others to reconsider shopping behaviors and create less waste. These practices are similar to practices of the actors in the Fruta Feia project [37], which was founded to educate Portuguese consumers and raise awareness of the issue of food waste. Conversely, a few entrepreneurs would rather avoid drawing attention to the food waste issue, because their selling proposition is solely the low price point.

The main commonality between the entrepreneurial businesses involved in this study and Fruta Feia and social supermarkets is their orientation. All businesses implemented a product-to-service switch, because imperfect food items are not exclusively treated as a resource, but businesses are

engaged in raising awareness or providing food services which derived from imperfect food items. Such development can be attributed to the focus on sustainability, as these switching tendencies can be observed also in other industries [30].

4. Conclusions and Recommendations

The study presented business models in the context of reducing food waste through using surplus food items. Surplus food is reintroduced into the food system through entrepreneurial retail, processing, and food service operations. The main barriers that entrepreneurs have to overcome are the logistics of supplying their businesses with the surplus items, as well as, in some cases, on the marketing side. Furthermore, they depend on collaborators for their input and support. They perceive their businesses as complementary to existing approaches to reduce food waste with the advantage of broader access to potential collaborators as well as customers through the monetary element. In addition, many entrepreneurs contribute to the broader society through awareness raising and using a resource, which might otherwise have to be disposed of as waste with all the resources involved in its production lost.

The businesses analyzed provide examples of how environmental and social sustainability can be balanced with economic sustainability and profit, as they use existing systems by creating new markets and products. Willingness to collaborate is a prerequisite [35], because upscaling is only possible through increasing collaboration across the supply chain. Agricultural producers, processors, and retailers could work together more closely in the exchange of information and to improve on-demand flow of goods and services to the consumer. The increasing amount of data collected throughout the supply chain needs to be governed and shared based on common sustainability goals to reduce inefficiencies in the chain. This can also be used to control production more efficiently and redistribute surplus in some areas of the chain to others where it can be used (see also [51]).

Additional measures to reduce food waste in the political arena can support stand-alone business models, integrated models, as well as nonprofit initiatives and organizations. Measures could include an approach to quality that focuses more on nutritional content than external characteristics. Other measures could provide incentives for retailers and processors to use or donate a perceived surplus rather than to dispose of it. As a supporting measure, a mandate to record and report amounts of food waste throughout the supply chain would not only provide the data needed to gauge suitable further measures but in itself could work as an incentive to reduce food waste. For this purpose, definitions and data collection methods must be unified. Agricultural production needs to be included in data collection, because measures further down the supply chain often have drastic consequences at the production level. Ignoring the production level might, therefore, lead to more food waste due to making misguided decisions and adopting unsuitable solutions, because the causes of food waste are not necessarily located where the waste occurs [52].

Future research needs to compare consumer acceptance of the different approaches to food waste reduction. There is potential to improve the integrated model through learning from stand-alone business models, which seem to garner higher acceptance by consumers. Furthermore, the effect of stand-alone business models on other larger operations through their role model function as innovators needs to be studied. As larger businesses, processors, and retailers learn from the entrepreneurial innovators, they may, however, take away the business opportunities from these smaller operations.

Studying the effects of the entrepreneurial businesses on consumers is another research gap. Whether these businesses can reach different people from those reached by awareness campaigns and, therefore, contribute to the broader education of consumers must be researched, as well as whether customers of these entrepreneurial businesses transfer potential learning and civic engagement to other behavioral changes, such as more conscientious shopping overall and discarding less food at the household level.

A further supply chain actor that should be investigated in the context of food rescue and for-profit business are online platforms, which are connecting businesses and consumers. Using apps, consumers

can withdraw information, where they purchase leftover foods or rescued food for reduced prices. These platforms act as intermediaries who are powerful as they possess consumer and business data.

For entrepreneurs active in food rescue as a business as well as potential future entrepreneurs, the following recommendations can be derived based on the present study. As the available quantities of surplus are not always sufficient for an economically viable business, better predictions of available quantities are needed. Better predictions can be accomplished through engaging in closer communication with wholesalers and grower cooperatives. Improved collaborations with these supply chain actors will allow better control, as larger quantities and bigger ranges of products become available. Consumer acceptance and communication issues can be improved through the implementation of marketing measures. Marketing can include presenting products' added benefits for the environment and supply chain actors involved in food rescue to consumers. With a focus on authenticity and sustainability, the social and environmental benefits that come along with the purchase of the products can be presented. Improved communication to consumers that their purchase contributes to food rescue, and emphasizing quantities rescued can also increase public awareness of food waste. In addition, materials from governmental campaigns, such as "Love food, hate waste" or "Too good for the bin", can be used to further raise public awareness of food waste. Finally, actively contributing to consumer education on food quality can increase business opportunities. For example, consumers using appearance as the main quality indicator leads to food waste. Therefore, activities showing consumers that appearance does not determine nutritional value serve as consumer education. Collaboration with schools and other educative institutions will be useful for this purpose.

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Appendix A. Overview of the Interview Guide

Appendix A.1. Introduction

Brief introduction of the interviewer and topics of the interview; explanation of consent form and audio recording; signing of consent form.

Please introduce yourself, your background, and your business.

Appendix A.2. Entrepreneurs' Motivation

In the beginning, what was your motivation to start the business? Did your motivation change over time?

Appendix A.3. Arena of Business and Marketing Strategies

At which stages of the supply chain does your business model contribute to food waste reduction? From where do you get your inputs? How did you decide which products to offer and how to sell them?

Appendix A.4. Structure of the Business and Collaboration

With which collaborators do you work? Please describe the logistics. What costs are involved (for food rescued as well as additional inputs)? Who are your customers, please provide details?

Appendix A.5. Differences from Other Approaches

Why is a separate business necessary to address food waste (as opposed to integrating waste reduction into the traditional supply chain)? How does a monetary approach contribute to further reducing food waste? Where do you see potential for new initiatives in food waste reduction?

Appendix A.6. Contributions to the Reduction of Food Waste

Tell me about your business' contribution to food waste reduction. Can you quantify your contribution to food waste reduction? In addition to saving food, how does your business model contribute to food waste reduction (indirect impacts)?

Appendix A.7. Sustainability

Considering the food supply chain, which sustainability goals are relevant to your business model? In what way, is your concept a sustainable business model? In addition to the food products, what else do you offer to your customers?

Appendix A.8. Expectations/Plans for the Future

How has your concept been accepted so far; which positive experiences did you make? What were the challenges and what limits to food waste reduction do you see? Imagine your business in five to ten years, what will happen?

Appendix A.9. Wrap Up

Is there anything that we have not discussed, that you would like to add?

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