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Key characteristics and success factors of supply chain initiatives tackling consumer-related food waste – A multiple case study

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ABSTRACT

Food waste accounts for a considerable share of the environmental impact of the food sector. Therefore, strategies that aim to reduce food waste have great potential to improve sustainability of the agricultural and food supply chains. Consumer-related food waste is a complex issue that needs collaboration between various supply chain actors and sector stakeholders. Although a range of initiatives from various actors already exists internationally, there is still a lack of knowledge on which lessons can be derived from such cases. The current multiple case study provides insights into how to successfully design future actions, by analysing common and distinct key success factors in 26 existing initiatives to reduce consumer-related food waste. The findings reveal that collaboration between stakeholders, timing and sequence of initiatives, competencies that the initiative is built on, and a large scale of operations are key success factors. Success factors are identified for the primary design, for the development and maintenance phase, and for reaching out to consumers. There are three general types of initiatives that differ in their aims and characteristics: information and capacity building, redistribution, and retail and supply chain alteration. The first type focuses most strongly on motivating consumer food waste avoidance behaviour and strengthening consumer abilities, while the second and third focus primarily on altering consumer food choice context, but combine this with aspects of raising awareness. Recommendations are derived for future initiatives which should take inspiration from existing initiatives, especially considering the right partners, competencies involved, timing the start of the initiative right, and aim to soon achieve a large scale.

1. Introduction

It is increasingly acknowledged that current human natural resource use exceeds the planetary limits (Steffen et al., 2015). Using more resources than the carrying capacity allows and running the risk of moving beyond certain thresholds endangers sustainable development. That is, it endangers the certainty that the needs of current as well as future generations can be fulfilled (UN, 1987). Therefore, more sustainable and cleaner production and consumption is called for. Respective efforts in resource efficiency gains (Weizsäcker et al., 2009), reduction of toxics (Braungart et al., 2007), circular economy approaches (Ingebrigtsen and Jakobsen, 2007), and decoupling resource use from growth need to be sufficiently scaled up in order to meet the current sustainability challenges (Pacala and Socolow, 2004). In addition, the idea of 'growth' as such needs to be questioned (Jackson, 2009) and materialistic lifestyles transformed, to which revitalising the concept of 'sufficiency' might contribute (Weizsäcker et al., 2009).

The food sector is of crucial relevance (Godfray et al., 2010; Foley et al., 2011), but rather complex when compared to the other major

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sectors of human activity that cause the greatest environmental impact: Housing and heating, transporting and travelling. Agriculture and food supply chains impact all of the planetary systems that are considered to be past safe thresholds (Rockström et al., 2009; Cordell et al., 2009). While some parts of the world are characterized by malnutrition, food insecurity, and natural resources under strain of population growth and climate change (Food and Agriculture Organization of the United Nations, FAO et al., 2015), other parts, where food is taking up only a minor share of household budgets, are challenged by over-supply and obesity (WHO, 2014, 2015).[1] These imbalances and unethical inequalities (Gjerres and Gaiani, 2013) have triggered research on possible solutions, international organizations to call for action, and food supply chain, public and societal stakeholders to start initiatives.

Food loss and food waste have received increasing public and research attention in recent years (Aschemann-Witzel, 2016; Chen et al., 2017). The FAO assessed food losses and waste to account for around a third of agricultural production (FAO, 2011). An analysis of worldwide crop production and consumption found that a fourth of the crops are lost or wasted (Kummu et al., 2012). Food losses are typically defined as loss or damage in early parts of the supply chain, as for example during harvesting, transport or storage. Food waste refers to food items ready for human consumption but not consumed, as for example when processed foods or meals are wasted in retail, catering, or in the consumer household.

Not all food waste is avoidable. Some surplus production is needed, but minimization of the current high scale of wastage is regarded as the best option, followed by redistribution of surplus to population in need (Papargyropoulou et al., 2014). Converting food to animal feed (Papargyropoulou et al., 2014), or recovering value in some way or other (Garrone et al., 2014) is considered as less favourable compared to food waste avoidance, and (because it is deviating the food to non-human consumption), still considered food wastage (Parfitt et al., 2010; Fusions, 2014). Yet, recovering value is still preferable over mere disposal from a perspective of efficient resource use. Food waste research has focused on waste treatment issues (Bernstad Saraiva Schott et al., 2016), waste sorting (Miliute-Plepiene and Plepys, 2015), valorisation (Mirabella et al., 2014), and innovation (Chen et al., 2017). It contributes to our understanding of how to achieve food production and supply chains that can 'close the loop' and move closer to the concepts of industrial ecology (Clift and Druckman, 2016), circular economy (Ingebrigtsen and Jakobsen, 2007), and cradle to cradle (Braungart et al., 2007).

While developing countries more likely experience loss in early stages of the supply chain due to supply chain inefficiencies, developed countries typically experience waste at the end of the supply chain (Parfitt et al., 2010; Cuéllar and Webber, 2010). Food waste at the end of the supply chain mostly occurs at the wholesaler/retailer-consumer interface (Stuart, 2009), due to interactions between factors at the retailer and the consumer stage, as for example aesthetic standards and marketing activities. Consumer household food waste accounts for around 40% of food waste in Europe (EC, 2010), and individual consumers are wasting approximately 10%–30% of the food they buy (Gjerres and Gaiani, 2013; Quested et al., 2013; Buzby and Hyman, 2012). As a study in Finland showed, this can be as much as 23 kg per capita a year (Katajajuuri et al., 2014). Tackling the problem of consumer-related food waste, however, is very complex. Food may be wasted due to a number of structural, economic, personal or social issues, such as packaging (too large unit sizes, not allowing fully emptying the content, etc. Williams et al., 2012), inability to interpret the date label (van Boxstael et al., 2014), lack of managing skills and routines to deal with shopping and leftovers (Stancu et al., 2016), feelings of disgust towards the thought of food going 'bad', anxieties about food safety (Watson and Meah, 2013), or because the consumer prioritises family preferences over re-using leftovers (Graham-Rowe et al., 2014; Cappellini and Parsons, 2012). These examples show that consumer-level food waste is influenced by supply chain decisions about product packages and food marketing, by regulations and standards, and by societal trends in lifestyle and food. Consumers typically do not plan to waste and some even feel guilty when wasting (Evans, 2012). Nevertheless, it is the daily commercial transactions, interactions and household practices that cause food to end in the bin (Evans, 2014).

Thus, there are a multitude of macro- and micro-environmental factors that cause and influence consumer waste behaviour (Watson and Meah, 2013; Graham-Rowe et al., 2014). These factors also impact the interactions in the supply chain (Göbel et al., 2015), and between the supply chain and consumers (for an overview, see Aschemann-Witzel et al., 2015; Fusions, 2014; Quested et al., 2013). To tackle food waste, collaborative action is needed and called for, similarly to other sustainability issues (Boström et al., 2015). Indeed, existing initiatives targeting food waste use collaboration and synergized actions between supply chain actors, public bodies and societal actors. However, little research has focused on the business or management side of food waste initiatives (Chen et al., 2017). Single case studies have been conducted that explore, for example, the amount of food waste generated by a specific retailer (Cicatiello et al., 2016), by a municipality's food waste collection (Miliute-Plepiene and Plepys, 2015), and through a city's waste management scenarios (Eriksson et al., 2015), case studies on stakeholder views on the elements of success in a residential food waste sorting program (Xu et al., 2016), or on supermarket actions against food waste (Aschemann-Witzel et al., 2016). Therefore, empirical, comparative research on success factors of multiple food waste reductions initiatives across different actors is currently lacking. It is thus unclear which factors influence the success of these initiatives, how these factors are influential, and, not least, how future consumer-related food waste initiatives may be developed based on these findings. Thus, further research into food waste and supply chain collaborative action is called for (Niesten and Lozano, 2015).

The present study explores the common or distinct characteristics of 26 existing initiatives that strive to reduce consumer-related food waste with the aim of determining key success factors of these initiatives. It suggests that useful lessons can be learnt from the initiatives, and identifies questions, or concerns, that need to be addressed by future initiatives. Given the complex nature of the food waste issue, the research applies a multiple-case study approach based on qualitative analysis of interviews and case materials. As such, this research is the first multiple-case study focusing on key characteristics and success factors of consumer-related food waste initiatives. The unique contribution lies in both analysing a multiple set of cases, as well as in identifying emerging concerns and offering recommendations for future initiatives. In sum, the study contributes to an improved understanding of how the challenges of increasing amounts of food waste can be met to develop more sustainable and cleaner food supply chains.

2. Theory

The research is based on the concept of 'key success factors' in

[1] Notwithstanding the even more complicating fact that a number of developing or emerging countries face a 'double-burden' of both malnutrition and obesity, while there are also citizens in developed countries for whom economic constraints mean that they have difficulties securing a sufficiently nutritious diet.

campaigns, initiatives or projects, and on the idea of focusing on either conscious consumer choice or alteration of the choice context. In the following, first the concept of key success factors is explained, and then the consumer behaviour theory behind differentiating between motivating choices versus altering choice context is outlined.

2.1. Key success factor concept

The concept of 'key success factors' has been widely used in business research (Baker, 1993; Ketelhöhn, 1998). A limited number of enabling factors have previously been identified to understand the potential drivers of a 'successful' activity or actor (Wang, 2014). Success factors have been categorized as potentially being related to a) the macro-environment (e.g. political, economic, environmental, social, technological, or legal), b) the micro-environment (e.g. supply chain partners, customers, competitors), or c) internal factors (e.g. strategy, competences, resources) of the organization (Grunert and Ellegaard, 1993). Thus, key success factors can be internal or external to the organization. Success factors can be identified as part of the basic design of the activity or of the further development process of the activity. It means that a success factor can be actively influenced or chosen, or that it can be a factor within the context or environment that cannot be managed or governed, but only responded to. The basic idea of the significance of certain key factors is derived from various marketing management models. For example, the PEEST(L) framework (acronym for the types of factors) is used to analyse the macro-environment (Kotler et al., 2012), and Porter's Five Forces framework provides the basis for a close look into the micro-environment and the competitive advantage it entails for a business entity (Porter, 2008). Comparing the findings of the external environment with an analysis of internal strengths and weaknesses (a SWOT analysis) can lead to the identification of future opportunities and threats (Kotler et al., 2012).

Application of the concept of 'key success factors' can be found in, for example, new product development (Biström and Nordström, 2002; Stewart-Knox and Mitchell, 2003), implementation of new manufacturing approaches (Hwang and Lu, 2013), introducing products to new distribution channels (Wang, 2014), and in social marketing and policy analysis (Aschemann-Witzel et al., 2012). These examples show that the typical application is when a new product, service or practice is introduced and should be evaluated to learn for similar situations later on. A recent single case study research on food waste sorting included stakeholder interviews that explored the perceived "elements key for success" (Xu et al., 2016, p. 1). The researchers found two major factors, one that might be classified as internal (good management in terms of clearly defining roles and responsibilities) and the other as external (the existence and involvement of an NGO that could act as a 'broker' and facilitator).

The idea of success factors also entails that certain factors can be 'made' into a key success or failure factor. This depends on how it is dealt with by the actor, that is, how internal and external factors interact. It is therefore crucial whether or not the right management or governance decision is made in the respective situation. This is especially relevant in a complex context such as food waste mitigation initiatives. Consumer-related food waste is caused by a wide array of factors within the supply chain (Göbel et al., 2015) and by the micro- and macro-environment of consumers (Quested et al., 2013). Decisions for a food waste-mitigation initiative concern which actors to involve in the initiative and how to involve these actors (for example, whether to work with voluntary agreements versus envisioning regulations). Decisions also include how and whether to include and combine commercial and public actors, and whether and how to combine profits with societal goals (Carroll and Shabana, 2010). Finally, decisions concern whether to focus on motivating and enabling consumers towards more sustainable choices, or whether to aim at changing the context in which consumers make food choices (Thøgersen, 2014).

From the above mentioned literature and for the use of the current study, it can be concluded that the success factor concept is applicable for different actors and types of initiatives across the value chain, as well as in different stages of development. Furthermore, a crucial distinction lies in factors that have to be passively 'taken' versus those factors that can be actively influenced, thus, in external versus internal factors. Given the lack of a clear definition in literature, a working definition is applied, which assumes that a factor is a 'key success factor' if identified or perceived as elementary and crucial for the success of the initiative.

2.2. Consumer behaviour: motivating choice or changing choice context

The decision to focus on motivating versus 'moving' (e.g. by changing the choice context) consumers towards more sustainable, cleaner consumption choices can be mirrored on consumer behaviour models. The theory of planned behaviour is a very prominent consumer behaviour model (Ajzen, 1985, 1988). It suggests that behaviour can be predicted on the basis of intentions to perform the behaviour (Fishbein and Azjen, 1975). The extent to which a consumer's intention to perform behaviours can be carried out depends in part on the amount of control the consumer perceives to have over the behaviour (perceived behavioural control, Ajzen, 1985), but also on the consumer's attitude towards the behaviour, and the subjective norms (the consumer's beliefs about whether others think that the consumer should engage in the behaviour, Ajzen and Fishbein, 1980). Perceived behavioural control, attitudes, and subjective norms are influenced by expectations about the likelihood of the positive outcome and by normative and control beliefs (Ajzen, 1985; Ajzen and Fishbein, 1980). Actually engaging in the behaviour is more likely when all factors enact a favourable influence. In line with the theory of planned behaviour, Ölander and Thøgersen (2013) introduced the helpful abbreviation of the 'MAO' factors. These categorize influence factors on behaviour as either related to M, motivation (which can be based in attitude or norms), A, personal ability, and O, the externally determined opportunity (with A and O similar to the distinction between perceived and actual behavioural control).

Applying these 'MAO' factors to consumer-related food waste behaviour, motivation to reduce food waste will be driven by environmental attitudes or thriftiness orientation, and by favourable social norms among family or peers. Consumers differ in their actual and/or perceived ability to handle and manage food purchase, storage and preparation. Opportunities – or lack of these - can be external contextual factors such as availability of packages with differentiated unit sizes, the presence of understandable date label or handling instruction, or storage facilities at home.

There is an ongoing debate about how production and consumption can transform to a more sustainably designed system (Geels et al., 2015). Great emphasis is given to holistic approaches that try to facilitate change via all factors (Thøgersen, 2014), as well as trying to encourage consumers to move through various development steps (van Trijp, 2014). Such a holistic approach means that consumers need to be motivated as well as 'moved', and that in interventions not only the individual's motivation and ability, but also the opportunity inherent in the context must be considered. This holistic approach is also relevant in a complex issue such as food waste. Holistically emphasizing all factors is important because voluntary, conscious behaviour change alone might not

provide sufficient scale and speed in sustainable transformation of consumption. Therefore, research and policy has recently given increased attention to strengthening the 'opportunity' side in individual consumer behaviour, by designing smart 'choice architecture' and 'nudging' consumers in the favourable direction (Sunstein and Reisch, 2014). In a holistic approach, focusing on motivating and enabling conscious behaviour choice emphasizes actions 'downstream' of the supply chain, at the consumer end, while designing a context to trigger sustainable behaviour focuses on 'upstream' actions in the supply chain. A holistic approach attempting to tackle all actions - down- and upstream - needs strong collaboration between different supply chain actors, public bodies or societal organizations. In the case of food waste mitigation initiatives, such collaboration appears especially useful due to the complexity of the issue.

From the above mentioned literature and for the use of the current study, it can be concluded that reduction of food waste caused by consumers will likely be successful if various consumer factors are influenced at the same time (e.g., both personal attitudes and societal norms), and if not only the consumer him/herself is appealed to (i.e., to his/her motivation and efforts to improve own abilities), but when also action is taken to change the consumer's surroundings (and thus the opportunities offered to consumers to act against food waste). Thus, it is of crucial relevance to consider actors acting at different stages of the supply chain, both up- and downstream.

3. Material and methods

In the following, the multiple, extensive case study approach is described with the recommendations for ensuring quality in case study research in mind. Then, the purposive sampling criteria are explained point by point, ending with a short characterisation of the chosen cases.

3.1. Case study approach

Case studies are often recommended when the research topic of interest is complex and needs to be studied in its context (Yin, 2014; Flyvbjerg, 2006). Case studies take into account the real-world context (Eisenhardt and Graebner, 2007). They are typically, but not exclusively, conducted by qualitative research, and contribute to an understanding of the 'why and how' (Eisenhardt and Graebner, 2007; Flick, 2009). Case studies are a preferred method to study business cases in its micro- and macro-environment, due to the possibility to grasp a complex situation and describe actors and processes in an accessible format (Eriksson and Kovalainen, 2008). Case studies can intensively explore single cases in-depth, or extensively research multiple cases in order to identify common patterns and characteristics (Eriksson and Kovalainen, 2008). The present study uses the approach in the latter sense in which the cases are instrumental to understanding these characteristics to allow for analytic generalisation beyond the present research context (Healy and Perry, 2000).

The present case study research uses the rather broad literature on key success factors, and up-stream versus downstream approaches to interventions, as basis for an a-priori specification of constructs (Eisenhardt, 1989) in the design of the study of consumer-level food waste avoidance initiatives. We distinguish types of actors, stages of development, and different approaches to influencing consumer behaviour change. To ensure good quality in terms of credibility, dependability, and confirmability of the qualitative research approach, recommendations on how to conduct case study research were followed (Carson et al., 2001; Eisenhardt and Graebner, 2007; Healy and Perry, 2000; Yin, 2014). Triangulation was used stepwise to improve validity during the process, in terms of including different material and methods on each case, as well as by letting several researchers analyse the same material (Eriksson and Kovalainen, 2008).

The approach was as follows: A case study protocol (Healy and Perry, 2000; Yin, 2014) was written before start of the sampling and data gathering to agree on aims and approach. The protocol was based on previous literature, but revised and discussed among the research team to ensure a uniform application of approaches across cases and researchers and to allow for inclusion of emergent categories of key success factors and influences (Healy and Perry, 2000). Purposively sampled cases were gathered which were selected based on theoretical categories (Eisenhardt and Graebner, 2007). Data was triangulated to the extent possible, using both interviews, secondary material, and multiple researchers' interpretations of the data. The semi-structured interview guide covered the development 'story' of the initiative, the internal or external factors that led to the success, and the proof of success that interviewees were able to provide. Interviews were transcribed verbatim. To the extent possible, cases were used for which data from multiple interviews or sources existed (e.g. an interview with the a representative of the initiative as well as an expert). Expert interviews from a previous research step were drawn from Aschemann-Witzel et al. (2015). Desk-researched secondary sources such as academic articles, reports, media reports and websites that mentioned the respective initiatives provided further information. A uniform template to develop a case description for each case was used, and early and final versions of case analyses filed in order to be able to trace back reflections of the research process, including preliminary analysis and results, at various stages (Carson et al., 2001).

Cases were analysed separately in a within-case analysis as well as in comparison in a cross-case analysis (Eriksson and Kovalainen, 2008). Several persons were involved in the data analysis process: a part of the total cases gathered were assigned to each of the authors. Each case description, material and interviews were critically questioned and assessed to provide a further analysis of each individual case. Furthermore, each author analysed his/her share of the cases in comparison, and provided a general reflection on the characteristics, success factors, lessons learnt, and emerging questions. These reflections were jointly discussed to identify findings, conclusions, and potential implications. The coding process was of an iterative nature, since codes for key success factors were decided on by the research team during the process of analysis, and based on the theoretical outset. All interviewees were given the opportunity to provide feedback on the results obtained, allowing for 'member checks' to ensure the soundness and thereby validity of the findings (Eriksson and Kovalainen, 2008). In reporting about the findings, tables visualising the cross-case comparison were used as well as quotations from the single cases (Healy and Perry, 2000). A factor was regarded as a 'success' when this was how it was perceived by interviewees, or described as such in material about the case, or emerged as an important aspect during analysis of the individual case, or was identified as such when conducting the cross-case comparison.

3.2. Purposive sampling criteria

The purposive sampling criteria for the cases were derived from a literature review and expert interview study on consumer-related food waste (Aschemann-Witzel et al., 2015). First, an 'initiative' was defined as an organization, project or activity created or managed by an actor in the food chain or by a stakeholder in the food area (governmental, food-sector-led or societal). Second, the initiative had to relate to reducing consumer-related food waste. Consumer-

related food waste was defined as wastage of food caused at one of the stages of the supply chain (including consumers) due to reasons connected to supply chain actors' expectations on consumer preferences and behaviour towards optimal versus suboptimal food (for a more detailed definition, see Aschemann-Witzel et al., 2015). These expectations especially related to acceptance of 'suboptimal food' or to consumer expectations of an optimal purchase environment, as for example assortment size and resulting reaction towards out of stock. These criteria resulted in initiatives that either targeted consumers directly (with information and capacity building), or that made changes in the supply chain that either resulted in new consumers for products that would otherwise be wasted (redistribution), or in changes that made it easier for consumers to help prevent food waste (retail and supply chain alterations). These criteria also ensured that cases with a focus on motivating consumers versus cases focusing on moving consumers towards avoiding food waste were included. Cases that were mentioned by the experts in Aschemann-Witzel et al. (2015) were considered, if they fitted the above-described criteria.

Third, the sampling criteria aimed at including a diverse set of actions, from different actors such as NGOs, companies, and public bodies. The key success concept is applicable to all different types of actors, as the literature shows. Consumer behaviour theory underlines that consumers need to be influenced via various variables, and consumer policy making thus calls for holistic approaches and collaborative action. For the potential cases considered, interviews from key informants from the initiative were sought, and these informants needed to be accessible for the researchers in order to be considered.

Fourth, cases were included if they were deemed successful, either by the actors behind the initiative, and/or by the experts interviewed (Aschemann-Witzel et al., 2015). Success was not defined as an actual reduction of food waste, given it was expected that few initiatives can actually measure this. At the outset, success was defined as either having achieved media/societal awareness and popularity or having stable or growing operations of the initiative. The underlying assumption here is that this success likely will contribute to reduction of food waste via various interrelations of factors on the long run. Only one of the cases was not successful in this regard, given it failed after some time.[2] Furthermore, further support for identifying cases correctly as successful was sought by desk-research and by asking interviewees about measurable proof of success, as for example volume of avoided waste, of redistributed food, volume of sale of products, or the extent to which information or supportive items (e.g. measuring cups) had been distributed to consumers.

The search for further cases stopped when a saturation point was reached, and no further crucially relevant key success factors appeared to emerge in analysis (Bowen, 2008). The current research included in total 26 initiatives that aimed to reduce consumer-related food waste, from different countries and from different actors (see Table 1). Of these, 23 were from Europe and three from outside Europe (one from the US, and two from Brasil[3]). The origins of the initiatives ranged from 1998 to 2015. All but one initiative (the retailer Intermarché in France) also included a personal or telephone/skype interview with one or more actors from the organization, that is, only secondary information had been gathered on the Intermarché case, but these in turn were based on various sources and the case was also mentioned in expert interviews. Table 1 shows the name of all initiatives, the year that it had started, the country of origin, and the category to which it belongs according to the final categorization.

3.3. Distinctions applied in the analysis

In the analysis of the cases, we differentiated between firstly, types of approaches or different types of initiatives in dependence of their location in the up- or downstream supply chain, secondly, different stages of development in which the initiatives where in, and thirdly, identified the emergence of key success factors and whether there was a focus on motivating or moving consumers (further specified as MAO).

4. Results

The 26 cases were categorized into three types of initiatives based on the different parts of the supply chain that they interact with: information and capacity building initiatives that target consumers directly, redistribution initiatives that find new consumers for food that otherwise would be wasted, and retail and supply chain alteration initiatives that help consumers waste less food, or provide new products to consumers based on food or produce that otherwise would be wasted (see Table 1). The types are thus based on the theoretical point of departure, stipulating that intervention approaches may be upstream or downstream. The first type represents a downstream approach, while the latter two are upstream initiatives, although this division is not clear cut, as upstream approaches may facilitate a downstream initiative. The key success factors were identified differentiating between the primary design or starting phase of the initiative, the initiative's development and maintenance, and factors in its reach to consumers. Furthermore, we show how the initiatives we explored and the key success factors driving them should be understood when looking at them with the MAO factors categorization, thus, the results also differentiate between those approaches that majorly focused on motivation or ability versus on changing the context, thus the opportunity. One factor was mentioned in all cases: the actor's motivation to 'make a difference'. Therefore, it was not defined as a key success factor, because it did not allow distinguishing between different cases, and seemed more as a general feature of food waste avoidance actions.

In the following, the three types of initiatives are described one by one. Each description is supported by examples from the cases and can be compared across cases (see Table 2 for an overview of all cases including identified success factors). Fig. 1 shows to which extent identified success factors were important overall, or in one the three categories, thus visualising our finding of which key success and MAO factors emerged as especially crucial for which type of initiative and part of the supply chain.

4.1. Information and capacity building initiatives

Multiple cases focused on providing information to and on building capacities of consumers (the final stage of the supply chain). As the interviewee from Matvett argued, provision of information is a primary step: *"Information and knowledge. You can't do anything unless you know"*. These cases aimed to increase awareness of the food waste issue by providing a platform for information and tips, or by connecting and working with stakeholders in the food supply chain on a variety of projects. Some actors were established organizations that existed before the

[2] Landbäckerei Schmidt in Germany had to stop the initiative, but was included because there was a good hypothesis provided by the interviewee as to why it initially was successful, but finally failed.

[3] It was originally our purpose to identify and explore cases from distinct types of initiatives in both the US (as a developed country but different from Europe) and Brazil (as an emerging BRIC country). However, we could not identify other cases than foodbanks in Brazil, and were not successful in gathering sufficient information on further cases in the US to be able to include these.

Table 1
Cases included in the analysis in this study, sorted by the type of initiative, with their target country, starting year, and a short characterisation of the case.

Name	Country	Year	Short characterisation
Information and capacity building			
RMA	A	2002	Resource Management Agency, Consultancy
WRAP	UK	2007	Waste & Resources Action Program, NGO
Konsumentföreningen	SE	2008	Konsumentföreningen Stockholm, Consumer association
Matvett	NO	2010	Collaborative organization of the Norwegian food industry, retailers and Østfoldforskning
Voedingscentrum	NL	2010	Semi-governmental institution, information provision
Stop Spild af Mad	DK	2008	NGO, campaigner-driven
CSB	DE	2012	NGO, Christlich-Soziales Bildungswerk Sachsen e.V.
Redistribution			
Student redistribution	NO	2012	Ås student activities, e.g. dumpster divers
Food Rescue project	SE	2013	NGO, student driven
OBA - ONG	BR	1998	Foodbank
Last Minute Marketing	IT	1998	Foodbank
FIERGS foodbank	BR	2000	Foodbank
Fødevarebanken	DK	2008	Foodbank
Matsentralen	NO	2013	Foodbank
Milchwerk	DE	2006	Retailer of suboptimal foods
Imperfect	US	2015	Retailer of suboptimal foods
Retail and supply chain alteration			
ICA	SE	2007	Retailer
Rema1000	DK	2008	Retailer
Coop (SE)	SE	2010	Retailer
Coop (DK)	DK	2013	Retailer
Intermarché	F	2014	Retailer
Albert Heijn	NL	2014	Retailer
Kromkommers	NL	2013	Consumer initiative producing food from suboptimal foods
Dörrwerk	DE	2014	Food processing start-up company
Landbäckerei Schmidt	DE	2014	Traditional family-owned bakery
Board of agriculture	SE	2010	Swedish Board of Agriculture, trade and markets unit

Note: A more detailed list of cases is available as a supplementary file.

initiative and at some point turned (some of) their attention towards the food waste topic (e.g. Konsumentforening in Sweden, Voedingscentrum in the Netherlands). Other actors were specifically created for the purpose (e.g. Matvett in Norway, Stop Spild af Mad in Denmark). Some actors were a public institution and based on public funding (e.g. Voedingscentrum in the Netherlands, WRAP in the UK). Further actors were a collaborative project of supply chain actors (e.g. Matvett in Norway), a consultancy (e.g. Ressourcen Management Agentur RMA in Austria), a Christian or social organization (e.g. Christlich-Soziales Bildungswerk CSB in Germany), or a social-media focused NGO driven by a campaigner-personality (e.g. Stop Spild af Mad in Denmark).

In the primary design, the success factors of the information and capacity building initiatives were primarily collaboration, timing and competencies. All actors stressed that **collaboration** with other organizations or supply chain actors had been of key importance to set up and maintain their operations and to achieve success. Furthermore, in most cases a success factor that emerged from the interviews was called **timing**. Timing had different perspectives. In some cases, timing meant being the first initiative to raise attention to the food waste issue. This established the initiative as the perceived main and major 'authority' within the country and in the field (e.g., WRAP in the UK, and Stop Spild af Mad in Denmark). In other cases, timing meant starting the initiative at the moment that food waste became a topicality in society. The topicality could relate to the economic crisis (e.g., Stop Spild af Mad in Denmark), or to food waste being a priority in other countries (e.g., Voedingscentrum in the Netherlands). It could also ease establishment of a further, country-own organization (e.g., Matvett in Norway). For example, the already established national campaign facilitated CSB in Germany to follow up with a more in-depth local campaign. A third key success factor was having or involving persons with the right **competencies**. Competencies here could be, for example, educational background (e.g., RMA in Austria), having long-standing experience with information and competence building (e.g., Voedingscentrum in the Netherlands or WRAP in the UK), or having networking competencies (e.g., Stop Spild af Mad in Denmark). The interviewee from WRAP underlined that *"… we had a track record in delivering or helping delivering policy objectives"*.

With regards to the further development and maintenance of the information and capacity building initiatives, **managing attention** and **achieving a large scale** were especially important key success factors. First, managing attention meant getting (media) attention at the right moments in time but not 'overdoing' it. As the founder of Stop Spild af Mad explained: *"… we shouldn't, you know, do anything in the media. It's very important to know when to make noise and when not to make noise"*. Managing **attention** was specifically important for initiatives focused on using **social media** and on placing the food waste topic in media reports (e.g., Stop Spild af Mad in Denmark and Matvett in Norway). Second, achieving a **large scale** (by various means, depending on the case) meant becoming a big (in terms of size) initiative or campaign (e.g., WRAP in the UK) or being able to work on a long-term basis (e.g., WRAP in the UK and Stop Spild af Mad in Denmark). This had the effect of the initiative being perceived as the major actor and authority on food waste, and greater familiarity with the initiative among consumers.

To successfully reach consumers, **having a positive focus** and **easiness** were important in several interviews. Having a positive focus meant that it is necessary to provide sufficient focus on how to ensure food is eaten and used (e.g., WRAP) in a humorous way (e.g. Konsumentforening in Sweden), or to underline the value of foods (e.g., CSB). It also meant *not* emphasizing the negative effects of and irresponsibility of food wastage, to avoid consumers to raise defences (e.g., Stop Spild af Mad). For example, CSB in Germany stressed that "*we wanted to try to focus on the appreciation of and on raising awareness among the children that they think about what goes into a simple potato, meaning time, effort, and other resources*". Also,

Table 2
Cases included in the analysis in this study, sorted by the type of initiative, with their identified key success factors.

Success factor type	Primary design or starting phase factors of the initiative							Development and maintenance factors						Consumer reach factors		
Name	Timing	Collaboration	Competencies/ Organization	Business opportunity	Multiple aims	Funding	Right place	Knowledge	Attention management	Branding	Prevent and treat	Large scale/ long term	Social media	Positive focus	Consumer-targeted	Easy
Information and capacity building																
RMA	X	X	X													
WRAP	X	X	X									X		X	X	
Konsumentforening	X	X			X									X		X
Matvett	X	X							X			X	X			X
Voedingscentrum	X	X	X			X						X				X
Stop Spild af Mad	X	X	X						X			X	X	X		
CSB	X	X												X		
Redistribution																
Student redistribution					X											
Food Rescue project	X	X			X		X							X	X	
OBA - ONG			X								X	X				
Last Minute Marketing	X		X							X	X	X				
FIERGS Foodbank		X			X					X		X				
Fødevarebanken	X				X	X						X				
Matsentralen	X	X	X		X		X	X			X					
Milchwerk		X		X				X								
Imperfect	X		X	X		X								X		
Retail and supply chain alteration																
ICA				X			X	X					X		X	
Rema1000	X	X							X							
Coop (SE)				X				X								
Coop (DK)	X											X				
Intermarché	X	X							X	X		X		X		
Albert Heijn	X	X														
Kromkommers	X	X	X	X		X							X			
Doerrwerk				X			X		X							
Landbäckerei Schmidt			X					X								
Board of agriculture		X		X											X	

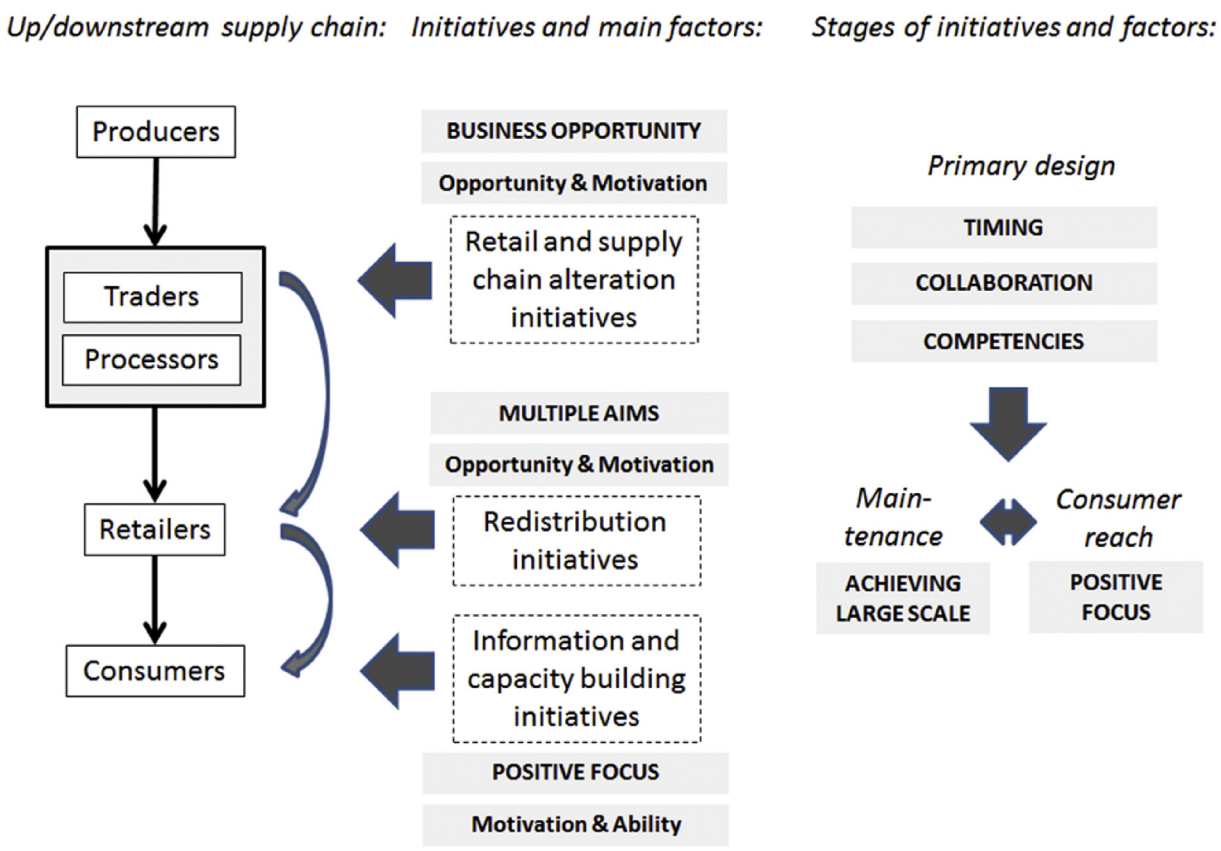

Fig. 1. An overview of how the three types of initiatives are localized within the up/downstream end of the supply chain, which primary key success and MAO factors are found for each of the three types in specific, and which key success factors were of particular importance per each of the stages of initiatives.

to successfully reach consumers, providing something easy to put into practice was important. This could be easy tips, such as short videos on small but effective recommendations for household food handling that avoids wastage (Konsumentforening), or handing out of helpful items to consumers, such as measuring cups (Voedingscentrum). As the representative from Konsumentforening mentioned: *"Now, the food waste issue in itself is complex, but it is also possible to strip it down to very simple practical tips"*.

Considering the 'MAO' factors, the information and capacity building initiatives were mostly examples that focused on creating awareness and improving knowledge among consumers. The underlying assumption was that this would improve consumers' attitude towards food waste avoidance actions, and would increase consumers' motivation to reduce food waste. Thus, they focus mostly on the motivation part of the factors. The initiatives nevertheless also incorporated elements to improve consumers' know-how, capacity and ability. Compared to the other categories of initiatives, it appears that a **positive focus** especially characterises this category, and can be regarded as a facilitator of motivation.

4.2. Redistribution initiatives

A second group of cases focused on tackling food waste via redistribution of foods across supply chains and consumers. These initiatives included foodbank NGOs from different countries, both very established (from Brazil and Italy) as well as newer ones (Denmark, Norway). Two initiatives were organizations that approached redistribution with a business perspective (Milchwerk in Germany and the retailer Imperfect in the US), and another two initiatives focused on consumer-driven redistribution approaches (the Food Rescue projects in Sweden, and student redistribution initiatives in Norway).

The success factors in the primary design phase of the redistribution initiatives were **timing, collaboration, multiple aims, competencies, business opportunity, funding and right place.** Similar to the information and capacity building initiatives, the first factor **timing** was mentioned as success factor in redistribution initiatives in multiple interviews. Timing originated from an increasing trend to tackle food waste across different countries, which facilitated the emergence of initiatives in further countries. Second, **collaboration** with other organizations or supply chain actors was mentioned. For example, in the case of Milchwerk in Germany, the willingness of the food producer to contribute to the initiative had been of key importance. For the Food Rescue projects in Sweden, support by a more professional foodbank was described as essential.

Third, a key success factor that appeared uniquely for redistribution initiatives was **multiple aims**. This meant that the initiative aimed for multiple goals at the same time. For instance, foodbanks in Denmark, Brazil, and Norway were described as successful in gathering supporters and volunteers because they combined both an aim to provide food to those in need and an aim to reduce environmental impact (Fødevarebanken in Denmark, Foodbank FIERGS in Brazil, and Matsentralen Norway). Also, the student 'dumpster divers' in Norway combined the personal incentive of acquisition of free food on the one hand with raising awareness of perfectly edible food being binned on the other hand. The food rescue parties succeeded because attendees could support a good cause as well as enjoy tasty meals in an inspiring event: "*I think it is very powerful in creating an atmosphere and a whole social experience that you remember and participate in*" (Interviewee from Food Rescue project Sweden).

A fourth success factor for redistribution initiatives was **competencies**. For example, the Italian Food Bank 'Last Minute Marketing' used knowledge and expertise derived from a university research project. Also, the founders of the US-American retailer Imperfect were two experienced waste entrepreneurs. Finally, the success factor of a good **business opportunity** (of two commercial initiatives: Milchwerk and Imperfect), and **funding** (from a private foundation for Fødevarebanken in Denmark, and through crowdfunding for Imperfect) were mentioned as key in the starting phase. The factor of a right place to start the initiative was connected to the possibilities of the place (e.g. a student environment in the Food Rescue project).

With regards to further development and maintenance of the redistribution initiatives, key success factors were **large scale, branding,** accumulating **knowledge** and **prevention.** Some interviewees from foodbanks indicated that a key to success had been to achieve sufficient **large scale** of the initiative (achieved by various ways). Attaining a large scale allowed the food banks to make use of economies of scale and synergies and significantly reduce retail food waste in total. Both FIERGS foodbank in Brazil and Last Minute Marketing in Italy mentioned that achieving a 'good name' as an organization facilitated their work; this describes a **branding** effect. Matsentralen and Milchwerk stressed the fact that experience and **knowledge** was accumulated, making further progress possible. Interviewees from three foodbanks indicated that besides redistribution, the foodbank case is successful because it is also working on the **prevention** of food waste and not only the redistribution alone. For example, the OBA-ONG foodbank in Brazil used the redistribution of food to spread information on the food waste issue. Matsentralen in Norway emphasized that some of the participating companies had become more aware of their own food waste, and the companies were subsequently more motivated to prevent overproduction or wastage in their operations.

To successfully reach consumers, a **positive focus** was mentioned. For instance, the redistribution-retailer Imperfect in the US stated that they portrayed quirky, suboptimal food as likeable 'underdogs' in their communication in order to engage potential customers: *"everyone likes an underdog so we can play an underdog story: 'this produce needs love and a home'. I think that will resonate with people and they get it"*. Also, the taste and fun elements of the Swedish Food Rescue project events were seen as attractive, positive elements.

Considering the 'MAO' factors, the redistribution initiatives focus on giving consumers the opportunity to receive suboptimal foods via the alternative retail that they create. These initiatives 'treat' the negative social and environmental effects of wastage caused by food supply chain organizations and by consumers' expectations and behaviour. They offer the 'waste' to other consumers that select alternative purchase places. Most redistribution initiatives, especially the individual consumer-driven activities, however, also emphasize the use of redistribution as a way to create awareness and to motivate subsequent actions in tackling food waste. Thus, providing opportunity is combined with awareness raising and thus supporting motivation. Compared to the other categories of initiatives, an especially unique key success factors for the redistribution initiatives is the presence of and appeal to **multiple aims**.

4.3. Retail and supply chain alteration initiatives

Finally, a range of cases focused on actions within the food supply chain. These cases included conventional retailer actions for tackling food waste (such as ICA in Sweden to Albert Heijn in The Netherlands, see Table 2) and new or established other supply chain actors that strive to prevent and avoid food waste (Kromkommers unto Board of Agriculture, see Table 2).

In the primary design phase, the success factors of supply chain alteration initiatives were **timing**, **collaboration, business opportunity, competencies,** and **right place**. For the first of the primary factors of importance, **timing**, a range of examples is identified: Rema 1000 in Denmark stated that in 2008, food waste became a topic due to a recent report and the newly started Stop Spild af Mad initiative. In other words, it was the right timing for such an action, as well as a supportive collaboration opportunity that emerged. Rema 1000 Denmark dropped multi-item offers ('buy one and get another one for free') in 2008, and received a lot of attention for this and other actions (e.g. offering certain fruit and vegetable per weight, which had not been customary in Denmark at that point). Coop in Denmark followed with food waste reduction actions several years later. In this case, timing was right because other retailers had already undertaken projects and it was time to follow up on what had become a 'new norm', as an expert depicted it: *"this is in fact something all supermarkets increasingly need to take into consideration and take a position"*. Similarly, ICA in Sweden had started an in-store kitchen in 2007 that produced a buffet of pay-per-weight meals from raw materials that otherwise were wasted. Coop in Sweden followed with a similar idea of an in-store deli in 2010. Finally, in 2014 the French retailer Intermarché received a lot of media attention for their campaign to sell suboptimal 'inglorious' fruits and vegetables. Albert Heijn in the Netherlands followed the example by introducing baskets of such fruit and vegetables in their online stores.

Second, **collaboration** in the supply chain (with retailers accepting the idea) was important for setting up the 'repurposing' of foods produced from fruit and vegetables otherwise wasted. For instance, Kromkommer's initiative of selling soup products made from vegetables otherwise wasted needed collaboration. A third starting phase success factor for supply chain alteration initiatives was a **business opportunity**. For example, ICA Sweden's in-store kitchen turned out to be a good business opportunity. Kromkommer in the Netherlands and Dörrwerk in Germany started to make a living from distributing foods produced from fruit and vegetables otherwise wasted in the supply chain. As the founder of Dörrwerk stated: *"I felt that I could perfectly combine my own principles and the business idea"*. The Swedish board of agriculture sold the below-standard Swedish Apple harvest of 2014 to consumers, resulting in an alternative business opportunity. Kromkommer further stated that their educational **competencies** had been important in their ability to start the initiative. The German bakery Landbäckerei Schmidt also mentioned competencies in their endeavour to adapt their assortment more efficiently to demand based on respective calculations. Moreover, **right place** was mentioned. For example, for Dörrwerk, selling fruit paper snacks made from fruits otherwise wasted, being in Berlin with a respective consumer interest for the product was key. ICA Sweden's in-store kitchen were successful due to amongst others being in the right place in the University City of Lund with innovation-minded consumer groups supportive of the idea.

The success factors in the development and maintenance of the relatively new supply chain alteration initiatives are difficult to identify, as the crucial success factors might not be known yet. Landbäckerei Schmidt, for example, continuously gained **knowledge** during the project (even though they had to abandon their project in the end). The two Swedish retailer initiatives of setting up in-store kitchens continued and further developed thanks to the knowledge of kitchen chefs. Retailers Rema 1000 and Intermarché were apt in **managing attention** that they created for their action, a fact that is also seen for Dörrwerk in the extensive media coverage that the initiative received. Kromkommers highlighted that their use of **social media** was crucial for the development success, and

also the ICA in-store kitchen successfully used social media to spread the news about their offers. The 2014 initiative of selling the bad quality of the harvest of Swedish Apples of that year to consumers was successful because consumers very much appreciated local produce. This indicates that the initiative was well **consumer-targeted**.

Coop in Denmark and Intermarché underlined reaching a **large scale** in terms of volume. To successfully reach consumers, Intermarché also added a positive focus to the new category products that they introduced. They developed a clever design of the campaign that presented the 'inglorious' fruits and vegetables as persons with their own individual characteristics.

Considering the 'MAO' factors, the initiatives focus primarily on providing consumers with the opportunity to buy or choose a product that, as a side-effect, allows reduction of food waste via different interactions. The actions do not necessarily empower consumers; however, especially retailer actions are also designed to create consumer awareness of the food waste issue. The underlying assumption is that this awareness triggers a motivation to reduce food waste. Compared to the other categories of initiatives, the **business opportunity** factor is especially characteristic of the retail and supply chain alternation initiatives.

4.4. Observations raising questions or concerns

The case study provides a number of observations and questions related to the overall goal of improving the management and design of food supply chains to achieve sustainable food supply chains. First, the question can be raised whether or not the approach to redistribute food or to create an alternative distribution channel is only treating the symptoms of food waste instead of the cause of the food waste problem. The foodbanks' focus on raising awareness for food waste and on trying to alter the supply chain shows that this is a question many initiatives themselves try to address.

Second, many initiatives take it as a fact that some food is suboptimal in the eye of the consumer and work with suboptimal food as an extra category. Only some initiatives try to broaden consumer's understanding of what is optimal or not. While this might be a given fact for now, the question is what the long-term effects are when focusing on one or the other approach. It also remains to be seen whether or not defining some foods as suboptimal further establishes the distinction between perfect and suboptimal foods, instead of diluting it.

In a similar vein, there is a third question connected to the practice of selling suboptimal food at a lower price. If one of the causes for food waste is the low valuation of foods (Aschemann-Witzel et al., 2015), then selling at even lower prices might reinforce such low evaluations even more.

Fourthly, the aspect of timing might raise the question of whether a decline in societal interest in and media coverage of food waste will harm the further development of the initiatives surveyed in the current study. If such a decline will occur, it is crucial that initiatives by then have established themselves sufficiently. It is also relevant that the supply chain actors have internalized food waste reduction strategies as one way to strive for more sustainable, cleaner and responsible supply chain design. As an example, foodbanks appeared to need sufficient processors and retailers to collaborate for their redistribution system to work efficiently. Also, processing suboptimal fruit and vegetables is labour-intensive. Thus, consumers need to demonstrate sufficient willingness to pay for suboptimal products for the processing of suboptimal foods to remain a good business opportunity.

Lastly, retailer-own initiatives might be questioned by some critics. Such initiatives might focus on some actions to reduce food waste, but they need to be balanced with commercial interests. For example, one probable goal of retailers is to sell increasing amounts of food. Thus, retailer initiatives might not necessarily deal with major causes of food waste, if these causes threaten the retailer's business as such. A similar concern has been found for collaborations between non-commercial and commercial organizations, and for any combination of business interests with a good cause. For example, Voedingscentrum handed out free measuring cups, but consumers only received the free cup when they bought a product at the retailer Voedingscentrum collaborated with.

5. Reflection and discussion

Many of the initiatives took their inspiration from previous initiatives, or were acknowledged by subsequent initiatives, as exemplified by the factor of timing. This finding underlines the importance of managing and facilitating the spread of knowledge about existing initiatives across supply chains and across countries. The results furthermore highlight that it is important to provide incentives for various stakeholders to become engaged in food waste avoidance initiatives, as the factor of collaboration shows.

Collaboration and timing, in combination with the other crucial key success factors such as seeing competencies, achieving large scale, business opportunities, combining multiple aims, and giving the topic a positive focus, were found to be success factors of the initiatives. A few examples can be named that show how the crucial success factors of collaboration and timing are enacted in practice. For instance, various foodbanks were founded based on an analysis and exploration of examples in other countries. In Brazil, the government facilitated companies' collaboration in donations to food banks with tax deductions. In Norway, the donations to food banks triggered companies to explore their operations and potential changes in efficiency. In France, the European year against food waste served as Intermarché's reason to conduct a campaign that year. Communicating the various motives that different stakeholders and consumers might find convincing (e.g. economic reasons versus ethical reasons) enables a broader range of organizations and persons to be engaged. Companies might save costs, see a business opportunity, or might improve their image. Consumers might save money, enjoy an event, or might contribute to a social or environmental cause. For example, the critical mass of retailers taking up the food waste issue in Denmark this triggered a competition to come up with new, distinct ideas.

The importance of collaboration for knowledge sharing has been underlined previously. Xu et al. (2016) found that an NGO served as a broker. Göbel et al. (2015) mentioned that the cause and effects of food waste are not necessarily located at the same stage of the supply chain. Secondi et al. (2015) go one step further and call for more public-private partnerships in addressing food waste reduction. The UK campaigner Tristram Stuart especially highlights the role of demand side-driven supply chain standards, suggesting that these standards cause food waste at early stages of the supply chain (Stuart, 2009). Providing consumers with the opportunity to buy suboptimal foods would thus reduce food waste across multiple supply chain stages.

Yet, consistent with research on entrepreneurs in the field of sustainability, we find that the business opportunity of the initiative is a crucial factor (Jolink and Niesten, 2015). Stressing multiple aims might provide a solution, by combining social and environmental arguments and motives. Thus, food waste, which seems to be inherently about both social and environmental aspects, might trigger supply chain actors to consider both the social and environmental sustainability dimension, contrary to the dominating focus on environmental questions (Seuring and Müller, 2008).

Abstracting from the issue of food waste, the multiple case study

shows that collaborative, well-timed supply chain initiatives that counter for the various needs of stakeholders and incentives to be involved appear to characterise successful cases of sustainable food supply chain transformation.

6. Conclusion and implication

This is the first study to research key success factors and factors of motivating versus moving consumers to action within food waste reduction initiatives across different actors and cross-country via a multiple case study approach. As such, it offers valuable explorations on what might be common patterns and characteristics of successful initiatives of this kind. This knowledge can serve as a basis for improving or developing food waste reduction initiatives in the future. The research also shows how the concept of success factors and the distinction of consumer behaviour approaches provided by the MAO factors can be applied to and executed in the field of food waste and to actors from various stakeholders and across countries.

6.1. Conclusions

In conclusion, initiatives tackling consumer food waste can be categorized into three main categories. Firstly, there are information and capacity building initiatives aimed at supporting consumer motivation and ability to avoid food wastage. Secondly, there are redistribution initiatives – as 'classical' foodbanks or consumer-led actions – that capture foods otherwise wasted in the supply chain. These initiatives provide consumers with the opportunity to consume otherwise wasted foods, and aim to raise awareness of the supply chain deficiencies. Thirdly, there are supply chain initiatives – as actions by conventional retailers or other established or new actors in the supply chain – that tackle food waste through altering retail sale or the supply chain functioning. These initiatives provide consumers with new opportunities and inform them about food waste through the action. It emerged that collaboration, timing, and competencies can be considered to be important key success factors for all three types of initiatives. Furthermore, information and capacity building initiatives are specifically characterized by a positive focus in talking to consumers, while redistribution initiatives are based on multiple aims, and retail and supply chain alteration initiatives are often grounded on a business opportunity.

6.2. Implications

The conclusions allow for a number of implications for stakeholders in the area of food waste reduction in the supply chain-consumer interface. The current findings reveal that future initiatives should take inspiration from existing initiatives, and that their starting time, place and collaboration should be well-considered. Collaborations between actors should provide the key competencies and incentives at the start of the initiative. In further developing and maintaining the initiative, good management of the attention obtained and working towards achieving a positive 'brand' of the initiative might support to achieve a large scale and long-term perspective of the initiative. Redistribution initiatives might especially stress multiple aims when striving to secure stakeholder collaboration and volunteer involvement. Supply chain alteration initiatives should ensure a good business opportunity for the involved partners. Especially information and capacity building initiatives ought to focus on the positive aspect of valuing and using the food, in a tasty and fun way. This can possibly be done by using humour and ascribing 'suboptimal' foods a 'personality'. Considering the complexity of food waste avoidance, initiatives might have a focus on either motivating conscious choice and supporting consumer abilities or altering the choice context towards providing opportunities, but should consider how they can contribute to both perspectives. For the successful, sustainable impact of initiatives on the long term, answers have to be found for critical questions such as whether initiatives focus too much on treating current symptoms instead of working on the root of the problem, and how initiatives can balance commercial versus ethical goals.

As a limitation, it has to be stressed that the definition of 'success' that we applied in selecting the cases is based on the assumption that success in terms of either having achieved media/societal awareness and popularity or have stable or growing operations will likely lead to a reduction in food waste. This might not necessarily be true, depending on the type of case and how it is executed. Further and more detailed research is needed into evaluating initiatives with regard to the actual reduction of supply chain and consumer food waste.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jclepro.2016.11.173.

Conflict of interest

We declare no conflict of interest.

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