To the rescue!
An ethnography of food waste reduction practices in the Netherlands

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Abstract

Food waste is a challenge to the sustainability of global food systems and to the environment and demonstrates a dire need for solutions in which the food produced for human consumption actually feeds people. Food rescue practices respond to this challenge through the redistribution of food waste materials, working towards a circular economic system. Through analysis of two food rescue organisations, this article maps the food waste network and the actors engaged in practices of transforming discarded food waste materials back into an edible food resource. Despite their best intentions to uphold the fundamental goal of saving food, 'food heroes' face logistical, financial, and ethical hurdles as they implement their food rescue practices. Operating within the globalised food system, which prioritises profit and productivity, is a major challenge to food rescue organisations. This article demonstrates the fragile intricacies of the food waste network and compares how food rescue operates within different levels of the food supply chain.

Key words: Food waste; food rescuing; Actor Network Theory; food supply chain; circular economy, discard studies.

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Ao resgate!
Uma etnografia das práticas de redução do desperdício alimentar na Holanda

Resumo

O desperdício de alimentos constitui um desafio para a sustentabilidade dos sistemas alimentares globais e para o meio ambiente, evidenciando a necessidade de soluções em que os alimentos produzidos para consumo humano alimentem realmente as pessoas. As práticas de resgate de alimentos respondem a este desafio através da redistribuição de resíduos alimentares, trabalhando no sentido de um sistema económico circular. Através da análise de duas organizações de salvamento de alimentos, este artigo mapeia a rede de desperdício alimentar e os intervenientes envolvidos em práticas de transformação de resíduos alimentares descartados novamente num recurso alimentar comestível. Apesar das suas melhores intenções de defender o objectivo fundamental de poupar alimentos, os "heróis da comida" enfrentam obstáculos logísticos, financeiros e éticos à medida que implementam as suas práticas de resgate de alimentos. Operar dentro do sistema alimentar globalizado, que prioriza o lucro e a produtividade, é um grande desafio para as organizações de resgate de alimentos. Este artigo demonstra as frágeis complexidades da rede de desperdício alimentar e compara como o resgate de alimentos funciona nos diferentes níveis da cadeia de abastecimento alimentar.
Palavras-chave: Desperdício de comida; resgate de alimentos; Teoria Ator-Rede; cadeia de abastecimento alimentar; economia circular, descartar estudos.

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Introduction

According to the Food and Agriculture Organisation of the United Nations, one third of all food produced globally is lost or wasted (Gustavsson et al., 2011). Food waste is an environmental, economic, and ethical problem, and exemplifies systemic issues within the global industrialised food system (Turner, 2018). Scholars have identified the major causes of food waste, and within industrial agriculture practices, these causes include aesthetic and quality standards, manufacturing practices, poor environmental conditions, lack of planning with a limited focus on waste, best before dates, and overproduction (Gustavsson et al., 2011). The staggering amounts of food lost or wasted along the food supply chain, approximately ten million tons daily, indicate that the destructive consequences of agricultural production including resource depletion, greenhouse gas emissions, and pollution, are wasted when one third of that food is not consumed by humans as intended (Gustavsson et al., 2011).

Food waste directly contributes to the current climate crisis and environmental degradation in two major ways. First, the practice of producing food has its own environmental impacts, depleting resources such as water, land, and energy, as well as contributing to biodiversity loss, carbon dioxide emissions, and pollution. Global agricultural practices account for 26% of the world's greenhouse gas emissions, 70% of freshwater withdrawals, and 32% of acidification (Poore & Nemecek, 2018). When one-third of food is wasted or lost, these massive environmental impacts are also wasted. In addition, wasting one third of food wastes the energy used for growing, packaging, transporting, and cooling that food, which have additional environmental costs (Poore & Nemecek, 2018). The second connection of food waste to the human-induced climate crisis is the greenhouse gas and pollution produced by food waste itself. Landfill emissions amount to one of the largest anthropogenic sources of greenhouse gases including methane and carbon dioxide, largely caused by the anaerobic breakdown of food which has been thrown away (Adhikari et al., 2006).

In response to the environmental and economic effects demonstrated by food waste, food waste reduction has been identified as a global goal by international institutions, national governments, and local organisations. At the international level, the United Nations have pledged to reduce food waste as part of the Sustainable Development Goals (SDGs) introduced in 2015 (EC, 2021). SDG 12.3 states the objective to "halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" (UN EP, 2021). In alignment with the United Nation SDGs, the European Union Platform on Food Waste and Food Losses was established in 2016 to bring together EU institutions, experts, and stakeholders in order to define the measures to prevent food waste, share best practices in reducing food waste, and evaluate progress in accomplishing the SDG goals (EC, 2021). The Netherlands, as a member state of the United Nations and European Union, works to uphold these overarching global goals to combat food waste, but as of 2022 there are no legislative policies or requirements for food waste reduction in the Netherlands (Ministerie van Algemene Zaken, 2016).

While these top down policies address food waste reduction at the international and national levels, food waste is, in the end, dependent upon the action and inaction of human actors and their conceptualisations of food and waste. Top-down strategies to reduce food waste at the government and industry level are accompanied by grassroots organisations which work at the local level to reduce food waste through collection and redistribution. My research concerns the practices of reducing food waste, which consists of people working through various initiatives to collect and redistribute food waste. The activity of collecting and redistributing food waste will be hereby addressed as "food rescuing", as this definition signifies the idea that food waste has been saved. These practices contribute to a circular economic model by reclassifying food waste as a resource and redirecting the materials back into the food supply system (Arisi, 2020).

Many initiatives exist within the Netherlands that aim to reduce food waste through creative strategies and varied practices (Marin, 2021). Too Good To Go, an application started in Denmark and utilised in cities throughout Europe and the UK, enables users to order food which has not been sold from restaurants, cafes, grocery stores, and hotels at a discounted price. Olio, another application, connects community members with their neighbors to share unwanted or unused food. The Waste Transformers is a group operated out of Westerpark in Amsterdam that converts organic waste from kitchens and other companies into biogas which can be used for fuel and heating. Buurtbuik rescues wasted food and seeks to combat poverty and loneliness through their community meals, prepared and eaten family-style. Many food rescue initiatives also uphold Sustainable Development Goal 2, ending world hunger, as the redistributed food is directed to poor and underprivileged communities and food banks. All of these programs contribute to the circular economic model by reconceptualising food waste as a resource which can be recycled for consumption.

Food waste rescue remains a bit of a band-aid solution, as these practices aim to tackle the material results of food waste, rather than *preventing* food waste at the start (Messner et al., 2020; Turner, 2018). Food waste reduction efforts highlight a dysfunctional food chain, which really will only be solved through systematic change enforced through improved food chain governance (Messner et al., 2020). Food waste rescue runs the risk of becoming a green-washed expression of corporate social responsibility, in which food industry powers promote this idea that food waste streams are redirected to food banks and other food saving initiatives rather than making significant changes to industrial food production and distribution, which would more effectively tackle the problem of food waste at its source (Messner et al., 2020; Devin & Richards, 2018). That being said, food waste rescue enhances the sustainability of current food consumption. The current globalised food chain produces constant waste, and the response to redistribute edible materials is both important and effective in reshaping the conceptions of waste and food. This led to the ultimate formulation of my research question: How do food rescue organisations respond to the problem of food waste within the globalised food system?

Food waste is generated at each level of the food supply chain; producers, distributors, retailers, and consumers. I chose just two of the many organisations, pseudonymously referred to as Tomaat and Aardbei, that work to rescue food waste in the Netherlands. Together they cover two phases of the food supply chain towards the consumers' end of the chain. I chose these field sites because in my initial request to study their practices, they each provided opportunities to become directly involved with their operations. Aardbei and Tomaat also exemplified food rescue practices with very different approaches, and as I conducted fieldwork at both locations each week, I could compare my research findings simultaneously, leading to deeper questions and a richer collection of ethnographic data. Tomaat is a company that works to reduce food waste at the distribution level, connecting large quantities of rescued food with actors in the food industry. Tomaat connects producers, distributors, and retailers through collecting and reselling or donating food waste materials. Aardbei collects food waste from the retailer level and redistributes the food waste materials to restaurant patrons, redirecting the food waste straight to consumers. Aardbei works at the grassroots, local level to redistribute food waste

from retailers, and processes the collected food into community dinner events. My two dissimilar field sites allowed me to draw a map of the food waste network, as food waste materials were redirected away from the trash bins and into the bellies of consumers.

Methodology

I conducted ethnographic fieldwork over the course of Spring 2022. I involved myself at Tomaat as a researcher and later as an employee, and spent most of my time with the operations team in the food rescue centre for approximately 170 hours over the three months. During this time I was fully involved with the operations of the food waste warehouse, which cultivated a deep understanding of how the food supply chain produces and treats food waste, and how Tomaat plays a role in transforming and redistributing these products as an edible material resource. My collected qualitative data includes how food products are processed, the personal insights of my correspondents and their ideas about the food rescue process, how the company negotiates external economic pressures, how logistical and operational problems were resolved, and ultimately how Tomaat operates as a player in the food supply chain.

I also conducted participant observation as a volunteer at Aardbei each week, and altogether spent approximately 30 hours participating in the various food rescue volunteer shifts and spending time with the volunteers and guests of the "Wasteless Dinners". My data includes describing the interactions with shop owners while collecting the food, the practices involved with selecting, sorting, processing, and creating meals from the collected food, and the gathered personal anecdotes of patrons and volunteers involved with the efforts of Aardbei.

During my fieldwork, I also took over 600 photos, most of which depict food in varying stages of edibility and other related objects and materials such as storage containers, which are integral to the study of food waste and demonstrate the sensory quality of my data. Additionally, I collected data in the form of published books, physical signs, communication materials, social media campaigns, and website promotions which have been produced by both Tomaat and Aardbei.

I have anonymised my field sites and interlocutors to protect the confidentiality of my informants at both food waste rescue organisations and to accommodate an accurate and truthful study of food waste reduction practices as best I can. I was surprised to discover dissonance between the fundamental goals of reducing food waste and promoting sustainable food consumption and the reality of practices exercised by actors in the food waste network. While I had set out to research how food waste operations advance the fight against food waste, I encountered an ethical dilemma when my findings took a rather negative turn. I decided that anonymisation and not mentioning the specific geographic location of my research enabled me to both observe critically and without bad conscience in my analysis of what works, and what does not work, when individuals and organisations set out to reduce food waste.

I was an active player within this network of food waste as I involved myself with the daily operating procedures at Aardbei and Tomaat. I tore through the imaginary veil of separation between passive "observer" to become a fully integrated "participant," and my role shifted between an ethnographic researcher, a volunteer, and an employee throughout my fieldwork. As I myself became a food rescuer, my insider perspective provided rich detail to my research, but also deeply complicated my ability to study and write about everything I observed without inserting my emotional concerns for the wellbeing of my fellow volunteers and employees within each organisation. My involvement created considerable ethical dilemmas. I struggled between the moral obligation to give an adequate analysis of the food rescue operations and not doing damage to the organisations that welcomed me with open arms and that I was part of for several months.

Theorising Food Waste Rescue

Food waste has consistently been studied through the methodological lens of Actor Network Theory, as scholars analyse all actors within the food waste network and argue for the importance of relationality and distributed agency (Alhonnoro & Norrgrann, 2018; Beacham, 2018; Turner 2018; Turner, 2019; Jarosz, 2000). My comparative analysis of food waste reduction practices utilises the analytical tool of actor network theory, and specifically the approach of material semiotics, to understand the relationships between human and non-human actors within this globalised food supply chain.

My primary theoretical lens, Actor Network Theory (ANT), is a way of understanding the social and the natural worlds through the relationships between all actors in a "materially diverse, heterogeneous system" (Law & Singleton, 2014: 382). The material diversity and heterogeneity originate from the different actors involved and their contrasting ways of relating to each other within their networks. This analytic framework has been put forth by Bruno Latour, John Law, and Michael Callon (Law & Singleton, 2014: 380). ANT breaks down the divisions between agency and culture, taking into account how human and non-human actors within a network relate to each other. Law and his fellow ANT theorists argue that networks of actors create an "ontological multiplicity" of realities (Law & Singleton, 2014: 380). The fluidity and shifting nature of the networks between actors create different realities through different practices. In terms of food waste, the realities enacted through material qualities determine if a specific food product is saved or thrown away.

Material semiotics engages with the signs and symbols that create cognitive frames for waste and food but allows for these frames to be changing and fluid. This idea contrasts with other major theories in relation to waste and discard studies, especially the symbolic-structuralist approach. Symbolic structuralism is largely influenced by the anthropologist Mary Douglas, who is attributed to popularising the classification of dirt as "matter out of place". Douglas argues that "dirt is the by-product of a systematic ordering and classification of matter, insofar as ordering involves rejecting inappropriate elements" (Douglas, 1966: 36). Her theory suggests that within a food system, inappropriate food will be rejected; this constitutes the food that is wasted. Douglas argues that "for something to be filthy, polluting, dangerous, it must violate some ideal sense of the way things ought to be" (Douglas, 1966 as cited in Reno, 2014: 2). Within the symbolic-structuralist approach, food waste is socially constructed by the relationships between humans and non-human food. This designation is static and unchanging and suggests that the social structures which define waste are immobile. A major ontological turn within Actor Network Theory is that the many relations within the network create many realities, which opposes the staticity of structuralism.

With this point of view in mind, I contend that in order to understand food waste rescue, one must think about how it is practised in all its material forms. The actors involved with the network of food waste "generate particular material combinations and forms" through their relationships (Law & Singleton, 2014). The practices involved with food waste reduction mobilise human and non-human actors across the food supply chain, from farmers to consumers and everything in between. The phenomena of food waste, and of its reduction, is inherently material, engaging with the movement and ontological conceptualisation of human and non-human actors.

These actors include a whole range of materials including the food itself, cardboard boxes, plastic wrapping, wooden shipping pallets, delivery trucks, delivery drivers, cold storage facilities, food sorters, food buyers, online market platforms, social media posts, volunteer group chats, cargo bicycles, fruit vendors, garbage bins and rubber gloves.

The economic-materialist approach to waste is concerned with waste and value and the flow of waste on a global scale. Scholars of this theoretical school focus on the materiality of waste and the political and economic structures that shape how and where waste appears (O'Hare, 2019). Reno (2014) writes that materials deemed worthless and rejected cannot be completely social and cultural but must on some level possess a

significant material character (Reno, 2014). Waste is also material after it has been rejected, and this materiality is significant when thinking about alternative food systems which incorporate redistributed food waste. Semiotics and classifications of waste are integral to deciding what is edible and considered food, and food redistribution organisations are actively generating new conceptualisations regarding food. Reno examines the semi-biotic nature of waste, which refers to the idea that life requires signs to engage with the world (Reno, 2014).

The materiality of waste is also explored by Australian anthropologist Bethaney Turner, who argues that engaging in alternative food practices present possibilities of "decentering human subjects and supporting more sustainable subjects" (Turner, 2018: 200). De-centering humans from the discourse of waste aligns with the post-human and intersubjective approach to waste described by O'Hare (O'Hare, 2019).

Tomaat: Rescue practices at a distributor

This section and the next one delves into the practices of food rescuers, and paints a picture of the actors, physical layout, and daily operating procedures at Tomaat and Aardbei. Through my analysis, I demonstrate how daily operations at both organisations are designed to uphold the overall goals of reducing food waste. This section discusses the operations of both food rescue organisations and important processes involved with the transformation of food waste from a discarded material to an edible resource.

Tomaat is a company that works at the distribution level to reduce food waste as a wholesaler of rescued food. Tomaat tackles the problem of food waste through its warehouse and online market, food waste-based products, and educational materials. The food waste rescue centre processes large quantities of wasted food which have been discarded by food growers and producers, distribution companies, grocery delivery services, and food retailers throughout the Netherlands. These products are mostly bought at reduced cost and sometimes collected through donations. After sorting and processing these food waste materials, the products are sold to caterers, restaurants, and other businesses. Tomaat also donates a reported 20% of their products to the *voedselbank* (food bank). As I came to discover, the numbers such as the quantity of food donated vary enormously week-to-week.

At the time of my research, Tomaat retained seven full time employees and three full time interns. I started as a volunteer but was soon offered a paid position. The employees are, with the exception of myself, all Dutch. They hail from middle class backgrounds, and most grew up in smaller villages outside of the city where Tomaat is located. Two of the co-founders were shaped by their experiences of working in food retail, as the waste they witnessed at a supermarket inspired them enough to leave their secure careers in pursuit of their idealistic dream to save food from being wasted. Tomaat is absolutely a passion project for both founders, as was evident in their daily involvement with operational procedures. Two account managers previously worked within the food supply industry and eagerly joined the company to facilitate its growth and sustainable impact. They are both invaluable resources to establish new connections with food producers and generated numerous streams of food waste products that enhanced the stability and resilience of the food rescue practices at Tomaat. Interns hold significant responsibilities within the organisation. Two of them shared responsibility for the social media and marketing of the company, and the third worked within the warehouse to support logistics. The varied backgrounds and assorted positions at Tomaat create a dynamic team, where each individual holds a unique role in allowing the organisation to function. Most significant were the differences in the way that the people of Tomaat were compensated for their time working there, which varied from monthly intern stipends of several hundred euros to full time salaries.

Upon entering the warehouse in which the operations of Tomaat take place, one is instantly greeted with a three-metre-high wooden painted sign declaring 'Come in and rescue food!' Walking through the main front hall towards the back, one passes the cleaning storage closet and then enters the middle hall, in which the freezer and cold storage hold all the food products that are kept at -18 degrees Celsius and 3 degrees, respectively. The final two spaces of the Tomaat centre are in the back and consist of the sorting hall and the 'room temperature' food storage. The sorting hall is a large space with more industrial shelving holding boxes and crates, and revolving quantities of dried foods or room temperature foods on pallets. The high ceilings accommodate the three-level industrial metal shelving holding large plastic storage containers, plastic wrapped pallets stacked with packages of Tomaat's own brand of beer and granola, used plastic crates and stacked wooden pallets. The *winkel* (shop) is also in this room, a shelf holding boxes of food which are not quite good enough to resell but definitely too good to throw away, from which the staff are free to take products for home consumption.

At the start of the day, the operations team gets to work sorting the products into standard quantities and containers. For several months, all products were put into new boxes, the standard large and small black cardboard boxes that Tomaat buys. Towards the end of my fieldwork, the operations manager placed more emphasis on saving materials and reusing cardboard, so products are kept in their original boxes if they are sturdy and fit the standard size for carts and shipping. He also moved to standardise quantities for each product on the website to enhance consistency and facilitate an easy ordering experience. This sorting process is the pivotal moment of transition for food waste and holds all potential for the reconceptualization from waste product to edible resource. After careful examination using the senses, products are either kept and weighed into boxes to be stored in the cooling rooms or thrown away (Figure 1).

Figure 1 - Oranges that have been sorted, with 'bad' oranges on the left and 'good' oranges on the right.

When all the products are sorted, the boxes are counted, entered on the new packing slip, photographed, and uploaded to the Tomaat website (Figure 2). The boxes are each labelled with Tomaat stickers printed with the product name, quantity, date sorted, and supplier information, wheeled on carts into the storage, and placed in their designated location according to product type. This stage requires some logistical manoeuvring to ensure that "first in, first out" standards are met, and moving stacks of cardboard boxes which have become slightly soggy from humidity can be very precarious.

Figure 2 - Photos taken of sorted, ready-to-buy food waste products, uploaded to the Tomaat online market.

The storage areas in the warehouse always seem to be nearing maximum capacity; every pallet of rescued-tomato ketchup feels like the last one that can squeeze into the back shelving area, but each week there is more to be stored and the operations employees find a way to make it fit. With more suppliers sending entire pallets of a single product, space is constantly being bartered with and maximised; much employee time is spent moving products around to accommodate new products. Decisions to give quantities of a product to the *voedselbank* (food bank) often comes down to storage, and most frequently donated fruits and vegetables are those that take up space, sell slowly, and come in large quantities, such as spinach and carrots.

The second half of the day revolves around picking customer orders. At this point, the food waste has been chosen as an edible food, fulfilling the goal of the food rescuing operations. My knowledge of Dutch food vocabulary is most tested during this practice, because order forms and all food labels are in Dutch. One of my linguistic mix-ups became a favourite teasing joke, when I sent five 15 kilo boxes of *ananassen* (pineapples) after a customer had actually ordered *perssinaasappels* (juice oranges). The end of the day involves finishing orders and performing quality checks on the products remaining in the halls, and tallying the quantities of food left, noting which products are running low.

In response to the economic challenge of reducing food waste within the current system of economic norms, the stance of Tomaat is best exemplified with this quote from the co-founder: '*we are activists with a business mindset!*' Tomaat actively participates within the global food trade, buying and selling food waste products through a capitalist model based on the financial value of food. The account managers at Tomaat are responsible for finding streams of food waste materials from food distributors and producers, and forge agreements to acquire those food waste materials at a cost. Tomaat typically buys food waste at 50-60% of the market value, and then sells it for a higher price (though still lower than normal retailer prices). The purchase rate depends on the quantity and quality of the food, and which supplier the food comes from. Most of the food

waste suppliers ask for a 'cut' from Tomaat and receive a percentage of the money made when their food product is ordered. Tomaat prioritises products that will sell, and so the business arrangements are established based on forecasting of which products the customers are most likely to buy. In attempts to ensure that transactions with suppliers are profitable for the company, Tomaat orders and approves deliveries of food waste to the food rescue centre that are desirable, easy to sort, and will have a longer shelf life.

One such product was *courgette* (zucchini). In early March 2022, a large shipment of yellow *courgette* arrived, and when the operations manager consulted the current market value, he was shocked. '*This is the highest price I've ever seen for a vegetable*!' He explained that the Dutch *courgette* producers had trouble yielding enough crops to meet the demands of the market, and so the price had skyrocketed. Though ominous news for the food industry, he was excited that this would enhance the desirability of discounted, rescued *courgette* through the Tomaat online marketplace. Tomaat set the price just slightly lower than the going rate, and the yellow *courgette* quickly disappeared from the storage room. This is how Tomaat typically sets prices. When food products are put online, they compare prices from a food market forum and the main online retailers available through search engine queries. After taking this into account, the food is usually priced at about 80% of the market price. Another employee emphasised in a conversation with me the importance of maintaining competitive prices. He believes that food waste products should be priced close to the market value of similar products in the mainstream food supply chain, because if they are priced too low, they are perceived as too cheap and therefore undesirable.

Aardbei: Rescue practices at a pop-up restaurant

My second field site was Aardbei, a nonprofit foundation which aims to reduce food waste at the consumer level through weekly dinners, workshops, and catered events that promote the consumption of rescued food. The wasteless dinners at Aardbei are cooked using food collected from markets which would have otherwise been thrown away. Food that is not cooked or is near the end of its edible life can be taken by people for free.

The location of Aardbei operations is on a residential street, in a building which was inaugurated originally as a squat. New visitors frequently struggle to find the exact door, as the outside entry is decorated with creatively anti-establishment stickers and banners but lacks a definitive label describing what lies behind each of the three plain black doors. The space is also currently home to several refugee families who have established themselves in a large gymnasium-like space, and apparently there are several apartment units used as artist studios and residences which I have never seen. One of the front doors leads to an office which several environmental groups use as a workspace, and has the feel of a cosy bohemian living room with the spice of rebellion headquarters. This ambiance of artistic, underground, alternative expression permeates the whole atmosphere of the premises, including the large main space which Aardbei rents every Wednesday for the wasteless dinners. The full industrial kitchen is stocked with necessary equipment for cooking large quantities of rescued veggies, a vast array of mismatched serving bowls and eating tools, and a large jar filled with (very dull) knives. Each visit to Aardbei, this container reminded me that I should have brought my knife sharpener.

Aardbei is operated by a board of directors and a large volunteer base. It has a flat hierarchy, in which sociocractic decisions are made by the members of the group and any volunteer stakeholders with a desire to become involved. During the time of my research, the board was in a state of flux as members stepped down and new members stepped into leadership roles. The dinner coordinator is the only position within the organisation that receives compensation, which amounts to a monthly stipend of 150 euros. Due to the heavy reliance on volunteers without any fixed obligations, most of my contacts at Aardbei did not have the clear roles within the organisation in the same way that Tomaat employs distinct positions, and the social dynamics changed drastically from week to week.

At Aardbei, the dominant language is English and the majority of volunteers are international. My informants are between the ages of 20 and 60, and hailed from all over the world, including the US, Central and South America, Europe and Asia. Most Aardbei volunteers are students studying in the Netherlands and are attracted to the organisation for social and community oriented reasons, as well as shared interest in environmental activism. My being an international student interested in environmentalism situated me exactly within the demographic of my informants. By entering my name in the spreadsheet of volunteers at Aardbei, I was immediately included in the core volunteer power of the organisation. I acted in every volunteer role within Aardbei, and I experienced nothing but open doors as I conducted my research.

The operating procedures at Aardbei consist of three volunteer shifts. The first is the pickup, when volunteers take the organisation's *bakfiets* (cargo bike) and wield it several kilometres away to a busy food market street. Once there, the pickup volunteer proceeds to go through a list of twelve designated shops with semi-established relationships, asking for food which may be bound for the trash. The precarity of these relationships is made apparent by the confusion and frequent refusal that the pick-up volunteers face when asking for food waste; oftentimes the shopkeeper does not understand, and thinks they are just begging for free food. Another element of precarity exists in the language barriers between volunteers and shopkeepers, most of whom speak Dutch as a second language, with very little conversational English. Eventually the volunteers face the much heavier journey back to drop off the food waste materials (see Figure 3).

Figure 3 - Bakfiets filled with food waste products. Additional volunteer bike basket contains rescued ginger.

In the early afternoon, the second step of volunteer shifts begins, with the arrival of the cooking volunteers and the dinner coordinator. The dinner coordinator decides what will be cooked using the available food waste products, a choice which requires extensive knowledge regarding diverse food ingredients, creativity, and adaptability, as she ensures that the menu uses as many of the food waste products as possible. The cooking shift works throughout the afternoon preparing the food waste products into a vegan, three course meal, consisting of an appetiser, main dish, and dessert. While the dinner coordinator holds authority over the ultimate choices of what to serve, volunteer voices are appreciated and encouraged, and in the best circumstances, the meal

comes together as a true performance of collaboration and teamwork. The cooking shift at Aardbei concludes with a volunteer dinner, during which everyone that participated in creating the dinner, including each volunteer shift, sit assembled at a long table and enjoy the fruits of their labour together.

After sharing the meal together, the last shift of volunteers prepares to serve the Wasteless Dinner to guests. Throughout the evening, people from the community come to eat, pay a donation to the dinner coordinator at the door, and find themselves a cosy table. Following the turmoil of the coronavirus pandemic, the Aardbei board emphasised efforts to recruit musicians and artists to perform during the dinners most evenings. As patrons leave, the serving volunteers clean up.

An important element of the food rescuing missions implemented by both Tomaat and Aardbei is educating consumers about food waste reduction. Tomaat, through social media campaigns and the publication of their own food waste cookbook, promotes the idea that consumers can have a positive impact by reducing food waste in their own households. Through their educational materials, Tomaat highlights various ways of preserving food products to ensure that they will last longer, including drying, pickling, fermenting, freezing, curing, and smoking. These practices prolong the life of food materials, so that fresh produce and meat won't become rotten or spoiled and need to be thrown away. Aardbei also promotes learning opportunities through their wasteless dinners and also food-saving workshops. Innovative food waste-based meals are at the centre of Aardbei's mission to save food, and each wasteless dinner is the culmination of the knowledge of the specific group of volunteers. During one cooking shift, I learned to make "quickles" (quick pickles) consisting of sliced carrots, beets, and cabbage, preserved with boiling water and vinegar, which I have made regularly since. On another occasion, the pick-up volunteers collected an abundance of stale bread, and Aardbei held a bread pudding-making workshop. By teaching volunteers and the wider community how food waste materials may be used in delicious recipes, the knowledge of food saving practices transfers from the organisation to the home, spreading awareness and solutions to the problem of household food waste simultaneously.

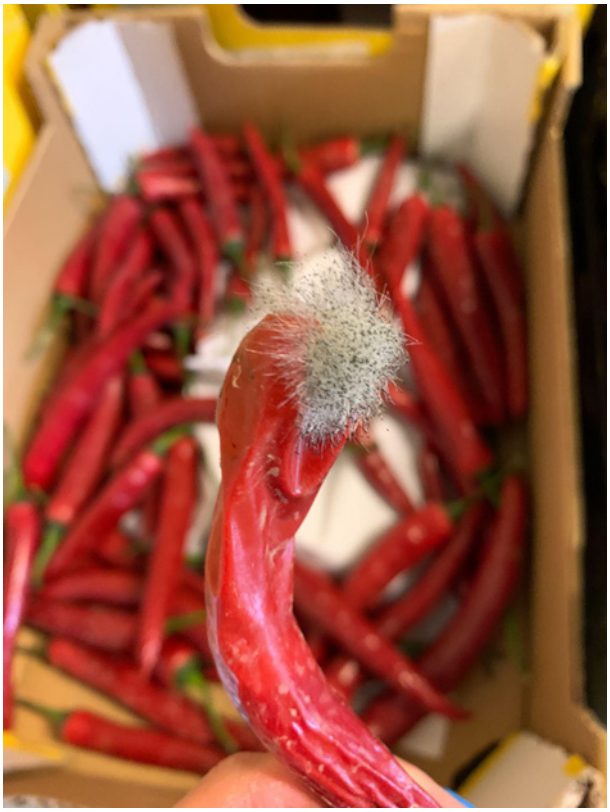
The Materiality of Food Waste

I approached my fieldwork and resolved to follow the food as it underwent the semiotic transformation from waste to resource. This section focuses on the multi-sensory experience of food waste rescue, and how interactions between human and non-human actors within the food waste network generate food rescuing practices. Material semiotics, the methodological lens through which materials imbue meaning, illuminates the ways that how food waste is defined and measured changes how it is understood and addressed (Law, 2019). My immersion into the role of food rescuer at Aardbei and Tomaat led me to intimate, multi-sensory interactions with food materials which shaped my understanding of the food waste network. While I worked at Tomaat and Aardbei, hundreds of kilos of fruits and vegetables passed through my hands and the hands of my respondents and into either the stew pot, garbage can, or storage box. Through these movements and spatial allocations, I was entranced by the physical material qualities that determined where food ended up. Food waste rescue practices are based on specialised knowledge regarding the biological (de)composition of a food product, how the food product is used, and how its vitality may be prolonged.

Different food products are framed as waste by actors within the global food system, and food waste reduction transforms these framings through processes of sorting and redistribution. Waste is largely determined through association, and may be configured spatially (Lehtokunnas and Pyyhtinen, 2022). An example of this spatial configuration may be highlighted through the box of *rode pepers* (Figure 4). This particular box may have been framed as waste because of the contaminating pepper juice. The human actors knew pepper juice could permeate the whole pallet, creating the perfect environment for mould. Within the global food value chain, it makes more economic sense to discard the whole pallet than to sort through the

boxes, resulting in massive waste. However, this framing may be spatially reconfigured, through the separation of crates, or better yet, by moving all of the "good" *pepers* into clean containers. Sorting and re-arranging food materials to save and prolong their vitality is a key practice within food waste rescue organisations.

Figure 4 - Rode peper (red hot pepper) which has been sorted out due to mould.



Another example concerns pallets originating from a supplier that specialises in exotic fruits. The pallets contain, among other things, boxes full of mangoes. These mangoes, which originated from Burkina Faso before landing in the Dutch food supply chain, underwent a material change which inherently transformed their status as an edible resource. The changing colour and smells emitted from the ripening fruit determined their value as a food resource; as the mangoes' vitality waned, so did their value as a food commodity. When they arrive, the mangoes, luckily, are mostly green with visually pleasing patches of peachy pink and orange. This batch is perfect, with at least a week before the orange and pink areas cover the fruit and they become a "sell fast" item. I put several of the softest, brightest fruits into the *winkle*, and then move the stickered boxes into the storage hall. Over the course of the next week, the boxes of mangoes gradually dwindle as orders are placed. The mangoes have begun to change; their sweet smell grows stronger, and they are soft to the touch (Figure 5). Some mangoes remain smooth and green, while others exhibit a wrinkly texture and prominent pinkish-reds and oranges. More mangoes are being moved to the *winkle* because they are too ripe to sell, and the operations manager reminds us of the importance of quality checks for any box going into an order. I arrived one Friday morning to find that all of the mangoes in the storage hall were gone; the remainder was donated to the Voedselbank (food bank).

Figure 5 - Mangoes in varying states of ripeness; as the mangoes become soft and change from green to orange and pink hues, they become a "sell fast" item.

Avocados form a third example. Avocados are a product that Tomaat keeps in stock consistently. The rate of saving avocados is high because of their popularity and the stability of their biological qualities, largely due to the protective skin and the fact that avocados do not start to ripen until after they are plucked from the tree, making them easier to ship. However, if the avocados at Tomaat fail to pass a quality check throughout their stay in the cooled storage of the Tomaat warehouse, or when they are picked for an order, they may be 'destroyed' due to softness, loss of rounded shape, or even colour.

Avocados, and other food waste products, undergo a completely different valuation system at Aardbei. Avocados that are rescued on a Wednesday morning will be used immediately that day and served with the wasteless Wednesday dinner. One Wednesday in March, myself and three other volunteers filled the *bakfiets* with a plethora of collected food waste, including several boxes of avocados. We were very satisfied with this collection, because we shared the knowledge that avocados can be used for a wide variety of healthy, delicious meals, and felt confident that our work as collecting volunteers would result in a successful dinner later that night. The dinner coordinator had the idea to make use of the avocados for frozen lime tarts as a dessert. The avocados were cut in half, the brown, inedible spots were cut away and discarded with the pits and skins, while the edible flesh was scooped and added to a bowl for use in the dessert dish. Because Aardbei uses avocados (and all other collected food waste products) immediately, the sorting process allows the inclusion of cutting away 'bad' parts of individual products, which optimises how much of the food can be saved. The avocados that we collected for Aardbei were misshapen, very soft, and dark in colour, and an evaluation at Tomaat would have certainly classified them as unsellable, and, if not taken home by employees, destroyed. At Tomaat, the saving of food is limited by time, and, additionally, by space and quantity, as each product is sold by weight, and only whole products are sold (so no cutting away of brown spots).

The '*worst part of the job*' at Tomaat as described by several people on separate occasions, is dumping food into the biogas bins in the front of the warehouse. There were days when the majority of the food I was meant to rescue through the sorting process was tossed in the biogas bins; the consolation being that at least the food was directed towards a sustainable initiative rather than the incinerator. Dumping food was especially disheartening when the discarded materials consisted of frozen products past their expiration date. Because Tomaat is held to government regulations of 'use by' dates, the meat and processed food packages which are

stored in the deep freezer must be thrown away four months after they have gone into the freezer. From a biological perspective these products are perfectly safe to eat because they have been frozen at -18 degrees Celsius, but Tomaat has a legal obligation to stop selling the products past this date, and sometimes large quantities of this food is destroyed if it hasn't been sold in time. Any other food product that has passed the expiration date must also be discarded, even though dry goods and preserves are safe past this time.

I was dumping two large trash bins filled with frozen steak cuts, vegetarian "chicken" nuggets, and camembert cheese into the biogas bins one day, when a colleague at Tomaat came over to retrieve some to take home. '*This cow died for nothing*', he remarked, and this statement struck me as the saddest moment of my fieldwork. Not only were we throwing away this meat that could be taken home by any consumer and made into a rather expensive, high-quality meal, but many animals died for these packages of meat to be consumed and that sacrifice was not even being respected. This interaction with the discarded meat raises questions of the material qualities of specific food waste; why did it feel worse to throw away food that came from an animal, than food that is plant based? Understanding the global food system requires mapping the networks between human and non-human actors, and this process must account for the slaughter of domesticated animals for human consumption. Turner (2019) described it best in describing the multi-species reality of eating, saying that "we never eat alone".

Discarding food, however, did not always feel so bad. While the nausea-inducing smell of noxious pepper juice certainly never abated, my overall perception of mould and rotting food certainly became normalised quickly. From basketball game-based competitions of throwing mushy pumpkins across the sorting hall into the dumpster, to sifting through 15-kilogram crates of *regenboog penen* (rainbow carrots) and feeling a slimy mess instead of a firm rod, the visceral response to decidedly "bad" food products became a sort of playful practice at Tomaat (Figure 6). While very obviously categorised as non-edible, disposing of these products was an integral part of the food saving job.

Figure 6 - Touching an unexpected mass of slime instead of a hard carrot instantly invoked a disgusted yelp by the unlucky food waste sorter.

Challenges to food rescuing practices

The largest hurdles to effectively saving food from being wasted are the economic pressures of the globalised food system for a distribution level company such as Tomaat, and the mobilisation of volunteers for a foundation such as Aardbei. The methodological lens of Actor Network Theory serves well here to illustrate how the food waste network is held together through fragile relations.

The goal of saving food as an environmentally and socially positive act resonates strongly at Tomaat, but time and time again I was reminded of the bottom-line company mentality that food waste equates to money. Saving food from being wasted is the idealistic goal of Tomaat, but the very vitality of food and the capitalistic system in which food waste rescue, at the distribution level, must operate in order to be profitable harbours conflict between idealism and economic realities.

A calculated component of Tomaat practices is the "worthiness" of sorting through quantities of food waste materials. As suppliers check in with the operations manager to let him know which products are available, the notification includes the quality of the food products measured on a scale of very high quality to very low quality. The operations manager then decides if the products will be worth sorting through and agrees to deliveries of the chosen products. In some cases, the food is more damaged or contaminated with inedible food than he had expected, and he evaluates on the spot if the entire quantity should be meticulously sorted or thrown away to save time and energy. When a large proportion of soft skinned products from a shipment are mouldy, oftentimes the entire quantity is thrown away, due to the extensive time it takes to sort out the bad products.

In one instance, a large pallet from a food waste supplier came into the warehouse, which the supplier had warned contained a large percentage of spoiled products. Rather than rejecting outright, we wanted to evaluate how much could be saved. I was set the task of going through boxes of tomatoes, saving what I could and tossing the rest into the biogas bin. After about half an hour, I had saved six boxes of tomatoes, and thrown away over forty boxes. The manager assessed the sorting and decided it was too time consuming, and therefore expensive, and instructed me to throw the rest away. I took 5 kilos home, with the intention of making tomato sauce which could be preserved. Tragically, as I cycled home the entire box was jostled and the smashed tomatoes were completely mouldy by the next morning. Despite my best intentions, the rescued tomatoes were lost anyway (Figure 7).

Figure 7 - Jostled tomatoes easily become bruised, and the broken exterior of the tomato can grow mouldy in a matter of hours.

This episode played out in much the same way as many mornings at the Tomaat warehouse. Despite the "best intentions" of the organisation to accept relatively "bad" quality food and saving as much as possible, the constraints of time and labour power really limit how many resources are spent in the sorting process. Effective sorting is very time consuming, and the physical assessment of every individual fruit is necessary with soft skinned products, because one smashed tomato in a box of 50 can pollute all the rest in a matter of days.

Aardbei, on the other hand, de-commodifies the food waste materials that are collected from food vendors. The redistribution of food at Aardbei works outside of the traditional market driven food system because the food waste materials do not retain or obtain an assigned economic value as it is collected from the retailers. As Aardbei volunteers move the *bakfiets* from shop to shop, they approach food sellers with the repeated phrase, '*Good morning, we are from [Aardbei], do you have any food that you are throwing away?*' The requested food has already been rejected, and the shopkeepers no longer treat those materials as a valuable commodity. The exchange of food waste is enacted as a system of giving, of donating food to the organisation's cause. The shopkeeper has released the monetary value which they had originally assigned to the food products when they placed price signs near the crates of fruits and vegetables.

After volunteers have collected, sorted, and cooked the collected food waste materials, the customers at the restaurant consume the three-course meal in exchange for a donation to Aardbei, usually between five and ten euros. Donation-based value is still a sort of financial exchange, though radically different from other pricing systems. The donation-based wasteless dinner allows participation by virtually anyone from any socio-economic class and creates an inclusive atmosphere while also supporting the existence of the foundation. Aardbei presents rescued food primarily as a shared, collective meal. The food waste resource becomes the happy object that brings community together, and the performance of food waste reduction represents an alternative food system being played out by the human and non-human actors. Excess food which is not cooked in the meal, whether because there were inadequate quantities to cook, the products did not fit into the menu, or the products are not vegan, are available for anyone to take for free.

The gift economy of food, labour, and a donation for the meals, while posing an alternative to the market economy, are also the organisation's Achilles heel. The operations at Aardbei are fully dependent upon the mobilisation of volunteers, and without their participation the organisation fails. My immediate inclusion within the group at Aardbei illustrated how desperately the organisation needs consistent volunteers. One of the largest challenges faced by the foundation lies in maintaining consistent volunteers for the pick-up shift. Without the regular collection of food products, the other shifts are futile, and unfortunately volunteers feel that the pick-up is the least desirable for a variety of reasons. The 9 o'clock meeting time is early, the *bakfiets* is perilously heavy, asking for free food from shop owners can be awkward, and oftentimes volunteers must complete the shift alone. On my second day researching at Aardbei, I was the only volunteer signed up for the pick-up shift, an experience which clearly demonstrated why recruiting and retaining volunteers is an enormous difficulty. My research at Aardbei had only very recently begun, and I wrestled with the idea that I was a researcher, but also the only pillar keeping the organisation's mission standing that day. Without the crates of fresh products I brought to Aardbei, the dinner would have failed. In a similar vein, another volunteer that began around the same time as me, described how she felt like a leader after just one day.

Such experiences conveyed responsibility and a deep sense of involvement with the fundamental goals of the organisation, which penetrates the motivations of other heavily involved volunteers. But not all. The shared responsibility was especially apparent somewhat later, when a volunteer had signed up to pick up food, but fully abandoned their duty; in the early afternoon, cooking volunteers arrived at Aardbei to find barren tables and no food. One energetic volunteer called the others to action, requesting '*if you've got things in your own fridge going bad… bring it*.' Several volunteers raided their pantries and brought whatever food they

could find and together the cooking team put together a feast of 'small bites'. The dinner was a success, and exemplified adaptability and playful engagement with available food resources, a necessary knowledge set in food-saving practices.

An even more shocking event took place about one month into working at Tomaat, when an alarming discovery led to a sharp turn in my research, reshaping my perception of the food waste saving practices and the priorities of the organisation. For context, Tomaat receives and processes shipments of food waste from a number of suppliers, most of which are wholesale distributors that work with grocery stores and other retailers. In the first weeks of my fieldwork, the most significant food waste supplier that worked with Tomaat began to exhibit logistical issues, and then altogether stopped sending Tomaat any food waste: the company had gone bankrupt. This supplier had been the perfect business partner for Tomaat, because of the vast variety of products they dealt with, the large quantities of waste, and their ability to make mixed pallets of products, so Tomaat received many different desirable products in manageable quantities. The loss of this supplier had the potential to sink Tomaat; without food waste to sell, there was no business to be run. The leadership of the company had to make a decision.

Another company, Kiwi (name changed for anonymity), had been a supplier for Tomaat since the beginning of my fieldwork, and I had not thought twice about how these deliveries were almost always perfect fruits and vegetables that barely required sorting before being stored and sold. When the large supplier went down, Tomaat started ordering products from Kiwi almost daily, until by late March there were four to six pallets from Kiwi every day. In a casual conversation with the operations manager while he was explaining how suppliers for Tomaat are found by the account managers and partnerships are negotiated, he told me that Kiwi was '*run by a guy that buys fruits and vegetables at auctions for really cheap*,' and that Tomaat was given a good deal. I came to learn that these products which I had sorted, organised and packed in orders for months were not food waste at all. The reality of the situation clicked: Tomaat was selling products purported to be waste material to their customers, with an absolute lack of transparency about their source. Every box of food at Tomaat receives a sticker to identify the type of product, date of sorting, and other details, and a small number that indicates the supplier so that the item can be traced. The number for Kiwi was stuck to many products in the Tomaat warehouse.

Regardless of the stated intentions, the ethical implications of selling non-food waste products as food waste seriously undermines Tomaat's idealist mission to combat food waste and make a meaningful, environmental impact. These actors of the food waste network became involved with the capitalist system they were seeking to reconstruct, changing both the inherent materialities of the food products they were dealing with, and compromising their basic legitimacy as a company that claims to be a sustainable alternative source for rescued food products. However, without the supplies from Kiwi, Tomaat would have been unable to survive and therefore not rescued *any* food. Previous research concerning the practices of food retailers in their ordering of products contend that retailers strive to avoid out of stock situations, to preserve their image and brand (Theotokis et al., 2012; Alhonnoro et al., 2020). Tomaat certainly avoided an out-of-stock situation, and by keeping it secret maintained their brand image as a sustainable company.

The supplement of non-food waste materials was a response to insufficient food waste materials; the system is held together through the networks linking non-human food to other actors in the food network. The system changes significantly depending on the availability of food products, resulting in a priority of consistently keeping specific foods in-stock over the integrity of every food product being salvaged waste.

The purchase of non-food waste products by Tomaat bolstered not only the variety and quantity of food products in-stock at the warehouse, but also significantly cut down on the time required to sort and process the food products. When fennel arrived from a food waste supplier, each individual was critically inspected for brown spots and any signs of decomposition before being designated as an edible material and being passed

from the shipping container into Tomaat boxes. The fennel delivered by the non-food waste supplier required barely a glance before being dumped en masse into the new containers. Though the reliance on non-food waste supplies as a supplement was viewed as a necessary evil, the Tomaat company certainly viewed these products as more 'perfect' and desirable than other products. Accordingly, the organisation established an aesthetic hierarchy very similar to the system which they claimed to work against. Food waste rescue is based on changing the conceptions of edible food, normalising physical imperfections, and promoting the use of products which consumers have been socialised to believe are 'bad'. The adoption of non-food waste products at Tomaat, and the implications for standards that the customers expected to receive when ordering what they believe to be food waste, is damaging to this central component of food rescue practices.

Conclusion

Food rescue organisations respond to the prevailing ethical and environmental travesty of global food waste, and while their strategies are founded on this idealistic, well-intentioned goal, the existing capitalistic food system and logistical hurdles frequently obstruct the success of food rescue practices.

Food waste rescue operations work within the food supply chain to save edible food from the landfill and redistributing food resources to consumers. The network of growers and farmers, distributors, transporters, retailers, and consumers, is involved with the process as food initially 'becomes' waste and is then reconceptualised throughout its life in the food waste chain. In this article I have explored the intricacies of the daily operating procedures at Aardbei and Tomaat, and the organisations' respective implementation of practices and organisational policies which affect their capacity to rescue food. All rescued food at both Tomaat and Aardbei are products of the globalised food system, passing through the Netherlands as they are exported throughout the globe. Tomaat and Aardbei function as additional links within the globalised food chain, as they work to respond to the systemic problem of food waste through redistribution. At a basic level, both Aardbei and Tomaat agree upon the circular economic concept that food waste is a usable resource which may be redistributed as edible food, and both appeal to the ethos of environmentalism and climate change activism to entice customers and participants.

Though they share the overarching goal of reducing food waste, the two organisations operate within different levels of the food waste supply chain and differ in their fundamental arrangements of human and nonhuman actors within this network. A massive challenge to both food rescue organisations is the conflict of interest between food waste reduction and current economic norms and practices (Messner et al., 2020). The human actors involved with food rescue practices at Aardbei approach this challenge through a radically alternative, anti-capitalist ideology, as they claim to reject the industrial power structures of the food system and donate transformed food waste materials to the local community. On the other hand, Tomaat attempts to actively participate within the economic norms of the food chain, by agreeing to the allocation of financial value to food waste materials and engaging with other actors in the food chain. The involvement in the market goes so far for Tomaat that it also accepts and sells large quantities of non-waste food, in order to have a reliable supply in stock, which is a necessary prerequisite to keep its food-rescuing activities going.

My research reveals a major takeaway, that by approaching food waste reduction as a normalised practice *within* the globalised food system or as an alternative system *outside* of the globalised system, the food waste itself becomes a political player with its own agency. Despite the many challenges to the implementation of food waste reduction, Tomaat and Aardbei do exemplify two groups of people that identify a global problem and feel compelled to action, and their undertakings are far from trivial. The founders of Tomaat recognise the power of food distributors in the Netherlands to significantly decrease their waste and have executed a

business plan in which large quantities of food are redirected from the landfill. Their emphasis on economic sustainability and making food waste profitable is perhaps the most realistic method to participate within the globalised food system while normalising food saving practices.

On the other hand, Aardbei operates outside of this globalised food system, while performing alternative practices of food procurement. The reliance on creativity and adaptability are the greatest assets of Aardbei operations, and my informants displayed tenacity and resilience as they mobilised in the face of pandemic restrictions and lack of human resources. While Tomaat and Aardbei rescue several thousand tons of food waste each year respectively, admittedly this quantity is a single pea in the great dumpster of global food waste. Nonetheless, perhaps the most meaningful impact accomplished by each organisation is the emphasis on education and setting an example. Volunteers from Aardbei conduct workshops at schools and universities throughout the city, and recruit high school students to participate in food-saving events. Tomaat circulates food waste cook books in three languages, and partners with other food waste-based companies to distribute their products. An example of these educational materials is a children's book titled *Meneer Tweebeenpeen* (Mister Two-leg-carrot), which seeks to normalise food products which do not fit the aesthetic standards of grocery retail giants. Through the multiplier effect, these streams of education and awareness may generate exponential societal impact, and great potential for increased participation in the movement to reduce food waste (Dahl, Løken, & Mogstad, 2014).

The fight to rescue food is not a waste.

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