A Circular Supply Chain Model for Alternative Food Networks in Montreal

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ABSTRACT

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Food waste and food insecurity have become a double burden in the Global North. In North America, traditional food supply chains are being challenged by the development of alternative food networks (AFN). On one hand, AFN aim to promote healthy food access through designing socially, economically and environmentally sustainable supply chains that empower local producers and consumers. On the other hand, the circular economy framework aims to redesign linear “take, make, dispose” supply chains into regenerative cyclic supply chains. Yet, little research exists that examines how AFN can close their supply chain loops using a circular economy framework. This multidisciplinary study aims to bridge these two concepts: it explores waste perception and management in alternative food networks (AFN) using a circular economy framework. This study uses a mixed methods approach and is divided into three main research phases. The first phase explores how AFN users perceive waste through a series of live exhibitions and surveys. The second phase identifies waste management practices of AFN actors through structured open-ended surveys. Our findings suggest that waste perception is socially malleable and that AFN actors voluntarily engage in various informal circular economy activities. The third research phase, a case study, generated concrete recommendations for the Citizen Market of Little Burgundy to achieve a closed loop, circular, and collaborative supply chain.

Key words: alternative food networks, circular economy, waste perception, waste management, symbiotic partnerships, cradle to cradle design, Montreal, closed loop supply chains.

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1 INTRODUCTION

In today's global context of food insecurity and climate change, the predominant food supply chain models of take-make-waste have been shown to be unsustainable. These linear supply chains connect food production, distribution and consumption in a linear fashion (without having a loop that brings waste back into the system), thus generating social, environmental, and economic externalities. Approximately 28% of agricultural lands around the world produce food that is lost along the supply chain while 794.6 million people are affected by chronic malnutrition (FAO, 2015). This global double burden of food insecurity and waste has lately received attention from political leaders, the media and the United Nations (UN). In September 2015, thirty world leaders were served a "landfill lunch" at the UN Sustainable Development Summit. The meal was prepared from food byproducts such as beer's spent grains, chickpea water, vegetable scraps and cocoa husk. This statement was meant to shed light on the global food waste issue in light of the December UN Climate Change Conference (ABC, 2015).

Even though hunger is often talked about in the context of the Global South, it is also becoming an issue in the Global North. In 2008, the United States has seen food insecurity increase more than 30% (from 15.8% to 21%) (Gundersen, 2013). In Canada, the number of food insecure people increased by 450 000 between 2008 and 2011 (Tarasuk, Mitchell, & Dachner, 2013). In North America, the fight against food waste and food insecurity has been led by charitable food aid. A vast network of non-profit food banks channel surplus food from large retailers and distributors to small community organizations, which then offer it to food insecure citizens. Food banks have been heavily criticized for being a mere byproduct of the industrial food system and only serving as a "Band-Aid" solution. Most of those redistribution programs do not tackle the root causes of food waste and insecurity as they are based on the predominant food supply chain model that is unsustainable (Tarasuk, 2001).

In North America, the externalities and contradictions of the predominant linear supply chain model are fostering alternative food supply chains. Local food networks, value recirculation supply chains, and community-based food supply chains have emerged as an alternative to the predominant food supply model. The latter are commonly termed alternative food networks (AFN) and have a social economy framework that aim to challenge the predominant food charity model. Those alternative food networks (AFN) are integrated in the local economy, aim to primarily serve the community in which they operate, and promote collaboration between supply chain partners rather than competition. Nevertheless, AFN are

very heterogeneous. Their mission and strategies vary depending on communities' cultures, resources, socio-economic backgrounds and political ideologies. Even though most AFN aim to simultaneously achieve social, environmental and economic sustainability, some primarily focus on reducing their ecological footprint while others prioritize food accessibility (Audet, Lefèvre, & El-Jed, 2015).

Most alternative food networks (AFN), and specifically community-based food supply chains, strive to create a socially, environmentally and economically just food system. While their goal is to balance these 3 facets of sustainability, these initiatives often face barriers such as lack of funding and human resources as well as market limitations. Even though those alternative supply chains have proved to be more socially and culturally sustainable than the predominant model, they still have to operate within the larger predominant linear food model. Like many food organizations, all they can do is simply reduce the negative ecological impacts of their supply chain. Nevertheless, some AFN adopt value-recirculating strategies; yet, such efforts are rarely documented. In Montreal, the "Sustainable and Equitable Montreal Food System" plan (SAM) that was recently drafted by the Conférence Régionale des Élus (CRÉ) aims to shift from the traditional supply chain model towards a more sustainable, resilient, and equitable one by the year 2025. Reducing the ecological footprint of Montreal's food system is one of the five goals of the SAM plan.

As a response to these concerns and goals, this thesis explores waste perception and management in the context of Montreal's alternative food networks (AFN). In this study, AFN includes local for-profit and non-profit food supply chain actors such as food producers, small restaurants, local markets, cooperative food stores, and community development organizations. The researcher engaged with AFN users and actors involved in different stages of the local food supply chain, i.e., production, marketing, processing and recycling. In these supply chains, waste is discussed through the multidisciplinary lens of sustainable supply chain management, sociology and anthropology of waste. This combination of academic frameworks permitted tackling the issue from a social and material point of view.

More specifically, this study asked the following questions:

1) How do AFN users perceive waste?

2) How do AFN actors recirculate value and how can symbiotic partnerships contribute for achieving a circular supply chain?

3) How can community food organizations close the loop and build a circular food model that is aligned with their sustainability goals?

Through the use of a circular economy framework, this research aims to explore, document, and recommend practices for closing the supply chain loop of AFN in Montreal. Based on the research questions and goals, this study is divided into three main research phases (Please see Chapter 3 for the general methodology):

1. Users' perception of waste in alternative food supply chains

2. Circular economy practices of alternative food supply chain actors

3. A case study in partnership with the citizen market of Little Burgundy

In this thesis, Chapter 2 presents a multidisciplinary review of literature in regards to anthropological waste theory, waste management frameworks, linear and alternative (AFN) food supply chains and the circular economy. Chapter 2 also presents the literature on Montreal-based alternative food networks (AFN). Chapter 3 presents the general methodology and research design. Chapter 4 presents and describes the results of a series of waste exhibitions that aimed to explore waste perception. Chapter 5 presents the findings of a series of surveys and discussions conducted with different AFN actors in regards to how they manage waste and recirculate value. Chapter 6 describes a case study of a community-based food supply chain in Montreal, i.e., the Citizen Market of Little Burgundy. The case study resulted in practical recommendations for the Citizen Market to achieve a collaborative and circular supply chain. Finally, Chapter 7 presents the concluding remarks as well as the possible areas for future research.

2 LITERATURE REVIEW

2.1 Introduction

With a world population of 7.1 billion, which is predicted to reach 9.3 billion by 2050, eradicating food insecurity is one of the most pressing global challenges we are facing today. According to the Food and Agriculture Organization of the United Nations (FAO), 794.6 million people are suffering from chronic malnutrition. The FAO and other public and private institutions have invested in the past years on projects for agricultural productivity, biotechnology, infrastructure, and nutritional fortification as part of the global strategy to improve food security. All those efforts were aimed at the production level of the food supply chain and may have in fact brought measurable outcomes. However, producing more food could have limited impact on food security without implementing effective strategies that can make food physically and economically available for people who need it most. Against that backdrop, the FAO estimates that one third of the food produced for human consumption is lost or wasted along the food supply chain (Bartlett et al., 2012). In developing countries, food losses are mainly within the production stages due to the lack of appropriate infrastructures and technologies (Stuart, 2009). In contrast, while medium and high-income countries benefit from more efficient supply chains, food waste is significant at the consumption level (Stuart, 2009). According to Stuart, reducing global food losses could play a significant role on increasing food availability along with improving social, economic, and environmental sustainability (Stuart, 2009).

Establishing and adopting a sustainable food supply model requires a holistic approach that integrates knowledge from across disciplines (Parfitt, Barthel, & Macnaughton, 2010). The following multidisciplinary literature review on waste in food supply chains, aims to integrate anthropological, sociological and food supply chain knowledge and perspectives. The first part of this literature review will examine anthropological and sociological theories of waste. We will then tackle the systemic root causes of waste by examining it in the context of food industrialization. After discussing the sustainability of alternative food supply chains, we will examine the literature on circular economy frameworks and their applicability on community food systems.

2.2 The anthropology and sociology of waste

According to Kennedy, understanding our waste perception and behavior in society is necessary if we wish to change it (Kennedy, 2007). Waste has been used as a tool by garbologists, sociologists and anthropologists to understand cultures and societies.

2.2.1 Different meanings of waste

What is waste? How do we define and characterize it? How do we draw the line between waste and value?

Mary Douglas' purity and danger theory is one of the most influential in the study of waste behavior in modern societies. The British anthropologist's study of purity in non-modern cultures generated her famous definition of dirt as being "matter out of place" (Douglas, 1966). Here, waste is defined as a cultural category rather than a physical reality. We classify an object as dirty not because of intrinsic qualities that the object possesses but because the object is not placed where it should be; it is in the wrong context. What we refer to as waste, rubbish or trash defies our social classification and definition of the way things ought to be (Reno, 2014). Douglas' theory has been important to understand cultural taboos such as menstrual blood and feces. The latter become a source of repulsion only when excreted out of the body (where they should belong). Placed out of their culturally accepted context, menstrual blood and feces become boundary objects as they lie in an unknown marginal and transitional state that signifies danger (Douglas, 1966). According to Kennedy, waste is not only matter out of place; it is "matter without place" (Kennedy, 2007, p.7). It is the context that provides a meaning, a function, and therefore a value to an object.

In his book titled "On Garbage", Scanlan (2010) builds on Douglas' social and cultural categorization thesis and complements it to explain the dynamics of waste creation in modern societies. According to Scanlan, the creation of garbage results from a human made categorization. Building on Douglas' famous saying, "where there is dirt there is system" (Douglas, 1966, p.36), Scanlan shows that this system is reflected by the separation of "the desirable from the unwanted" and "the valuable from the worthless" (Scanlan, 2010, p.15). After using up a desirable object, modern societies find themselves with the unwanted byproduct of their consumption. This isolated mess of incompatible parts is removed from reference points such as place and time, and therefore sees its function and value disappear. In modern society, garbage is physically and psychologically separated from the object it once belonged to, from

society and from nature. By being isolated from the whole, its fate becomes refusal and disposal (Scanlan, 2010).

Although Mary Douglas' theory of waste is useful in interpreting ideas around cultural taboos and purity, it has been questioned and challenged in its applicability for understanding waste in modern societies. In today's context of global poverty, climate change and environmental degradation, some scholars in the social sciences are moving away from a cultural relativist definition of waste. According to Reno, Douglas' anthropocentric perspective portrays waste as a mirror of human cultures (a distinctly human product), and focuses on waste's cultural meaning rather than its materiality (Reno, 2014). Reno challenges the idea that waste can only be understood as a mere conceptual product of social categorization. The author proposes a bio-semiotic approach that examines waste beyond human perceptions of order and disorder. The proposed ecological framework portrays waste as a temporary means of exchange between forms of life: waste is a temporary state between different life forms. Rather than perceiving waste as an object symbolizing the threat of death, Reno views waste as a way to perpetuate life processes (Reno, 2014). The Douglasian approach therefore needs to be complemented by other theories of waste in order to gain a more holistic understanding.

But if Douglas' cultural categorization can partly explain contemporary waste perception, is that human categorization of waste and value fixed? Does our worldview necessarily precede our waste behavior?

In his theory of rubbish, Thompson argues that the creation and destruction of value is a dynamic process that simultaneously involves both worldview and action. The latter are interdependent and have a dynamic relationship (Thompson, 1979). Thompson conceives rubbish in the wider context of value creation and destruction. Indeed, Thompson conceptualizes rubbish in relation to two other categories of objects: transient and durable objects. The transient represents objects with finite life spans and whose value declines with time. Whereas the durable represents objects with infinite (or very long) life spans and whose value increases with time (Parsons, 2008). What we recognize as rubbish, trash or waste represents an in-between category that can potentially transfer from transience to durability. These categories represent how objects are seen and perceived rather than their intrinsic physical properties (Parsons, 2008). Even though Thompson's approach differs from Douglas' cultural determinism, he acknowledged that value is socially malleable (Thompson, 1979). The rubbishness or value of an object is not only determined by its intrinsic properties but rather emerges through the ways that an object is seen, placed and experienced. Similarly, in "The

Social Life of Things", Appadurai (1986) suggests that "commodities, like persons, have social lives" (Appadurai, 1986). Objects are socially conditioned and translated into human and social interests. Intrinsic properties only act as a natural limitation to social malleability (Thompson, 1979). Thompson's dynamic theory of waste has been widely used to study how antique objects regain value in society. However, its applicability to waste in food supply chains is limited since food is a transient good and cannot pass through the rubbish phase then become durable by mere social malleability (nature works here as a limitation). Thus, Thompson's categories will not apply to this particular study but his theory on dynamic value creation and destruction will be relevant to our study, in general.

2.2.2 Social dynamics of waste

Waste in modern society has been widely attributed to post-war consumerism. The throwaway society thesis represents both a sociological analysis and a moral critique of contemporary society (O'Brien, 2013). Gandy (1993) and Tammemagi (1999) blame the post-war increase of waste streams to the increasing levels of economic activity, emergence of cheap consumer goods, improved living conditions and consumer demand for convenience (Tammamagi, 1999; Gandy, 1993). Bauman (2004) and Ferrel (2006) also blame society for being disengaged from production and addicted to consumption and disposal (Ferrell, 2006; Bauman, 2004). Scanlan (2010) sheds light on the physical and psychological separation between consumers and the object of their consumption (Scanlan, 2010). Contemporary society is described as wasteful and modern consumers are portrayed as profligate and disdainful in their consumption behavior in comparison to their grandparents' generation (O'Brien, 2013).

Others have however refuted the throwaway society thesis and expressed that it is not sufficient in explaining increasing waste streams in modern society. In his sociological study of household food waste in the UK, Evans (2011) demonstrates that families regularly use leftovers in cooking meals and that wasting food is generally accompanied by a feeling of guilt (Evans, 2011). Similarly, Cappellini and Parsons (2012) explore the social dynamics of family meals in UK households. They confirm that families use thrift practices such as storing, reusing and processing leftovers. According to them, those practices reflect not only technical skills (such as food processing and preservation), but also managerial, coordination and social skills (Cappellini & Parsons, 2012). Those practices have a sacrificial dimension for family members who collectively contribute to saving resources for the wellbeing of the household. During social events, higher grade freshly cooked food is served rather than leftovers. Sharing leftovers is a reflection of intimate relationships between family, relatives and close friends. Thus, serving

leftover food or freshly cooked food is a way to mark boundaries of admission and exclusion to the family (Cappellini & Parsons, 2012).

Even though these scholars refute the throwaway society thesis, they nonetheless acknowledge that the same families who practice thrift also waste considerable amounts of food (Evans, 2011). Food waste is however not generated by mindless instantaneous actions of throwing away edible food but by a gradual process. This transition from value to waste involves a combination of factors such as over purchasing, mismanagement, social obligations and uncertainties and procrastination. The foods whose expiry date is approaching tend to be hidden somewhere in the back of the fridge, out of sight and out of mind (Evans, 2011). Thus, in accordance to Thompson's rubbish theory, waste in food supply chains cannot be understood by predetermined categories but by a dynamic movement between value and waste.

In his study of the history of waste in British homes, O'Brien demonstrates that contemporary citizens do not waste more materials as compared to the previous generations (O'Brien, 2008). According to the author, there is a difference between what one *throws* and what one *wastes*. Society is responsible for the latter but has very little control over the former. For instance, a family can ensure that all the food they purchase is consumed (therefore creating no waste) but has little control over the type of packaging in which this food is available (the packaging ends up being thrown in the garbage especially if it is non-reusable or non-recyclable). The reason why modern society throws more is that "there is a greater quantity of materials passing through its various industrial and domestic sectors" (O'Brien, 2013, p.19). In the context of food-related waste, one cannot fully understand waste without an overview of contemporary food supply chains and the industrial society that embraces them.

2.3 Commodity-based food supply chains

In this section, waste is examined in light of the wider power and supply chain structures of current food systems.

2.3.1 Consolidation of the supply chain

Although some foods such as sugar and bananas have been in global circulation for about 400 and 100 years respectively, most foods were produced and consumed locally, regionally and nationally up to the 1960s (Friedland, 2003). Globalization has drastically changed most food supply chains, i.e., how food is produced, processed, shipped, distributed, marketed, consumed, and disposed of all over the world. Food supply chains have become a

complex global network of interdependencies where the primary producer and the final consumer are both distanced and disempowered. As Howard's analysis reveals, the food industry's capital is nowadays consolidated through webs of interests and power that control agriculture (Howard, 2013). Only a few corporations (such as Monsanto, Bayer, Cargill, Syngenta, ADM etc…) currently dominate world agriculture, from the gene makeup up to what is available at the supermarket. This centralized model is solidly backed by neoliberal food policies and is exported as the only solution to food insecurity in the name of international development (McMichael, 2006). This consolidated food supply chain model has been accompanied by a commodification of essential agricultural goods and services. The latter are traded across the global market with no qualitative differentiation, i.e., with no regards to who produced them, who needs them, and the social and environmental impacts of their production and circulation. Neoliberalism separates the economic sphere from the political and social ones and considers food security to be the natural outcomes of economic development through free trade and market deregulation. This view is translated into policies that only and exclusively tackle economic efficiency with the assumption that social benefits will naturally result (McMichael, 2006). However, literature on food security has shown that this is not the case.

2.3.2 Circulation of commodities in a global market

In his work, Polanyi examined the commodification of the three classical components of production: nature, man, and capital (Polanyi, 2001). Polanyi's notion of the commodification of nature is reflected in today's increasing land grab and privatization of seeds (Pottier, 1999). In fact, the World Bank and the International Land Coalition reported land grabbing figures to be 57 and 80 million hectares respectively (Deininger & Byerlee, 2011; Hall, 2011). It has also been widely acknowledged by international development organizations that land grabbing does not provide the benefits that investors promise such as "more jobs, new technology, and better infrastructure". Peasants are displaced and dispossessed of their land and wealth, which threatens their livelihood, food security and self-sufficiency. Moreover, the crops produced from such investments (i.e., land acquisitions) are exported, which also negatively impacts local food security in developing countries (Pottier, 1999).

Moreover, an increasing commercial exploitative appropriation of seeds and indigenous knowledge is observed both in Global South and Global North. This phenomenon commonly termed "biopiracy" restricts the ability of farmers to access, save, reuse, and exchange seeds, thus severely affecting food security and biodiversity (Mushita, 2007). Human beings and their labor are also turned into disposable commodities that can be efficiently bought and sold, hired

and fired, to maintain the system's efficiency (Striffler, 2002). In his ethnographic portrait of Tyson's poultry processing plant, Striffler uncovers hidden working conditions and sheds light on the disconnect between labor and life (Striffler, 2002). According to Polanyi's anthropological research, labor was, indeed, an integral part of life before it became commoditized (Polanyi, 2001, p.75).

2.3.3 Food waste and food insecurity: a double burden

This global circulation of food as commodities is accompanied by overproduction of certain subsidized crops such as soy and corn. It is also accompanied by over stocking of produce to survive in a competitive global market (Stuart, 2009). Food-retailing practices have a significant influence on the quantities of wasted food. In fact, corporate food retailers usually have stronger market power than the manufacturers that supply them (Stuart, 2009). Thus, due to unpredictable demand combined with poor forecasting systems, those suppliers (manufacturers) tend to over-produce as they are regularly faced with pressure to deliver very large stocks in very short notice and in order to avoid paying back-order penalties or losing their retailing benefits (Stuart 2009). In North America, many low-income consumers are thus subject to the negative health impacts of having a non-diverse diet consisting mainly of corn and soy derivatives (Wight, 2013). Moreover, this supply chain model has led to a proliferation of single use packaging materials that are disposed off by consumers. O'Brien's earlier statement of distinguishing what a society wastes and what it throws makes sense in that context. When consumers purchase a food they need, they often find the latter packaged in a material that is of no use after the product's consumption. The packaging material is therefore disposed of but not wasted (O'Brien, 2008).

Even though systemic issues of current supply chains lead to health and environmental externalities, those issues nonetheless affect consumer perceptions and behavior. In linear food supply chains consumers are distanced from producers: it is often difficult to know where a specific food product comes from, who produced it, under which conditions, and what it really contains. As a commodity, food is removed from contextual reference points such as time and place: the consumer purchasing food has no way to relate to the amount of time required to prepare it and the place in which it was produced (Scanlan, 2010). This lack of transparency associated with geographic and physical disconnection from the food source has been translated into a temporal, psychological and social disconnection. By not personally knowing their producer, the region of production, and not realizing the efforts spent on growing food, consumers do not always relate to the environmental, economic, and social impacts of foods

they consume (Vogt, 2010). In North American society, food is widely considered as a disposable commodity rather than a mean of survival (Stuart, 2009). According to Scanlan (2010), this lack of citizen engagement and participation is also visible in municipal waste management: just like unrecyclable waste is thrown in the trash, recyclable waste is thrown in the recycling bin. Even though the author acknowledges that the latter has some ecological benefits, he argues that the lack of personal involvement in the details of disposal serves to distance us from our waste (Scanlan, 2010).

Furthermore, one third of the food produced globally is wasted along the value chain. The FAO estimates food waste's carbon footprint to be 3.3 billion tonnes of CO2 equivalent of greenhouse gas (GHG) released in the atmosphere each year. Moreover, the total volume of water used every year to produce food that is lost or wasted accounts for 250 km^3. In addition, 1.4 billion hectares of land is used annually to grow food that is lost or wasted; this represents 28 percent of the world's agricultural area (FAO, 2014). In Canada, 40% of the food produced is wasted along the value chain (Gooch, Felfel, & Marenick, 2010, p.2) and household waste represents more than 50% of that food waste (Gooch, Felfel, & Marenick, 2010, p.4).

This high amount of waste is unfortunately accompanied by increasing rates of food insecurity. In 2012, 4 million individuals in Canada, representing 13% of Canadian households, experienced some level of food insecurity (Tarasuk, V, Mitchell, A, Dachner, 2014). In Montreal, 40% of the population has no financial and/or geographic access to fresh produce within walking distance. This population lives in what are commonly referred to as "food deserts". Montreal food deserts include the Southwest, Verdun, LaSalle, Lachine, and Hochelaga-Maisonneuve (Bertrand & Goudreau, 2014). These potential food desert areas (highlighted in dark blue in Figure 1) are characterized by a high level of social deprivation combined with a low level of supermarket accessibility (Apparicio, Cloutier, & Shearmur, 2007). Food insecurity is reflected in the increase of food bank use in Montreal. Moisson Montreal revealed in their 2012 report that, during the month of March 2012, 422155 grocery hampers were distributed to individuals requesting emergency food assistance. This represents a 17% increase to the food bank compared with 2011 (Moisson Montreal, 2012).

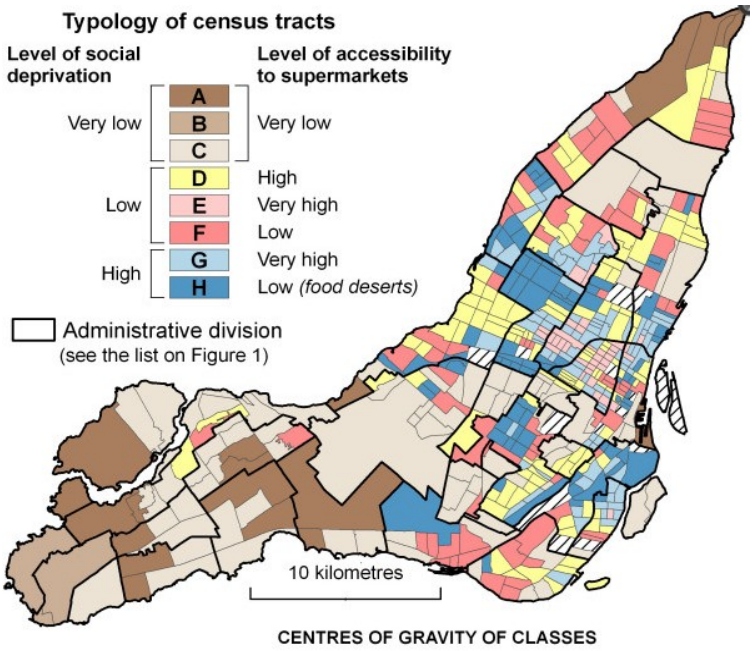


Figure 1: Potential food deserts map in Montreal

Source: (Apparicio et al., 2007)

As literature shows, neither a unique throwaway society thesis nor systemic issues of global supply chains can alone explain food related waste. Those systemic and behavioral factors have a dynamic relationship and affect one another. A linear supply chain model is not compatible with food security, environmental sustainability, and economic resilience. In North America, it is in that context of urban food insecurity and food waste that alternative food supply chain models (known as alternative food networks) emerged.

2.4 Alternative food supply chain models

The food sovereignty development trope is the most direct political opposition to the dominant food system (Boyer, 2010). La Via Campesina, the international peasant-led organization that introduced the food sovereignty concept, denounces industrialized, centralized, corporate and export-driven agriculture. It proposes instead an alternative decentralized, family-based sustainable production that is locally oriented (McMichael, 2006). In North America, food movements are advocating for alternative food supply chains and a renewal of the human-earth relationship. The development of the social economy sector in regards to food is reflected in the emergence of consumers and producers cooperatives, community-supported agriculture (CSA), citizen markets etc…

Nevertheless, the food movement is heterogeneous and includes various alternative

food models, including local and short supply chains, the freegan movement, and community food supply chains (Venn et al., 2006). In North America, local food supply chains have emerged as a reaction against the corporate food model that stripped producers and consumers of their rights and power (Freidberg & Goldstein, 2011).

2.4.1 Local food supply chains

The local food movement has significantly expanded in the past few years. The movement is commonly associated with a reduction of food's environmental impact (commonly expressed as food miles), a physical and social re-connection between producers and consumers, and the development of local food economies (Venn et al., 2006). The North American and European literature on localism categorizes the global as capitalistist and the local as a point of resistance to the status quo (DuPuis & Goodman, 2005). The local food movement is reflected in North America through the emergence of farmers' markets, CSA (community-supported-agriculture) programs, as well as community and collective urban gardening initiatives. There has been many attempts to conceptualize those alternative food networks in literature.

Venn and his colleagues recognize four categories of local food networks based on the degree of connection between consumers and producers: 1) "producers as consumers" relates to instances when food is produced by the same individuals who will consume it (examples: community gardens and food cooperatives). 2) "Producers-consumers partnerships" represents instances when the risks and rewards of agriculture are shared between the producers and consumers. Such a partnership includes community-supported agriculture (CSA). 3) The "direct sell" category represents short supply chains (reduction of middle men) where farmers directly sell their produce to consumers. This face to face contact promotes a social connection between the production and consumption stages of the supply network (examples: farmers' markets, producers' cooperatives, and box shemes) 4) The fourth category according to the author includes "specialists retailers" who enable a more direct relationship than conventional western supermarkets (Venn et al., 2006; p. 254 and p. 255).

However, the local food movement has received extensive criticism from activists and academics alike. Local food movements can be elitist, culturally irrelevant, and economically unaccessible to low-income citizens (DuPuis & Goodman, 2005). Indeed, some alternative food networks (AFN) such as farmers' markets and CSA programs are economically inaccessible to food insecure populations (who would benefit from those alternatives the most). By not affording

to engage in this new movement, those populations find themselves again, socially, culturally, and nutritionally excluded. Such socio-economic inequalities are already present in the corporate food system and are being perpetuated in the local food movement, which questions the latter's food security and sustainability potential (DuPuis & Goodman, 2005).

In fact, sholars are now advocating a shift from defensive to reflexive localism. Rather than treating localism as intrinsically just, Dupuis and Goodman (2005) propose a process-based vision of improvement. The idea is to move beyond the blind adoption of localism to an imperfect yet dynamic model that blends environmental sustainability with cultural, social, and economic inclusion (DuPuis & Goodman, 2005). Furthermore, understanding the motivations behind localism is of primary importance for the development of local alternative models. McEntee proposes a conceptual framework that includes two types of localisms based on different motivations: traditional localism and contemporary localism (McEntee, 2010). contemporary localists most often include the middle class population who is concerned with food's environmental impact, their local food economy, as well as social distinction (Bourdieu, 1984). Such individuals engage in local food networks through subscribing to a CSA program (which requires financial capital) or going to farmers' markets (which are often more expensive than conventional supermarkets) (McEntee, 2010). On the other hand, traditional localists engage in traditional, less costly and more labor intensive food networks such as collective gardens and food cooperatives. Their primary motivations according to the author are food security and socio-economic inclusion (McEntee, 2010).

Thus, local food networks can be environmentally sustainable but are not necessarily socially sustainable; similarly, they can be socially sustainable without being environmentally sustainable.

2.4.2 Freeganism and value recirculation supply chains

Freeganism came to life in the mid-1990s. The emergence of the freegan movement is similar to the local food movement as it also developed within the context of and as a reaction to the global capitalist food system. The main difference is that whereas the local food movement is mostly embedded in the consumerist culture, the freegan movement is considered an urban subculture, within that larger consumerist culture. Freegans denounce the materialistic, individualistic, wasteful corporate culture by engaging in value recirculation and gleaning activities. The latter include reclaiming discarded items, reusing, recycling, up cycling (transforming waste products into ones of higher value), sharing, and bartering (exchanging).

They limit their participation in the consumerist economy by using alternative living strategies that consume the least environmental resources. This political, non-hierarchical, decentralized counter-culture movement is associated with a sense of community, cooperation, as well as environmental and social concern (More, 2011).

Studies show that the freegan community is diverse in regards to its socio- economic status, employment profile, education level, age, and food security status. The motivations and values for engaging in freegan activities are as heterogeneous and decentralized as the community: they can be socio-economic, political, and/or ecological depending on the individuals (Barnard, 2011). Despite their heterogeneity, freegan individuals give a clear message to society: they are anticapitalist and anticonsumerist; they practice cooperation, collaboration, sharing, and bartering rather than competition and commodification. The methods they use to convey this message are not however homogenous: they can include community gardening, collective cooking, communal housing, dumpster diving, stealing, and bartering. Some of those methods overlap with those of the local food movement but their motivations and message might differ. Adding to that, not all the methods cited above have an equal sustainability status.

For instance, dumpster diving and stealing practices are often conducted in large commercial food retailers. Those methods are only sustained by the system they are fighting against in the first place. This lack of alignment between their goals and methods is a dilemma dumpster divers face and acknowledge. With that being said, dumpster diving is commonly practiced in Montreal. This practice has received attention from the media lately. Marshal narrates in details his brief dumpster diving experience in Metro's newspaper (Marshal, 2013). In Montreal, this alternative urban culture has been translated into several social movements such as soup kitchens and cooperatives that creatively use food waste to provide meals to people in need. For example, "Food Not Bombs", an anti-poverty global movement, collects leftovers to cook and serve free meals on St Henri Street and the Plateau area in Montreal (Edwards & Mercer, 2007).

On the other hand, communal gardening and cooking are freegan practices that contribute in skill and capacity building, and that are self-sustained by the community. Collective kitchen initiatives adhere to sustainable practices (like composting and local sourcing). However, unlike local food movements, those initiatives are flexible and break rules (for example, they accept non-local sourcing) when economic, social sustainability or food security is threatened (Bohne, 2012). The People's Potato and the Midnight Kitchen are collective

kitchens on Concordia and McGill campuses respectively, where anyone has access to a free lunch. The Coop Sur Généreux is a housing cooperative in the Plateau area where 10 persons voluntarily cooperate for their mutual social, economic, and cultural benefit. They share chores, cooking, meals, and waste management. Studies have shown that community kitchen participants acquired useful skills regarding food preservation, processing, and waste management through collective cooking and meal sharing. Furthermore, participants felt less isolated when connecting with people sharing similar challenging social conditions (Engler-stringer, 2005).

2.4.3 Community supply chains

During the 1980s and 1990s most responses to food insecurity started occurring at the community level because that approach delivered more long lasting solutions compared to traditional food aid measures such as food banks. This shift from a project approach to a process-based vision and food systems approach contributed to the emergence of the community food security concept in the 1990s. Community food security (CFS) is defined by Hamm and Bellows as, “a situation in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice” (Hamm & Bellows, 2003, p. 37). The concept of CFS incorporates economic and social rights, community empowerment and resilience, as well as a systemic understanding of natural resource allocation within a community’s food system. It connects economic, social, and environmental sustainability within a food systems approach that includes all stages of the supply chain.

In fact, there have been efforts to conceptualize community food systems, considering their unique ability in tackling food insecurity from a multidisciplinary perspective. In one of his articles, Sherriff presents the conceptual framework of the just sustainability paradigm (JSP). Inspired from the permaculture movement, this concept refers to a model that operates at a nexus of social and environmental justice. It includes a holistic education on food, agriculture, and health; has a farming component, aims for organic foods, but prioritizes local foods (Sherriff, 2009). By efficiently allocating the community’s assets and recirculating its value locally, this model also has the potential to improve the community’s local economy (Gibson-Graham, 2006). However, according to Sherriff, one of the main challenges of community food projects is that they do not always attract the target population due to cultural incompetency issues. Indeed, the language and expression used need to be customized to the community’s culture, socio economic realities, and priorities. Moreover, citizens who need those projects

most should be encouraged to use them and mentored in how to best engage in them (Sherriff, 2009).

Citizens' cultural and socioeconomic priorities are expressed through community gardens. Community gardens empower urban producers to regain control over the food they grow and eat. Disempowered consumers are turned into food and soil citizens (Baker, 2004). This political empowerment also involves the process of food systems localization whereby citizens have a space (a garden plot in this case) where they can safely embody their culture and values in a positive and productive way. For instance, in Toronto's community gardens, some producers buy their seeds from ethnic stores, use their traditional farming knowledge acquired at home, experiment with growing their native plants in Toronto's landscape, and use certain parts of the plants to cook culturally accepted dishes. Baker advocates for integrating the concepts of "food citizenships" and "food systems localization" within community food movements through urban farming and other activities that facilitate that shift of power (Baker, 2004).

2.5 A circular economy framework for community food supply chains

In the community food model, users and consumers of food are active stakeholders of the supply chain. Community food systems aim to be socially and culturally sustainable. Even though most of community food initiatives have environmental sustainability integrated in their values, it is not always reflected in their practices. This is partly due to economic and market limitations. This part will thus aim to bridge the literature on both the circular economy and community food systems.

2.5.1 From a waste reduction to a circular economy framework

Community initiatives along with businesses and municipalities generally follow the 3 RV ("Reduce Reuse Recycle Valorize") waste reduction framework. However, most food packaging materials such as aluminum, plastic and metal are often downcycled, which means that they are converted into new materials of lesser quality or reduced functionality. For instance, High Density Polyethylene (HDPE) or number 2 plastics commonly used in milk, juice and water packaging cannot be used again for food-grade items due to contamination and safety issues. Those specific packages are downcycled into objects like chairs and benches. Waste reduction is thus studied in the framework of cradle to grave supply chains meaning that after two or three life cycles, most materials will eventually end up in landfills (McDonough & Braungart, 2002).

That 3RV method of achieving environmental sustainability is also termed eco-efficiency, which basically means doing more with fewer resources. Using that definition, a 100% eco-efficient organization would ideally use 0% resources and in that case, would have 0% output. This contradicts most business models that aim to provide a product or service to the community or the general public. That also explains why many businesses and community organizations see environmental sustainability to be inherently uneconomic. Organizations use the eco-efficiency framework knowing that it is impossible to achieve 100% success (McDonough & Braungart, 2002). McDonough and Braungart challenge the 3RVs framework and state that eco-efficiency, if used as a goal, will only serve to slow resource depletion. The authors propose to use eco-efficiency as a tool in service of a greater vision: eco-effectiveness. According to them, instead of improving our practices, we should change the fundamental structure of those practices (McDonough & Braungart, 2002).

The circular economy is a development strategy that aims to redesign production and consumption supply chains at the systemic level. This regenerative economy model can be used as a framework for modern food supply chains but is not restricted to the latter: it is applicable for all contemporary value-chains. Through aiming to maintain the value added in products rather than downcycle them, this system contrasts the prevalent linear model of resource extraction, production, consumption and disposal (Vanner et al., 2014). While the preventive 3RV strategy proposes a hierarchy of waste, the circular economy strategy eliminates the concept of waste. Waste is seen as a material like any other, a raw material that can be used for new designs. By closing resource loops, circular economy strategies continuously reconnect producers, consumers and recyclers. The circular economy strategy is based on two main pillars: the “cradle to cradle” principle and industrial symbiosis (Vanner et al., 2014). In the next lines, we will review the literature on these pillars and explore the existing applications to community-based food supply chains.

2.5.2 Closing the loop: “cradle to cradle” supply chains

There has been extensive literature and theoretical frameworks aiming to redefine food supply chains from linear to sustainable closed systems where resources are returned back as inputs (Sahamie, Stindt, & Nuss, 2013). The closed loop sustainable supply chain literature includes concepts such as industrial ecology and symbiosis, reverse logistics, life-cycle assessment, integrated chain management, and cradle to cradle design (Morana & Seuring, 2011).

Cradle to cradle design is the first principle used in circular economy strategies. In their book dedicated to cradle to cradle design, McDonough and Braungart identify biological cycles and technical cycles. Biological cycles refer to the circular movement of organic materials that once used, can be safely disposed off in natural environments, decompose and provide biological nutrients to the soil. This movement of biological mass should be localized since the ecological balance and needs of each region differs (McDonough & Braungart, 2002). Agroecology is a concept that illustrates both biological cycles and community-based food systems. Agroecology refers to the application of ecological science to design and manage sustainable models of food production. Practitioners and academics have applied this concept to study closed loop alternative food networks (AFN). Altieri and Toledo both advocate for the importance and potential of agroecology by sharing concrete success stories in Cuba, Brazil, Mexico, Central America and the Andean (Altieri & Toledo, 2011). Agroecology is associated with traditional knowledge, participatory methods and the adoption of polycultures. Unlike monoculture organic farming that uses external biological inputs, agroecological farming adopts a self-sustained closed loop system where organic waste is reused as organic input. By using inputs that are not subject to market price volatility, this production method is not only environmentally and socially sustainable, but also economically sustainable for small producers.

Even though agroecological farming is a good example of how small scale food production systems can achieve a fully closed loop, contemporary AFN are not limited to food production. AFN also include activities such as food distribution, marketing, and processing (Venn et al., 2006). Unlike food production, those activities are not limited to the use of organic material inputs: they often require non organic inputs such as packaging material.

In the cradle to cradle literature, those inputs are called technical nutrients. The latter are defined by non-toxic inorganic or synthetic materials that have no negative effect on the natural environment and on human health. Those technical nutrients move in a technical cycle which means they can be continuously reused without losing their quality and value (McDonough & Braungart, 2002). Examples of technical nutrients potentially used in food supply chains include regenerative packaging materials such as metals and plastic. According to the cradle to cradle principle, food packages have to be designed for disassembly and continuous recycling. That means eliminating toxic elements and hazardous materials because the latter will limit the life cycle of the package. Food packaging can also be designed out of organic materials which will permit them to safely biodegrade in the soil and be recovered as biological nutrients. The recovery of packaging has to be thought of and facililated at the conception phase. This cradle to cradle design strategy is termed eco-design (Vanner et al., 2014).

2.5.3 Cradle to cradle community food supply chains through collaborative partnerships

Even though a single organization can adopt eco-design principles and internal value recirculation activities, it can rarely close the loop on its own (Morana & Seuring, 2011). The second pillar of the circular economy strategy is industrial symbiosis (IS). The latter is a cross-sectorial collaborative approach that consists of sharing or exchanging by-product resources and services among industries in a given territory. This collaborative network creates synergies between different organizations (Vanner et al., 2014). According to El-Haggar, the criteria for successful symbiosis between different supply chain stakeholders includes: 1) waste quality and quantity database, 2) technical knowhow and innovation, 3) access to talent and strong social network, 4) environmental and economical awareness, 5) possibility of mutual benefits, 6) proximity between partners' locations, 7) communication and trust between partners, 8) space or facilities for the partnership and 9) legislation and incentive mechanisms (El-Hagar, 2007). Indeed, these practices need to be accompanied by appropriate supporting structures that encourage such networking to take place within local supply chains. Industrial symbiosis (IS) has been studied in the traditional framework of industrial food businesses but less attention has been attributed to the collaborative practices of AFN. Collaboration is a value deeply embedded in community food supply chains. It is also widely practiced among different actors to achieve economic, social and environmental goals.

Community systems aiming to close their loop face barriers such as lack of staff time, of access to knowledge, and of adequate facilities (Baker-French, 2013). A fully autarchic closed loop model is thus not realistic enough to conceptualize a holistic sustainable food system. AFN need to be studied within the local context of the communities in which they operate: food cannot be isolated from other community activities. In that respect, inter-organizational mutually beneficial approaches are needed (Morana & Seuring, 2011). In his community survey, Traub found that a main barrier for access to farmer markets is the limited diversity of needed products and services, especially non-food items (Traub, 2011). Traub recommends encouraging partnerships between farmers' markets and other local organizations. Examples include distributing promotional material of the market in other community-based organizations (i.e., health clinics, local salons, etc.) and inviting community organizations during the market for hosting food-related (nutrition, cooking, gardening, composting) and non-food-related (books, concerts, local crafts) exhibitions and workshops (Traub, 2011).

Those synergistic collaborative partnerships are employed by a number of food security community development organizations. For instance, Cincinnati Imago, Enright Eco village, and their CSA program are three sister organizations that have successfully built synergistic relationships in Cincinnati, Ohio. By sharing and combining their assets and resources, these organizations have connected environmental education, community living and local food production in the neighborhood. Wight frames this collaborative model within the Agro-Ecological-Educator (AEE), a community development framework inspired by Paulo Freire's revolutionary work. By linking complementary human activities with each other and integrating them in the natural cycle, the AEE framework has the potential to redefine the human-earth relationship; and as a result, reconnect us to food (Wight, 2013).

Similarly, Nuestras Raices, a Puerto Rican grassroots urban agriculture organization of Holyoke, MA, is a multifaceted NGO that addresses a diverse array of food systems issues. This community-led organization has developed a large network of community gardens, a 30-acre city farm, cooking projects, youth programs, and environmental policy initiatives. It also provides a safe community space where ideas are exchanged, culture is celebrated, and knowledge is transmitted across generations. Thus, Nuestras Raices has constructed a community food economy consisting of an internal circulatory system in which outputs from a production process become inputs to another (Graham & Cornwell, 2009).

2.6 Research context: alternative food networks in Montreal

In the Montreal context, the food supply chain includes retail outlets (supermarkets, grocery stores, fresh produce stores, etc…), the central market, wholesalers, brokers, packagers, hotels, restaurants, and various institutions. This conventional supply chain aims to handle large volumes and provide a low cost and uniform quality offer on the mass consumption market. In order to do that, it adopts a centralized structure that is dominated by a few companies that buy large volumes of commodities from a small number of large producers. This supply chain model generates a lot of waste (due to its uniformity standards), only benefits a small number of large producers (mostly non local producers), and the food it produces does not reach consumers who need it most. According to the latest report drafted by the commission on social development and Montreal diversity, 60% of the Montreal population has a diet deficient in fruits and vegetables (Comission sur le developpement social et la diversite montrealaise, 2015, p.34). Following the same trend present in North America, this rampant food insecurity in Montreal is accompanied by food waste. In fact, not only does almost half of

the produced ends up being wasted but 20 to 50% of the food “waste” generated is still edible (Comission sur le developpement social et la diversite montrealaise, 2015, p.33).

Alternative food supply chain initiatives have recently proliferated in Montreal. Like other alternative food networks, those Montreal-based initiatives take very diverse forms. While they share the same sustainability and solidarity values, they differ in their supply chain focus and strategies, as well as their business model. In Montreal, AFN include community urban gardens, CSAs, neighborhood markets, distribution cooperatives, and collective kitchens among many other models. Those initiatives have one common supply chain strategy: promoting physical and financial access to healthy food by building locally based short supply chains, particularly in the neighborhoods that are qualified as “food deserts”. This supply chain strategy provides a nexus between the fields of health, food security, community development, local economy, and ecological sustainability (Audet et al., 2015).

Several organizations including Equiterre and the Santropol Roulant manage community supported agriculture (CSA) programs. Neighborhood markets such as the St Henri Citizen Market, the Little Burgundy Citizen Market, the Frontenac market, the Petit Marché de l’Est have also proliferated in various districts in the city. The central value shared among those retailers is solidarity and food security. Thus, even though they aim to locally source their food, some produce is imported to satisfy their mission of food access. Seasonality and cost remain the two main limiting factors those initiatives face when they try to source locally. These AFN are thus working together to develop innovative supply chain strategies that would enable to link local producers with consumers while keeping costs low. Provender, a Montreal-based startup, designed an online platform that connects local farmers with local restaurants. Even though Provender does not specifically target food insecure neighborhoods, they demonstrated the important role of technology in facilitating short supply chain development. Another initiative is Fruixi, a bicycle service that sells local fresh fruits and vegetables in several Montreal food deserts (Audet et al., 2015).

In Montreal, there have been efforts to bring together these alternative supply chain initiatives to develop a sustainable municipal food system. The Conférence Régionale des Élus (CRÉ) in Montreal recently drafted a 10-year development plan for a “Sustainable and Equitable Montreal Food System”, also termed SAM 2025. SAM’s mission is to mobilize regional and local partners working at different scales and spheres of action (environmental, economic, social) in regards to food. The project relies on the expertise of regional and local actors including the industrial, commercial, institutional, municipal and community sectors. SAM aims to shift from

the traditional supply chain model towards a more sustainable, resilient, and equitable one by the year 2025. The plan has five transverse orientations: 1.Enrich the Montreal food supply, 2.Reduce the ecological footprint of Montreal's food system, 3.Promote access to a healthy diet, 4.Promote healthy food, and 5.Reinforce regional linkages. Moreover, the commission on social development and Montreal diversity is currently analyzing the opportunity of forming a food policy council in Montreal. The latter would focus on the following: nutrition and public health, political representation, urban agriculture, waste management, and food waste reduction (Comission sur le developpement social et la diversite montrealaise, 2015).

2.7 Concluding remarks

This literature review aimed to provide a multidisciplinary understanding of waste in contemporary food supply chains. Waste is an important topic of discussion in the social science and sustainable supply chain literature. Even though the social science literature is providing important information to understand waste perception and behaviors, waste is still being studied as something to be understood rather than a potential value for communities. The social science methodologies and the anthropological theories of waste can serve a purpose beyond understanding waste. They can inform community supply chains on socially and culturally appropriate ways to reuse and transform waste. For a community food supply chain to achieve real sustainability, cultural compatibility must also be accompanied by a systems thinking rather than a produce-consume-waste thinking. There is an academic gap between the literature on the circular economy and the literature on community-based AFN. This multidisciplinary research aims to bridge that gap through exploring circular economy practices in Montreal's AFN.

From a practical perspective, this thesis is aligned with the third orientation of SAM: reduce the ecological footprint of Montreal's food system. The local initiatives mentioned above aim to responsibly manage food surplus and byproducts as well as to eliminate waste. They do so by taking a system's approach, portraying problems as opportunities and developing symbiotic and synergistic partnerships. Most AFN process and preserve the surplus fresh produce in order to sell it at low prices; the processing takes place either in their own facilities or in the commercial kitchen of one of their partners. Such practices results in multiple benefits and tackle both the 1st (enrich food supply), 2nd (reduce ecological footprint) and 3rd (promote access to a healthy diet) SAM orientations. Given the recent attention given to this topic in Montreal, this research will give important insight on municipal food policies in regards to waste management and food waste reduction.

3 METHODOLOGY

This research aims to address the literature gap between alternative food networks (AFN) and the circular economy (CE) paradigm. It aims to: **i.** Understand how AFN users define waste and value, **ii.** Provide a snapshot of existing and potential CE practices by local AFN actors, and **iii.** Facilitate and promote a circular supply chain model adapted to Montreal's local AFN. This chapter describes the general methodology and research design used to achieve these objectives. This study comprises three main research phases in line with the research objectives. This chapter aims to give an overview of those research phases and explain their interconnection and integration in the research design. The methods relevant to research phase 1, 2 and 3 are detailed in Chapters 4, 5 and 6 respectively.

1. Waste perception of alternative food supply chain users

2. Circular economy practices and opportunities for alternative food supply chain actors

3. A case study in partnership with the Citizen Market of Little Burgundy

3.1 A multidisciplinary research process

Given the multidisciplinary nature of the research problem and objectives, this study draws on the disciplines of supply chain management, sociology and anthropology in order to integrate their insight and develop a comprehensive understanding of the topic. According to Kennedy, all managerial, design, scientific or technological development to fight waste will be useless without a proper understanding of the cultural aspects of waste (Kennedy, 2007). Thus, this research explores waste in local food supply chains from a sociological, anthropological and supply chain management perspective. On one hand, sociology and anthropology of waste are important for grasping how communities perceive and define waste. On the other hand, a supply chain management perspective describes and analyzes the flow of material resources in AFN.

This multidisciplinary approach is reflected in the research design and methodology. The integration of the disciplines was conducted gradually throughout the research process. As presented in Figure 2, the topic of waste was first tackled from a social science perspective (phase 1). It was then studied in the Montreal context from a supply chain management lens (phase 2). These two phases were treated separately and their results were compared and integrated in the discussion. The highest level of integration of the three disciplines occurred in

the case study (phase 3) that applied the interdisciplinary knowledge gained throughout the research (see Figure 2).

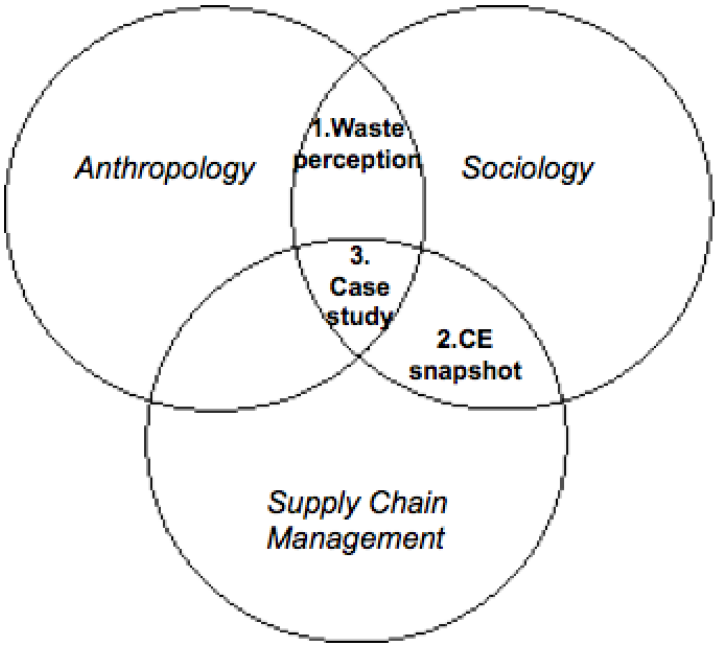


Figure 2: Integration of academic disciplines in research phases

3.2 A community engaged research process

The research objectives stated above were not designed to be universal but rather bound to the local research context. The multidisciplinary approach described above aims to generate applied knowledge that is relevant to alternative food networks (AFN) in Montreal. This study aims to create “living knowledge”, a knowledge that is valid for the participants and useful beyond the research’s outcomes (Swantz, 1996). A community engaged action oriented research process was hence selected as the general methodological framework for this study. In this research, community engagement implies a reciprocal relationship and mutually beneficial partnership between the researcher and the community (Ahmed & Palermo, 2010). Using that definition, the degree of community engagement varied throughout the research process, where the case study represents the most community engaged and action-oriented phase of the research work (see Figure 3).

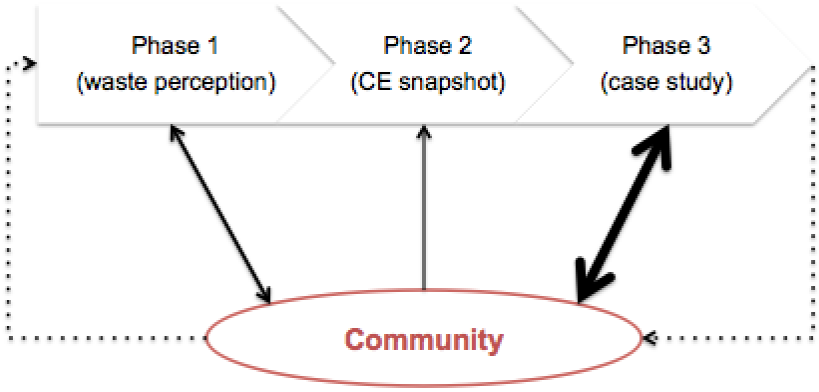


Figure 3: Community engagement level in each research phase

Legend:

Community outreach: one-way interaction

Community engagement: mutually beneficial information exchange

Strong community engagement: Strong long-term reciprocal relationship and mutually beneficial partnership

As shown in Figure 3 above, the first research phase aimed to collect data on how communities perceive waste and this data collection was conducted via an interactive exhibition where participants were made aware of recycling ideas. Thus, phase 1 provided a mutually beneficial information exchange between the researcher and the participants. The second phase aimed to collect supply chain management data from a diverse pool of participants involved in different supply chain levels. It was not logistically feasible to organize an interactive data collection method that would bring all the participants together. Stakeholders involved in food production, processing, marketing, recycling and community development have different work schedules and different peak seasons. Thus, phase 2 provided a one-way interaction where participants provided information to the researcher via customized surveys. Due to the limited scope of the research project, the information collected in phase 2 did not directly result in customized recommendations to all surveyed participants. This information was used to inform phase 3 of the research (the case study): a specific community organization benefited from these findings. Phase 3 was the research phase with the highest level of community engagement. There is a long-term mutually beneficial relationship between the researcher and

the community. Since September 2014, the researcher has been continuously working as a volunteer consultant to the community organization, focusing on “closed loop and partnerships”. In exchange, the community organization has provided the researcher with various learning opportunities in regards to community development and sustainable supply chain management. The case study was also the most action oriented research phase as the outcomes include practical recommendations for implementation. In the next chapters, more details are provided for the specific data collection and analysis methods employed in each research phase.

However, it is important to note that the methodology used is not a participatory action research (PAR) methodology. PAR is a specific research methodology within community-engaged research. Our methodology has many aspects of PAR: it aligns its goals with those of the community, it is built on a reciprocal long-term relationship with the community, and it provides living knowledge and real opportunity for action. However, PAR engages the participants in each research phase: the problem definition, research design, data collection, data analysis and dissemination. In PAR, participants share many tasks with the researcher and highly contribute to the research direction. We could not fully implement a PAR research process due to encountered participation barriers, which will be detailed in sub-section 3.4.

3.3 Research design: integration of research phases

AFN and community food systems’ literature emphasizes the importance of food citizenship, i.e., the active involvement of citizens in their food supply chains (Baker, 2004). Citizens are more than consumers and should engage in food production, processing, distribution, marketing or recycling. AFN encourages people to have a comprehensive and systemic knowledge of how food is produced, distributed, cooked, eaten and revalorized. This holistic perspective blurs the line between food consumers (or users) and food actors (or professionals). In AFN, most people are both food supply chain users and actors. Their role changes from user to actor and from actor to user depending on the social and physical context they are placed in. Moreover, according to Thompson, people’s waste behavior is dependent on both their worldview and their actions or experience. There is a dynamic relationship between those two variables: the worldview affects the actions and the latter shape the worldview (Thompson, 1979). When studying waste and circular economy practices in AFN, one has to study both waste perception (worldview) and waste management (action). As Figure 4 shows, the research was designed in a way that both the user and actor perspectives were considered.

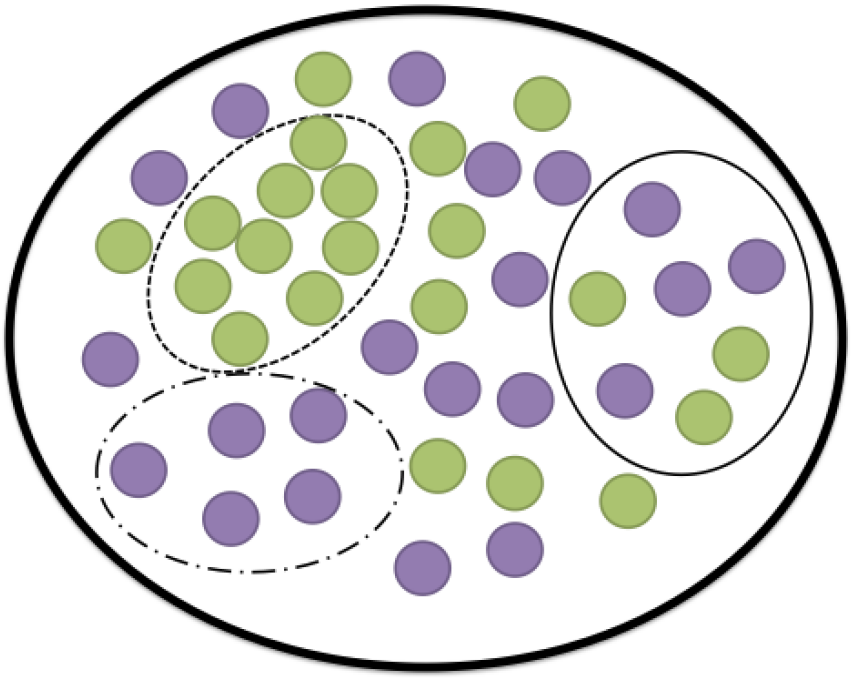
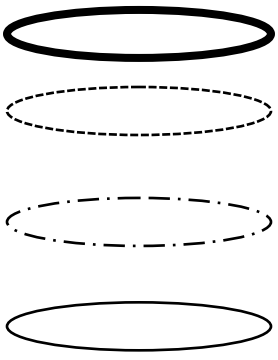


Figure 4: A research design built around AFN users and actors

Note: In this figure, each green circle represents a food supply chain user (i.e., consumer, buyer etc.) and each purple circle represents a food supply chain actor (i.e., producer, restaurant, retailer etc.)

Legend:



Alternative food supply chain network (AFN) in Montreal

Phase 1: Getting a user's perspective on waste and circular economy practices

Phase 2: Getting an actor's perspective on waste and circular economy practices

Phase 3: Engaging both users and actors of a specific AFN to design a zero waste circular food system

The general research design is summarized in Table 1 below:

Table 1: Research design overview

	Phase 1	Phase 2	Phase 3
Theoretical framework	Anthropological and social studies of waste	Sustainable supply chain management and circular supply chain studies	Interdisciplinary framework
Data collection method	Live exhibitions accompanied by surveys and discussions	Surveys Interviews	Regular participation in community meetings, operations and events Participant observation One live exhibition accompanied by surveys and discussions Interviews and discussions with the market's actors Interviews and discussions with potential partners
Participants	AFN users N=80	AFN actors N=33	The market's users and actors N=50
Data collection events	8 exhibitions	4 fieldtrips	Continuous
Data analysis method	Quantitative and qualitative analysis	Quantitative and qualitative analysis	Data triangulation
Time between start and completion	1 month	1 month	1 year of continuous interaction, relationship building and participation in the community.

3.4 Hurdles experienced during the study

A number of challenges were encountered when the methodology was employed. The fieldwork was conducted over the summer 2015 in order to reach a diverse pool of local food actors. That is a very busy period for producers and small restaurants and it created participation barriers. This limitation was somewhat offset by conducting short supply chain surveys (phase 2) to AFN actors with time constraints. The data collection method in each research phase was thus designed in a way that would best suit the participants while delivering consistent data.

Also, in regards to the case study (phase 3), the Citizen Market is not necessarily representative of all alternative community-based food supply chains in Montreal. As shown in the literature review, such initiatives are very diverse and they are shaped by the local needs and culture of the neighborhood they operate in. The research was designed in a way that would offset that limitation: the first two phases of the research tackled different AFN contexts in order to provide more general data. The case study thus provides complementary data. It is an "empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context" (Yin, 2009, p.18) . This experiential case study allowed for a thorough analysis of a particular AFN and aimed to produce living knowledge for that particular organization.

Moreover, the time during which we conducted the case study was unstable for the Citizen Market. The community organization was lacking financial capacity and sustainability and had to undergo structural changes. During that time, some activities and services were discontinued. It was not easy to mobilize the community around "waste" when the organization's existence itself was at stake. The research design was thus constantly adapted to suit the fluctuating needs and situation of the community.

4 WASTE PERCEPTION OF ALTERNATIVE FOOD SUPPLY CHAIN USERS

This first research phase aims to explore how AFN users categorize and distinguish trash from value. Understanding how people define, perceive and describe items made out of “trash” can inform supply chain actors wishing to engage in sustainable behavior as well as municipal policy makers. In this chapter, we will use the terms trash, rubbish, garbage and waste interchangeably.

4.1 Methods

In this research phase, the data was collected through live exhibitions of items that were repurposed out of food supply chain waste. During the exhibitions, multiple-choice surveys were distributed to participants asking them which repurposed items they found most useful, which ones remind them of garbage, which ones they would do at home for their own use, which ones they would sell and which ones they would buy (Appendix A). Even though most of the participants surveyed are actively engaged in specific areas (see Figure 5) of their food supply chain, the context in which the exhibition was presented focused on their perceptions and preferences as users. The exhibition format was designed to leave room for open-ended discussions and comments. A real-life exhibition of the items was preferred to a virtual photo representation because it provides the participants with an opportunity to interact, touch, smell, appreciate or reject the object in front of them. Those sensory experiences play an important role in determining and showing to what extent we value, appreciate or reject certain objects. This data collection method also aimed to engage participants and start informal discussions around waste, recycling and repurposing. It also indirectly aimed to raise awareness on the waste that society generates from daily food related activities.

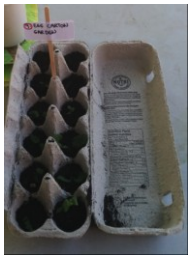
The raw materials used to design the seven objects included organic food waste materials (i.e., orange peels and used coffee grounds) as well as packaging waste that was in contact with food before being repurposed (i.e., egg cartons, cans, corks and plastic bags). The following seven objects were exhibited (see table 2 below for details):

1. A personal storage box
2. A tin can lantern
3. A coffee scrub & orange coconut moisturizer
4. A cork board

5. An orange peel candle
6. Plastic bag coasters
7. An egg carton garden

Table 2: Repurposed items presented during the live exhibition

Item	Raw Materials
 1- Personal Storage Box	- Egg carton - Personal objects for display
 2- Tin Can Lantern	- Tin can - Paint
 3- Coffee Scrub and Orange Coconut Moisturizer	- Used coffee grounds - Coconut Oil - Orange peel
 4- Cork Board	- Wine cork - Plastic box - Glue

	5- Orange Peel Candle	- Orange peel - Vegetable oil - Cotton
	6- Plastic Bag Coasters	- Plastic bags
	7- Egg Carton Garden	- Egg carton - Soil - Seeds and seedlings

As explained in sub-section 2.2 of the literature review, the social and physical context in which an individual is placed may affect his perception and response to the repurposed objects. Priorities, challenges, skills and interests can vary from one supply chain context to another. For instance, people engaging in regular urban food production might perceive item 7 (i.e., egg carton garden) differently then people engaging in community development activities. The latter might appreciate the creativity and craft aspect while the former might focus on the effectiveness of an egg carton in containing seedlings. Also, since food producers use compost as an input in their operations, they may be more knowledgeable and interested in organic waste management in comparison to restaurants and retailers. Thus, in order to get a general understanding of waste perception and to avoid having a biased sample, this exhibition was repeated in five different supply chain contexts (see Figure 5). Exhibitions were conducted and participants were approached during the following local community-based activities:

- Food production
- Food marketing
- Food processing

- Recycling and composting
- Community development and artistic workshops

Figure 5: Supply chain contexts where the exhibition was conducted

The exhibitions and surveys aimed to have a more or less equal representation of the five supply chain contexts illustrated above (see Figure 5). However, it is important to note that the sampling method selected is not purposive. Even though the researcher pre-selected the different contexts in which the exhibition was conducted, all participants present in the selected contexts were encouraged to engage in the exhibition and data collection. From all the participants, only a random sample agreed to engage in the data collection. A total of 85 participants engaged in the exhibition and filled the survey. The data was inputted in a spreadsheet and was analyzed qualitatively and quantitatively. Quantitative data derived from the surveys were triangulated with qualitative data such as the participants' reactions, explanations and comments. This analysis generated seven research themes that are further discussed in sub-section 4.3.

4.2 Results

4.2.1 Sample used

In order to generate data that is representative of the usual day-to-day AFN context in Montreal, the same exhibition was repeated in those different alternative food network (AFN) contexts. As Table 3 and Figure 6 show, the different supply chain contexts were not all equally represented like planned in the method section. Participants involved in production, processing and recycling contexts are less represented than participants involved in food marketing and community development contexts. This variation in participation rate from one context to another can be explained by logistical reasons. In alternative food supply chains, food markets and community development events usually bring together more people than operational contexts (i.e., production, processing, recycling). In the latter, only regular employees and volunteers are usually present. In the former, participation is not only limited to employees and volunteers; customers and users are also present.

Moreover, as seen in Figure 6, females are more present than males in regular events of AFN in Montreal. Out of 85 participants who agreed to fill the survey, 60 were females (i.e., 70%) and 25 were males (i.e., 30%). Regarding the age distribution, 74% of participants were less than 45 years old (see Figure 6). About 45% of participants were females aged between 25 and 44 (see Table 3 and Figure 6).

Table 3: Sample description

	Age								Total
	24 or less		*25-44*		*45-64*		*65 or more*		
Supply chain context	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	
Production	0	2	1	8	1	1	0	0	13
Marketing	3	1	4	11	3	9	1	2	34
Processing	1	0	2	3	1	2	0	0	9
Recycling	2	0	4	2	0	0	0	0	8
Community development	1	4	0	14	1	1	0	0	21
Total	7	7	11	38	6	13	1	2	**85**

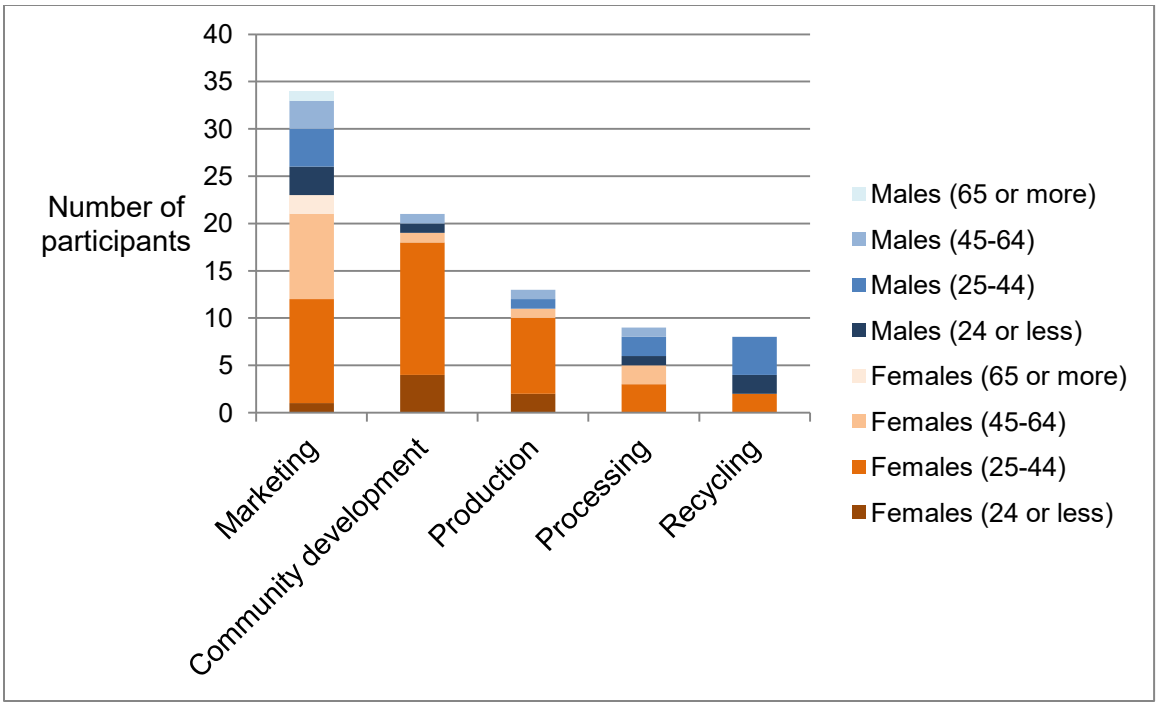


Figure 6: Sample description

4.2.2 Participants' perception of exhibited items

As shown in Figure 7, item 3 (i.e., coffee scrub and orange-coconut moisturizer) and item 7 (i.e., egg carton garden) were described as useful by 26.44% of participants (in both cases). In contrast, item 1 (i.e., personal storage box) and item 6 (i.e., plastic bag coasters) were described as useful by only 6.61% and 2.48% of participants respectively. Those same items (item 1 and item 6) were described as garbage by 21.59% and 22.73% of participants respectively.

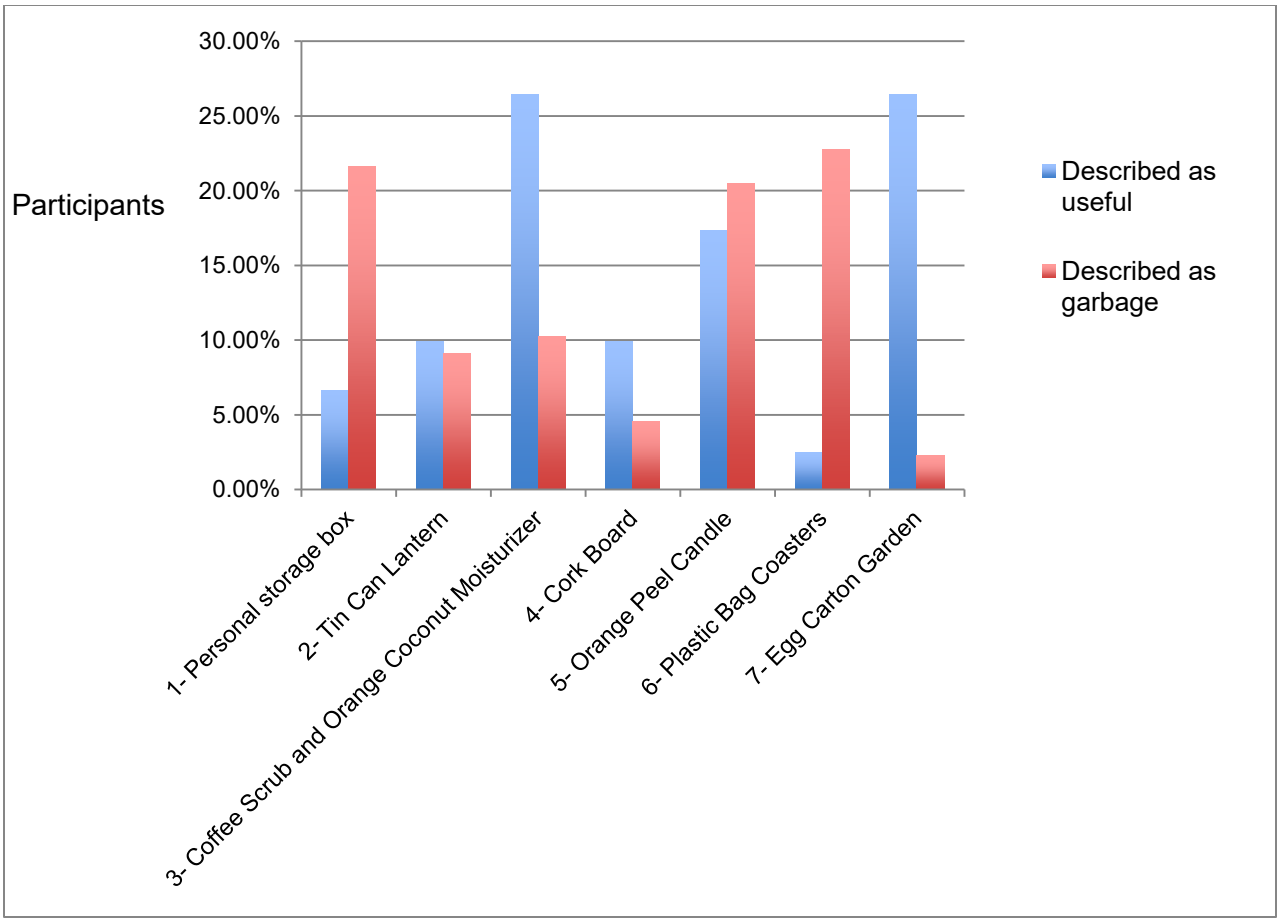


Figure 7: Participant perceptions on repurposed items

In the stacked bar chart (Figure 8), when compared to each other on a scale of 100%, item 7 was significantly preferred over item 1. Even though both items were made from the same material, each one has a different purpose and function.

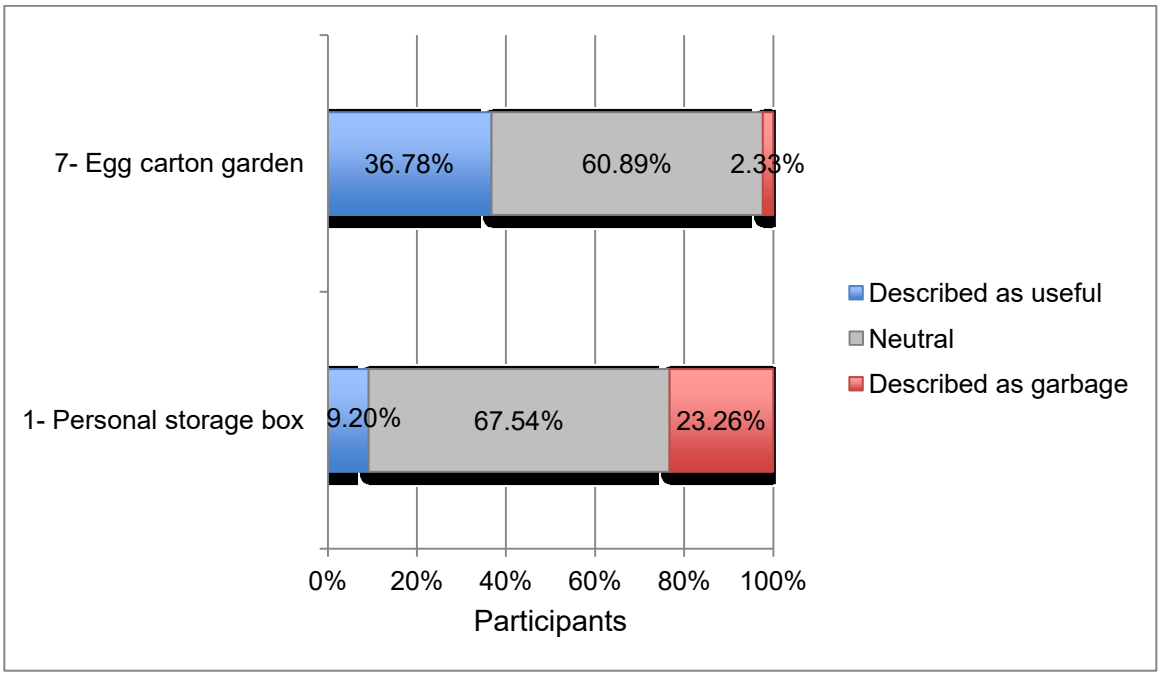


Figure 8: Repurposing an egg carton into two different items: different reactions

As shown in table 4, out of the seven exhibited items, three are physically perishable (i.e., meaning they have a short shelf life and will either be consumed or deteriorate quickly) and four are non-perishable (i.e., meaning that they are more durable).

Table 4: Perishability of exhibited items

Item	Perishable	Non perishable
1- Personal storage box		X
2- Tin Can Lantern		X
3- Coffee Scrub and Orange Coconut Moisturizer	X	
4- Cork Board		X
5- Orange Peel Candle	X	
6- Plastic Bag Coasters		X
7- Egg Carton Garden	X	

Figure 9 shows that 63.20% of participants described perishable items as useful in contrast to only 12.40% who described non-perishable items as useful. Moreover, 57.96% of participants described non-perishable items as garbage in comparison to 32.95% participants describing perishable items as garbage.

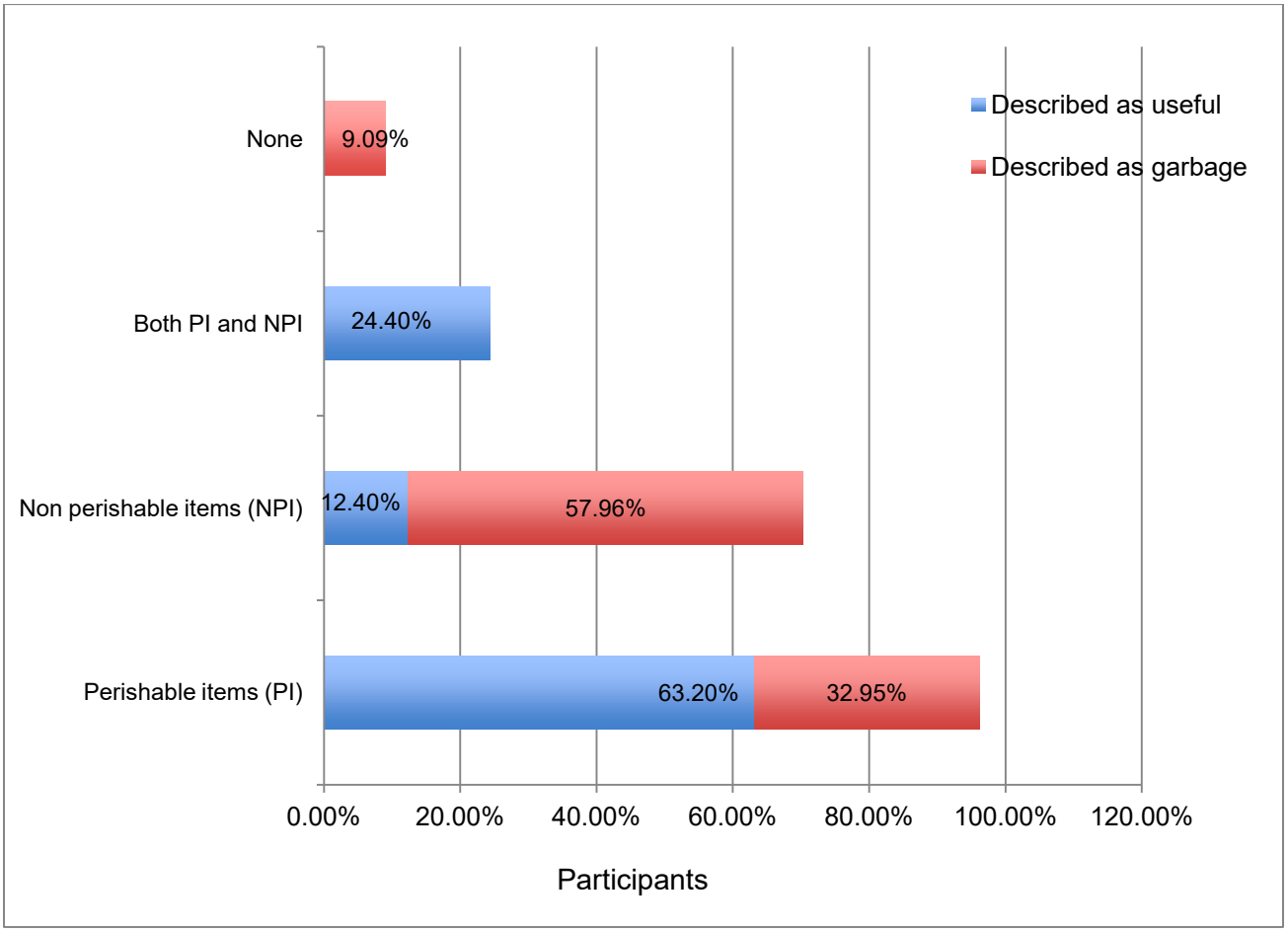


Figure 9: Relation between object perishability and acceptance

As shown in Figure 10, for six out of seven items, the number of participants who would engage in making those items for their personal use is higher then the number of participants who would engage in commercial activities (sell or buy) associated with these items.

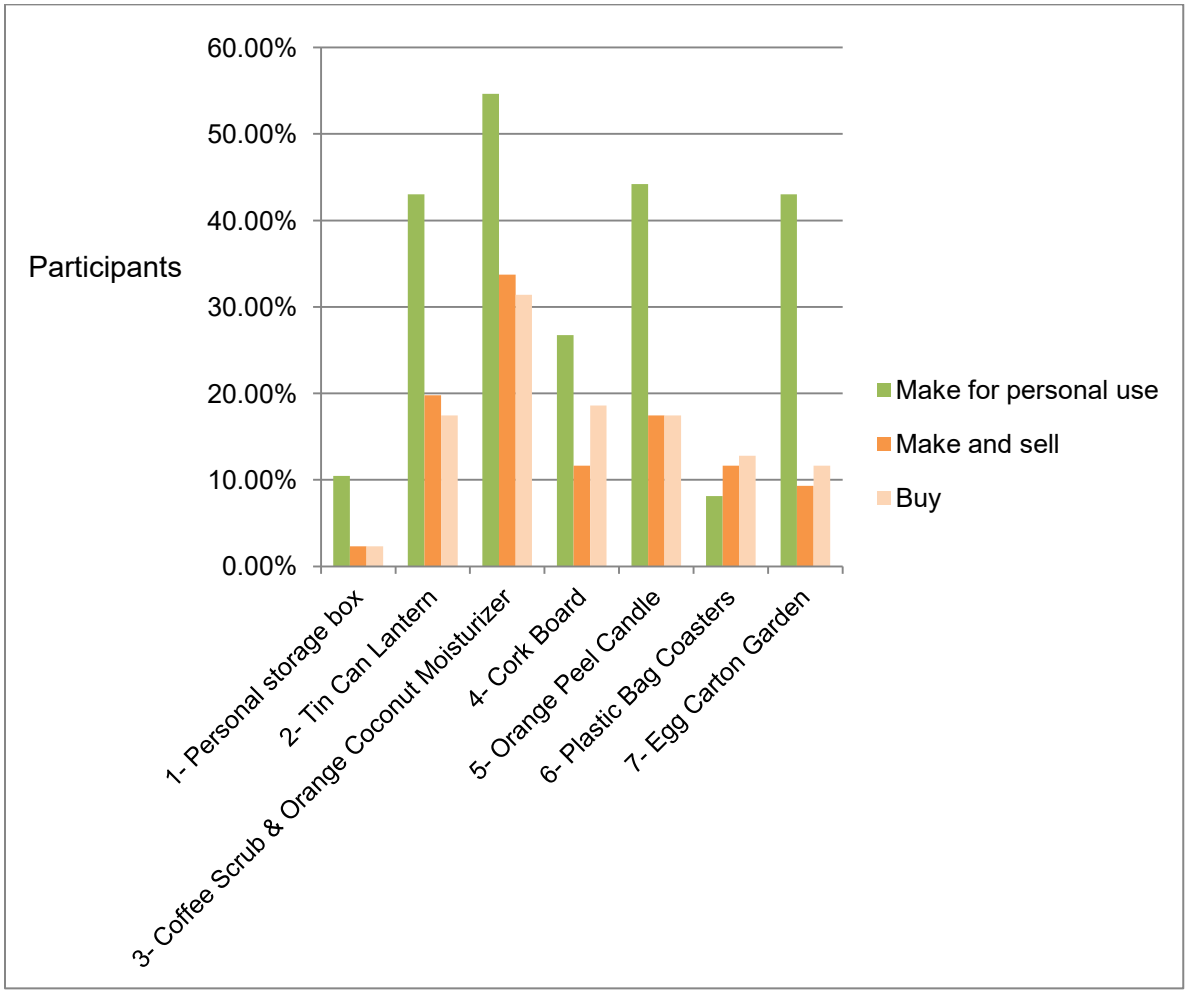


Figure 10: Comparing private usage and public transactions of repurposed items

4.3 Discussion

4.3.1 Waste as matter out of place

According to Douglas' Purity and Danger Theory, "where there is dirt there is system" (Douglas, 1966, p. 36), people do not think of rubbish as matter with specific intrinsic physical properties. Rather, they categorize objects as useful or rubbish by accepting or rejecting the social and physical context in which these objects are placed (Douglas, 1966). The following

observation relates Douglas' theory to contemporary waste management dynamics. During a discussion on recycling, a participant explained that she was not using the municipal compost system available in her neighborhood. Her reason was that the collection is only made once every week. The woman explained that she doesn't have the space to store organic waste and that she considered leaving it in a sealed box in the fridge but couldn't bring herself to do so. "I don't want to leave it in the fridge next to fresh food". This statement implies disgust and repulsion in placing organic waste in an inappropriate place (a fridge) in contact with incompatible matter (fresh food).

Similarly, the exhibition showed the same pattern in people's perception of garbage. In this exhibition, two identical egg cartons were repurposed into two objects with different social meanings and purposes. The first object (i.e.,1. personal storage box) consists of using the egg carton as a box to store personal items such as nail polish, makeup, and jewelry. The other object (i.e., 7. egg carton garden) consists of using the egg carton as a container for starting seedlings. As shown in Figure 8, only 9.20% of participants saw the personal storage box as useful and 23.26% indicated that it reminded them of garbage. In contrast, the egg carton that contained soil and herbs, was seen as useful by 36.78% of participants and only referred to as garbage by 2.33%.

Participants referred to the personal storage box as "obvious", "unoriginal", "useless", "a source of disorder". Participants explained that they were not comfortable leaving an egg carton in contact with sterile objects in their bathroom or bedroom: "this is something I wouldn't put in my room". "I wouldn't mind storing objects in a yogurt container because you can wash a yogurt container. But this carton contained eggs and is unwashed", said a woman explaining her reasoning. The egg carton itself does not remind them of trash, but putting it in contact with personal supposedly "clean" objects is not an appealing idea. An unwashed egg carton and a lipstick are considered to be incompatible matter and should therefore not be in physical contact. The personal storage box is thus rejected in the context it is presented in: something to place in your room for storing personal items. When matter is placed or represented in a context that does not conform to social and cultural norms, it can be perceived as garbage (Douglas, 1966). In contrast, participants welcomed the idea of starting seedlings in an egg carton and mixing living and organic matter together, knowing that the latter will be buried and decompose in their garden. The fact that the egg carton is unwashed is not an issue when the latter is mixed with matter it is compatible with. The egg carton, soil and seedlings are all organic matter and will all biodegrade.

4.3.2 The impact of appearance and usage to perception of repurposed items

Some participants may be more or less tolerant to disorder and to mixing incompatible matter. However, a minimum amount of transformation is required to change their perception of a recycled item from trash to value. During the exhibition, participants justified their rejection of the personal storage box by the “ugly” and raw appearance of the latter: “this object is not transformed enough, it would have been nice if the carton was decorated or painted” commented some participants who engaged in the exhibition. The item in question was indeed not modified physically in order to resemble a traditional personal storage box. But more importantly, it resembled much more an egg carton than a storage box. The personal storage box simply consisted of an opened egg carton containing personal items rather than eggs. According to Kennedy, garbage is “out of sight”, thus “out of mind” (Kennedy, 2007). In that exhibition, the trashed material that was repurposed into a useful material was not out of sight. This object was repurposed in a way that does not hide its previous life and purpose. When participants can visualize the item’s previous life, they are reminded and connected to its past use and disposal (Scanlan, 2010).

It takes more than a physical transformation of an object to change a user’s perception of a repurposed item. During the exhibition, when the orange peel candle was not lit, some participants did not recognize what that object was supposed to represent. Just lighting the candle changed it from being a perishable orange peel to an original repurposed candle. In order to repurpose an item A into an item B and for users to recognize and use the object as item B (and not as the remnants of item A), the object’s appearance and usage has to conform to the social and cultural norms of item B.

4.3.3 The function and purpose of an object

During the informal discussions, waste was defined as “something you cannot use”, “something useless in its current state”. The perceived usefulness or uselessness of a material is related to the extent of which it will be valued. The final purpose of the item plays a role in how it is accepted or rejected, and how it is valued. For instance, in regards to the personal storage box, participants can make or buy practically any object and use it as storage. Other simpler objects (repurposed or not) can satisfy the storage function without creating a sense of disorder or disgust. Tolerating the discomfort of placing an egg carton in a bedroom or bathroom is therefore not worth it. Moreover, people do not relate to storage as a fun activity. Gardening on the other hand has a positive leisure connotation and is appreciated and valued in a country

where one can only plant seedlings in the spring. Moreover, referring to Figure 7, only 2.48% of participants referred to the plastic bag coasters as “useful”. According to a participant, “we can think of better uses for plastic bags”. The plastic bag coasters are rejected due to their perceived uselessness in comparison with what can be done with plastic bags. In contrast, Figure 7 shows that 26.44% of participants referred to the coffee scrub as useful. The explanations of participants regarding why they chose the coffee scrub were all related to the item’s function and its positive properties.

Circular economy strategies therefore have to be aligned with the raw material needs of local food supply chains. For instance, recycling food waste into organic compost would not be a sustainable practice if the target stakeholders did not need the extra organic compost that was produced. When designing closed loop supply chain strategies, it is thus important to consider the following questions:

- Which food supply chain stakeholder will use the raw materials derived from recycling?
- Do those stakeholders need more supply for this raw material? Is this action filling a need or is it just creating surplus?
- How will the target stakeholders use those raw materials?
- How are those raw materials valued? And why?

4.3.4 The impact of perishability on the acceptance of items

This exhibition aimed to explore why certain materials are more valued than others. On one hand, organic food materials have very short life cycles and deteriorate rapidly compared to other sources of waste. Referring to Thompson’s theory of rubbish, these materials are transient, ephemeral and become rubbish in very little time (Thompson, 1979). Humans are disgusted and repulsed of dirt, and dirt is matter out of place (Douglas, 1966). In that sense, one might argue that orange peels, used coffee grounds and soil should be buried in the ground rather than used in our homes and on our bodies. Moreover, human beings experience organic rubbish differently than non-organic rubbish: organic matter smells, decays, transforms, lives and dies. Those basic life processes are part of the natural biological cycle that humans are subject to. The lack of control over this natural transfer from transient to rubbish can be perceived as a source of disorder and danger to our social order. On the other hand, non-perishable items have longer life cycles and are more controllable.

Are we less tolerant to organic perishable matter in comparison to non-organic non-perishable matter?

The results of the exhibition show that it is interestingly not the case; participants were more prone to categorize perishable matter as useful and non-perishable matter as rubbish (see Figure 9). It is crucial to clarify that Thompson's theory doesn't limit the transient attribute to what is physically transient (organic). Non-perishable materials can be transient as well if their socially constructed value decreases with time. We cannot therefore objectively categorize items that are more physically transient as transient and those that are less physically transient as durable. According to the Rubbish Theory, all seven objects shown to participants are somewhere between being transient, durable and rubbish. Their categorization is socially constructed, malleable and flexible (Parsons, 2008).

4.3.5 Value as a social construct

Why are some objects more positively perceived than others? What are the social and cultural factors that are in play during this categorization?

Douglas's Purity and Danger theory is useful in understanding our relationship and tolerance to disorder but also shows limitations when applied to understand what our diverse and modern society values. The results of the exhibition support Thompsons' thesis that society gives objects their quality. Contemporary food packaging (carton, plastic, paper, glass etc…) and food materials (coffee grounds, peels etc…) do not have noble connotations. They are simple materials whose value decreases with time. However, this study shows that repurposed perishable materials are valued. When asked why they find those organic items useful, participants justified their choices by stating the following desirable qualities: "organic", "natural", "smells good", "exfoliates well". Here, natural doesn't equate rubbish; natural is a positive quality that is valued and even idealized. This observation fits the current North American food context that is being shaped by various contemporary social movements that advocate a return to nature. The latter include the slow food movement, the organic movement, the permaculture movement, etc… This observation is aligned with Thompson's rubbish theory in that the value that participants attribute to the exhibited objects is socially conditioned (Thompson, 1979).

The qualities that participants attributed to the exhibited perishable items outweigh the transient nature of the latter. In fact, the objects that were seen as most useful (i.e., the coffee scrub, the orange peel candle and the egg carton garden) imply ephemeral experiences whereas the ones that were seen as least useful (i.e., storage containers, boards and coasters) imply ownership. Transient human experiences such as gardening, exfoliating the skin, or enjoying the orange scent of a candle seem to be more valued than the ownership of durable

objects. This observation is aligned with current observations in regards to consumer preferences. Today's users are expressing a preference for access over ownership (Zimmerman, 2012). In fact, consumers show a preference towards services that enable them to access products on demand rather than owning those products, making them users. In this emergent collaborative consumption model, access is achieved through business models built on sharing, exchanging, returning and reusing resources (Zimmerman, 2012). In fact, alternative food network actors in Montreal are sharing, pooling and exchanging resources such as work space, purchase orders, transportation, tools, food and knowledge in order to use their existing assets efficiently and enable food access to the community. This shift from individual ownership to collaborative and shared access has the potential to make AFN more economically, socially and environmentally resilient. The sustainable collaborative practices of AFN actors and their potential will be further explored and analyzed in the next chapter.

4.3.6 Rubbish tolerance and social interactions

The results presented in this chapter indicate that more people would use the exhibited items in a private context than in a public one. As shown in Figure 10, for six out of the seven exhibited items, the number of participants who would make the items for their own use (i.e., private context) is higher than the number of participants who would sell or buy the items (i.e., public context). In total, 95% of participants said they would make at least one of the exhibited items for their own personal use; 71% participants said they would buy at least one of the items; and 59% said they would make and sell at least one of the items. The data suggests that rubbish seems to be less tolerated in public transactions than in private contexts. In accordance with Thompson' Rubbish Theory, there seems to be a boundary in the public-private continuum where an object loses its socially malleable value and becomes rubbish. According to Thompson, the boundary between rubbish and non-rubbish is not fixed but moves in response to social pressures (Thompson, 1979).

Public transactions of repurposed items imply the adherence to social norms and commercial standards. In fact, participants explained their willingness or unwillingness to engage in commercial activities of repurpose items by providing a set of favorable conditions needed to engage in such activities. The main conditions that emerged when people considered buying the exhibited items were the esthetic appearance of the items, their neatness, their presentation and their labeling (i.e., "I would buy the tin can lantern if it looked prettier" "I would buy the coffee scrub if the recipe looked more complex"). The objects exhibited resembled too much their original state to be considered for purchase. For many participants, the main reason

not to buy those items is that they could make them themselves (an observation that is based on the analysis of the data). The main condition for commercial transaction of repurposed waste seems to be the extensive transformation of that byproduct into an unrecognizable new object.

When asked if they would make and sell the exhibited repurposed items, participants had to shift their supply chain perspective from users to actors. One person explained that she would engage in making and selling orange peel candles only if she can partner with a fruit juice business. She added that she would need to find an “efficient” and effective way to make use of their fruit peels given the perishability of the latter. Other participants explained that they would make and sell the coffee scrub because it is “the easiest to sell”. Coffee is a raw material that they regularly consume and the processes (re-formulation, packaging, labeling, marketing) needed to transform used coffee grounds into a scrub are simple and rapid.

4.3.7 The role of supporting environments and resources

Observations made during the exhibitions suggest that resources play a role in shaping how objects are perceived and how they move between the rubbish and non-rubbish categories. The four main resources identified as impacting how waste is managed are space, time, knowledge and social network.

As discussed in sub-section 4.3.4 of this chapter, participants show a preference for perishable items (that will be either consumed or naturally degrade) over non-perishable items (that will stay around for a long time). Participants don’t seem keen in constantly reusing and seeing their waste but would rather consume it and make it disappear. As discussed in sub-section 4.3.4, there could be several explanations to why people prefer consumable materials to durable ones. Another explanation could be the lack of space associated with living in the urban context of Montreal. Participants portrayed the “lack of space” as a barrier to recuperate, reuse and recycle waste. This barrier plays an important role in moving the flexible boundary between the non-rubbish and rubbish. Perishable items are soon made invisible and disposed of by the user. This disappearance may or not be environmentally sustainable depending on the disposal method and site. Unlike perishable items that disappear through being consumed or biodegraded, durable items take up space and accumulate. According to a participant, “When something accumulates in you basement, you know it is waste. Objects need to flow, from one state to another, or from one person to another”. From this perspective, it is only when objects stop moving and start accumulating that they become useless.

Time is another limiting resource when it comes to waste management. Participants explained that they did not always have the time to recuperate, store, repurpose, recycle or exchange the byproducts they generate. Moreover, the first question many people asked when engaging in the exhibition is “how did you make that?” In order to identify with the object and understand its purpose, one needs to understand the process it went through. Information and knowledge are indeed valuable resources that could either promote or limit a community’s ability to manage waste sustainably.

The fourth resource (i.e., social network) is extremely valuable because it links people with complementary assets and creates symbiotic and synergistic relationships that are necessary for a sustainable supply chain. If a person has both the time and knowledge to repurpose waste but does not have the space, a solution could be to use or rent a space of someone they know (i.e., a person or an organization). For instance, citizens or social economy businesses can partner with Carrefour Alimentaire Centre-Sud and use their commercial kitchen for preserving their food surpluses. Alternatively, if someone has no time, knowledge, or space to repurpose a byproduct, they could donate, sell or exchange it to someone they know who has those resources (i.e., a person or an organization). For instance, a busy brewery that generates beer byproducts does not necessarily have the time to effectively reutilize that material; by partnering with pig producers the brewery can have this byproduct collected at no cost. In that example, the producer has the time and resources to collect the beer byproduct since they value it as a main raw material that they have to source in all cases. Not only does the social network of a person or organization affect how it will manage its byproducts, but it also affects the person’s (or organization) perception of what is trash: “Garbage is something that has no use for me and anyone that I know. If I know someone who reuses that byproduct or uses it as a raw material, I do not consider it as garbage”.

4.4 Concluding remarks

This chapter aimed to explore how waste and value are defined by a sample of AFN users. In accordance with Thompson, the boundary between rubbish and non-rubbish was found to be flexible and socially malleable. It depends on a number of factors such as the social and physical context in which the object is placed, its esthetic appearance, its function and purpose, its socially constructed qualities, its place in the private-public continuum, and the perceived presence or lack of resources.

This moving boundary shows how different contexts generate different perceptions. Users' perceptions shape their behavior as actors; someone's worldview of waste can be reflected in how he manages the byproducts he generates. In fact, the relationship between worldview and action is not a one-way causal relation. Just as perceptions inform actions, the latter and their result in return inform the worldview (Thompson, 1979). In Chapter 5, we will explore how AFN actors manage and engage in collaborative circular economy practices. We will compare the observations made in Chapter 4 with the daily reality of AFN in Montreal.

5 CIRCULAR ECONOMY PRACTICES AND OPPORTUNITIES FOR ALTERNATIVE FOOD SUPPLY CHAIN ACTORS

This phase of the study aims to explore how local alternative food supply chain actors manage the byproducts they generate, and to discuss the role of symbiotic partnerships in contributing to a circular food model. Alternative food networks (AFN) aim to shorten the spatial, social and economic distance between local users and actors (Venn et al., 2006), changing the role of users from mere consumers to pro-active citizens with a certain degree of involvement in their supply chain (Renting, Schermer, & Rossi, 2012).

In a food system where the line between users and actors is blurred, is it the case that the worldview of users is reflected in their actions and waste practices? Are the findings related to waste perception aligned with those related to waste management and practices?

5.1 Methods

In this research phase, the data was collected through structured open-ended surveys, interviews and informal discussions. In the supply chain surveys, local food actors were asked about (i) their profile (i.e., type of food supply chain activity, location, market etc.), (ii) their input and output management (i.e., sourcing, waste management, etc.), and (iii) their inter-organizational partnerships aiming to recirculate value (Appendix B). In this research phase, structured open-ended surveys were selected as the main data collection tool for the following reason: only 4 out of the 40 participants that were contacted had the time to meet for an interview. In fact, those supply chain actors were working in a fast paced environment that required their full attention (local food markets, small restaurants, community spaces). In contrast, 33 out of the 40 participants agreed to participate in the survey. The researcher conducted the surveys in the participants' work location (neighborhood markets, restaurants, food shops, etc.). This face-to-face interaction was proven to be effective as it enabled the researcher to connect with local AFN actors and to avoid collecting data that was out of context. Moreover, in some cases, surveys were extended into in depth discussions depending on the participants' time and interest. Thus, the open-ended surveys allowed for a balance between a consistent data collection, an unburdensome experience for participants, and the opportunity for in depth discussions.

The participants contacted were all local and small sized organizations engaged in Montreal's food supply chain. The participants included traditional for-profit businesses (such as

local restaurants and producers), non-profit organizations with a food security mission (such as non-profit food markets and collective kitchens) and cooperatives (such as food stores and restaurants). As discussed in sub-section 2.5.3 of the literature review, an output of a production process could be an input for another production process. In other words, one stakeholder's byproduct may be perceived and used as a raw material by another stakeholder. For instance, one farmer's organic waste may be another farmer's raw material for his compost production system. A brewery's byproducts may be one farmer's raw material for animal feed. A retailer's unsold vegetables could be a restaurant's affordable ingredients of its soup of the day. Thus, in order to identify existing and potential synergies, participants from the following three supply chain stages were contacted and surveyed (see Figure 11 below). The participants surveyed were involved in (i) agricultural production (i.e., local food producers), (ii) food processing (i.e., local cafes, restaurants, breweries and collective kitchens) and (iii) food marketing (i.e., local markets and local retailers or stores).

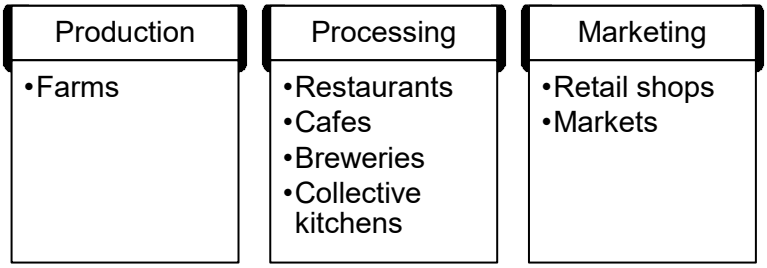


Figure 11: Local organizations surveyed

A total of 33 participants were surveyed in regards to their supply chain practices. The survey data were inputted in a spreadsheet and analyzed quantitatively and qualitatively. Supply chain practices were quantified and partnerships were described and mapped (see sub-section 5.2). Also, in order to provide a context to the data collected in the surveys and in-depth discussions, key informants from institutions or organizations focusing on waste management in Montreal were interviewed (i.e., Recyc-Quebec, Compost Montreal and Eco quartier NDG). The data collected in these three interviews were triangulated with the survey data. This permitted to generate research themes (see sub-section 5.3) that are aligned with the current municipal waste management context. Finally, the literature on circular supply chains was revisited and a circular economy framework for AFN was proposed.

It is important to note that the data collected in this research phase does not aim to be representative of Montreal's local food supply chains. This study is exploratory in nature and it provides the reader and local stakeholders a snapshot of existing local circular economy practices. It aims to inform food organizations that want to engage in sustainable supply chain activities on the current practices, challenges and opportunities ahead.

5.2 Results

5.2.1 Sample used

Participants were approached in public markets, neighborhood markets, and small food stores. The participants included actors involved at the production (i.e., local producers), processing (i.e., restaurants, cafes, breweries, and collective kitchens) and marketing stages (i.e., public markets, neighborhood markets and small food stores) of the local food supply chain. As shown in Table 5 and Figure 12, out of 33 participants, 14 were local producers (i.e., 42.4%), 10 were involved in food processing (i.e., 30.3%) and 9 were involved in food marketing (i.e., 27.3%). Most of the participants surveyed were for-profit local businesses (i.e., 82%). Those local businesses consist of food production, processing and marketing organizations. Of the participants surveyed, 9% were non-profit local organizations and 9% were local cooperatives. Non-profits and cooperatives that were surveyed are involved in food processing and food marketing.

Table 5: Sample description

	Legal Structure									Total
	For Profit			*Non Profit*			*Cooperative*			
Supply chain context	*PM*	*NM*	*SS*	*PM*	*NM*	*SS*	*PM*	*NM*	*SS*	
Production	9	5	0	0	0	0	0	0	0	14
Marketing	2	0	3	0	2	0	0	0	2	9
Processing	0	0	8	0	1	0	0	0	1	10
Total	11	5	11	0	3	0	0	0	3	**33**

PM = Public markets
NM = Neighborhood markets
SS = Small store

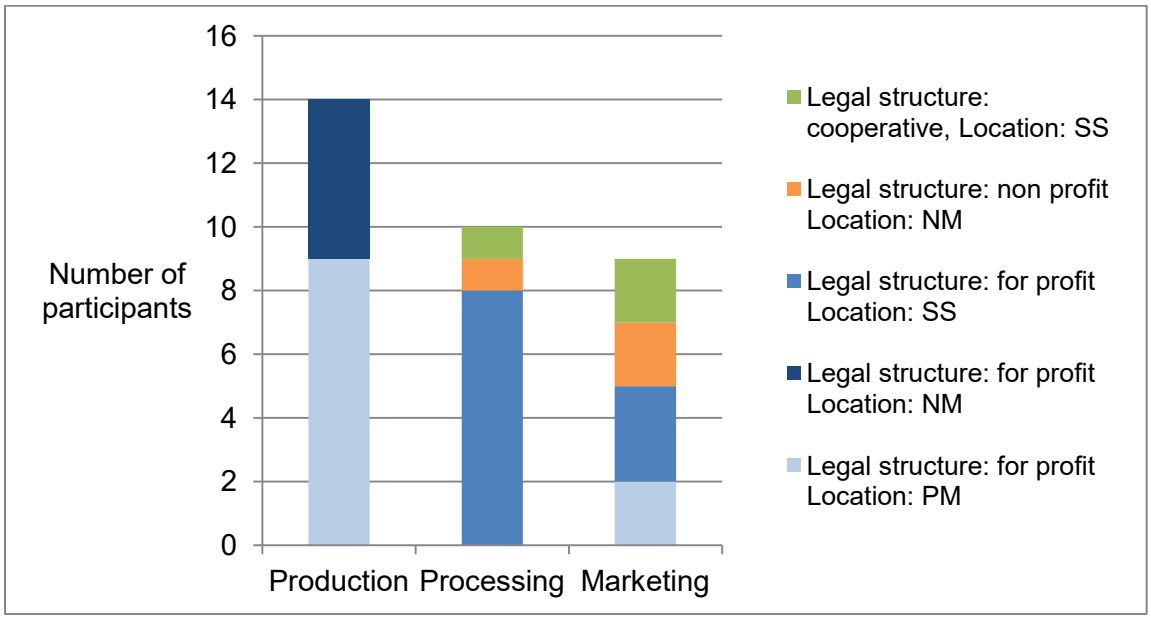


Figure 12: Sample description

PM = Public markets
NM = Neighborhood markets
SS = Small store

5.2.2 Current waste management practices of local food supply chain actors

Table 6 shows the main sources of byproducts generated at the production, processing and marketing stages of local food supply chains. Food processing mainly generates edible and inedible food byproducts (i.e., such as plant stems, spent grains, fruit peels, animal bones etc.) while food production and marketing mainly generate food surpluses. Food packaging byproducts can be generated at any stage of the food supply chain depending on the operational model of the organization.

Table 6: Main sources of byproducts generated in local food supply chains

	Production	Processing	Marketing
Fresh food surplus	x		x
Edible food byproducts		x	
Inedible food byproducts	x	x	
Food packaging byproducts	x	x	x
Other waste materials			x

When surveyed, 100% of participants said they use recycling bins for non-organic recyclable items. The likelihood and frequency of recycling was not assessed in this study. In comparison, out of the 33 participants surveyed, 48.5% compost the organic waste they generate (through a regular collection by compost organizations or through an indoor composter) and 51.5% dispose of their organic waste in the garbage (i.e., the latter is sent to landfills). As shown in Table 7 and Figure 13, food producers were the most likely to compost organic waste (i.e., 71.5%) in comparison with food processors (i.e., 30%) and marketers (i.e., 33.3%). In fact, 58.8% of participants who composted were for-profit local producers while 12.5% and 18.75% were non-profits and cooperatives respectively. Moreover, 12 out of the 17 participants who did not compost (i.e., 70.6%) were for-profit businesses involved in food processing and marketing. These observations suggest that, in general, the likelihood to compost is not correlated with the legal structure of the organization (i.e., for-profit, non-profit or cooperative) but rather with its supply chain operation (i.e., agricultural production, processing or marketing). It is important to note that these observations are limited to the specific research context and sample used.

Table 7: Organic waste management

	Legal Structure						Total
	For Profit		*Non Profit*		*Cooperative*		
Supply chain context	*OWC*	*OWL*	*OWC*	*OWL*	*OWC*	*OWL*	
Production	10	4	0	0	0	0	14
Marketing	0	5	1	1	2	0	9
Processing	1	7	1	0	1	0	10
Total	11	16	2	1	3	0	**33**

OWC = Organic waste composted
OWL = Organic waste landfilled

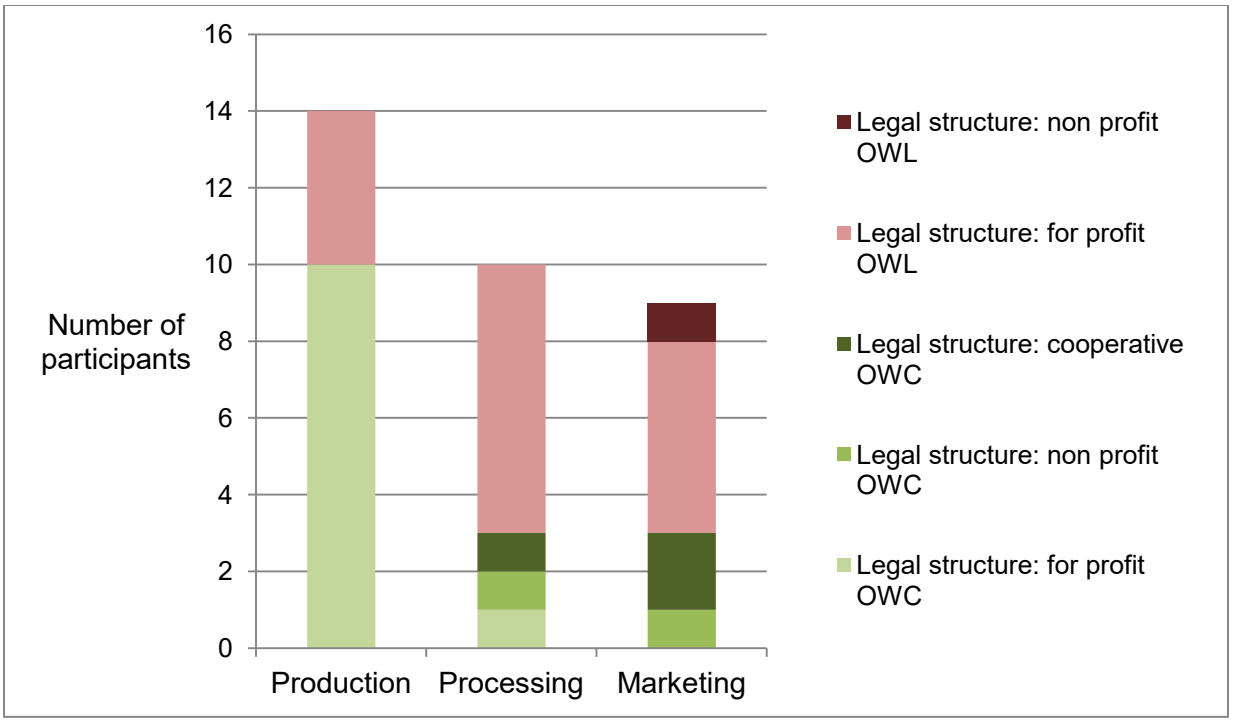


Figure 13: Organic waste management

OWC = Organic waste composted
OWL = Organic waste landfilled

5.2.3 Partnering to close the loop

5.2.3.1 Quantitative findings

As seen in Table 8 and Figure 15, 53.8% of for-profit businesses and 50% of non-profit organizations surveyed engage in value recirculating partnerships. In regards to cooperatives, 3 out of the 3 participants surveyed (i.e., 100%) partner with other supply chain stakeholders to recirculate value. As Table 8 and Figure 14 show, 70% of participants involved in food processing partner with other organizations in order to donate, sell, purchase or exchange byproducts. In comparison 57.1% of local producers and 44.4% of marketers engage in similar value recirculating partnerships. These observations suggest that stakeholders involved in food processing (when compared to food producers and marketers) are most likely to partner with other organizations to manage their waste.

Table 8: Value recirculating partnerships

	Legal Structure					
	For Profit		*Non Profit*		*Cooperative*	
Supply chain context	*P*	**Total*	*P*	**Total*	*P*	**Total*
Production	8	14	0	0	0	0
Processing	5	8	1	1	1	1
Marketing	1	5	1	2	2	2
Total	14	27	2	3	3	3

* = For example, total number of marketing participants/organizations that have a for profit structure
P = Number of participants/organizations that engage in collaborative partnerships that aim to recirculate byproducts and create value within the supply chain

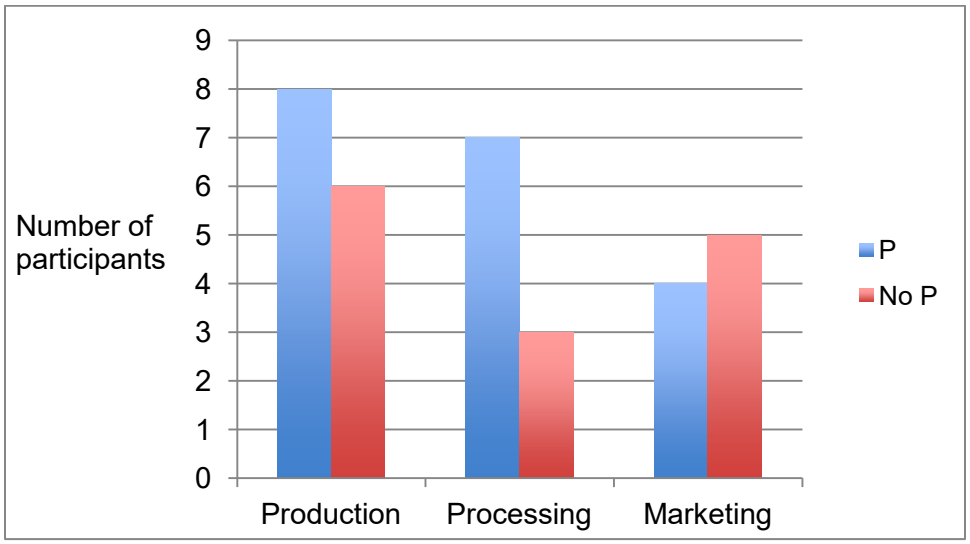


Figure 14: Value recirculating partnerships in each supply chain stage

P = Number of participants/organizations that engage in collaborative partnerships that aim to recirculate byproducts and create value within the supply chain

No P = Number of participants/organizations that do not engage in collaborative partnerships

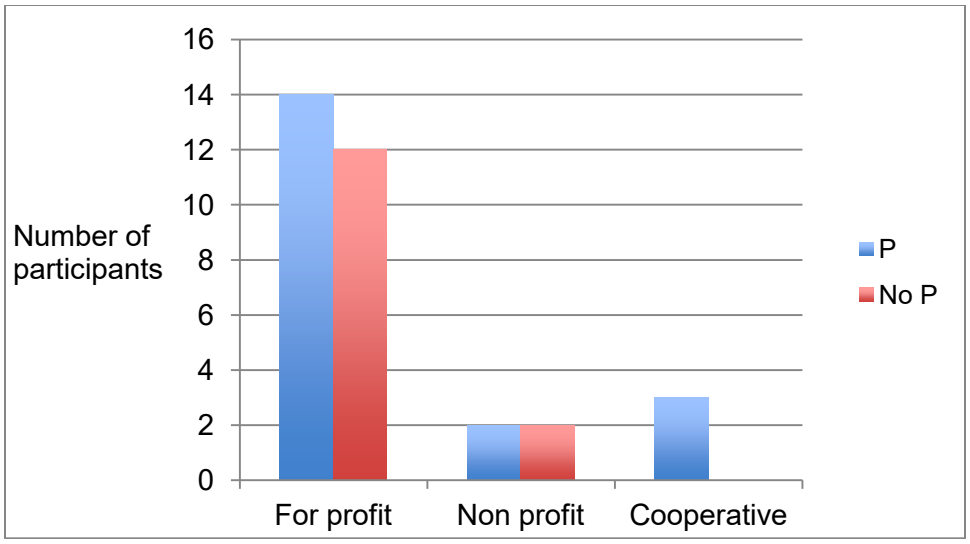


Figure 15: Collaborative partnerships in each legal structure

P = Number of participants/organizations that engage in collaborative partnerships that aim to recirculate byproducts and create value within the supply chain

No P = Number of participants/organizations that do not engage in collaborative partnerships

5.2.3.2 Mapping supply chain partnerships

The legend used in Figure 16 – Figure 25 is provided below:

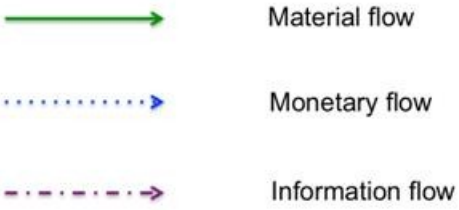


Figure 16 illustrates a partnership between two food stakeholders involved in the same supply chain activity: two local horticultural producers. These producers share technical and market related knowledge, which they can both benefit from. Even though they are involved in the same supply chain activity, those stakeholders have different production capacities and different business priorities. Producer B has a larger production capacity than producer A and thus generates more quantity and variety than his partner. Producer A can only produce a certain variety and quantity of crops and directly buys the rest from his partner (i.e., producer B). Producer A can thus accommodate market needs while respecting his operational limits

whereas Producer B can generate additional revenues from Producer A's produce. Also, both producers generate organic waste from their operations but only producer B has a compost operation (where organic waste is turned into fertilizer). Producer A gives his organic waste to producer B which result in benefits for both partners: producer A can easily and freely dispose of organic waste and producer B has a free source of raw material for his compost operation.

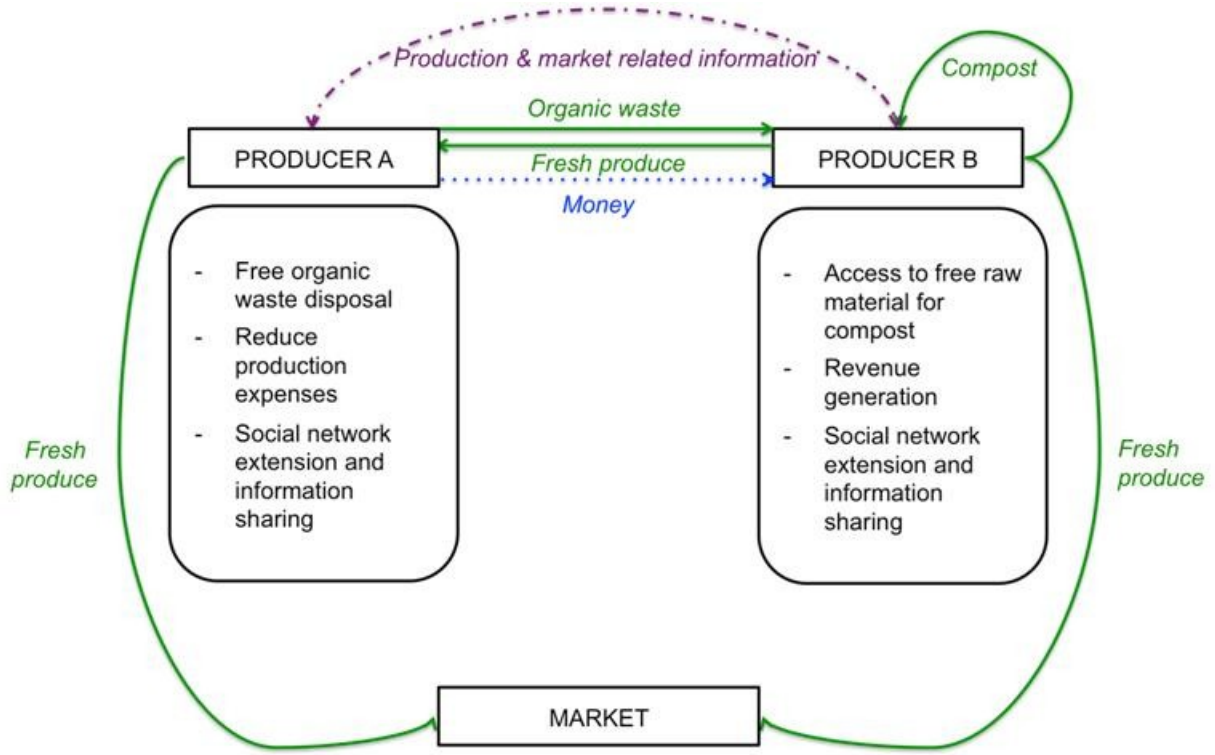


Figure 16: "Producer-Producer" partnership

Figure 17 below shows a partnership between two food stakeholders involved at different stages: a local producer and a food security community organization. The latter usually acquires surplus processed and canned food from large food chains. This partnership enables the community organization to encourage local production and provide a diet higher in fresh produce to individuals in need. It also enables the producer to reduce its waste and disposal costs, contribute to society's needs and extend its network.

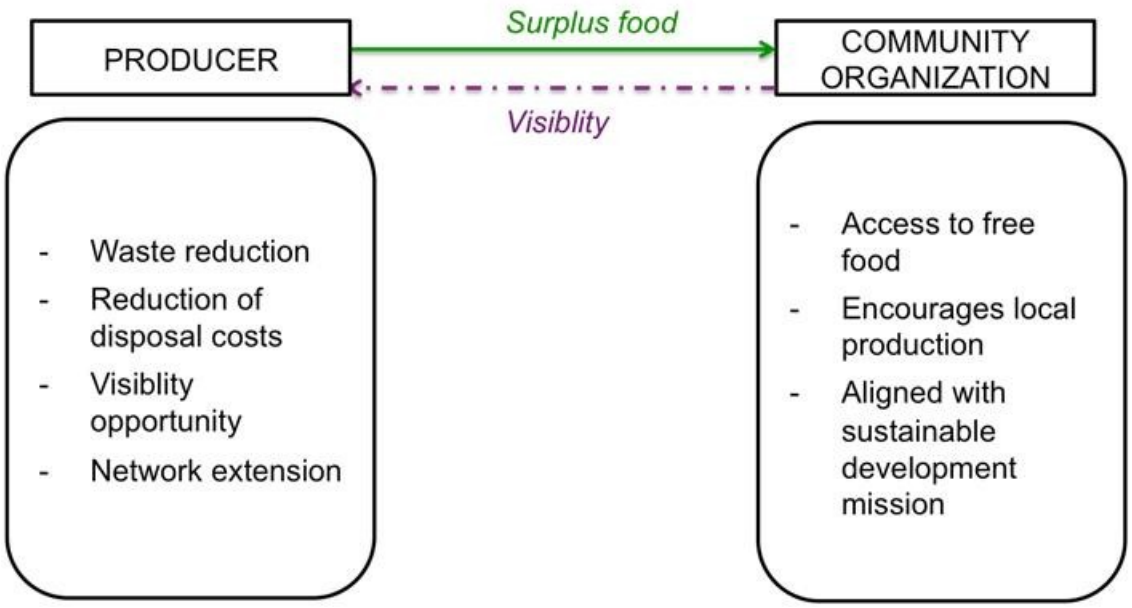


Figure 17: "Producer- Food security community organization" partnership

Figure 18 shows a partnership between a coffee shop and its customers. The latter collect used coffee grains (byproduct of the café's operations), which they use as a fertilizer in urban mushroom production. The café can reduce its waste disposal costs (since coffee grains are a significant source of waste) as well as encourage small-scale urban agriculture projects.

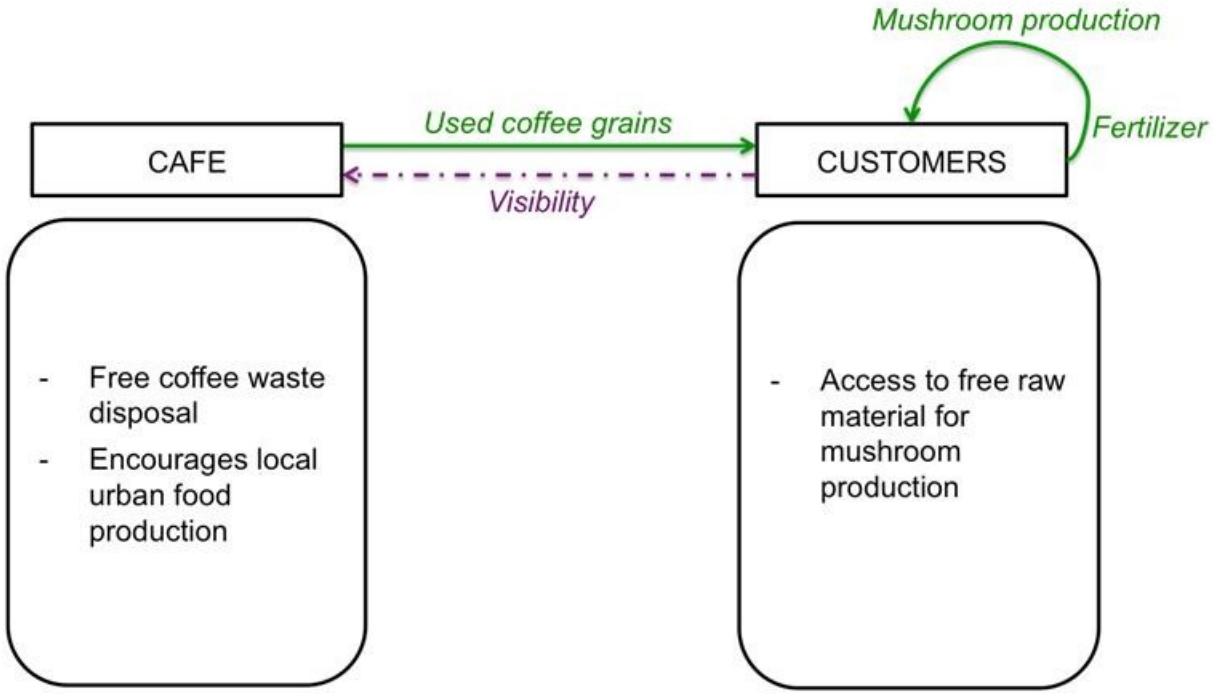


Figure 18: "Processor-Customer" partnership

Figure 19 illustrates a partnership between a brewery and a local producer. The brewery generates significant amounts of malt, which is a byproduct of the brewing process. A producer collects the malt for free and uses it as animal feed (due to its high nutritional content). This is a win-win solution since the brewery can freely dispose of its “waste” and another food actor considers the latter a “free raw material”.

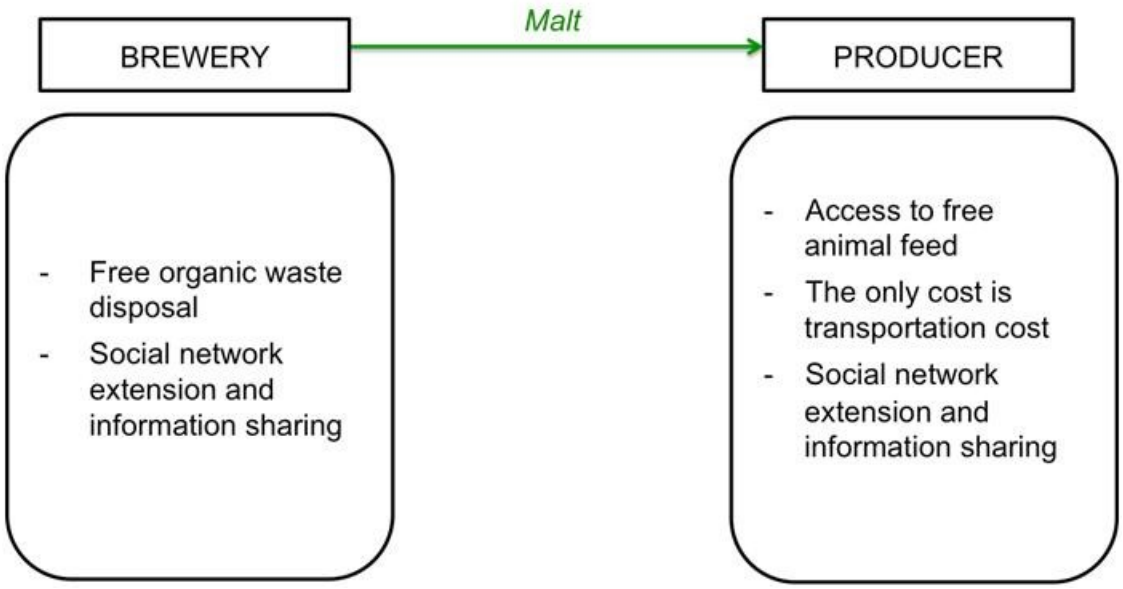


Figure 19: "Processor-Producer" partnership

Figure 20 illustrates a value recirculating partnership between local producers and their customers. During local market events, customers return empty food packages from the last purchase to producers (such as wooden boxes, plastic boxes, carton boxes etc.). Producers save on resources and customers contribute in waste reduction, environmental sustainability and economic resilience of their local supply chain.

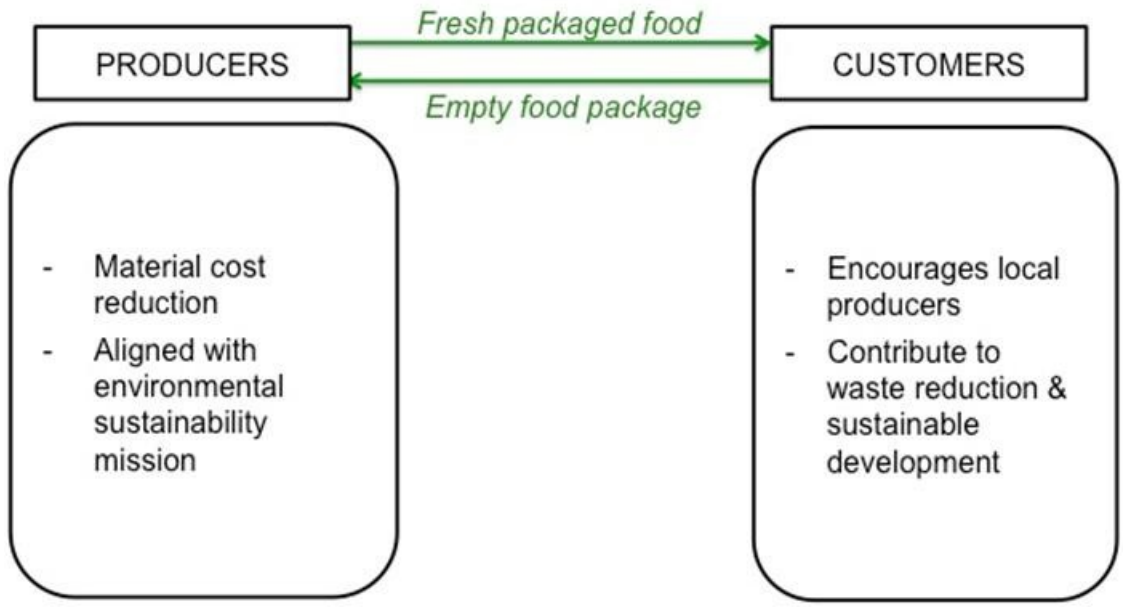


Figure 20: "Local producer-Customer" partnership

Figure 21 illustrates an indirect partnership between local retailers and customers. The retailer sells food in bulk and the customer brings his own reusable packaging to transport the food. This helps reduce material resources required for supply chain operations, save on packaging costs and improve environmental sustainability of local food supply chains. These economic and environmental benefits affect both partners. This partnership is indirect because there is no direct exchange of material but both stakeholders have to collaborate in order to save on packaging. It is an initiative than aims to reduce waste at the source.

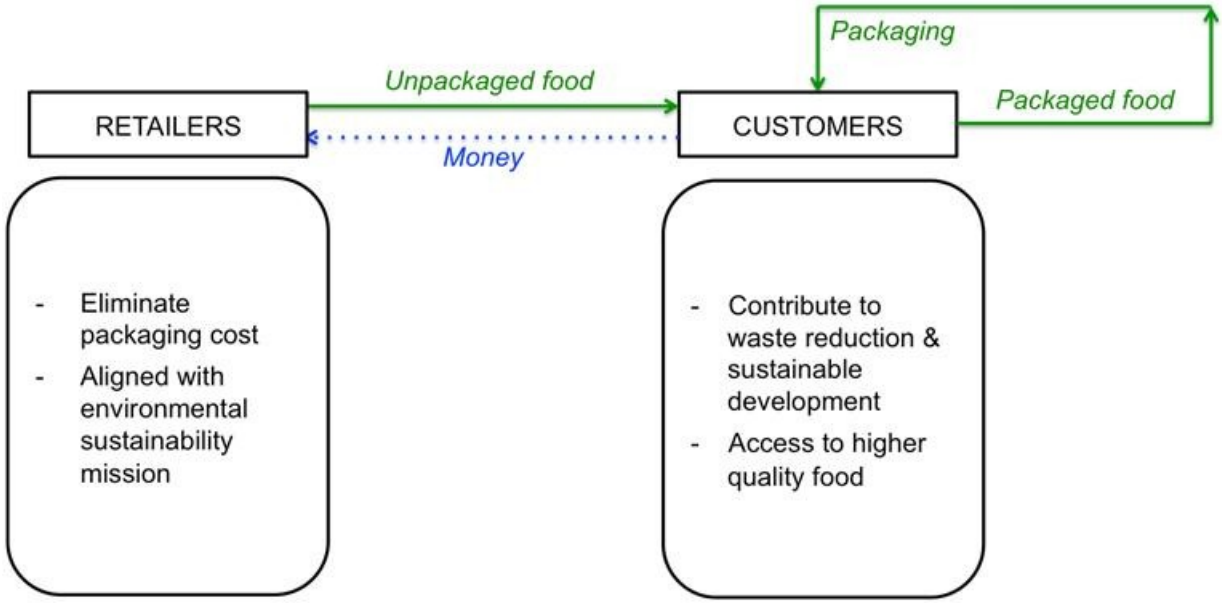


Figure 21: "Local retailer-Customer" partnership

Figure 22 illustrates the relationship between an environmental advocacy and educational organization (i.e., the eco quartier) and local food supply chain actors. The eco quartier provides valuable information, expertise and tools for local commerce wishing to engage in more sustainable behavior (i.e., composting, recycling, waste reduction, etc.)

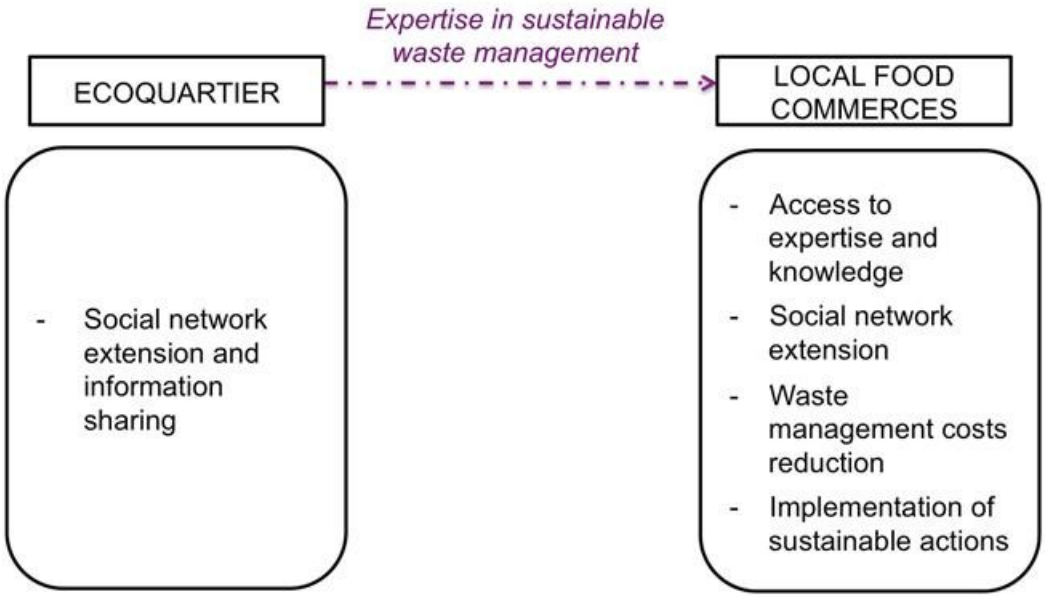


Figure 22: "Eco quartiers-local food actors" partnership

Figure 23 illustrates a partnership between three supply chain actors: producers, a market and citizens. In this example, the market acts as a facilitator between the producer and the citizens. The market purchases surplus fresh food from local producers at a discounted price. Producer can thus at least recover their costs and eliminate waste without an added transportation or processing cost. The market then organizes a collective kitchen for the local community: a group of citizens collectively cook all the remaining surpluses into dishes of their choice, which they then divide among themselves and take home. Citizens only pay for the raw material: the surplus food. This enables them to have financial access to healthy fresh produce. In that example, the non-profit market fulfills its mission of food security and sustainable development.

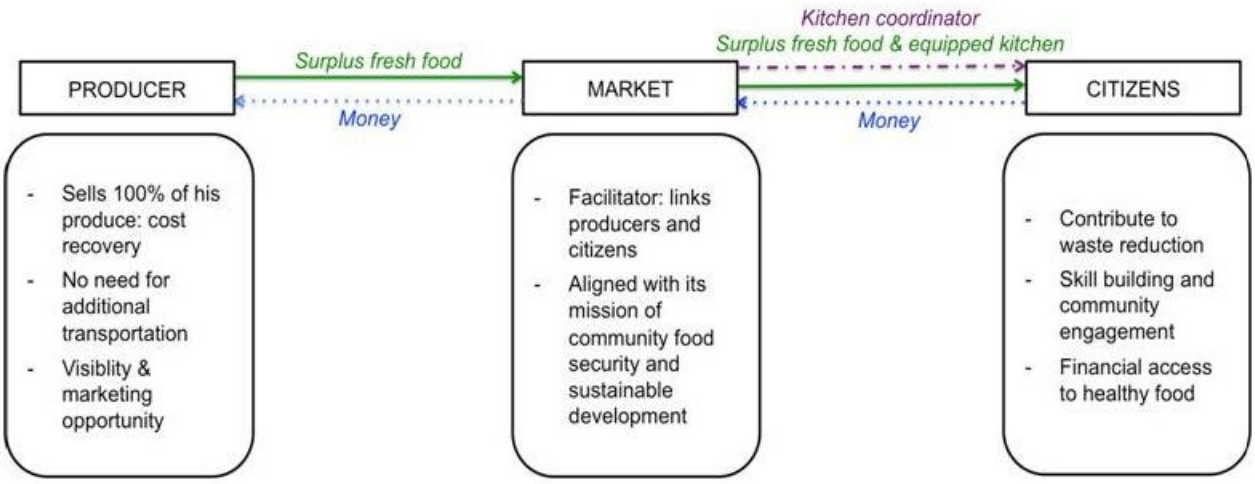


Figure 23: "Producer-Market-Citizen" partnership

Figure 24 shows a partnership between three supply chain actors: producers, processors and citizens. Processors purchase surplus fresh food from local producers at a discounted price. Producer can thus at least recover their costs and eliminate waste without an added transportation or processing cost. The processor then cooks and preserves (through freezing, fermentation etc.) the fresh produce, which permits him to sell it year-round. The processor thus encourages local production while reducing waste and providing a year-round supply of local food to the community.

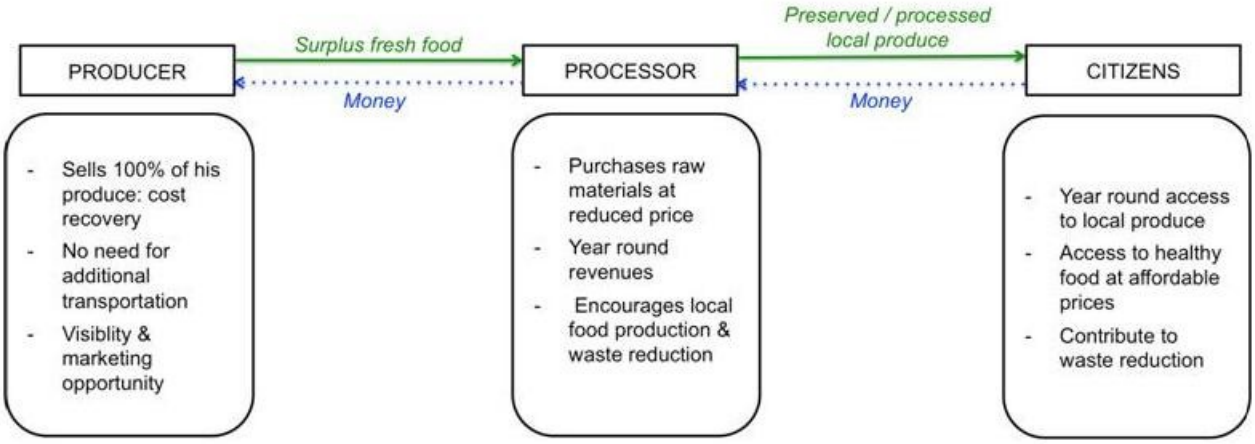


Figure 24: "Producer-Processor-Citizen" partnership

Figure 25 shows a partnership between three food supply chain actors: food commerce (i.e., retailers/restaurants), a compost company and local producers. Food commerce (especially actors involved in food processing) generates a significant amount of organic waste

(i.e., inedible cooking byproducts) and used cooking oil. A local compost company collects these byproducts. The company collects the organic waste and charges for the collection service. When clients also donate vegetable oil, they obtain a discount on their collection price (because the compost company uses oil as a biofuel raw material for its trucks). The company then transports the organic waste to a compost site where it is transformed into organic fertilizer. The latter can then be sold or donated to local producers.

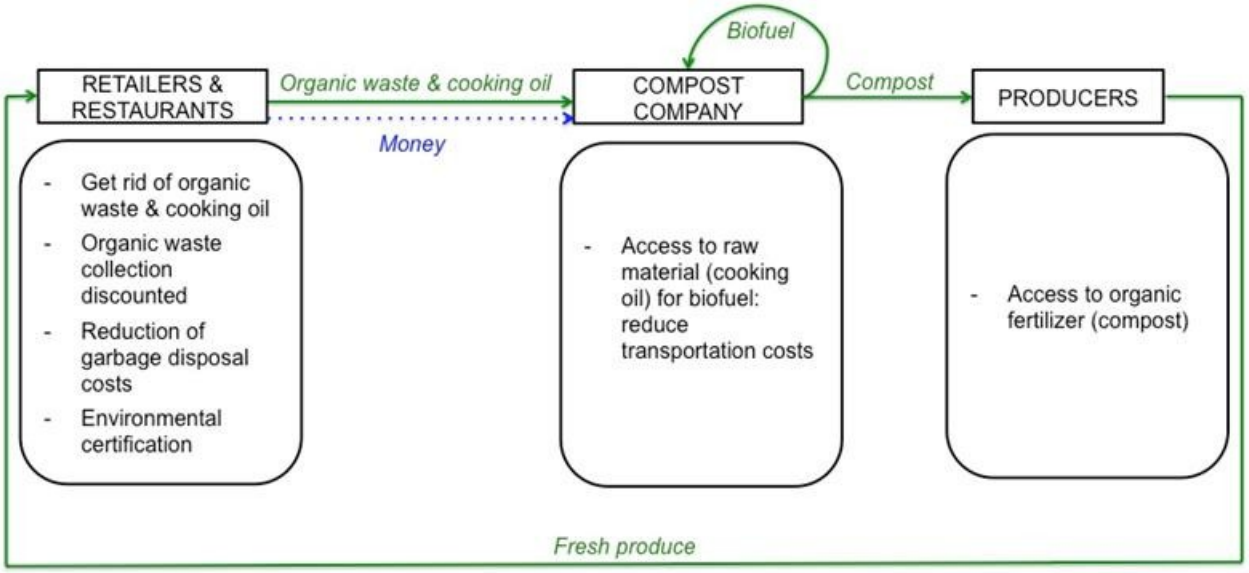


Figure 25: "Retailer/Restaurant-Recycler-Local producer" partnership

5.3 Discussion

5.3.1 Current waste management practices of local food supply chain actors

As Table 6 shows, food supply chains generate byproducts such as food surpluses, edible and inedible food byproducts and packaging byproducts. The food surpluses generated at the production and marketing supply chain stages (see Table 6) can be directly sold, donated or consumed. These surpluses are commonly due to a gap between supply and demand (Giuseppe, Mario, & Cinzia, 2014). Reselling, donating, or exchanging these food surpluses with other supply chain actors requires some logistical and supply chain management considerations (Giuseppe et al., 2014). In contrast, the edible and inedible byproducts generated at the processing stage are more likely to require further processing prior to being reused. Edible food byproducts (for example: lemon peels, beet leaves, cherry pits, spent beer grains) have to undergo processes such as heating, freezing, drying, salting, sugaring, picking, canning pickling

and fermentation. These processes will transform those edible byproducts into longer shelf life foods such as jams, pickles, flour, vinegars and canned produce. Similarly, inedible food byproducts (i.e., organic waste and used cooking oil) have to undergo biological and chemical transformation processes (such as composting, anaerobic digestion and trans esterification) to be turned into inputs (such as organic fertilizers, biogas and biodiesel). Waste management at the food processing stage therefore not only requires a supply chain management approach but also technical expertise.

In regards to organic waste management, 3 out of the 3 cooperatives and 2 out of 3 non-profits surveyed confirmed to compost their organic waste. These cooperatives and non-profits are engaged in food processing and marketing; a compost company to whom they pay the service collects their organic waste. It is however important to note that those organizations have sustainable development as one of their core values. Moreover, these sustainable practices are marketed by these “green” organizations to cater for a specific clientele. In contrast, for-profit walk-by restaurants and food stores had a lower composting rate than cooperatives and non-profits. In regards to the sample of local for-profit restaurants surveyed, sustainability was not a part of their marketing: these traditional small businesses depend on walk-by visibility and word-of-mouth marketing. Therefore, compost is not perceived as a marketable activity that can help increase profits and improve their reputation.

In fact, for-profit agricultural producers were the most likely to compost organic waste in comparison with supply chain actors involved in food marketing and processing (see Table 7 and Figure 13). 71.5% of local food producers surveyed confirmed that the organic waste they generate is regularly composted and turned into organic fertilizer. Most of the producers surveyed run a compost operation in their farm and a minority partner with other stakeholders (donate their organic waste so that it is composted elsewhere). In fact, producers are the only stakeholders who perceive organic fertilizer (also commonly referred to as compost) as an operational input. This different supply chain perspective results in a different perception and management of organic waste. The latter is considered as a potential raw material for producers. In contrast, only around 30% of actors involved in marketing and processing confirmed to send their organic waste to be composted. Unlike producers who consider composting as a needed routine operation for their business, marketers and processors consider composting as a non-necessary (i.e., an added) activity that they can market. During discussions, most barriers related to composting (such as smells, waste liquid leaks, unsavory appearance and costs) came from participants involved in food marketing (i.e., food stores, food

markets) and processing (i.e., restaurants, collective kitchens, cafes). These actors operate at the middle of the food supply chain and are less exposed to the beginning (agricultural production) and the end (recycling) of the chain. Food producers on the other hand, operate at the beginning of the food chain and are thus exposed and affected by the middle (by marketing the food they produce) and the end (by composting organic waste) of the chain. These supply chain findings are in line with the conclusion generated in the previous chapter (sub-section 4.4); that the boundary between rubbish and non-rubbish is socially malleable and depends on the social and supply chain context of the objects in question.

Similarly to the waste perception findings (see sub-section 4.3.7), waste management seems to also be affected by the available physical, monetary, human, and social resources. During surveys and interviews, participants named lack of space, time and money as the main barriers to circular economy practices. For instance, sorting organic waste from non-organic waste in small restaurants requires organization, training, space and time which the participants said they lacked. Moreover, organic waste collection is often a service that these businesses have to pay for. In that regards, participants confirmed they were willing to engage in circular economy activities if the latter were not to incur extra costs for them. However, when asked how interested they are in reducing waste in their supply chain, 22 out of the 33 participants (i.e., 66.7%) indicated a level of interest of 1 (from a scale of 1 to 10, 1 being extremely interested and 10 being not interested at all). It is important to note that this level of interest was conditional to them having access to resources. In fact, all the stakeholders surveyed are small organizations with limited resources and most of them cannot “close the loop” on their own.

5.3.2 Partnering to close the loop

Can local extra-organizational partnerships bridge the gap between the strong willingness to engage in the circular economy and the lack of resources?

As discussed above (sub-section 5.3.1), there is a common perception among food supply chain actors that environmental sustainability comes at the expense of economic and financial sustainability. However, an open food system that extracts natural resources to create products and byproducts and dispose of the latter is not sustainable in the long run. This linear supply chain model needs to be redesigned to generate a circular resource flow. As defined in sub-section 2.5.3, industrial symbiosis (IS) consists of a cross sectorial collaboration between different organizations to exchange waste. Industrial symbiosis is embedded within the Industrial Ecology (IE) approach of studying and designing industrial systems that operate like

natural ecosystems. The latter consist of self-regulated cycles that consume what is produced: animals and plants feed on each other's waste through a complex web of interactions (El-Hagar, 2007). In this research, symbiotic partnerships between local food supply chain actors were explored and mapped (see sub-section 5.2.3.2). It is important to note that the size and operational capacity of the organizations tackled in this research are very different than those studied in traditional IS research. This research focuses on small-sized local food businesses, non-profits, and cooperatives involved at the production, processing and marketing stages of Montreal's food system. In these organizations, the quantity and type of material, money and information flows is different than those circulating at an industrial scale.

As shown in Table 8 and Figure 14, 57.1% of local producers engage in symbiotic partnerships that aim to recirculate materials. Producers informally collaborate with their supply chain partners to access affordable production inputs (i.e., animal feed and fertilizer), manage unsold surplus food, and reduce packaging costs (see Figures 16, 17, 18, 19, 20, 23, 24 and 25). Producers engage in material exchange with other producers, compost companies, breweries, coffee shops, customers, food security community organizations, food processors, and markets. According to the producers surveyed, the main challenges of these symbiotic partnerships relate to the logistics associated with partnering with stakeholders that operate at a distance. In fact, the local producers surveyed operate in rural areas but market their produce in urban areas where most of their supply chain partners (i.e., markets, processors, customers etc.) operate. Even though producers engage in a wide variety of partnerships, they also have the hands-on experience and ability to "close the loop" on their own. Indeed, producers commonly use the byproducts they generate as inputs in their operations. Organic waste generated from horticultural production is either internally transformed into organic fertilizer or used as animal feed.

As shown in Table 8 and Figure 14, 44.4% of participants involved in food marketing engage in symbiotic partnerships that aim to recirculate value. The partnerships identified are mostly indirect. For instance, some local food retailers work to reduce waste at the source through selling bulk produce (see Figure 21). This sustainable practice requires understanding and collaboration from customers given that the latter have to bring their own reusable packaging materials. This supply chain strategy aims to prevent the waste rather than reuse or exchange it: it follows the 3 RV ("Reduce Reuse Recycle Valorize") waste reduction framework. Even though this indirect partnership does not involve an exchange of materials, it can still be considered symbiotic and mutually beneficial. It aims to eliminate the cost associated with

packaging for both the retailer and the customer. By removing that cost, retailers can potentially sell higher quality foods at more competitive prices and customers can have access to food that is at a higher quality than what they regularly purchase for the same price. Participants involved in food marketing were also found to facilitate symbiotic partnerships between local producers and citizens. As mapped in Figure 23, a non-profit market purchases surplus fresh food from local producers at a discounted price, helping the latter to recover their costs. The market provides this surplus food to local citizens through a learning and community engagement event: a collective kitchen. Citizens pay for the raw materials (i.e., surplus food) costs, collaboratively process the surplus food and divide it amongst the group. The market that has a direct working relationship with both stakeholders (i.e., producers and citizens) makes this waste reduction partnership possible.

Participants involved in food processing such as restaurants, cafes, breweries and collective kitchens, have the highest number of partnerships in comparison with producers and markets (or retailers). Indeed, 70% of food processors surveyed confirmed to engage in value recirculating partnerships. In fact, these small-sized organizations have very limited space, time, as well as monetary and human resources to manage waste. In addition, due to their main supply chain activity (i.e., processing), they generate a significant amount of food byproducts (as discussed in sub-section 5.3.1). Thus, food-processing organizations can rarely “close the loop” through internal management only. Moreover, in Montreal, these actors (example: restaurants) tend to be found in high-density urban areas since citizens are their direct clients. Hence, partnering with nearby organizations involved at other supply chain stages can be valuable in that case.

5.3.3 Informal, symbiotic and collaborative supply chain partnerships

Industrial symbiosis (IS) provides a useful framework for understanding symbiotic partnerships that aim to recirculate materials and energy at the industrial scale. This research however showed that such collaborative partnerships are also practiced on a more informal level by small and medium-sized enterprises (SMEs) within Montreal’s local food supply chain. Even though the symbiotic partnerships mapped above (see Figures 16, 17, 18, 19, 20, 21, 22, 23, 24 and 25) are diverse and have unique supply chain and social contexts, they also share some common characteristics. They show a flow of materials, money and/or information between different supply chain partners. The main flowing materials consist of surplus food, mixed organic waste, special organic waste (i.e., spent coffee or beer grains), used cooking oil, compost and packaging. As for the main flowing information, it relates to technical know-how,

market information, and visibility. Also, as the adjective “symbiotic” imply, these partnerships are mutually beneficial to the stakeholders involved. Participants exchange material resources for other material resources, information, or money. Some partnerships are traditional in the sense where the service provided is paid for (at a discounted price). Others depend on non-monetary resources. For instance, some stakeholders “return their partner’s favor” through offering them marketing visiblity in the market. Other forms of collaboration such as material-material exchanges aim to help both partners dispose of the material they have no need for and access the one they need. Finally, the stakeholders engaging in these partnerships have described most of them as informal. These initiatives have been developed over time through social connections across the local supply chain. They are deeply embedded within the community’s value of cooperation.

These collaborative relationships can also be framed within the sharing economy framework. That term is very broad and includes citizens, non-profits, cooperatives, and corporations that engage in maximizing the utility of existing assets via renting, lending, bartering, and giving (Hamari, Sjöklint, & Ukkonen, 2015). Those transactions are often facilitated by technology. In such systems, participants share access to tangible and intangible assets rather than having individual ownership (i.e., car sharing, tool sharing, skill sharing, work space sharing) (Zimmerman, 2012). As discussed in sub-section 4.3.5, supply chain users prefer items that provide valuable life experiences rather than durable possessions. The prioritization of access over ownership is thus observed both from a user and actor’s perspective. In fact, it was observed throughout this research that AFN in Montreal commonly share, pool and exchange material, information and monetary resources to fulfill their mission and goals. For instance, non-profit food markets pool their purchase orders in order to increase the volumes and get better prices from their supplier. This enables them to sell the food at low prices in food insecure neighborhoods and to contribute to community food security. These partners also share and exchange scarce resources such as food, storage space, work space, transportation, tools and knowledge. It is important to note that the symbiotic partnerships explored in this research are a specific type of resource sharing; they not only aim to reduce resource use and costs but they also close material and energy loops.

The “sharing economy” term has been heavily criticized for replicating the same inequalities present in the current economic system. There is a gap in regulations in regards to the sharing economy model. Even though the profit may be shared, the risk is not: platform businesses operating within the sharing economy model (such as Airbnb and Uber) are pushing

all responsibilities, risks and liabilities to workers and consumers (Cagle, 2014). Thus, symbiotic partnerships may be a collaborative market-based solution, but they also need to be practiced within a regulatory framework and to be accompanied by an institutional supporting structure.

5.3.4 A regulatory framework for AFN partnerships

For most of the participants surveyed, these informal partnerships are considered as "common practices" that these actors engage in out of economic necessity, social values, or cooperation values. Even though the social and financial incentives in forming these partnerships are evident, the latter are not framed within a circular economy strategy and don't have a clear regulatory framework. In the case of Montreal, these local circular economy practices should be integrated within a municipal circular economy strategy and supporting policies. These informal supply chain exchanges need to be supported through environmental reforms and waste management policies that encourage and regulate that type of collaboration.

The Extended Producer Responsibility (EPR) is the most significant pillar in Quebec's upcoming waste management policy. ERP follows the Polluter Pays Principle (PPP) as it aims to internalize waste management costs. The PPP implies that producers should pay for the total cost of the product or service that they sell, including its social and environmental cost. According to Recyc-Quebec, the municipal regulation for sewage disposal of used cooking oil is a successful EPR example. The recuperation rate of used oils went from 63% in 2001 to 92.4% in 2008 after the implementation of the EPR program. In fact, all the restaurants surveyed confirmed that a company collects the cooking oil they generate and pays them for providing that material. These companies use the cooking oil as a raw material for products such as biodiesel.

One of the main arguments of EPR proponents is the current lack of incentives in the form of regulatory requirement in "closing the loop". For instance, in Montreal, organic waste segregation and recycling is currently not mandatory. Supply chain actors and users can choose to recycle their organic waste if they wish but they are not legally required to do so (as the results in sub-section 5.2 suggest). In fact, waste management costs in Montreal are integrated within municipal taxes. Supply chain users and actors who wish to engage in circular economy activities are not financially incentivized to do so since they will pay the same amount of taxes as their counterparts who do not engage in such activities. Moreover, organic waste collection for example represents an extra cost: for restaurants, it seems more expensive to have garbage and organic waste collected separately than to have a single garbage collection contract.

Nevertheless, the city of Montreal is planning a ban on organic waste landfill disposal in 2020. This ban represents an incentive for local food supply chain users and actors to recycle their organic waste or partner with a private entity that would need that material. Moreover, the city is developing an organic waste collection program for the residential, industrial, commercial and institutional sectors: the organic waste will be transported, processed and recovered in biomethanization and compost facilities (Communaute metropolitaine de Montreal, 2015). This will ensure that even though supply chain actors and users are held accountable for their environmental impact, the responsibility of "closing the loop" is shared with the city.

In regards to local food supply chains, EPR programs (similar to the used cooking oil regulation) could also be developed to encourage recuperation of food byproducts such as spent beer grains, yeast byproducts, used coffee grains, lemon peels, etc. Even though these byproducts can be composted along other organic waste, there could also be reused and reprocessed to create value along the supply chain. Municipal waste management policies should encourage, facilitate and regulate such recuperation and reprocessing.

5.3.5 A circular economy framework for AFN

The traditional Life Cycle Analysis (LCA) method identifies the environmental impact of a product from resource extraction to disposal, or in other words, from "cradle to grave", as illustrated in Figure 26. According to El-Hagar, the dominant "cradle to grave" conceptual framework which the LCA assessment method is based on needs to change (El-Hagar, 2007). In fact, as illustrated in Figure 26, even though man-made supply chains may be linear, natural systems are cyclic: environmental degradation caused by improper waste disposal results in resource depletion on the long-run. Also, forming symbiotic partnerships to exchange, recuperate and recycle toxic materials would be unsustainable in the long-term. These materials will inevitably end up in the environment. As discussed in Chapter 2, according to O'brien, "there is a greater quantity of materials passing through" the various supply chains of modern societies' (O'Brien, 2008, p.19). The design of most of these materials considers a one-time use and a specific function. The materials embedded in the products limit people in regards to their reuse, recycling and sustainable waste management. Most packaging materials cannot be continuously reused due to their toxicity level which dictates how they can be used and for how long they can be used. Hence, they eventually end up being disposed off. The LCA linear assessment method is based on the eco-efficiency concept of making the system more efficient or less harmful (McDonough & Braungart, 2002). However, focusing solely on the end of the

chain will only help slow environmental degradation and resource depletion rather than prevent it.

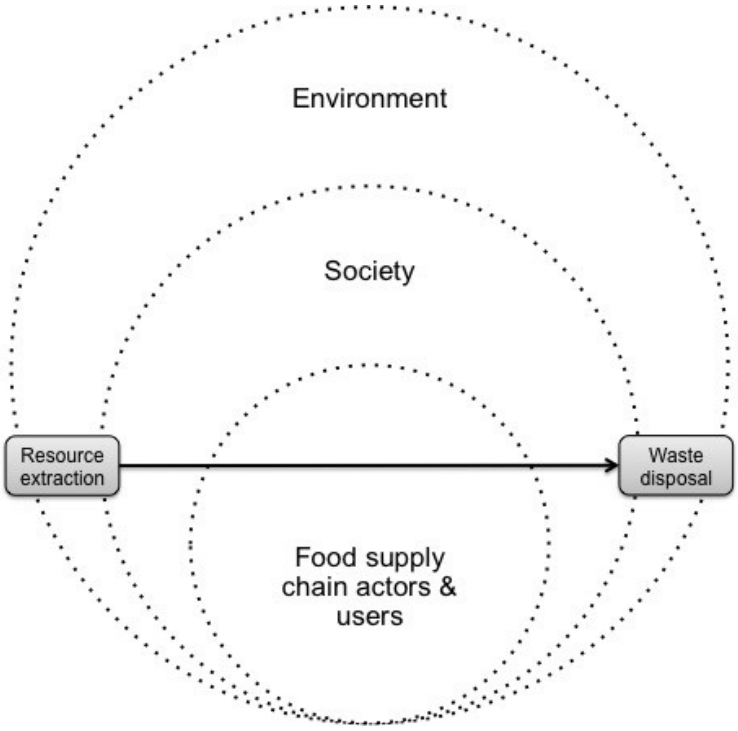


Figure 26: Cradle to grave food supply chain model

McDonough and Braungart (2002) propose the sustainability concept of eco-effectiveness. Instead of focusing on making a destructive system less destructive, the authors advocate for redesigning supply chains altogether to be non-harmful to the environment (McDonough & Braungart, 2002). At the center of the eco-effectiveness concept lays the cradle to cradle practical design framework. In the context of food supply chains, a cradle to cradle design approach aims to make food products (including packaging and any material used in food supply chains' operations) that can be safely reused, recycled or composted. Clean production (CP) is a preventive approach intended to minimize waste through reducing it at the source. CP implies using raw materials and processes that are non-toxic, that minimize waste and that are easily recyclable. When EPR programs are developed, and organizations are responsible for the collection and recycling of the byproducts they generate, they have a stake in implementing CP techniques (see Figure 27). The latter include three main strategies: source reduction (i.e., good housekeeping, process modification, raw material change, etc.), recycling facilitation (i.e., on-site or off-site) and product modification (i.e., in the case where the product cannot be produced using CP technique) (El-Hagar, 2007). Thus, circular economy initiatives to

close the loop (such as symbiotic partnerships and internal waste management) need to be integrated with clean production (CP) techniques at the design phase (see Figure 27).

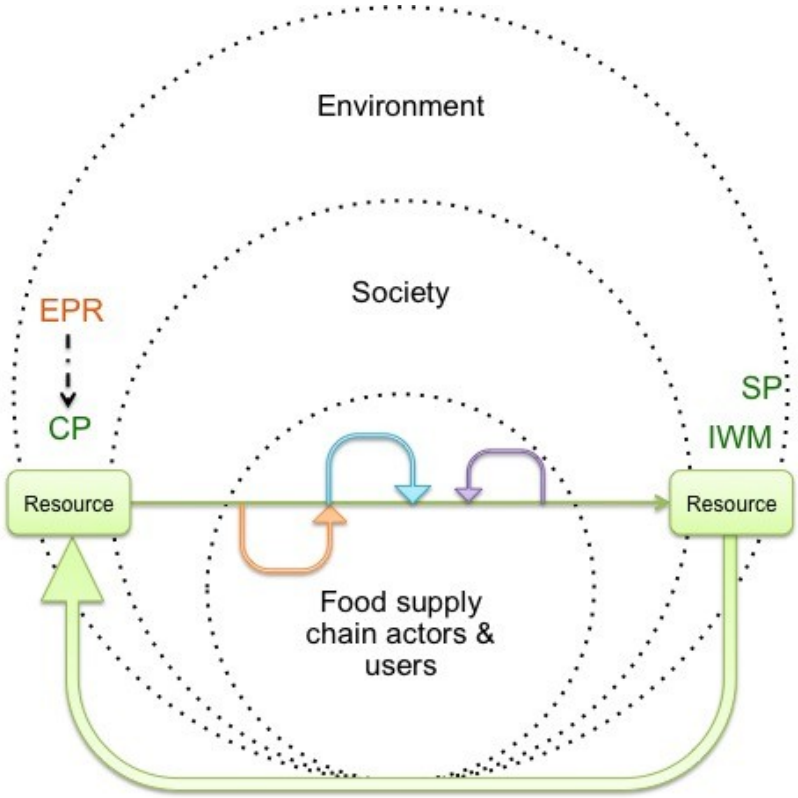


Figure 27: Cradle to cradle food supply chain model

Legend:

Circular economy policy

EPR: Extended producer responsibility.

Circular economy practices

CP: Clean production

SP: Symbiotic partnerships. The orange and blue loops illustrates the SP concept where waste of one supply chain actor is used as a raw material by another actor

IWM: Internal waste management. The purple loop illustrates the IWM concept where a supply chain actor closes the loop through an internal circular economy activity (i.e., on-site recycling or composting)

AFN need to adopt a cradle to cradle model of production: efforts at the end of the chain need to be coupled with efforts at the beginning of the chain. This circular and closed loop conceptual framework eliminates the concept of waste (see Figure 28). In that context, the concept of garbage, trash, rubbish or waste needs to be redefined as a “residual material” (i.e., byproduct) that can be used as a raw material for another process in the food supply chain or another industry. This holistic view of human-made supply chains acknowledges nature’s finite resources and aims to understand and mimic its regenerative process of creation.

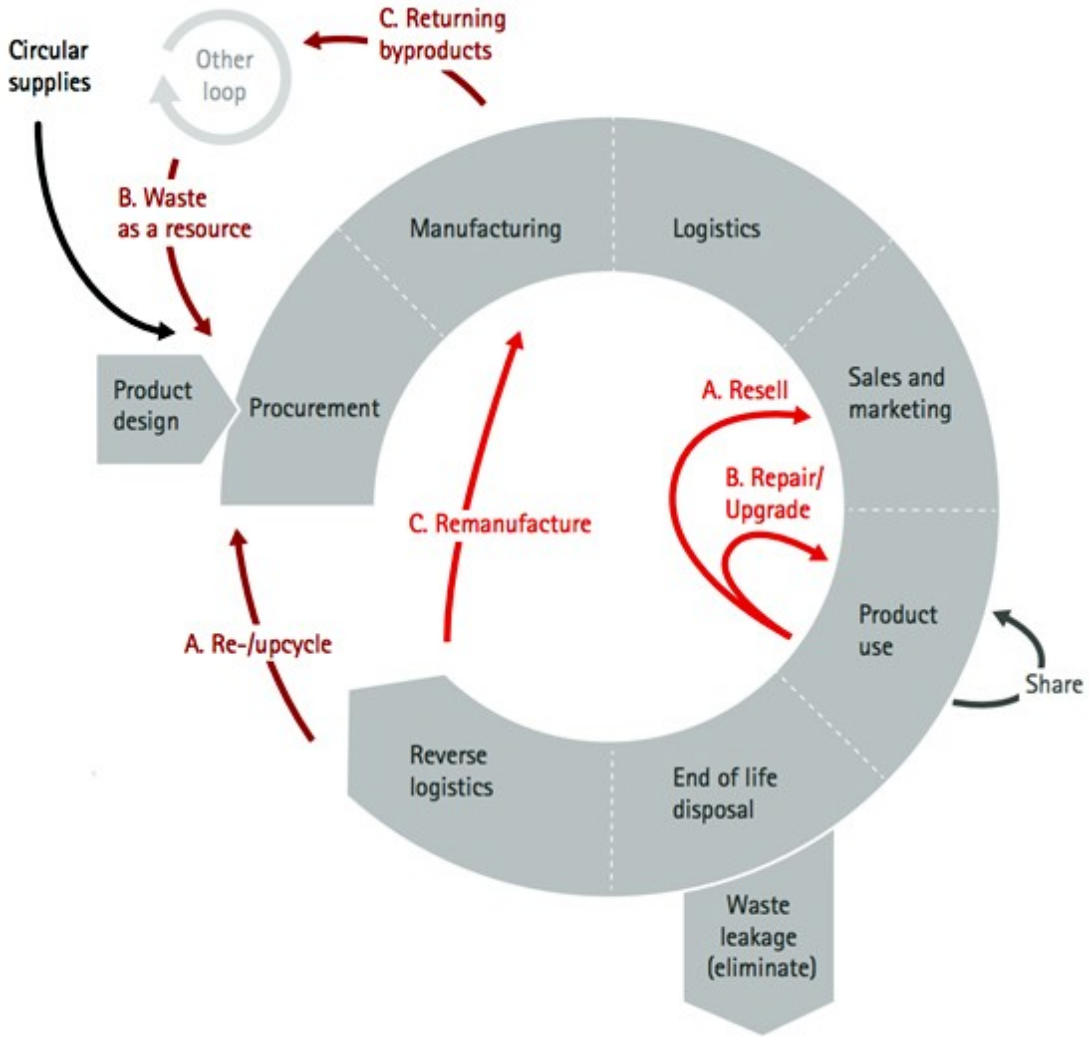


Figure 28: Circular supply chains
Source: Accenture (2014)

As discussed in Chapter 4, the boundary between what is defined as “rubbish” and what is “non-rubbish” is socially conditioned, flexible and malleable. It depends on factors including cultural and social acceptance, esthetic appearance, social trends, and available resources. According to Thompson (1979), there is a dynamic mutual relationship between actions and perceptions. Implementing a circular framework for waste management (cradle to cradle design and policies) could potentially change or even eliminate the concept of “rubbish”.

5.4 Concluding remarks

Through surveys and interviews conducted, local alternative food networks (AFN) in Montreal were found to engage (at various levels and degrees) in circular economy activities such as clean production (i.e., source reduction strategies), resource sharing, on-site recycling (or composting), and symbiotic partnerships. Nevertheless, these circular economy practices remain mostly informal and voluntary. They need to be accompanied by municipal waste management policies that encourage, facilitate and regulate such activities. These individual and community practices also need to be explored with a circular economy conceptual framework rather than a 3 RV waste hierarchy lens. In the next chapter, we will explore how a particular local AFN can implement such value recirculating activities within the circular economy framework and close the loop.

6 ACHIEVING A CIRCULAR SUPPLY CHAIN: A CASE STUDY AT THE CITIZEN MARKET OF LITTLE BURGUNDY

6.1 Introduction to the case study

This research phase bridges theory with practice through a case study at a community-based food organization: the Citizen Market of Little Burgundy. The Citizen Market was initiated by the "Équipe Mobile en Alimentation", a non-governmental organization (NGO) founded in 2004 in response to community food insecurity in Montreal's South West borough. The NGO's core mission is to improve food access and food security in the neighborhood of Little Burgundy and its connected sectors through a social justice and sustainable development approach. In fact, the South West of Montreal has recently seen an increased polarization of access to fresh fruits and vegetables. According to Montreal's Social Services and Health Agency, the percentage of populations with excellent access and with no access to fresh foods both significantly increased between 2004 and 2010. On the other hand, the percentage of populations with intermediary access to fresh foods decreased from 37% in 2004 to 17% in 2010. In Little Burgundy, 39.8% of the population lives below low-income cutoffs (LICOs) and does not have access to fresh food (Bertrand & Goudreau, 2014). The Citizen Market is situated in a food desert area of Little Burgundy. As defined in Chapter 2, an area is considered to be a food desert when the population there has no financial and/or geographic access to fresh produce within walking distance. Although the closest market, the Atwater market, is located at 1.4 km of the Citizen Market's area, this market is financially inaccessible for many members of the Citizen Market's target population.

The Citizen Market is part of Montreal's alternative food networks (AFN): it aims to promote physical and financial access to healthy food in a food desert area of Little Burgundy. The non-profit market aims to achieve its community food security mission through developing local, short and sustainable supply chains. Like other AFN (as discussed in Chapter 2), the Citizen Market employs a supply chain strategy at the nexus between the food security, health, community development, local economy and ecological sustainability. The organization's supply chain focus is food marketing and retailing. It purchases fresh fruits and vegetables from local food producers and wholesalers and sells the produce to the community via bi-weekly neighborhood markets. In order to make the produce as affordable as possible, it is sold to customers at cost (i.e., with a zero profit margin). Volunteers and employees run this non-profit

market and the latter uses a participatory democratic structure in regards to decision-making and operations. The Citizen Market partners with organizations who share the same solidarity and sustainability values. These organizations include the St Henri Citizen Market, the Santropol Roulant, the Little Burgundy Coalition, the “Garde-Manger Pour Tous”, the Eco-quartier and the Montreal Children’s Library. Some of these partnerships will be further detailed in the context of the research in sub-section 6.3.1.

This case study analyzes and maps the organization’s current supply chain operations from sourcing to waste management. It then provides practical recommendations to the community organization for achieving a circular closed loop supply chain. The anthropological and supply chain theories and concepts discussed in Chapters 4 and 5 will be further explored in this chapter from a real-life perspective. This case study aims to create living knowledge for the Citizen Market’s volunteers, employees, customers and community. Moreover, this community organization is one of the stakeholders engaged in the discussions around the plan for a “Sustainable and Equitable Montreal Food System” (SAM), as well as the formation of a Montreal food policy council. The recommendations generated in this research have the potential to be implemented by the Citizen Market but also to contribute to the SAM plan and upcoming food policy council.

6.2 Methods

The choice of the case study approach permitted the researcher to conduct an in depth community-engaged and action oriented research on one organization’s supply chain within a limited time scale. Throughout the academic year of 2014-2015, the researcher actively participated in the market’s regular and occasional activities. These activities included action plan committee meetings, annual general meetings, community events, market preparation and planning, market events, inventory management, surplus food management and processing. The researcher also attempted to organize community events revolving around waste (such as community discussions, workshops and focus groups) but was not able to mobilize the community around that topic. This could be due to many factors but the main reason was the timing of the research. As explained in sub-section 3.2, the research took place during a very unstable time for the Citizen Market. The market was restructuring its operations and activities due to financial instability. The organization thus lacked capacity to organize additional events and the community was very concerned about the future of the Citizen Market. The data was therefore collected only during planned events. Nevertheless, throughout the year, the researcher built a mutually beneficial relationship with the Citizen Market’s community. As

explained in section 3.2, the researcher has been working as a volunteer research consultant for the organization, focusing on “closing the loop”. In exchange, the community organization has provided the researcher with various experiential learning opportunities in regards to community development and sustainable supply chain management.

During the events mentioned above, the data was collected through the following ethnographic methods: participant observation, interviews and discussions with the market’s key actors and users (i.e., volunteers, employees, founder, board members and customers). Moreover, the researcher engaged in short interviews and discussions with potential partners of the Citizen Market including local producers, restaurants, cafes, a compost company and community organizations. In regards to the users’ perception of waste, this case study uses data that was collected for the first research phase, where one of the exhibitions was conducted during a Citizen Market event where customers were asked about their opinion on upcycled objects (see Chapter 4). The data was analyzed both qualitatively and quantitatively. The findings are presented in sub-section 6.3 in the form of written text accompanied by figures including supply chain maps.

The recommendations were drawn from conversations with the Citizen Market’s actors and users, as well as the researcher’s own observations. These recommendations have been disseminated to the Citizen Market during an action-plan committee meeting, where community members, customers, employees and volunteers were present. The organization has initiated contact with Compost Montreal in regards to closing the loop on organic waste. The recommendations in regards to surplus and packaging management are also currently being discussed and considered for implementation.

6.3 Results, discussion and recommendations

6.3.1 Current supply chain analysis

In this section, we will analyze the organization’s current supply chain strategy and operations. The Citizen Market aims to provide healthy food to the Little Burgundy Community at affordable prices through biweekly market events in the neighborhood. An average of 100 customers attend these market events. The market sells fresh produce such as fruits, vegetables, eggs, and honey as well as homemade processed food such as jams, sauces, and frozen meals. Most of these produce are highly perishable and have very short life cycles. Due to the nature of the produce, there is a small quantity of packaging material involved in the marketing operation. The main packaging materials observed include biodegradable coffee

cups, egg cartons, aluminum and plastic containers (carrying processed foods), glass jars (carrying jams, honey and soups) and plastics bags (carrying grapes). On some occasions, some herbs such as thyme and mint are sold in small plastic boxes. Moreover, customers need to purchase a biodegradable grocery bag (5 cents/bag) from the market if they don't have one. In fact, it was observed that most customers bring their own reusable grocery bags and only purchase the market's bags when their own bags are insufficient to carry the produce.

In regards to sourcing, the market purchases fresh produce from local producers and a wholesaler. The latter supplier provides the market with produce all year round at good prices. However, not all foods that the wholesaler provides are local. The market thus also works with a local egg supplier, and two local horticultural farms (one rural farm and one peri-urban farm). The horticultural farms provide fresh local and organic produce to the Citizen Market during the summer and fall seasons. The working relationship between the peri-urban farm (i.e., The Santropol Roulant) and the Citizen Market is described by both supply chain actors as a partnership. Organic food is commonly perceived as a luxury due to its usually high costs in comparison with non-organic food. As part of its social and food security mission, the Santropol Roulant provides organic food to the Citizen Market at very low prices: customers can thus afford to purchase local and organic food while encouraging local food production.

Moreover, the Citizen Market collaborates with the St Henri Citizen Market in regards to sourcing. This synergistic partnership between those two actors involved at the same supply chain stage (i.e., food marketing) aims to pool financial, material and information resources. The two markets pool their purchase orders, which permit their supplier to provide them with better prices. The markets also share physical resources such as storage space and transportation equipment. This collaborative supply chain strategy is aligned with the market's core mission of food access. In fact, the Citizen Market is currently working on expanding this synergistic sourcing partnership to include other neighborhood markets in the South West borough. Their vision is to create synergy with other markets to source local food all year-round: this will contribute to empowering local producers while keeping the food accessible for the community.

In regards to waste management, organic waste resulting from food surplus processing is currently thrown in the garbage and sent to landfills (see Figure 29). Based on observations and measurements, the organization generates around 10 kg of organic waste per week. The quantity of organic waste generated in the market heavily depends on the extent of on-site processing operations. Organic waste will decrease if more surpluses are sold/donated and will increase if more surpluses are processed on site. Most packaging waste that is generated in the

market is recyclable (i.e., carton, plastic, metal, paper) and is disposed off in recycling bins to be collected by the city (see Figure 29). On some occasions, recyclable packaging waste was found in the garbage when there wasn't a recycling bin nearby (see Figure 29).

Figure 29 is a general descriptive supply chain map of the Citizen Market that illustrates the current different supply chain activities as well as the inefficiencies of the organization. For the scope of this case study, the supply chain map has an organization centric view. The material flows are centered on the Citizen Market's operations. This map has a high aggregation and low process view depth (i.e., low level of details). It mainly aims to depict the supply chain's actors (i.e., organizations), materials (i.e., products), flows, and processes (i.e., activities). It also has a cyclic view in that it includes return channels and other circular supply chain activities that can close the loop. It has a strategic purpose of identifying the circular supply chain activities as well as the material "leaks" in the organization's supply chain. Even though the map shows actions to reduce waste, the market's supply chain is mostly linear (especially in regards to organic waste) and the value recirculating actions are limited. For instance, surplus seems to be only managed through one return channel (i.e., in house processing). Thus, the recommendations will aim to provide locally accessible solutions to (i) close the loop, (ii) diversify and expand the closed loop activities in regards to surplus management, (iii) reduce waste at the source and (iv) use waste as a source of community-engaged innovation.

Figure 29: Descriptive supply chain map of Citizen Market

Legend:

6.3.2 Food surplus management recommendations

According to the Citizen Market's volunteers and employees, the main resource management issue they face is food surplus management. Every market generates a certain amount of unsold fresh surplus (see Figure 29) due to fluctuating supply and demand. Until December 2014, this surplus was regularly processed and transformed into healthy meals that were brought to the community via the Citizen Café. Moreover, until May 2015, the community organization had a cooking course program where participants processed food surpluses. The resulting jams, sauces, cakes, salads, and frozen meals were sold during market events. However, the Citizen Café and cooking course program were stopped due to financial cuts that the Citizen Market had to face. This sudden change in operations generated community concerns in regards to how the Citizen Market would manage food surpluses. The community organization had to quickly adapt and respond to that supply chain situation: volunteers contributed their time in cooking, freezing and preserving surpluses to re-sell them. The organization also used its social network and started selling and donating surplus food to nearby community organizations. However, despite these informal mitigation attempts, some of the surplus ends up unsold, rotten and has to be disposed of in the garbage bin. Preventing surplus unsold food is difficult without decreasing purchase order volumes and the latter action would affect final prices of the produce. Moreover the surplus generated represents an added value to the organization and the community if properly managed. According to the market's coordinator, "all these activities need to be framed within a surplus management plan that is both flexible and structured".

One option of surplus management would be reselling the produce through a last-minute marketing strategy. According to one key informant, the organization could consider re-selling the surplus fresh food to customers at lower prices through a "food box" scheme. Prior to each market, customers could subscribe to a "food box" of a monetary value of their choice. For example, every week, customers would be able to chose between a 5$, 10$ or 20$ food box that would contain unknown mixed surplus food. After each market, a volunteer or employee could place mixed unsold surplus in boxes (according to the number and value of food box subscriptions as well as the surplus of that week) that would later be picked up by the customers.

As illustrated in Figure 30, this initiative can potentially enhance healthy food access to low-income citizens as well as raise awareness regarding sustainable and collective resource management. Moreover, customers would choose whether to subscribe or not from one week to

another (depending on their needs and wishes). There are neither conditions nor commitments to the food box program, which could encourage the community to participate. Further flexibility can be realized due to the rather unpredictable nature of surplus, which varies from week to week. Thus this program is not meant to become a regular supply channel but a flexible and adaptable complimentary supply channel. In addition, a food box scheme would help the community organization to recover its costs while eliminating processing and logistics costs usually associated with surplus management. Indeed, there is little management required for implementing this program as the boxes contain a mix of produce and are picked up by the customers themselves. The only additional task this option would generate would be the food boxes' preparation after each market.

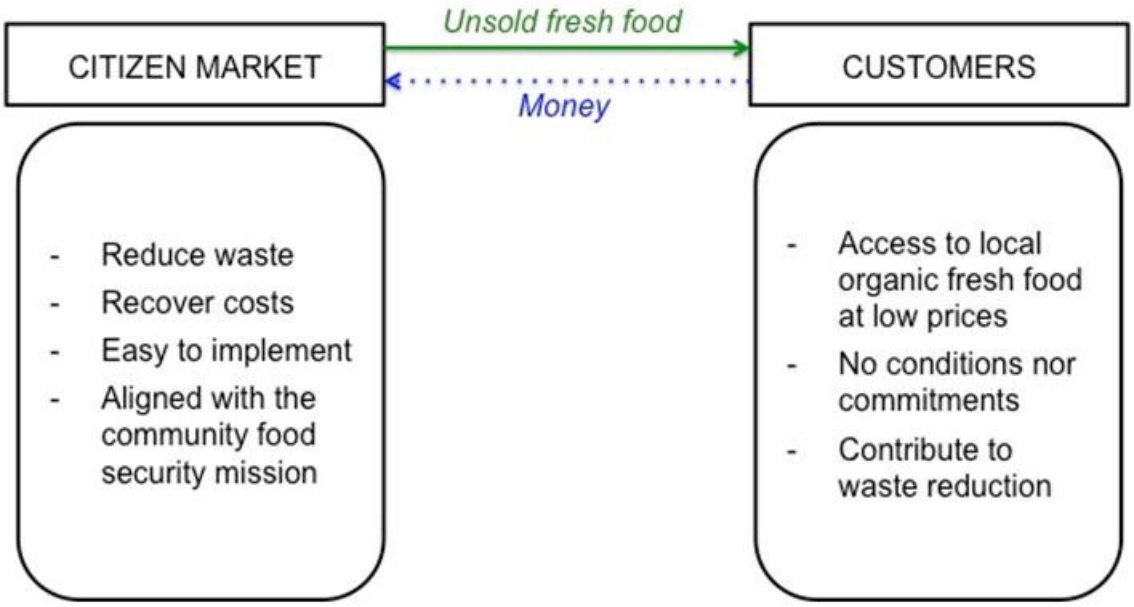


Figure 30: Food box scheme partnership

However, from a holistic supply chain perspective, a food box program would not necessarily prevent waste. Since customers and community members involved in this program do not choose the specific produce they buy, this might result in food waste at the household.

Moreover, due to initiative's flexibility, the demand for food boxes will not be stable from week to week. The Citizen Market therefore cannot only rely on food box schemes to manage surplus and needs to complement this surplus management method with other value recirculating options.

The Citizen Market can also consider re-selling the unsold surplus fresh produce to nearby community organizations (i.e., educational organizations, children's camps, food banks, etc…) and local restaurants or cafes of the neighborhood (see Figure 31). After each market event, depending on the surplus quantity and types, an employee could be responsible for contacting a known list of nearby organizations who would be interested in last minute purchases of fresh produce at low prices. Similarly to the food box scheme, this partnership would be a flexible one. Community organizations and restaurants would not have to commit to this program. This initiative would also require less resources and management in comparison to in house processing. Moreover, such symbiotic partnerships with local non-profits and small business can expand the social network and visibility for the Citizen Market.

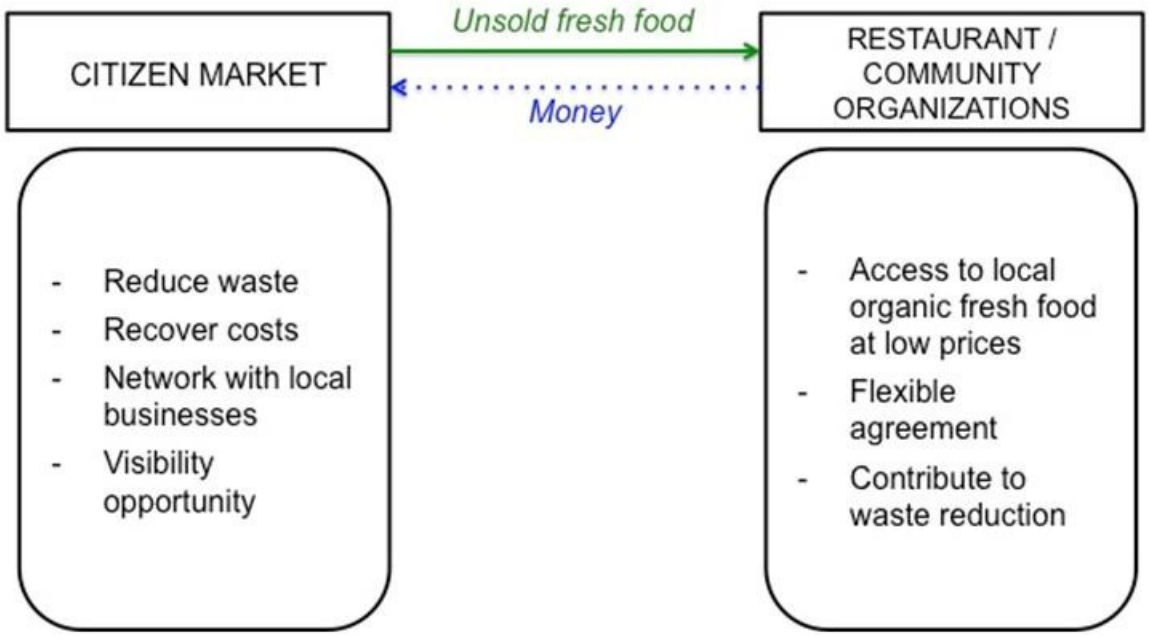


Figure 31: Citizen Market - restaurants/community organizations partnerships

Legend:

Material flow

Monetary flow

However, this initiative illustrated in Figure 31 would be different than the food box scheme in that the last-minute customer (community organizations and restaurants) would be able to choose which surplus they need in order to avoid waste (due to the scale, nature and needs of those organizations). In the case of such partnerships, the transportation and logistic costs and management would have to be negotiated between the two partners. The partnerships recommended include stakeholders in the same neighborhood, which limits these costs. It is important to note that partnering with customers (through the food box scheme discussed above) and with community organizations is a community-centric option of recirculating value. In those initiatives, the value is recirculated within the community. On the other hand, partnering with local restaurants and cafes would be a less community-centric option. Nonetheless, it would encourage local small business to access affordable organic produce and could generate indirect benefits for the community.

During the summer of 2015, 13 potential partners including restaurants, cafes and community organizations in the South West borough were contacted regarding that possible partnership with the Citizen Market. Out of 13 participants, 6 (i.e., 46%) were interested in purchasing surplus fresh produce from the Citizen Market at reduced prices. These interested supply chain actors included 2 non-profit community organizations and 4 for profit local restaurants/cafes. According to one restaurant owner, they use a lot of “seconds” (i.e., surplus and soon to be expired vegetables) in their soups: this partnership would thus help them access these produce from a nearby community market. Other cafés were mainly interested in surplus fruits for their desserts. Some of these local restaurants could also provide surplus processed food (such as surplus baked goods) to the Citizen Market. Moreover, a community organization in front of the Citizen Market’s space was interested in purchasing affordable surplus fresh produce at the market and to reduce their dependence on large chain supermarkets such as Super-C. It is important to note that this last-minute marketing method (i.e., reselling surplus to customers, community organizations and restaurants) largely depends on external demand. As such, it must be accompanied by other more stable valorization strategies.

Such a valorization strategy consists of in-house surplus management as shown in Figure 32. The Citizen Market would preserve (through freezing, drying, pickling, cooking etc…), process, store and re-sell the food during regular market events. As explained above, the market is already employing this in-house valorization method when necessary.

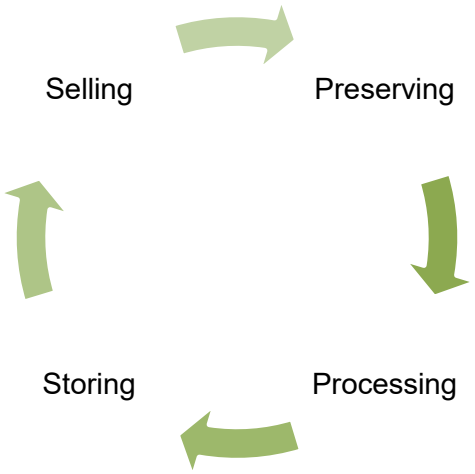


Figure 32: In-house surplus management

This internal waste management practice has the potential to enhance community awareness regarding sustainable resource management, promote community engagement and develop skills. However, this internal circular economy practice is human resource intensive. Currently, volunteers (in collaboration with the market coordinator) process the surpluses through unpaid voluntary labor. It is more viable if the volunteers were accompanied and supported by a regular employee responsible for surplus management. The latter would organize, facilitate and manage processing sessions in collaboration with the volunteers. Analyzing past sales to assess which processed foods (i.e., soups, jams, frozen lasagna etc…) were most preferred by the community could also guide recipe development. The recipes could also change depending on the time and human resources available. Simple recipes such as juices and soups could be selected in times with low operational capacity whereas more refined and complex recipes could be developed when recourses are available. Moreover, the market could also organize a monthly collective kitchen session where citizens transform the market's surpluses into meals that they take home (see Figure 23 in Chapter 5 for a similar initiative). This will ensure that the benefits of this initiative (i.e., skill building, empowerment, access to healthy food) reach a more diverse group of citizens who might not necessarily be regular volunteers. Due to the teamwork, creativity and improvisation required in collectively processing surplus, this activity can generate community-based experiential learning and recipe innovation.

6.3.3 Waste management recommendations

As shown in Figure 29 and explained in sub-section 6.3.1, inedible organic byproducts that result from spoilage or processing are disposed off in the conventional garbage and collected for landfill disposal. The current organic waste quantity is not very large (i.e., can be

compared to that of a household) but will increase as the Citizen Market expands its operations. Moreover, one of the core values of this community organization is sustainable development (see sub-section 6.1). Closing the loop on organic waste will ensure that the mission and values of the organization are reflected in its supply chain practices.

The following recommendation is based on the local context and assets present in the South West borough. A local start-up compost company located in St Henri, Compost Montreal, collects organic waste from local food supply chain actors (i.e., restaurants, community organizations, markets etc…) and transports it to a compost site where it is transformed into organic fertilizer. As part of its social mission, Compost Montreal has existing symbiotic partnerships with community organizations. The compost company collects the organic waste these organizations generate at a reduced cost or for free (depending on the financial capabilities of the organization). In return, the community organization promotes and provides visiblity for the compost company through traditional and modern marketing techniques. This "free collection for visibility" partnership is recommended for the Citizen Market and mapped in Figure 33 below.

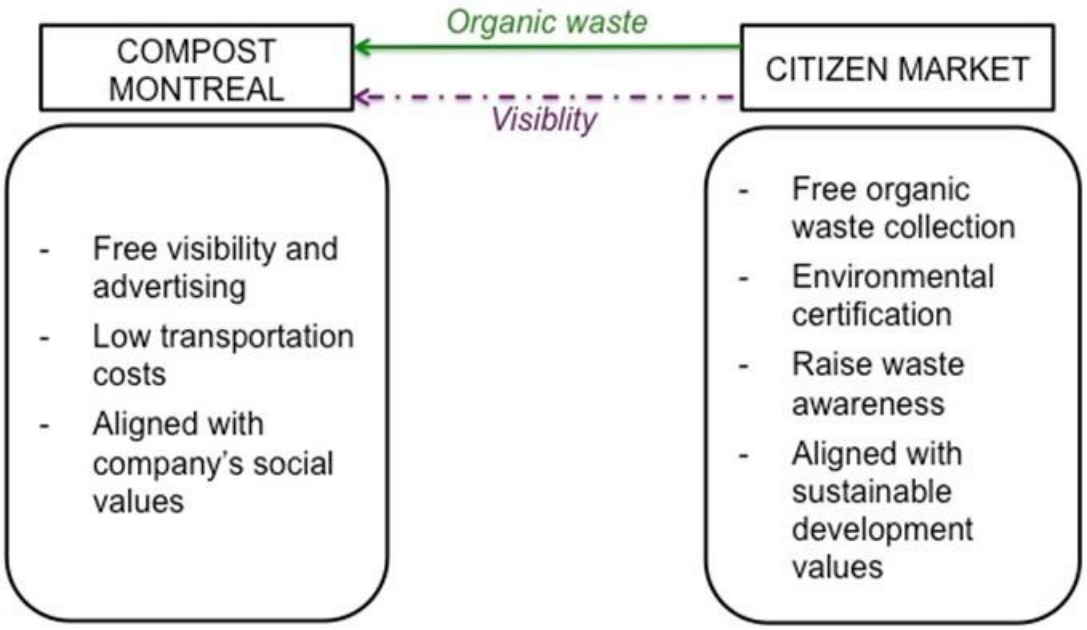


Figure 33: Citizen Market - Compost Montreal partnership

Legend:

Material flow

Information flow

The organic waste generated by the market can be segregated at the source and collected weekly by Compost Montreal. As a way to support the market's mission, the compost company could provide the service free of charge. The market would only pay the compost bin ($35) and not the total cost which is approximately 150$ per month on average. The short distance (i.e., 2 km) between both organizations will keep transportation costs associated with this partnership very low. In exchange, the Citizen Market will promote Compost Montreal through visibility and marketing activities. The community organization can distribute brochures and exhibit banners (in regards to the Compost Company) during market events. The partnership can also be communicated to the community virtually through the market' website and social media (i.e., Facebook, Instagram etc…). This partnership could help the local compost company expand their social and business connections in the Little Burgundy neighborhood. Also, the compost company uses biodiesel (generated from used cooking oil) for fuelling its trucks: the cooking oil byproducts generated during in-house processing sessions could be donated to the compost company. Moreover, Compost Montreal provides environmental impact certificates for its clients that quantify the amount of organic waste diverted from landfills and the greenhouse gas emission reductions among other metrics. Such a practice would reduce the ecological footprint of this socially responsible food market and would increase community awareness and literacy in regards to sustainable waste management (see Figure 33). However, Compost Montreal is still in its start-up years and has limited resources to work with.

Byproducts and waste in local food supply chains also includes food-packaging materials. This type of waste can be eliminated through clean production principles such as reduction at the source and sustainable sourcing (see sub-section 5.3.5). The Citizen Market is currently planning to expand its operations. In addition to the community market events, a regular community grocery store that provides affordable healthy food will be open during the week. This expansion represents an opportunity for the organization to adopt a source reduction strategy in regards to packaging. For instance, fresh produce such as nuts, grains, vegetables, fruits can be sold in bulk. Moreover, homemade produce such as soups and juices can also be sold in bulk (i.e., the customers would bring their own packaging). This would help keep costs as low as possible. In regards to products that need to be packaged, the organization can shift to 100% biodegradable and compostable materials. These actions would have to be coordinated and managed with the market's suppliers and some products might need to be eliminated or replaced if they have no sustainable packaging alternative. In addition, unpreventable packaging waste needs to be disposed in recycling bins. More focus should be

put on recycling bin visibility and on distinguishing “non-recyclable waste” from “recyclable waste” through informative posters and signs.

In regards to necessary packages such as egg cartons, they can be returned and continuously reused by the local producer (as shown in Figure 34). The market’s customers would return empty egg cartons in their next visit and the latter will be stored and collected by the egg supplier in his next visit. This collaborative customer-producer partnership facilitated by the Citizen Market has the potential to reduce costs for the producer, actively engage the community in waste reduction and is aligned with the Citizen’s Market values. This initiative is commonly practiced in some local retail stores. It would be very simple to implement and doesn’t require additional logistical steps: the exchange would take place during scheduled events (regular market event and produce delivery). The Citizen Market could develop a point-based incentive system whereby customers who return empty cartons would receive a gift after accumulating a certain amount of points.

Figure 34: Producer-Market-Customer partnership

Legend:

The surplus and waste management recommendations discussed above mainly involve re-selling surplus, transforming and re-selling surplus, composting organic waste, as well as reducing, reusing and recycling packaging waste. However, these byproducts can also be a source of innovation, new product development and community engagement.

6.3.4 From waste to new product development

As discussed in Chapter 4, live exhibitions of repurposed items were conducted to explore waste perception of food supply chain users. The items exhibited are described in Table 2 of Chapter 4. During the exhibitions, multiple-choice surveys were distributed to participants asking them which repurposed items they found most useful, which ones remind them of garbage, which ones they would do at home for their own use, which ones they would sell and which ones they would buy (Appendix A). One of these exhibitions was conducted in the Citizen Market during a regular market event (see photo 1). In this chapter, we will analyze the results of that particular exhibition (i.e., 34 participants, mostly customers of the Citizen Market) through a new product development and supply chain extension lens.

Photo 1: Exhibition at the Citizen Market on June 6th 2015

As shown in Figure 35, the coffee scrub (i.e., item 3) ranked the highest in terms of its description of being “useful” and the potential for buying it. Even though the exhibition only aimed to assess waste perception, the coffee scrub idea generated a lot of interest from the community members and market customers. This information can be used by the community organization to integrate waste management with new product development using a cradle to cradle design approach.

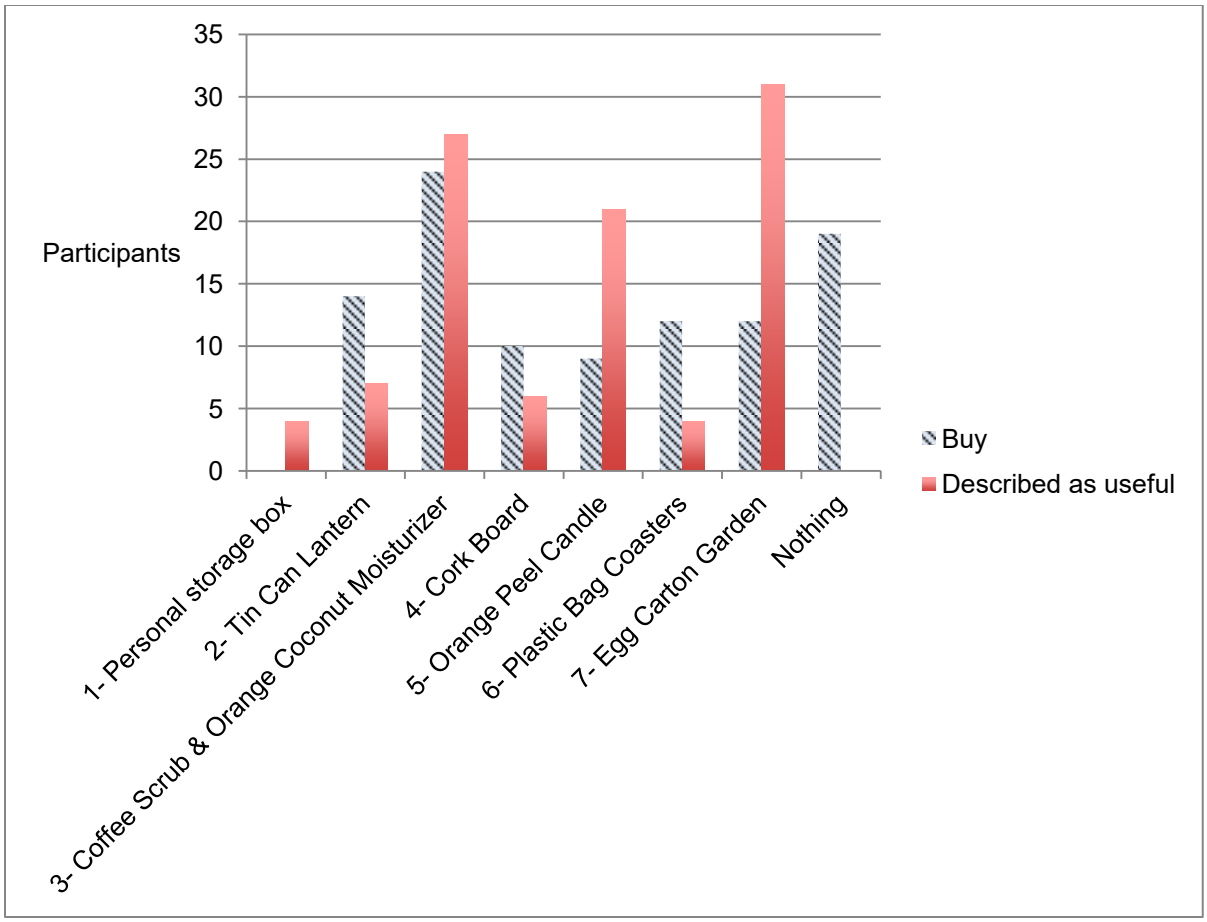


Figure 35: Citizen Market customers' preferences

The exhibited skin exfoliator product was made out of used coffee grounds. As shown in the process map (Figure 36) below, used coffee grounds are currently disposed off in the garbage to be sent to landfills. As proposed in Figure 37, the Citizen Market could donate (or sell at very low prices) a general coffee scrub (i.e., non-differentiated product) that could be either used as a body exfoliator, a cleaning agent or an organic fertilizer. This multifunctional product would be packaged in compostable bags with a label indicating the product description, shelf life, and proposed recipes (see Figure 37). In contrast to Figure 36 that shows a linear cradle to grave supply chain process, Figure 37 shows a closed loop circular process.

Legend for Figure 36 and 37:

Figure 36: Current waste management of coffee brewing byproducts

Figure 37: Proposed new product development for managing coffee brewing byproducts

This cradle to cradle new product development approach would extend the coffee grounds' life cycle and increase waste awareness among the Citizen Market's actors and users. This multifunctional product can also inspire, empower and enable the community in developing their own beauty and cleaning agents in order to save on household costs and use safe alternatives. Even though this needs to be tested for assessing people's acceptance, some customers may prefer to buy a differentiated product that is ready to be used for a specific function (i.e., for example: an orange-scented coffee scrub and moisturizer). In that case, the market will need to invest more material and human resources for providing that product and they would sell it at a higher price (but still affordable) than the undifferentiated one. This upcycling process can potentially generate revenues for the Citizen Market while diversifying its offer from a solely food based market to a "natural products" market.

The exhibited tin can lantern ranked by the participants as the second highest in regards to the possibility of buying this item (see Figure 35). The Citizen Market currently uses tomato paste for food processing and the tomato paste cans are then disposed off in the recycling bin (see Figure 38). The life cycle extension of that type of item can be conducted though community arts and craft workshops. Such an initiative would bridge community development, experiential learning, new product development and waste management. The Citizen Market could organize community workshops in its space or collaborate with Atelier 850, a nearby community organization that organizes experiential learning activities for children. This upcycling activity would include collecting recyclable packaging waste (such as milk carton, tin cans, plastic boxes) and transform them into useful objects such as lanterns and planting containers (see Figure 39). Indeed, Figure 38 shows a linear supply chain process whereas Figure 39 shows a closed loop circular process. Some of the items would be later distributed to participants and some would be sold during specific market events. These activities will contribute to empowering the community through developing craft skills and creativity. Like the coffee scrub, such items could also attract a more diverse crowd during market events.

Legend for Figure 38 and 39:

Figure 38: Current waste management of packaging byproducts

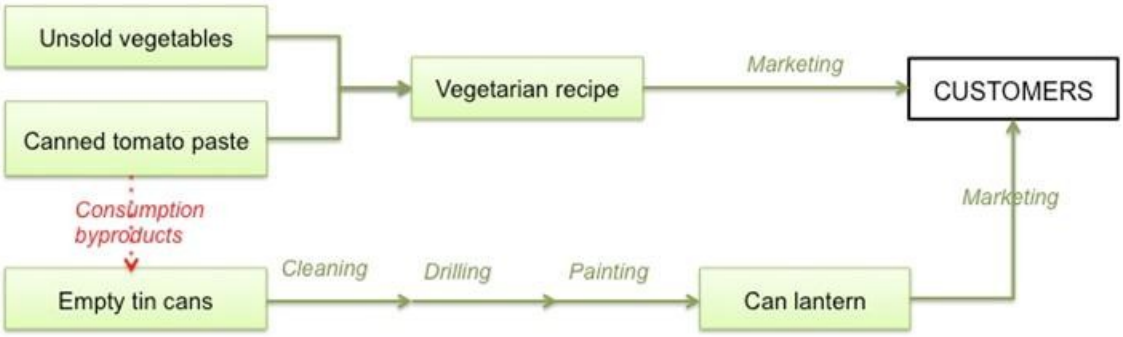


Figure 39: Proposed new product development for managing packaging byproducts

6.3.5 A circular economy framework for the Citizen Market

As discussed in the previous sections of this chapter, the main byproducts circulating in the community-based supply chain studied consist of edible surplus food, inedible organic waste and packaging waste. In its current operations, the Citizen Market aims to adopt sustainable practices in regards to surplus food and packaging byproducts by processing the former and recycling most of the latter. The latter materials are however not always recirculated. Moreover, organic waste generated through processing or spoilage is not recycled. This case study aims to build on the existing sustainable practices of the organization and recommend additional complementary practices that aim to recirculate value. It aims to provide a diverse array of local solutions that the Citizen Market can consider for achieving a closed loop supply chain. One of these locally inspired recommendations includes symbiotic partnerships with nearby supply chain partners (i.e., restaurants, other community organizations, other markets, compost companies etc…). Through the documentation of existing symbiotic partnerships (see Chapter 5), this study has focused on the potential of applying the industrial symbiosis concept to alternative food networks. In the case of the Citizen Market, the recommended symbiotic partnerships included collaborative practices to compost organic waste, reuse packaging and re-sell surplus food. Figure 40 depicts the possible ecological relationships between the Citizen Market and its local food supply chain partners. Some of these potential partnerships (when complemented with other circular economy initiatives as illustrated in Figure 42) will be crucial for achieving the proposed closed loop supply chain illustrated in Figure 41.

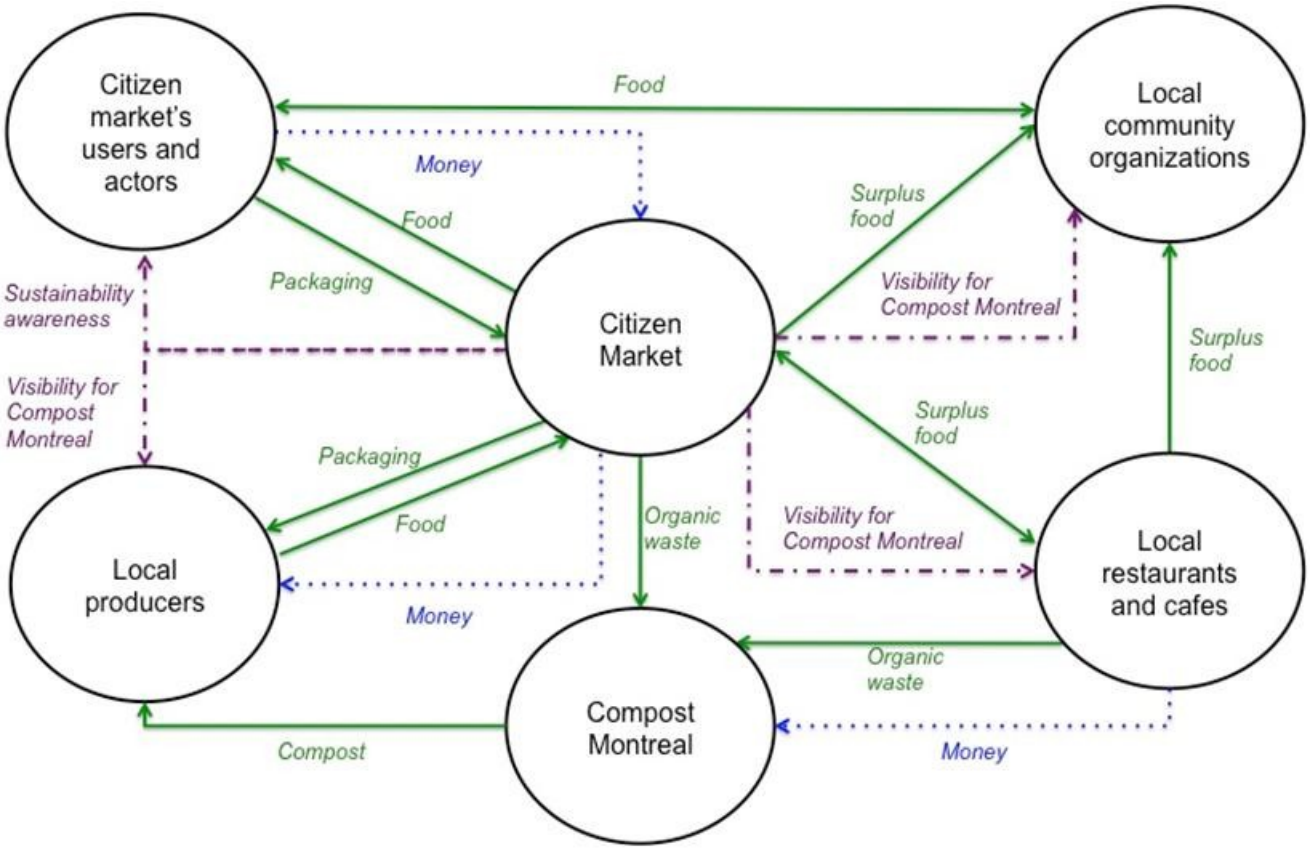


Figure 40: Applying industrial symbiosis concept in AFN: the Citizen Market case

Legend:

Material flow

Monetary flow

Information flow

Figure 41 (below) is a prescriptive supply chain map that illustrates a proposed future circular supply chain model for the Citizen Market. Similar to the descriptive supply chain map depicted in Figure 29, the prescriptive map also employs a high aggregation and a cyclic and organization centric view. The organization's supply chain aims to be flexible and responsive to the community's needs and supply fluctuations. The circular economy practices suggested thus allow for certain flexibility. The prescriptive future supply chain map (Figure 41) depicts all the practices proposed. These practices can ideally work in synergy to achieve a zero-waste food system. Moreover, the organization may choose to adopt certain circular economy practices at certain times depending on the situation and context. Contrarily to the descriptive (i.e., current) supply chain map depicted in Figure 29, the prescriptive (i.e., proposed) supply chain map depicted in Figure 41 has a closed loop. This is achieved through clean production practices, internal waste management and valorization, cradle to cradle product development, and symbiotic partnerships.

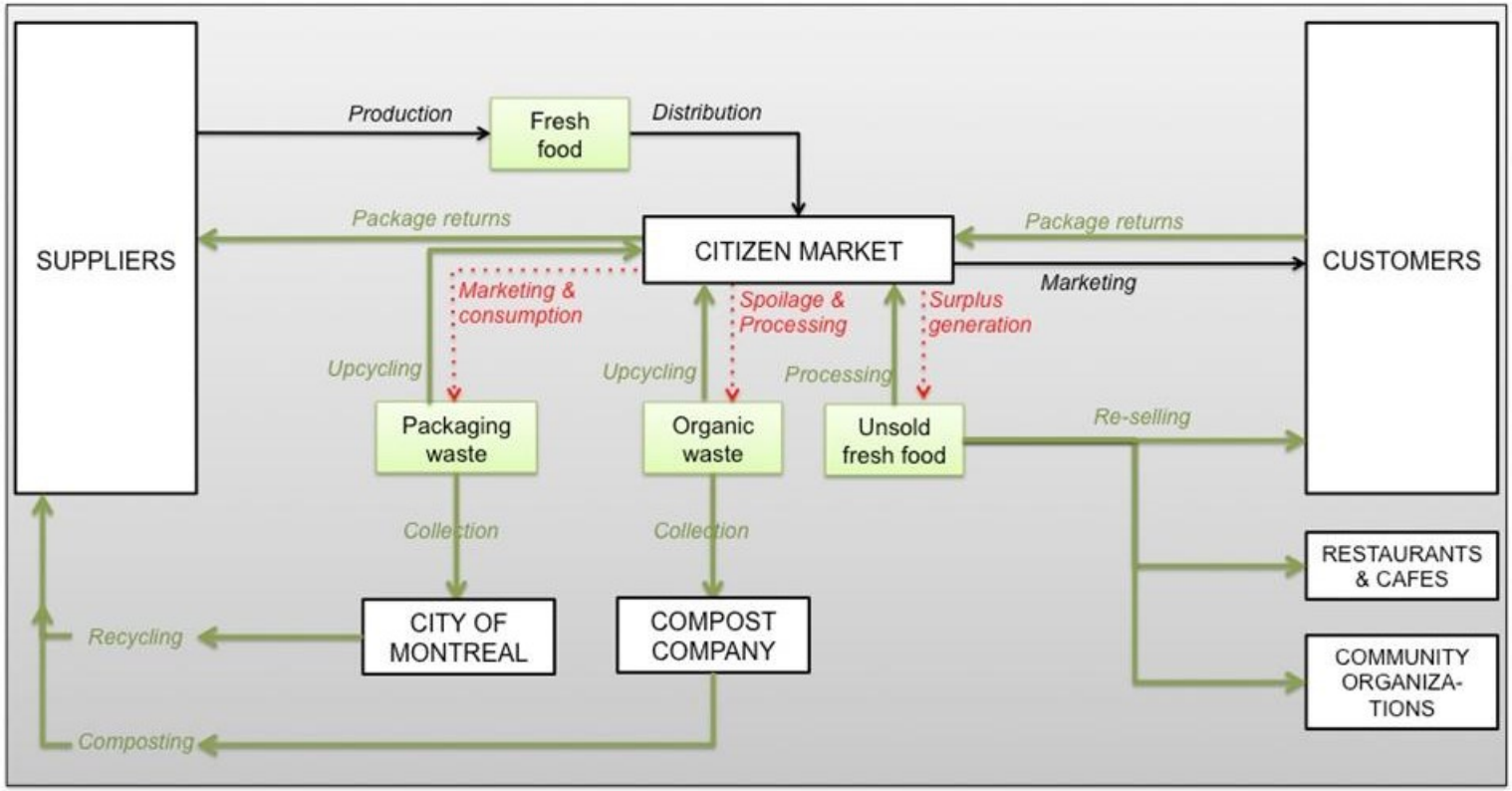


Figure 41: Prescriptive supply chain map of Citizen Market

Legend:

Nonetheless, these practices can have different processes and outcomes when applied to manage different materials (i.e., food surplus, organic waste, packaging waste). Some recommended practices have a great potential for empowering the community and recirculating value at a very local level (within the Citizen Market community). Others have a lower social value to the community but have a higher potential ecological impact. Figure 42 (below) maps the different proposed practices along two main axes: ecological impact and social impact. This conceptual map can guide the organization in adopting or postponing certain practices depending on their supply chain situation and the goals they want to achieve.

For instance, using a cradle to cradle approach for developing new products from waste has a very high potential for community engagement, experiential learning and innovation (see Figure 42). It may also generate revenues for the Citizen Market if the upcycled items are sold during market events. However, this practice only targets specific valuable byproducts (example: coffee ground). Developing and selling coffee-based scrubs will not by itself close the loop because coffee grounds only represent a small fraction of the organic waste generated by the organization. Therefore, even though this is an environmentally friendly practice, its positive ecological impact is limited in comparison with a symbiotic partnership that would enable all organic waste to be collected and composted (see Figure 42). The latter however may not have direct community benefits.

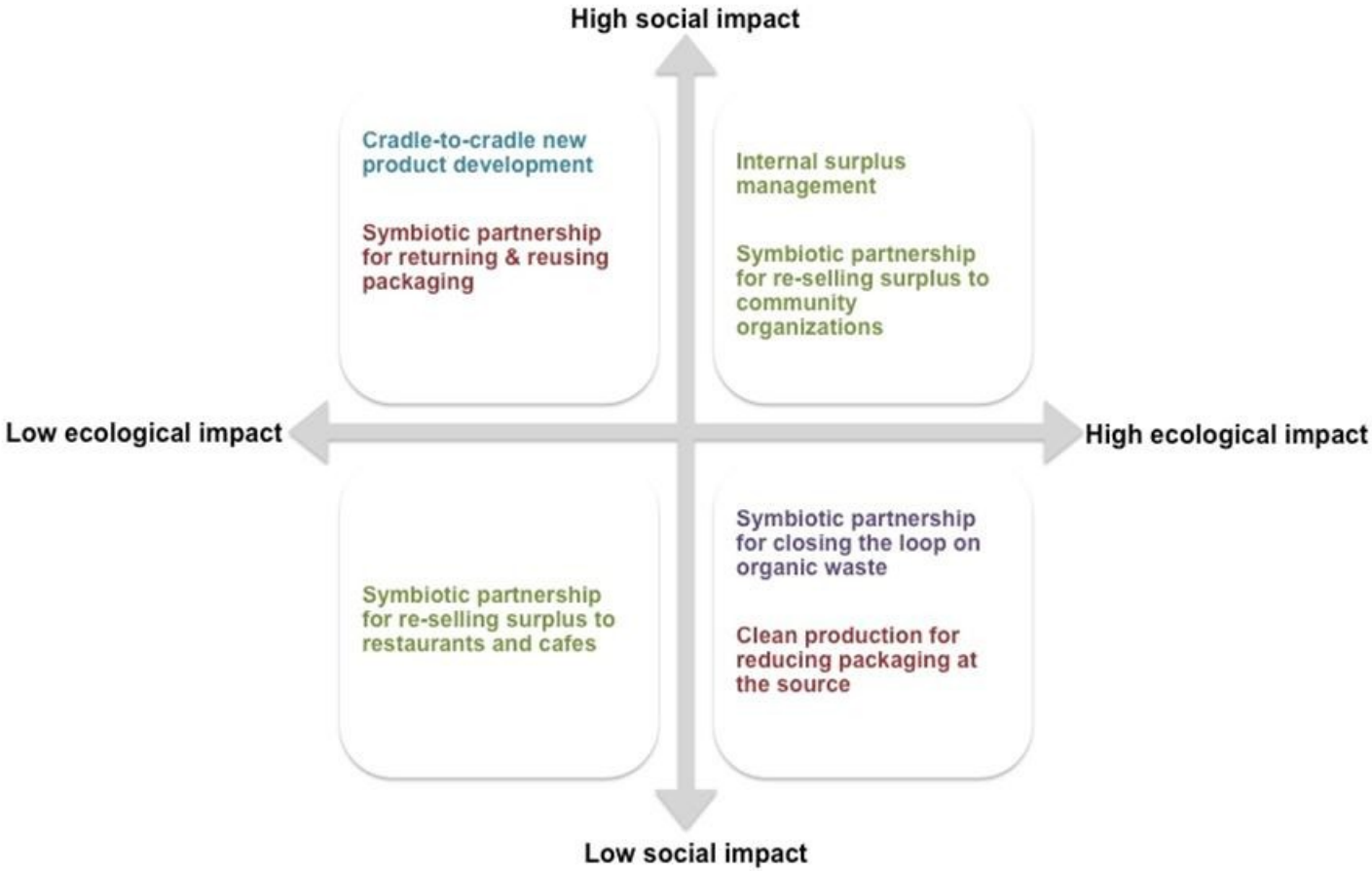


Figure 42: Conceptual map of circular economy practices

Legend:

Green: surplus management

Purple: organic waste management

Red: packaging waste management

Blue: packaging and/or organic waste upcycling

Moreover, in regards to packaging, a symbiotic partnership (facilitated by the market) between an egg supplier and customers may have a high social impact (see Figure 41). It will engage the community in reducing waste throughout the supply chain; it will help a local producer reduce costs; it will increase waste awareness; and it may develop stronger relationships between supply chain partners. However such partnerships tackle a specific type of packaging and not all packaging byproducts involved in the supply chain. Thus, such partnerships must be implemented for packaging materials that cannot be eliminated from the supply chain or for biodegradable and non-toxic packaging materials (eg: egg cartons). Such actions at the end of the chain have to be complemented by a clean production approach that aims to reduce packaging at the source (or shift to biodegradable non-toxic packaging materials).

As for surplus management as shown in Figure 42, in-house processing has a potentially high social (i.e., the community is engaged both in the production and consumption stages) and ecological impact (i.e., all surplus can potentially be processed internally). This practice is however resource intensive and might not be feasible at all times. It has to be complemented by other options. Partnering with nearby community organizations can be an effective way to recirculate the value in the community while reducing internal management costs. Local restaurants and cafes are, however, different from most community organizations in that they have a set menu and would need a certain type of surplus produce. For example, a bakery might only need surplus fresh berries for deserts while a restaurant might only need surplus carrots for making soups. It is improbable that a single restaurant will collect all the surplus of the Citizen Market. This will limit the ecological benefits of such practices. Moreover, these partnerships have the lowest social impact because they do not directly benefit the community (in comparison to the options discussed above).

6.4 Concluding remarks

This case study depicted the current supply chain strategy and practices of the Citizen Market and provided recommendations for achieving a circular supply chain where value is recirculated locally.

Below is a summary of these recommendations:

- Sell food surplus to the Citizen Market’s customers through a “food box” program
- Sell or donate food surplus nearby local community organizations
- Sell food surplus to nearby local restaurants and cafes

- Process food surplus internally and re-sell it during regular market events
- Develop a mutually beneficial partnership with Compost Montreal in regards to organic waste collection for compost
- Develop a mutually beneficial partnership with the market's suppliers and customers in regards to package returns
- Purchase food with minimal to no packaging materials; and eliminate and/or replace materials that are non-recyclable or non-compostable from the organization's supply chain flow
- Develop and sell new products, made out of the organization's food and packaging byproducts, during regular market events
- Improve waste management literacy (in regards to recycling and composting)
- Increase visibility of recycling (and compost) bins

These recommendations are based on the circular economy practices explored in Chapter 5; the waste perception observations explored in Chapter 4, and most importantly, the local context of the Citizen Market. These recommendations, their application and potential impacts can only be assessed based on the local social and supply chain context. There is not universal solution for "closing the loop". Practices such as industrial symbiosis, internal waste management, clean production and cradle to cradle design work are complementary and work in synergy. The appropriate combination of circular economy practices can differ from one supply chain to another depending on the types of goods produced, the target market, the organization's mission, and the supply chain strategy employed.

Can the proposed practices change the organization's users' and actors' perception of waste? Can a change in actions be translated to a change in worldview? According to Thompson's rubbish theory, the answer is yes. The definition of waste is one that is socially malleable and dynamic. Waste perception and behavior are not fixed social phenomena. They depend on many factors such as the local, cultural, social, physical and supply chain context. If presented and used under the "right" (i.e., culturally relevant) conditions, the transformation of a byproduct into a valuable product can change our initial perception of that byproduct. This change in perception, activated by a life experience, can in turn make us re-question our everyday practices.

7 CONCLUSIONS AND AREAS FOR FUTURE RESEARCH

This multidisciplinary study explores waste perception and management in the context of Montreal's alternative food networks (AFN). It aims to study alternative food supply chains using a circular economy framework for waste management. The circular economy model and its related concepts of industrial symbiosis, cradle to cradle design and clean production have been studied in the context of industrial supply chains. While such research is of great importance, this thesis aims to extend the circular economy principles to alternative food supply chains. The latter aim to employ economically, socially, and environmentally sustainable supply chain practices. Nevertheless, they are rarely framed within the circular economy model. This exploratory study thus aims to fill that gap in literature by providing a snapshot of the existing and potential circular economy practices of alternative food networks (AFN).

The study specifically aimed to answer the following research questions: 1) How do AFN users perceive waste? 2) How do AFN actors recirculate value and how can symbiotic partnerships contribute for achieving a circular supply chain? 3) How can community food organizations close the loop and build a circular food model that is aligned with their sustainability goals? To answer those research questions, the researcher engaged with a diverse sample of AFN users and actors (including traditional for-profit businesses, non-profit community organizations and cooperatives) involved in different stages of the local food supply chain (i.e., production, marketing, processing and recycling).

In the first research phase (Chapter 4), the researcher explored how waste is defined, perceived and categorized through live exhibitions of upcycled items in different AFN contexts. Waste perception was found to be dynamic and socially malleable in accordance with Thompson's rubbish theory. Materials are categorized as valuable or rubbish according to the context in which they are presented, their esthetic appearance, their function and purpose, their socially constructed qualities, their place in the private-public continuum, and the perceived presence or lack of resources. Moreover, AFN actors involved at different stages of the supply chain have different activities, processes, inputs and outputs. This different supply chain context could generate different waste perceptions and management.

The second research phase (Chapter 5) thus aimed to survey AFN actors across various supply chain stages to explore the ways in which they manage the byproducts they generate. AFN actors manage ways through a combination of complementary and synergistic practices that include internal waste management (i.e., on-site recycling), resource sharing, symbiotic

partnerships, and clean production practices. Most of these practices were found to be informal and voluntary, especially in regards to surplus and organic waste management.

The third research phase (Chapter 6) aimed to provide, through a real-life case study, practical recommendations for a specific local AFN. The Citizen Market of Little Burgundy is a non-profit food market that aims to promote financial and geographical access to healthy food, through a sustainable supply chain strategy. Based on the study's findings on waste perception and management (Chapter 4 and 5), this case study aimed to provide a combination of local and complementary solutions for the Citizen Market to "close the loop".

In the natural world, the concept of "waste" or "rubbish" does not exist: every natural process output represents an input for another process. Alternative food networks (AFN) have a potential to close their supply chain loop and collaboratively design a circular food model where the concept of "waste" does not exist. Such a supply chain model would design cradle to cradle products and processes where "residual materials" are continuously transformed and used as "raw materials". Supply chain processes need to be redesigned into symbiotic networks where value is continuously recirculated in local communities. In accordance with Thompson's rubbish theory, there is a dynamic relationship between worldviews and actions: different perceptions lead to different waste management practices but the latter also shape perceptions. For perceptions to change, supply chains need to be radically redesigned. In fact, a circular economy framework to waste management has the potential to not only close material loops, but also significantly change how byproducts are perceived along the supply chain.

This study contributes to the literature in the following fields of study: waste perception, waste management, the circular economy, industrial ecology, and alternative food networks (AFN). This study also aims to influence the debate on AFN and local food movements in general by studying these sustainable supply chains through a circular economy framework. Moreover, in light of the recent SAM (Sustainable and Equitable Montreal Food System) plan, this research aims to provide practical recommendations for reducing the ecological footprint of Montreal's food system. When the City of Montreal creates a food policy council, this study can help the council develop policies for waste management and food waste reduction. Municipal food policies and waste management policies should aim to encourage, incentivize, and facilitate circular economy practices for local food supply chain actors.

Finally, it is concluded that future research should continue studying AFN in the context of the circular economy. Using a multidisciplinary approach to study this issue was able to bridge theory with practice. It is thus also recommended that researchers from other fields be

involved in future work related to ecological sustainability of alternative food networks. These fields can include green chemistry, sustainable product design and development, geography, programming and community development.

Based on the findings of this exploratory study and the gaps identified in literature, industrial symbiosis research could apply the ideas presented in this study on a supply chain optimization modeling level. Future work can identify, map and test symbiosis opportunities between Montreal-based food supply chain actors such as food producers, Montreal's Public Markets, food stores etc. Involving the fields mentioned above will facilitate the availability of information and techniques (in the form of interactive platforms, maps, and small-scale equipment) to local food actors.

In closing, sustainable research and practical initiatives should aim towards a closed loop, circular, cradle to cradle and regenerative local food supply chain.

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APPENDIX (A): WASTE PERCEPTION SURVEY

Sexe: Femme Homme

Groupe d'âge / Age group: 24 ou moins 25-44 45-65 65+

Lequel de ces objets est le plus utile pour vous? / Which of these objects do you find most useful?

1. Personal storage box
2. Tin can lantern
3. Homemade Coffee scrub & orange coconut moisturizer
4. Cork board
5. Orange peel candle
6. Plastic bag coasters
7. Egg carton garden

Lequel de ces objets vous fais penser à un dechet? / Which of these objects remind you of garbage the most?

1. Personal storage box
2. Tin can lantern
3. Homemade Coffee scrub & orange coconut moisturizer
4. Cork board
5. Orange peel candle
6. Plastic bag coasters
7. Egg carton garden

Seriez-vous interessé(e) à fabriquer ces objets chez vous pour votre propre usage? Si oui, lequel(s)?/ Would you make any of these objects at home for your own use? If yes, which one(s)

1. Personal storage box
2. Tin can lantern
3. Homemade Coffee scrub & orange coconut moisturizer
4. Cork board
5. Orange peel candle
6. Plastic bag coasters
7. Egg carton garden

Seriez-vous interessé(e) à fabriquer ces objets afin de les vendre? Si oui, lequel(s)? / Would you make & sell any of these objects? If yes, which one(s)

1. Personal storage box
2. Tin can lantern
3. Homemade Coffee scrub & orange coconut moisturizer
4. Cork board
5. Orange peel candle
6. Plastic bag coasters
7. Egg carton garden

Seriez-vous interessé(e) d'acheter ces objets ? Si oui, lequel (s)? / Would you buy any of these objects? If yes, which one(s)

1. Personal storage box
2. Tin can lantern
3. Homemade Coffee scrub & orange coconut moisturizer
4. Cork board
5. Orange peel candle
6. Plastic bag coasters
7. Egg carton garden

APPENDIX (B): WASTE MANAGEMENT SURVEY

This survey is destined for food producers

1. What type of production are you engaged in?

☐Rural food production ☐Urban food production ☐Peri-urban food production

2. What do you produce?

☐Fruits ☐Vegetables ☐Herbs ☐Meats ☐Dairy

Other. Specify:

3. What is the purpose of food production?

☐Self-sufficiency ☐Commercial ☐Both

4. Where are your market(s) located?

5. How do you market your produce?

☐Wholesalers ☐Public markets ☐Food retailers/store

☐Community supported agriculture (CSA)

Other. Specify:

6. Do you currently use organic compost as an input in your operations?

☐Yes ☐No

Other. Specify:

7. If yes, where do you access organic compost?

☐Self produced ☐Retailers/Markets ☐Other food producers ☐Compost companies

Other. Specify:

8. If no, do you wish to have access to organic compost as an input for your operations?

☐Yes ☐Maybe in the future ☐No

9. Do you currently use organic waste as an input in your operations?

☐Yes ☐No

10. Where do you access organic waste?

☐Self produced ☐Retailers/Markets ☐Processors (example: restaurants)
☐Other food producers ☐Compost companies
Other. Specify:

11. Do you wish to have access to organic waste for your operations?

☐Yes ☐Maybe in the future ☐No

12. What type of material(s) do you use for packaging your produce?

☐Carton ☐Plastic ☐Glass ☐No packaging
Other. Specify:

13. Do you currently recuperate used packaging from your customers?

☐Always ☐Most of the time ☐Sometimes ☐Never

14. In the future, do you wish to recuperate used packaging from your customers?

☐Yes ☐Maybe ☐No

15. What waste does your operations generate?

☐Recyclable organic waste ☐Recyclable non-organic waste ☐Non-recyclable waste
Others. Specify:

16. How do you manage that waste?

☐Collection for landfill disposal ☐Collection for recycling ☐Collection for compost
☐In house recycling ☐In house compost
Other. Specify:

17. Do you have partnerships in regards to waste reduction/recycling?

☐ No. Have not thought about it ☐Thought about it, but not yet acted
☐Ready to implement partnership activities ☐Yes. Strong partnerships in place

18. Who do you currently partner with to reduce/recycle waste?

☐Wholesalers ☐Public markets ☐Food stores
☐Food processors ☐Artists ☐Community organizations
☐Compost companies ☐Recyclers ☐Packaging supplier
☐Food producers ☐The city □ Consumers & citizens
Other. Specify:

19. What are the services/products that you and your partner(s) exchange?

☐Waste management expertise ☐Space

☐Waste awareness ☐Edible food

☐Waste collection ☐Non-edible food (organic waste)

☐Visibility/Marketing ☐Packaging materials

☐Equipment and tools ☐Money

Other. Specify:

<u>IF you currently have a partnership in regards to reducing/recycling waste:</u>

20. Who provides what to whom? Describe the partnership(s)

21. According to you, the partnership(s) is/are:

☐Formal ☐Semi-formal ☐Informal ☐Other. Specify:

☐Centralized ☐Semi-centralized ☐Decentralized ☐Other. Specify:

22. Your partner(s) is/are situated in the same:

☐District ☐City ☐Province ☐Country ☐Other. Specify:

23. Rate your interest in contributing in waste reduction in food supply chains from 1 To 10

<u>1= extremely interested and 10 = not interested at all</u>

This survey is destined for food markets/retailers

1. What produce do you market/sell?

☐Fruits, vegetables, etc… ☐Meat products ☐Dairy products

☐Seeds ☐Organic fertilizer ☐Container plants

☐Breads ☐Processed and/or preserved foods (ex: jams, frozen food etc…)

Other. Specify:

2. Where is your market/retail store located?

3. From whom do you purchase food?

☐Self-production ☐Local food producers ☐Public markets ☐Wholesalers

Other. Specify:

4. What waste does your operations generate?

☐Recyclable organic waste ☐Recyclable non-organic waste ☐Non-recyclable waste

Others. Specify:

5. How do you manage organic waste?

☐Collected by a compost company ☐Collection for compost by the city

☐Collected for landfill disposal (with regular garbage) ☐In house compost

Other. Specify:

6. How do you manage non-organic waste?

☐Collected for recycling ☐Recuperated and reused ☐Collected for landfill disposal

Other. Specify:

7. Have you previously been asked by a supplier if could recuperate used packaging?

☐Yes ☐No

8. Do you currently recuperate used packaging from your customers?

☐Yes, often □ Sometimes ☐No

9. If yes, which type of packaging do you recuperate (example: egg cartons)?

10. In the future, do you wish to recuperate used packaging from your customers?

☐Yes ☐ Maybe ☐No

11. Do you have partnerships in regards to waste reduction/recycling?

☐ No. Have not thought about it ☐Thought about it, but not yet acted

☐Ready to implement partnership activities ☐Yes. Strong partnerships in place

12. Who do you currently partner with to reduce/recycle waste?

☐Wholesalers	☐Public markets	☐Food stores
☐Food processors	☐Artists	☐Community organizations
☐Compost companies	☐Recyclers	☐Packaging supplier
☐Food producers	☐The city	☐ Consumers & citizens

Other. Specify:

13. What are the services/products that you and your partner(s) exchange?

☐Waste management expertise	☐Space
☐Waste awareness	☐Edible food
☐Waste collection	☐Non-edible food (organic waste)
☐Visibility/Marketing	☐Packaging materials
☐Equipment and tools	☐Money

Other. Specify:

<u>IF you currently have a partnership in regards to reducing/recycling waste:</u>

14. Who provides what to whom? Describe the partnership(s)

15. According to you, the partnership(s) is/are:

☐Formal ☐Semi-formal ☐Informal ☐Other. Specify:

☐Centralized ☐Semi-centralized ☐Decentralized ☐Other. Specify:

16. Your partner(s) is/are situated in the same:

☐District ☐City ☐Province ☐Country ☐Other. Specify:

17. Rate your interest in contributing in waste reduction in food supply chains from 1 To 10

<u>1= extremely interested and 10 = not interested at all</u>

This survey is destined for food processors

1. What produce do you process?

☐Fruits, vegetables, etc… ☐Meat products ☐Dairy products

☐Coffee ☐Grains (breads etc…)

Other. Specify:

2. Where is your activity located?

3. From whom do you purchase food?

☐Self-production ☐Local food producers ☐Public markets ☐Wholesalers

Other. Specify:

4. What waste does your operations generate?

☐Recyclable organic waste ☐Recyclable non-organic waste ☐Non-recyclable waste

Others. Specify:

5. How do you manage organic waste?

☐Collected by a compost company ☐Collection for compost by the city

☐Collected for landfill disposal (with regular garbage) ☐In house compost

Other. Specify:

6. How do you manage non-organic waste?

☐Collected for recycling ☐Recuperated and reused ☐Collected for landfill disposal

Other. Specify:

7. Do you have partnerships in regards to waste reduction/recycling?

☐ No. Have not thought about it ☐Thought about it, but not yet acted

☐Ready to implement partnership activities ☐Yes. Strong partnerships in place

8. Who do you currently partner with to reduce/recycle waste?

☐Wholesalers ☐Public markets ☐Food stores

☐Food processors ☐Artists ☐Community organizations

☐Compost companies ☐Recyclers ☐Packaging supplier

☐Food producers ☐The city □ Consumers & citizens

Other. Specify:

9. What are the services/products that you and your partner(s) exchange?

☐Waste management expertise ☐Space

☐Waste awareness ☐Edible food

☐Waste collection ☐Non-edible food (organic waste)

☐Visibility/Marketing ☐Packaging materials

☐Equipment and tools ☐Money

Other. Specify:

<u>IF you currently have a partnership in regards to reducing/recycling waste:</u>

10. Who provides what to whom? Describe the partnership(s)

11. According to you, the partnership(s) is/are:

☐Formal ☐Semi-formal ☐Informal ☐Other. Specify:

☐Centralized ☐Semi-centralized ☐Decentralized ☐Other. Specify:

12. Your partner(s) is/are situated in the same:

☐District ☐City ☐Province ☐Country ☐Other. Specify:

13. Rate your interest in contributing in waste reduction in food supply chains from 1 To 10

<u>1= extremely interested and 10 = not interested at all</u>