Fresh City: Impacts of local food

Social, environmental, economic dimensions

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1 — Introduction

Fresh City Inc. is a social enterprise that delivers fresh produce in customized boxes to homes in the Toronto area. Box content is grown locally and using organic production methods. Fresh City either grows this food on fields that they rent within the city limits (Fresh City Farms), purchases it from suppliers from around Toronto, or – if not otherwise available – from the Ontario Food Terminal. However, Fresh City is not only a food producer and delivery service. The vision of Fresh City is "to be a thought and market leader in empowering all to make conscious food choices" (Fresh City website[1]). To do so, Fresh City wants to re-connect city dwellers with farming – as educated and conscious consumers, as political advocates for a more sustainable food system, and hands-on, as part of their production enterprise. This assessment investigates the impacts of this enterprise from a social, economic, and environmental perspective.

Food systems are a vital artery of human society. It not only provides the calories that are essential to maintain basic body functions, but healthy food is increasingly recognized as the basis for good health. Current changes in dietary patterns contribute to chronic diseases such as obesity, diabetes mellitus, cardiovascular disease, hypertension and stroke, and some types of cancer. These are not only becoming increasingly significant causes of disability and premature death (WHO 2003), but also threaten to collapse national health budgets (Anis et al., 2010, Wang et al., 2011). Authors like Swinburn et al. (2011) argue that modern societies are creating an obesogenic environment, a culture that is a remnant of a food system historically designed for providing sufficient food to people in a scarce world. Today, Swinburn and colleagues argue that the food system fosters unhealthy eating patterns both in terms of quality, and the quantity of our food.

At the same time, the provision of food also forms a backbone of the Canadian economy. According to Statistics Canada, Canadians spent $92 billion on food and beverages in stores for household use in 2007, plus an additional $50 billion in restaurants and bars (StatCan 2009). Agriculture and agri-food industries employed more than 15% of Canada's workforce, a percentage that is growing continuously (Keith 2003). This not only includes primary production in agriculture, but also manufacturing and the service sector. Depending on the food chain, food may be handled by wholesalers, processed, packaged, sold, and prepared. Each step can require

[1] http://www.freshcityfarms.com/about/our-vision

transportation, and general services in retail, advertising, or other business support (StatCan 2009).

Agricultural practices are one of the main determinants for humankind's impact on the environment. Based on total area, agriculture is the most important human land use. For example, the food system as a whole is responsible for 19%-29% of all greenhouse gas emissions (Vermeulen et al., 2012). When assessing planetary boundaries of growth, agricultural practices are core drivers for the top four challenges for humanity: the rate of biodiversity loss, the global nitrogen cycle, climate change, and the global phosphorus cycle (Rockstroem et al., 2010).

In short, the shape of our food systems not only determine nourishment, health, economy, and culture, but ultimately whether the planet's environment can continue to sustain mankind. The prevalent food system is believed to cause overuse of environmental resources for food production (IAASTD 2008), while it leaves many in hunger without access to adequate nutrition (FAO 2012), and simultaneously generates an obesogenic living environment where diet quantity and quality are detrimental to health and burden health budgets (Swinburn et al., 2011). Unfortunately, food systems are complex and result from an entanglement of primary production practices; access to land and other productive assets; vertically integrated distribution chains and market dominance; research and development; consumption patterns that reflect an obesogenic living environment; insufficient access to adequate nutrition by many; an institutional framework of governmental intervention and policies that cannot resolve failures of the food system; and ultimately power (IAASTD 2008).

In recent years, multiple initiatives have started to re-invent and re-structure our food system. Assessing the impacts of an innovative food chain approach, for example by Fresh City (Toronto, Ontario), can only be undertaken in the context of such food system complexity. A technocratic approach is to focus on a particular aspect of the food system, such as measuring the greenhouse gas emissions created attributable to one component of the food chain. A holistic assessment addresses which of all impacts on the food system are most relevant, and also addresses how a player like Fresh City contributes to re-shaping a dynamically changing food system. Such assessment takes into account a range of aspects from the socio-economic and bio-physical realm, but also systemic characteristics such as adaptive capacity and resilience against shocks.

2 — Method and Perspective

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2.1 Objectives and Methodology

The general objective of this study is to assess the impacts of Fresh City. The study takes a holistic approach using a food system perspective. As far as feasible, a qualitative holistic assessment is then supplemented with technocratic assessments that quantify specific aspects.

The enterprise of Fresh City has rapidly evolved into a complex operation with multiple activities, which will be described in greater detail in Section 4.3. Fresh City's activities have impacts via multiple parts of the food system.

In order to capture the impacts as comprehensively as possible, a food system assessment framework was chosen. This framework will be described in Section 2.2. As this is a first impact assessment study of Fresh City and in consideration of the resources available for this project, the specific objectives of this study are (a) to identify the types of economic, environmental, and social impacts Fresh City has along the food chain, and (b) to quantify, where feasible, these impacts. These results are expected to help to verify the success of Fresh City in implementing their vision of a more sustainable food system, identify opportunities to improve current practices of Fresh City and local food distribution more broadly, and contribute to the public and scientific debate about the impacts of local food that is outlined in the remainder of this chapter.

In order to meet these objectives, three research questions were posed:

1. What type of food chains and agri-food systems are promoted by Fresh City?

2. What types of environmental, economic, and social impacts can be expected along the food chain and farming system associated with Fresh City, as compared with the conventional agri-food system?

3. What are the impacts of Fresh City operations with respect to:

   (a) Greenhouse gas emissions within the distribution system,

   (b) The circulation of money within the local economy, and

   (c) Consumer food choices and behavioral changes associated with joining Fresh City?

In order to answer these research questions, we undertook the following:

- A literature review of the impacts of local and organic foods, using a food system perspective,
- A food system classification of Fresh City,
- An impact assessment of Fresh City operations using:
- Producer interviews and farm visits,
- Land use analysis using GIS,
- Greenhouse gas analysis of the distribution system,
- Staff interviews,
- Local economic impact assessment using the Local Multiplier 3 method, and
- A consumer survey.

Due to the level of detail involved in the greenhouse gas analysis and the consumer survey, the full analysis for these two components are submitted as technical appendices. A separate summary report was also submitted.

2.2 Using a Food System Perspective to Measure Impacts

A food system perspective offers a framework with which to understand the impacts of individual components of the food system in a holistic manner. A food system includes the activities, processes, and infrastructure involved in providing food to people. This includes growing, harvesting, processing, packaging, transporting, marketing, consuming, and disposing of food and food-related items (Ericksen 2008).

Outcomes of the food system can be understood through its impacts on:

1. Food availability (production, distribution, exchange, food security),

2. Food utilization (nutritional value, social and cultural value, food safety), and

3. Access to adequate food (affordability, allocation, food preferences, food sovereignty).

However, food systems also impact:

4. The state of the environment and natural capital (ecosystems stocks and flows, ecosystem services, access to natural capital),
5. the state of society and social, political and human capital (social and economic welfare, employment, wealth).

While food system reform requires a holistic approach (IAASTD 2008; Godfrey et al., 2010a) and a "multifaceted and linked" strategy (Godfrey et al., 2010b), most scientific literature related to the impacts of local food does not take such a systemic perspective. Instead, literature reviews on the impacts of local food production and distribution (Martinez et al., 2010; Matsubuchi-Shaw 2013 for Fresh City) highlights a range of specific impacts that are highly dependent on the setting of a specific enterprise or local contextual factors. For example, Coley et al. (2009) show how the concept of food miles cannot be used as an indicator for environmental impact, without taking into account the context of food distribution. Instead, an empirical approach is recommended for food system assessments. Unfortunately, there is no protocol yet for what components need to be covered in such evidence-based assessment (Coley et al., 2009; IAASTD 2008).

Using a food system framework allows us to distinguish different types of food chains and parallel food systems, based on the activities, processes, and infrastructure involved in providing food to people. Most authors (e.g. Lockie 2009; Gelfand et al., 2010; Bloom and Hinrichs, 2011) identify the conventional food system (large-scale production, aggregation and distribution for large retail corporations, consumer shopping at retail outlets) and several alternative food chains. While no consistent definition of alternative food chains or systems is currently accepted in the literature, two key characteristics identify such alternative systems: product distinctions (sometimes in the form of certification) and relationships between the actors within the system.

- *Product distinction* ranges from local food (distance to consumers or market relationship between producers and consumers), certification (under an organic standard for environmental practices) or other private standards, and fair trade certification (social and economic practices).
- *Relationships between actors* in the food system include direct marketing relationships, cooperative relationships, and collaborative relationships (such as in value chains). Implicitly, these types of actor relationships are often associated with a different (smaller) scale of production than in the conventional food system.

These two characteristics – product distinction and relationships between actors – were used to analyze how Fresh City is embedded in its food chain and to identify the type of food system in which it is embedded. Product distinction will be reviewed in the next section. Relationships will be reviewed as part of the Ontario food system, in Section 4.2.

3 — Review of Food System Impacts

3.1 Some Definitions: Product Distinction in Ontario

Product distinction describes food that is characterized by particular types of production, processing and marketing, in order to receive a price premium or access different types of markets. This section will outline the key characteristics of, differences between, and ambiguities of several relevant product distinctions found in Ontario, in preparation for the food system characterization. In Ontario, the most relevant product distinctions are:

1. Local food
2. Certified organic
3. Private standards

Private standards are defined, controlled, and advertised to consumers by independent organizations. Examples include Ontario's Local Food Plus and the Demeter standard for bio-dynamic production.

In addition, many direct marketers distinguish their produce as "naturally grown" or as "self-declared organic producers" without being certified under any regulatory system. While these actors are relevant players as direct marketers, their practices do not fall under any distinct definition and will be reviewed as food system actors in Section 4.2.1.

3.1.1 Local Food

The concept of local food has gained in importance in the last decade. However, there is a great deal of confusion related to the term because many definitions coexist amongst consumers, producers, retailers, governments, and regulatory bodies, as well as academics.

Martinez et al., (2010), distinguish two basic types of local food markets. The first type describes transactions conducted directly between farmers and consumers (direct-to-consumer). Venues range from farmer's markets, community supported agriculture (CSAs) programs, to road-side stands, on-farm sales, and "pick your own" operations. The second type of local food market wholesales directly to restaurants, retail stores, and institutions such as government entities, hospitals, and schools (direct-to-retail/food service).

Many consumers associate 'local' with such marketing arrangements or with a particular geographic distance (e.g. 50km, 100 miles). Canadian governmental agencies increasingly accept the definition that "local food" is food that is grown and produced within the province, because there are many practical limitations to governing and regulating relationship- or distance-based definitions. This type definition is the basis for local food funding in Ontario (OMIF and Greenbelt Fund) and the province's potential Local Food Act, as well as for the Foodland Ontario logo. This definition was also recently adopted by the Canadian Food Inspection Agency.

The provincial definition will be adopted within this study, because governmental actors provide a legal definition, as well as data based on their definition. However, in order to address the prevalent consumer perspective, relationships between actors will also be considered as part of the food system lens.

3.1.2 Organic Certification

The Canadian Organic Products Regulations, 2009 (SOR/2009-176)[1] was passed in 2009. This created the Canadian Organic Standard, which regulates international and interprovincial trade of organic food. The Canadian Organic Standard covers a wide range of production practices for field crops and livestock, wild gathering, and food processing and trade. It does not address other topics such as cosmetics, clothing, and fishing.

3.1.3 Private Standards

In addition to national organic standards, several private standards exist for sustainable agriculture. These are less broadly known by the general public and currently play a minor role in Ontario's consumer markets.

Local Food Plus. In 2005, the Canadian charitable not-for-profit organization Local Food Plus (LFP) was founded in order to to grow local sustainable food systems. LFP considers itself a "solutions provider for local sustainable procurement". According to their website, LFP "certifies farms and processors for environmentally and socially sustainable practices, makes connections throughout the supply chain, helps buyers of all different sizes find Certified Local

[1] http://laws-lois.justice.gc.ca/eng/regulations/SOR-2009-176/index.html

Sustainable food, and educate and engage our community to help eaters understand the many pluses of local sustainable food systems" (LFO website[2]).

Unlike organic standards, LFP certification follows a "best practice" approach that prescribes local marketing, as well as ethical and environmental standards:

> "LFP requires farmers and processors to sell locally in order to certify their products. In addition, LFP certifies producers for labour practices, animal welfare, biodiversity, and energy use. LFP certification is achievable for "conventional" farmers and processors who employ sustainable production systems – such as Integrated Pest Management, – that are not part of organic certification. LFP works with and certifies organic farmers who also wish to have LFP certification to recognize their additional social and environmental practices, as well as conventional farmers who employ sustainable production systems that meet LFP standards." (LFP Website[3])

The website currently lists approximately 60 certified operations[4].

IFOAM Principles of Organic Agriculture. The International Federation of Organic Agriculture Movements (IFOAM) was founded in 1972 by representatives of the Soil Association (United Kingdom), the Swedish bio-dynamic Association and the Rodale Institute. The organization has grown to include around 500 member organizations in 75 countries. It has became the most important player to develop and lobby for organic standards worldwide and represents the organic movement at the United Nations. IFOAM defines organic agriculture as follows:

> "Organic Agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved." (IFOAM Website[5])

According to the IFOAM website, IFOAM regards "any system that uses organic methods and is based on the Principles of Organic Agriculture as "Organic Agriculture" and any farmer who employs such practices and such systems as an "organic farmer" regardless of whether the products are marketed as organic or not. Biological, bio-dynamic, permaculture, agroecological, and natural farming methods are considered to be organic agriculture methods and approaches. Organic farming is not exclusive to any form of land and/or resources ownership nor is it restricted to a particular size of farm (IFOAM Website[6]).

Demeter Certification. The first guidelines for organic agriculture were set by pioneers such as Rudolf Steiner and Hans Mueller in the 1920s and 1930s. Steiner's guidelines for agricultural production have become known as bio-dynamic farming and are now certified by Demeter organizations worldwide (Vogt 2005). Demeter farms aim to foster a self-contained farm and are generally required to combine field and/or vegetable crops with animals, particularly ruminants, in order to support nutrient cycling. According to Demeter International, there are 28 certified bio-dynamic producers in Canada[7].

[2] http://www.localfoodplus.ca/about
[3] http://www.localfoodplus.ca/about/faqs#8
[4] http://www.localfoodplus.ca/find-food/committed-partners
[5] http://infohub.ifoam.org/en/what-organic/faq-organic-agriculture
[6] http://infohub.ifoam.org/en/what-organic/principles-organic-agriculture
[7] http://www.demeter.net/statistics

Other Private Organic Labels. During the 1970s, organic farmers organized themselves in associations in many places throughout the world and defined production practices for organic agriculture (Vogt 2005). In German-speaking countries, non-government organic associations continue to exist whose labels predate the European organic regulations. Their guidelines exceed the minimum requirements of the EU standard. Labels are well-recognized by consumers and products receive higher premiums than the EU organic labels. Examples include Bioland and Naturland, both from Germany.

Certified Naturally Grown. A less restrictive standard in North America is "Certified Naturally Grown" (CNG). This private certification system is designed for small farms that direct-market in their local communities and for whom the inspections under the national standards are too expensive. The standards are those of the National Organic Program from the U.S.A. Inspections under CNG are through a peer guarantee system in which inspections are carried out by other farmers. Approximately 800 farms and apiaries in Canada and the United States are certified naturally grown[8]. The website lists three farms in Ontario.

Self-Declared Organic. "Self-declared organic" describes farmers who distinguish their products with terms such as "natural", "naturally grown", "grown organically", "without chemicals", "grown without pesticides", without having third-party certification. Unlike the well-regulated organic standard, these terms are not defined legally[9].

A recent survey conducted for the Organic Council of Ontario (OCO) by the Ontario Farm Fresh Marketing Association[10] (OFFMA) interviewed a total of 1411 visitors at farmer's markets about their perception of agricultural food trends. The study found that consumers at farmer's market have a low interest in organic foods in comparison to other product distinctions. Farmer's market visitors associated the category of "extremely important" with "buy local" (65%), community-supported agriculture (53%), 100-mile radius (43%), natural food (39%), and, organic food (30%).

It remains unclear whether this conclusion can be generalized to other retail venues, because it was conducted in the context of farmer's markets. In such settings, eaters have a direct relationship with farmers. It is possible that interviewees implicitly associate "buy local", community-supported agriculture, 100 mile radius, and natural food designations with the types of production practices that are actually regulated in organic agriculture, and therefore place lower importance on the organic certification. In essence, they may implicitly assume that vendors at farmer's markets use sustainable practices and value animal welfare and therefore place lower importance on actual certification. Thus, while the survey suggests that consumers do not have a strong preference for organic certification at farmer's markets, these findings may not translate directly to conventional retail settings.

3.2 Impacts of Local Food: A Review

Using a food system perspective as described above, we reviewed the impacts of two main alternative food system approaches that are relevant to Fresh City: local food and certified organic food. The objective of this review was to take a broad perspective and capture multiple

[8] http://www.naturallygrown.org/

[9] The term "natural" is regulated for processing but not for farm production.

[10] Organic Council of Ontario. The Feeders Meet the Eaters: Direct Marketing in Ontario's Organic Sector. Factsheet, 2012

types of impacts that are related with each other. For each type of impact, key publications were highlighted, along with their primary findings.

The food system perspective should look at food availability, food utilization, access to adequate food, as well as at social/economic welfare and on the state of the environmental/natural capital

3.2.1 Food Utilization (1): Nutritional Value And Other Ingredients

The human health impacts of local foods are difficult to quantify and measure because many factors can affect the nutritional composition of foods. However, some general considerations related to agriculture production, harvest, processing , transportation, and retailing do suggest that local foods can be nutritionally superior (Frith 2007):

Freshness. Local food tends to be fresher, because less time is needed in transportation and storage. Recent studies show that produce remains physiologically active for extended periods after harvest. As a result, cell respiration prevents the loss of nutrients and continues to support metabolisms for complex proteins and even immune responses of the "plant" (Goodspeed et al., 2013).

Ripeness at harvest. With long distance transport in trucks or at sea, many types of fragile produce (e.g., apples, nectarines, melons, apricots, peaches, bananas, tomatoes) are ripened artificially long after harvest. While full color may be achieved with this procedure, the nutritional quality may suffer in comparison with ripening in the sun on the living plant (e.g. vitamin C).

Variety selection. Supermarket food produce varieties have been selected for yield, growth rate, suitability for mechanized harvest before ripeness, and the ability to withstand long-distance transport, processing standards, and appearance. These characteristics come at the cost of nutritional value (vitamin, mineral, and phytochemical content), and taste. In contrast, producers that direct market are more able to, and therefore are more likely to, prioritize taste and nutritional value.

Production methods. Smaller-scale producers that directly market, often have production systems that prioritize soil health, which cultivates a diverse soil biology which also increases the nutrient content in crops. In such production systems, plants often grow slower and develop a deeper and stronger root system, causing a slower and more consistent nutrient uptake that can ultimately benefit the nutritional quality of plants.

Processing and Packaging. Processing (pre-cutting, slicing, chopping, and peeling) causes injuries to the plant tissues and initiates enzymatic changes. It alters chemical make-up and promotes the loss of nutrients (compare Goodspeed et al., 2013).

Storage and transportation. Fruits and vegetables are highly susceptible to errors during storage and transportation. Food can suffer changes in nutritional value and sensory quality including loss of texture, appearance and flavor during storage, particularly if storage conditions (temperature and humidity) are not ideal. Also, faulty cooling and gases can strongly accelerate the degradation of freshness and cause overripe or wilted food.

3.2.2 Food Utilization (2): Food Safety

Food safety is an increasingly contentious issue, where studies on the issue are often conducted by organizations that have an interest in either the conventional or an alternative the food system. While some food system stakeholders worry about the danger of local food (especially due to difficulty of monitoring in small-scale production), other stakeholders worry about the safety of large-scale conventional food production and processing, especially because contamination of food scandals can rapidly impact on people throughout a country and even across national boundaries, enormous areas, or large sectors of the economy.

The Canadian Food Inspection Agency (CFIA) provides a guide to food safety[11] for both direct marketers, as "a voluntary tool that provides the Canadian food industry with generic guidance on how to design, develop and implement effective preventive food safety control systems" (CFIA 2010). CFIA also provides commodity-specific guidance sheets that apply to conventional and local food producers alike. Private actors also provide guidelines for appropriate handling of food in a specific context, for example Ontario's umbrella organization of farmers' markets [12].

Some small-scale producers and processors report that many of these regulations are geared toward the scale and methods of the conventional food system, and complain about "strangulation by regulation". However, no independent and sufficiently widely- accepted scientific studies were found that provide any conclusive evidence in this debate.

3.2.3 The State of the Environment and Natural Capital

The environmental impact that is most often cited in support of local food is associated with reduced transportation miles. The transport sector uses energy, most often in the form of fossil fuels, and it requires a road infrastructure that absorbs landscape, energy, and resources.

Research has also shown differences between the conventional and local supply chains, with often surprising net impacts. Producers of local food tend to transport smaller quantities of food to many more locations. The transportation distances, use of loading capacity of vehicles only partially loaded, fuel types, and trip frequency of small-scale supply chains can radically increase the emission intensity of transportation, on a per-km basis. This is further aggravated if consumers use passenger vehicles and drive many kilometers in order to reach farms and farm stores. Thus, studies have shown that emission savings with shorter overall food transportation distances can be offset by an inefficient local transportation system (Mariola 2008, Corley et al., 2009). Hence, generalized claims about greenhouse gas emission savings with local food are flawed. Rather the emission savings are highly dependent on the individual local food system context and require an empirical, evidence-based assessment (Corley et al., 2009).

Moreover, transportation miles alone are a poor indicator for the sustainability of food. A 2008 study from the United Kingdom summarizes that "food miles are a poor indicator of the environmental and ethical impacts of food production. Only through combining spatially explicit

[11] http://www.inspection.gc.ca/food/non-federally-registered/safe-food-production/guide/eng/1352824546303/1352824822033

[12] Farmers' Markets Ontario Food Safety Matters - A manual for farmers' market vendors, managers and staff. Available at http://www.farmersmarketsontario.com/DocMgmt%5CFood%20Safety%5CManuals%5CFMO%20Food%20Safety%20Guide.pdf

life cycle assessment with analysis of social issues can the benefits of local food be assessed. This type of analysis is currently lacking for nearly all food chains" (Edwards-Jones et al., 2008). The group highlighted some relevant topics for a holistic impact assessment:

- Often local food is produced using environmentally more sustainable organic practices than the conventional food system, even if producers are not certified organic under any standards. As elaborated in Section 4.2.1, direct customer relationships often substitute for formal certification, which is costly.
- Unlike large-scale producers who grow only a small number of one or a few crops and thus foster monocultures, local producers who produce at small scales and market directly often produce a much larger range of crops, and thus foster agri-ecological diversity and diverse landscapes. These landscape effects have not yet been quantified in the scientific literature, in part because the relationship between production scale, production practices, and distance from markets is not well understood, and partly because impacts are scale dependent (Gabriel et al., 2010).
- Local food is dominated by high-value products (horticulture, fruits, meat, and dairy) and tend not to rely directly on genetically modified organisms (GMOs) crops. GMO crops are most often used for feed (corn and soybeans), fibre (cotton), energy (corn), or as raw materials for highly industrial processed food ingredients (e.g. corn, soybean, canola). These uses of GMOs are not seasonal and lose any product distinction, but are consistent with the requirements of global commodity markets. Thus the impacts of GM crops and the associated chemical fertilizers and pesticides may be avoided in local foods.

3.2.4 Welfare: Economic Impacts Using the Local multiplier

A comprehensive review of the impacts of local food impacts by Steve Martinez et al. (2010) identifies several studies that have found beneficial economic development impacts from local food, in the form of income and employment growth.

A key concept when measuring the economic impact of local foods is the most direct cause-effect relationship: import substitution. The argument is that, in the conventional food chain, money flows to the agricultural supply industry (agrochemicals, machinery, seeds, feed), without benefiting the local economy. This supply industry often provides related services (consulting, repairs) and even financial services (mortgages). In comparison, import substitution (producing in the "local" area what was formerly purchased from outside) generates additional local spending because the businesses that produce food locally also participate in the local economy. They order inputs through local points of sales; demand local services; and can stimulate local production of inputs (Swenson, D. 2009). In addition to economic benefits for producers and immediate services (e.g. abattoirs), many less direct sectors of the economy benefit, such as processing, transportation, tourism, retail, advertisement, and general business services (website administration, accounting, law).

Import substitution not only impacts the local economy, but the concept provides a framework to assess broader sustainability issues of the food system such as fair labor, equity, and democracy, and environmental stewardship (Bellows & Hamm, 2001). A key factor is that in a democratic society, in local food chains, production and processing facilities fall under the regulatory and judiciary system that consumers in a democratic society can participate in.

A second way in which local food can have an economic impact is the re-circulation of consumers' food dollars within the local economy. Farmers who direct market can retain a greater portion of the retail food dollar than those selling on commodity markets. With more money from their food sales, because there is no mark-up due to either finance administration nor advertisement at distant headquarter locations, nor shareholder value. The additional profit income is translated immediately into an increase of additional spending money (Martinez et al. 2010). This is the multiplier concept, which holds that money that flows into an economy can have a multiplied impact on the rest of the economy. What impact the money flows have depend on how institutions, businesses, and individuals spend money, because they do not all spend money in the same way and in the same places.

In the U.S.A., estimates were made using the multiplier concept that each dollar spent at farmers' markets generates 58 cents in indirect and induced sales within the area, and each additional dollar of personal income earned at a farmers' market generates 47 cents through additional spending (Otto and Varner 2005). Each full-time job at a farmers' market created half an additional full-time job in other sectors of the local economy. These sectors include direct employment, construction, servicing, advertising, consulting, retail, accounting, and other sectors.

Other economic impacts result from spillover spending and displacements effects. Spillover spending describes what happens when that local food market draws customers into an area and stimulates the purchase of goods that otherwise would not have been purchased, for example in downtown farmer's market locations (Lev et al., 2003). The displacement effect describes how the use of productive resources in one way, that would have been used another way, reduces the benefits of import substitution. For example, land that was used for corn production for global commodity markets is converted into a horticulture field for local markets. The net economic impacts resulting from the production for local markets must take into consideration the loss of benefits from the corn production.

Ultimately, vibrant and diversified rural economies are also the basis for providing livelihoods for families, as well as for domestic services. In the 20th century, the break-down of agricultural employment has triggered a migration wave into urban centers (Taylor & Martin, 2002). One result of "rural exodus" is the global breakdown of governmental and community services (child care, health, schools, agricultural extension, fitness, entertainment, churches, see Rhoda, 1983). While this trend also dominates rural areas in Canada (Bryant and Joseph 2001), it is partially counteracted by migration from urban centers into rural amenity areas, especially from retirees and self-employed households (Dahms & McComb 1999), creating new challenges for rural services.

3.3 Impacts of Certified Organic Production: A Review

Organic standards have evolved from production guidelines over private standards, into national governmental standards, which are the product of negotiation among sector players (Vogl et al., 2005). They do not define a single type of farming system, but rather define allowable practices and inputs. The impacts of using organic farming practices within the food system, as defined in national standards, are thus complex and many aspects of these impacts remain disputed. However, compared with conventional production practices, consensus on some impacts are starting to emerge. The section below attempts to summarize these areas of consensus.

3.3.1 Food Utilization (1): Nutritional Value and Other Ingredients

Most national organic standards throughout the world are relatively new. In the US, the Organic Foods Production Act was passed in 1990. European countries passed the EU-Eco-regulation in 1992. However, only in 2000, the US established the National Organic Program (NOP) and the USDA organic label, followed by a EU-wide label for organic food in March 20021. Canada passed its organic regulations for international and inter-provincial trade in 2009. Thus, strictly speaking, organic production and consumption according to these standards remains a fairly recent trend in modern times, and few people exclusively consume organic food. It is thus not simple to measure the beneficial impacts of an organic diet and the discourse is often politicized. Keeping such complexity in mind, there is growing stronger consensus that several components in our food can be harmful to human health and these are summarized next, based on an extensive review by Matt et al. (2011) for the European Union.

The scientific literature does not give a clear picture about nutritional benefits of organic food. Studies typically test the concentration of specific elements and simple components that are believed to have beneficial characteristics. Organic food was shown to have more iron, magnesium, Vitamin C, lycopene, or carotenoids (compare Matt et al., 2011). Still, most scholars take a precautionary position that research is still insufficient for understanding how vegetable nutritional content impacts on health. Even though most medicines were somehow derived from plants or funghi, scientists started to understand the physiology and chemical clockwork of plants only recently. For example, in 2001 the group around Dangl and Jones published that many modern crops lack in plant proteins that are common in wild species. Five years later, the same group described the immune system of plants (Jones and Dangle 2006) and the role of hormons in plants (Bari and Jones, 2009). In June 2013, Goodspeed et al. described how vegetables continue to metabolize even after harvest following a circadian rhythm. This metabolizem shows as respiration, but also influences complex protein concentrations that are associated with herbivore resistance. These recent discoveries mostly remain within the plant science departments and research still does not connect back how these complex components interrelate with human nutrietion. This is not surprising: according to Huber et al. (2011), each plant contains between 7500 and 10,000 components that act synergistically in the plant organism. For the absolute majority of these components, it is neither known if and how they are taken up by the human digestive apperatus, nor how humans respond physiologically to an uptake, nor how these componets interact with each other in our body (Huber et al,. 2011). For this reason, no review of the nutritional value of organic vs. conventional is attempted.

The most relevant adverse components in food are pesticide residues, mycotoxins, pathogens, nitrates, and artificial additives (Matt et al., 2011). The impact of these components on human health is complex and depends on a myriad of factors, ranging from genetic predisposition, other lifestyle factors such as smoking or stress, diet, and exercise. However, these components do have negative health impacts and research exists that compares the prevalence of each of these components in organic and conventional food.

Pesticides. The intake of pesticides is associated with many metabolic disturbances, malformations, and diseases (including cancers) in humans. Evidence exists that a strictly organic diet significantly decreases the level of pesticide residues in human breast milk and also in the urine of children. The group of Matt et al. (2011) concluded that "organic food consumption significantly reduces body exposure to pesticide poisoning".

It is well known that organic raw materials can have minimal residues of pesticides. Some of these pesticides are ubiquitously present in the environment today, others result from specific contamination events or fraudulent behavior. However, USDA studies (Punzi et al., 2005) show that average pesticide levels in organic food were 100 times lower than on conventional food (e.g. carrots[13]). Organic food thus significantly reduces the exposure to these toxins.

Artificial Additives. In conventional food processing several hundreds of different synthetic additives are permitted for use. In contrast, in organic standards, food processing is far more restrictive and allows less than 50 natural substances in food processing. Banned substances include (Matt et al. 2011):

- Artificial colors (shown to cause DNA damage in the bladder and gastrointestinal track in rats, and allergies, headache, migraine, hyperactivity, concentration and learning difficulties in humans and especially in children).
- Mono-sodium glutamate, which can cause metabolic disturbances (hyperinsulinemia, increased food intake and overweight/obesity).
- Artificial sweeteners, which have been shown to cause higher energy intake, headaches, and cancers.

Furthermore, combined effects of these substances are likely to exist, but very difficult to assess experimentally. Food that is organically produced and processed reduces the exposure to these chemicals and is likely much safer than conventionally processed products.

Nitrates. Not toxic by themselves, nitrates are converted into two toxic substances in the body: nitrites, which block haemoglobin and prevent oxigen uptake, and nitrosamines that cause cancer with long-term exposure. Vegetable in general, and leafy greens in particular, are important sources of nitrate uptake for humans (Santamaria 2006).

Nitrates are mostly taken up by the root system of plants during the night, and are accumulated for growth during the day. Next to crop type and variety, several factors can increase the nitrogen content of plants: the availability of too much and/or rapidly available nitrogen fertilizer, warm soils during the night that stimulate microbial activity and physiological processes, and the inhibition of growth during the day that prevents the breakdown of the accumulated storage (short daylength, Neely et al., 2010; such as row cover that reduces light, or defficiency in other nutrients such as P, K, and especially Mb, Santamaria 2006). To a lesser extent, nitrate concentration even fluctuates over the daily cycle: lowest concentrations are in the evening after sunny days, while highest concentrations were found in the early morning and/or during cloudy days (Neely et al., 2010). Also, winter greens tend to have much higher nitrate levels than summer greens, peaking around November. Then, soils are still sufficiently warm and active to supply roots with nitrates and fill the storage, while daylengths is already too short to metabolize it. The European Union thus defines two different maximum permitted nitrate levels for summer and winter and also accepts higher levels if vegetables are grown under glas (Santamaria 2006).

In the majority of relevant studies, organic products had lower nitrate levels than conventional vegetables (see a review from Matt et al., 2011). These results are not without ambiguity, because research methods differ and because the definitions of organic agriculture encompasses a wide range of practices. For example, most organic farms strongly rely on compost as slow source of nitrates, even though some of the more commercial organic farm enterprises also apply rapidly accessible nitrates that are allowed under organic regulations.

[13] Pesticide content of other food items can be found at (based on USDA data)

3.3.2 Food Utilization (2): Food Safety and Pathogens

Bacterial Contamination And Pathogens. Since organic systems rely on natural fertilizers such as manure and plant debris, there are questions about the safety of organic foods. To avoid bacterial contamination under organic practices, fresh manure cannot be applied to the soil for a minimum of 90 days before harvest or must be composted between 55deg and 77deg C. According to one account, "microbial contamination could occur just as easily on an organic farm as on a conventional farm" and that the important issue is that proper production practices are used within both organic and conventional systems." (Quoted from Moira Matsubuchi-Shaw 2013, p. 14)

While comparative research between organic and conventional produce indicates some differences with regard to microbiological activity in general, there is no conclusive evidence that certified organic produce carries a higher risk of disease and pathogen contamination than conventional. Good hygiene practices must be maintained along either food chain in order to prevent contamination with pathogenic bacteria (Matt et al., 2011).

Mycotoxins. Under high humidity and temperature, the growth of mould and other fungi creates toxic metabolites that are dangerous to humans, animals, plants, and microorganisms (Matt et al., 2011). There are claims that are based on the argument that organic food production does not use synthetic fungicides, and therefore produce mycotoxins, but research can not confirm that organic foods in general carry more mycotoxins than conventional food (Matt et al., 2011).

3.3.3 The State of the Environment and Natural Capital

The environmental impacts of organic agriculture have been assessed with respect to energy use, water quality, soil health, greenhouse gas emissions, ecosystem impacts, and ecosystem diversity, and particular issues such as the effects on native pollinators.

Energy Use. Organic systems consistently demonstrate greater energy efficiency per land unit and unit of production compared to conventional operations (Lynch et al., 2011). These positive results are usually attributable to the absence of synthetic fertilizers, particularly nitrogen, and synthetic pesticides, which are highly energy-intensive to produce. However, there are "some variable results" for energy use and GHG emissions when measured per unit of product, largely because of the yield differences between organic and conventional systems for some crops, hog, and poultry production (Lynch et al., 2011). Such results suggest that the energy and emission efficiency of organic systems can only improve with research on optimizing organic yields and input use (MacRae, 2009).

Soil Health. A wide literature survey shows evidence suggests that soil microbial activity and biodiversity benefits from the unique characteristics of organic production regimes (Lynch et al., 2012) and tends to preserve or improve soil quality better than conventional practices (Gomiero et al., 2011). Earthworm abundance and biomass, and soil microbial quotient benefit strongest from longer crop rotations, which are more commonly found on organic than conventional farms, as shown on potato farms in Atlantic Canada (Nelson et al., 2009). However, studies on soil organic content (SOC), which for many farmers is an important index for nutrient retention and soil quality, does not provide a conclusive picture (Leinfeld and Fuhrer 2010; Lynch et al., 2012). While some studies find slower reduction of SOC under organic cropping regimes, others

propose that organically managed soils actually accumulate organic carbon. Long-term studies, however, could not confirm these findings because increased microbial activity also causes rapid respiration and loss of SOC.

Water Quality. Since organic farming does not allow the use synthetic pesticides, such pollutants do not pose a risk to water quality. While incidences have been documented in which incorrect organic management practices can pollute the environment, most researchers agree that the water quality impacts of organic farming tend to be lower than those from conventional farming systems (Stolze et al., 2011).

Greenhouse Gas Emissions. In addition to energy-related GHG emissions, agricultural producers impact the soil balance of organic matter, water-logged fields emit methane, and nitrogen is partially reduced and emitted as nitrous oxide (N2O). Both methane and nitrous oxide are potent greenhouse gases and their effect usually is more relevant than carbon dioxide (Vermeulen et al., 2012). Regarding soil organic carbon, organic production systems appear to have greater carbon sequestration potential than most conventional practices (Lynch et al., 2012), with the possible exception of some no-till systems. However, there is significant debate in the literature about both the quantity and quality of carbon stored in no-till systems, leading some to conclude that current no-till estimates are overstated (MacRae et al., 2009). On balance, organic systems would also appear to have greater adaptive potential to climate change than many conventional systems (MacRae et al., 2009).

Ecosystem Diversity. Organic farms, because of their reliance on diversified cropping systems, are being found to support larger populations of beneficial organisms, such as songbirds and pollinators, than conventional farms (species abundance and richness of birds and pollinators, Beecher et al., 2002). Additional literature of European origin also suggests that organic management supports a wider abundance and richness of species across a wide range of taxa (birds, mammals, invertebrates, in Lynch et al., 2012). North America's specialized farmlands have a reduced need for crop rotation, as well as low within-field and between-field variability (Lynch et al., 2012). In southern Ontario, even when accounting for similar field types, crops, field sizes, and adjacent habitat, organic farms have significantly more bird diversity than conventional farms. Most likely, the reasons for this include the reduced availability of nesting sites, and reduced diversity and continuity of food supply caused by the lower plant species richness which provide seed, and less abundance of soil invertebrates on conventional farms (Freemark and Kirk, 2001). Another Ontario study found more native and exotic plant species in fields and woody hedgerows on organic sites (Boutin et al., 2008).

Landscape Effects. Many ecosystem services require sustainable landscape-level management. These affect many aspects of biodiversity, soil and nutrient management, pest control, pollination, and resilience to droughts, floods or hurricanes (Kremen et al. 2012). For example, native pollinators remain the main providers of pollination services of most farms interviewed in assessment. Native pollinators (and especially solitary bees, Gabriel et al., 2010) require a diversified agriculture with untouched hedge rows and other habitats for reproduction. Habitat conversion through intensified agriculture is quoted as main threat to native bees, along with pesticides and invasive species (Kremen et al., 2002).

However, connection between organic certification and landscape characteristics remains little understood. Gabriel et al. (2010) showed that biodiversity partially depend on farming practices (organic vs. conventional) at the field level, but that biodiversity also strongly interacts with landscape variables such as the proportion of arable land and semi-natural grassland, and field margin and hedge lengths. Two recent large-scale studies also gave little support evidence that organic farming practices alone can support higher densities of birds (Piha et al., 2007;

Chamberlain et al., 2010). Instead, combined landscape characteristics on multiple farms in a region were identified as a main determinant of species diversity and abundance. Further study is recommended that not only takes into account certified organic production, but also "self declared organic" small farms, natural areas, and environmental management practices on conventional farms.

4 — Fresh City & Ontario's Horticulture Syster

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4.1 Ontario's Horticulture Production

By market value, Ontario produces 48.2% of all vegetables grown in Canada. Quebec and British Colombia together produce another 44.0%, while all other provinces together produce 7.7% (Figure 4.1). According to production data published by Statistics Canada, the main crops (by farm gate value) produced in Ontario are field tomatoes, carrots, sweet corn, dry onions, peppers, and cabbage. Other important crops include asparagus, cucumbers, broccoli, green and wax beans, peas, squash/zucchini, and pumpkins (Figure 4.2). The total farm gate value of all these crops amounts to $356 million (StatCan, 2011), which does not include greenhouse production. Greenhouse operations produce tomatoes ($241.6 million), cucumbers ($150.6 million), peppers

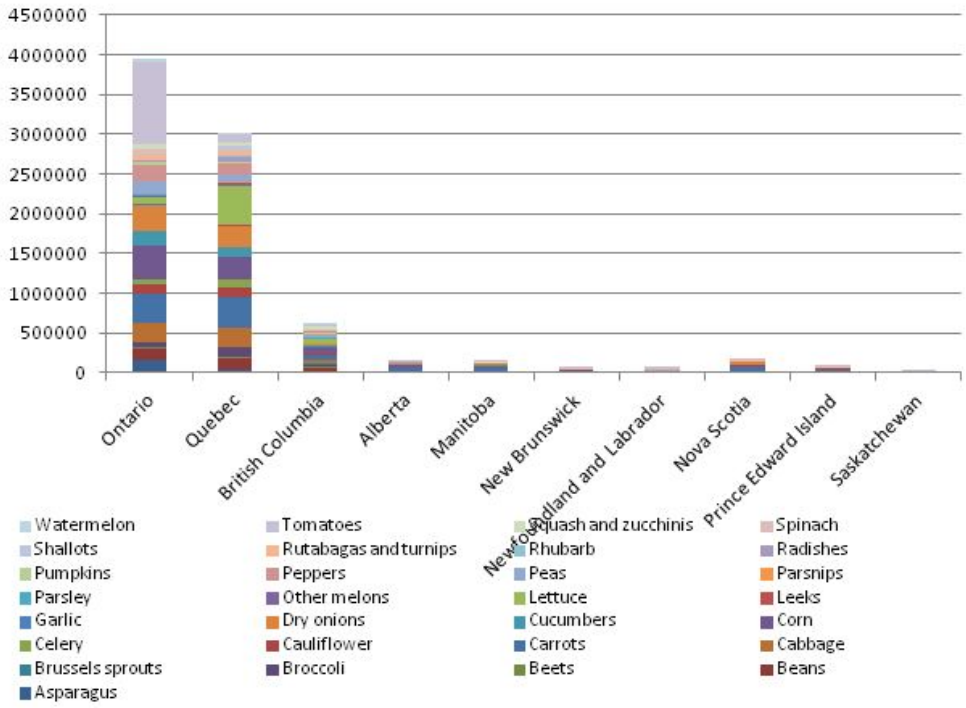


Figure 4.1 — *Total value of vegetable production in Canada, by Province*

($149.6 million), and other crops of minor relevance. Including greenhouse operations, Ontario's 3,909 vegetable producers earn a farm cash receipt of $511 million (AgriCan[1]).

According to Agriculture and Agri-Food Canada (footnote 1), Ontario exports vegetables and vegetable products with a value of $763 million per year. By value, the top five export commodities are greenhouse tomatoes, greenhouse peppers, greenhouse cucumbers, tomato ketchup, and mushrooms. The vast majority of these exports (99.5%) are destined for the U.S.A.

At the same time in 2010, Ontario alone imported $1,637 of vegetables. The main horticulture products imported are lettuce, peppers, cabbages, kohlrabi and kale, greenhouse tomatoes, and onions/shallots. Canada as a whole imported vegetables with a total market value of $2,853 million[1]. In 2011[2], imports came mainly from the United States and Mexico (Table 4.1). These included tomatoes ($322 million), lettuce ($395 million), peppers ($218 million), cauliflower & broccoli ($171 million), onions and shallots ($133 million) and carrots ($124 million).

If produce from Ontario were consumed within the province (Figure 4.3), each citizen would have to consume 16 pounds of onions, 7.5 pounds of cabbage, 5 pounds of beans, peppers, and field tomatoes, 22.5 pounds of greenhouse tomatoes, and 8.7 pounds of greenhouse peppers, and more than 100 pounds of carrots (OMAF production data for 2011, StatCan 2009 data for greenhouse vegetables, author's calculation assuming 13.3 million inhabitants in Ontario). Looking at the consumption side in 2009, the average Ontarion consumed 90 pounds of

[1] Agriculture and Agri-Food Canada. A Snapshot of the Canadian Vegetable Industry, 2010. http://www5.agr.gc.ca/resources/prod/doc/horticulture/brochure-cdn-veg-ind-2010_eng.pdf

[2] Compare: Statistical Overview of Canadian Horticulture 2010-2011. Market Analysis and Information Section, Horticulture and Cross Sectoral Division, Agriculture and Agri-Food Canada. Published in October 2012. Catalog No. A71-23/2011E-PDF , ISBN 1926-1837

Origin	1990	2010
United States	335.2	1,049.00
Mexico	41.7	374.2
China	8.3	50.1
Peru	0.1	26.9
Spain	9.9	20.5
Other	49.4	116.7
Total	444.7	1,637.40

Table 4.1 — *Imports to Ontario in 1990 and 2010 (values in Million Ca$). Source: Agriculture and Agri-Food Canada*[1]

vegetables (40.2 kg, Statistics Canada[3]). such that Ontario's vegetable production far exceeded its consumption.

While Ontario's produce is largely exported to the U.S.A., large quantities are imported into Ontario, many of which are grown here. In parts, this trade addresses seasonal availability of produce. However, as will be discussed in the next sections, even during Ontario's peak harvest season, the conventional retail chain relies on imports, while producers seek export markets for better prices.

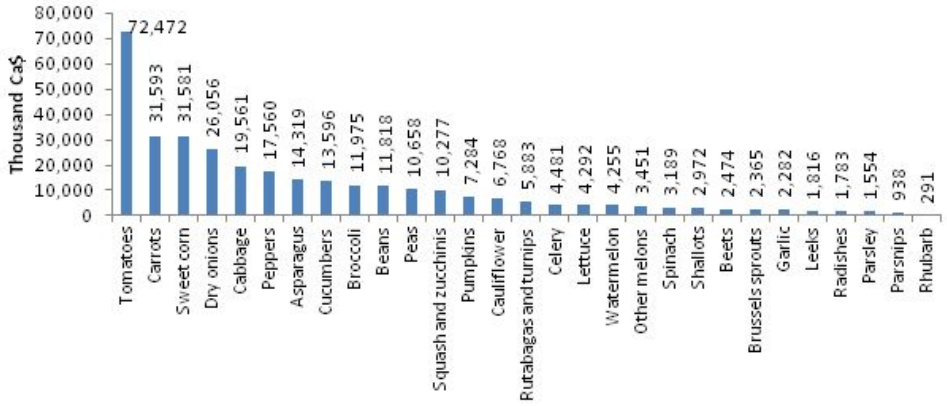


Figure 4.2 — *Farm gate value of annual production (Ontario), by vegetable. Average for years 2006 – 2012*

[3]Statistics Canada. Food Statistics 2009. Agricultural Division, Statistics Canada, Ottawa, Ontario Catalogue no. 21-020-X

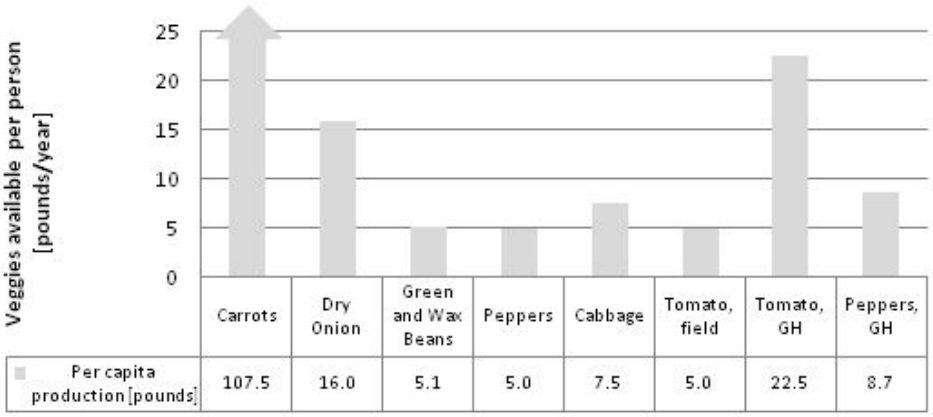


Figure 4.3 — *Ontario-grown vegetable available per capita*

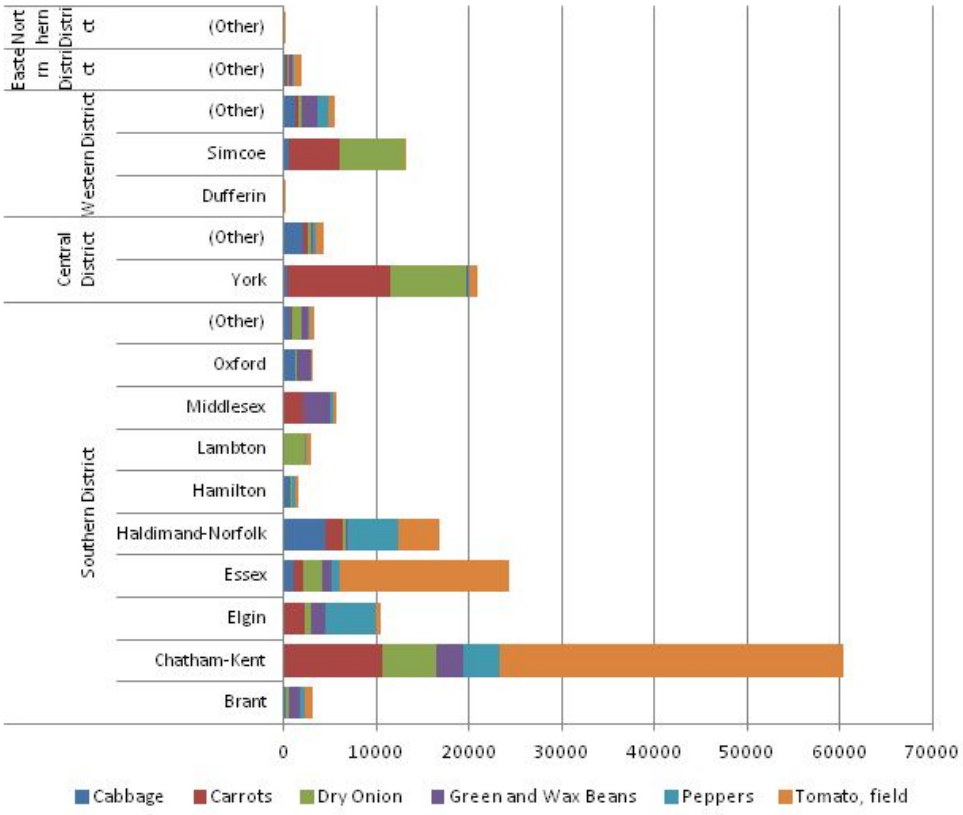


Figure 4.4 — *County-level marketable value of field vegetable production in Ontario for selected crops (Source: OMAF Agricultural Census)*

4.2 Actors in Ontario's Horticulture Food Chains

4.2.1 Production

Conventional producers

County-level production data for field vegetables highlights the most important production areas in Ontario (Figure 4.4). The most productive areas are the Holland Marsh to the South of Lake Simcoe (Simcoe and York county), as well as the areas along the north shore of Lake Erie, including Essex, Chatham-Kent, Elgin, Norfolk, and Haldimand counties. While some of this production is organic, the majority of value is produced under conventional practices for export markets.

One important reason for farmers to produce for export markets is related to the distribution chain. For example, farmers in the fertile lands of the Holland Marsh (Simcoe and York counties) have become Ontario' largest production hub for carrots, onions, and other crops that thrive in organic soils (celery, parsnip, beets, mixed lettuce). However, Ontario's retail market for the Marsh's products is highly concentrated in the hands of three large retail conglomerates[4]. The limited competition amongst these buyers allows them to set low prices. So to avoid the low wholesale prices for product and the strict requirements for volume and continuous year-round supply, it is easier and more profitable for growers to export their products to the United States. In recent years, the growers of the Marsh have formed the Holland Marsh Growers Association[5]. Together, they started to organize and aim to improve processing, sales, and storage in order to allow them to access markets within the Greater Golden Horseshoe.

Conventional horticultural producers are represented by several commodity groups, which have a variety of roles that include advocacy with government, research and development, producer training, and consumer education. Conventional horticultural commodity groups in Ontario include:

- Holland Marsh Growers Association
- Fresh Vegetable Growers of Ontario
- Ontario Berry Growers Association
- Ontario Fruit & Vegetable Growers Association
- Ontario Garlic Growers' Association
- Ontario Green House Peppers Growers' Association
- Ontario Highbush Blueberry Growers' Association
- Apple Marketers' Association of Ontario
- Grape Growers of Ontario
- Ontario Apple Growers
- Ontario Asparagus Growers' Marketing Board
- Ontario Fresh Grape Growers Marketing Board

[4] Plan Scape Inc.. Holland Marsh – Agricultural Impact Study. August, 2009
[5] Holland Marsh Growers' Association. http://www.hollandmarshgold.com

- Ontario Greenhouse Vegetable Growers
- Ontario Processing Vegetable Growers
- Ontario Tender Fruit Producers Marketing Board
- Ontario Tomato Seedling Growers' Marketing Board

The challenge of co-existence

The Holland Marsh exemplifies many of the challenges of co-existence between organic and conventional production. The Holland Marsh produces nearly half of the carrots produced in Canada under conventional practices, most of which is destined for export to the US. Meanwhile, in the year 2010, Canada imported over 10 times the organic carrots that it produced.

In the intensely managed agricultural landscape of the Holland Marsh, it is difficult to rely on organic pest management practices, because organic pest management practices are influenced by neighbouring farms. For example, crop rotation in the Holland Marsh uses few crops that give exceptionally high yields on its peat soils. Also, one field abuts the next, such that pests can rapidly migrate from one farm to another. At Holland Marsh, the Muck Crops Research Station has implemented an Integrated Pest Management program that monitors insect thresholds before recommending spraying pesticides. This has reduced the use of insecticides on onions by 80%, and has contributed to a 40% reduction in the amount of pesticides used on muck crops (Footnote 5, p. 25). One one hand, organic pest management strategies, perform better within a more diversified landscape where a multitude of pest-predator relationships maintain an ecological balance. On the other hand, the integrated pest management strategy at Holland Marsh requires that all farmers participate, such that organic farms don't become shelters for pests.

Certified organic producers

Compared to other countries, "significant data collection challenges remain" to measure organic production in Canada (Holmes & Macey, in Fibl 2012) because the "Canadian competent authority has not yet implemented mandatory data collection through its accredited certifying bodies." After eight years of tracking changes through a private initiative of the Canadian Organic Growers, no numbers are available for 2010 except for two provinces, Ontario and Quebec. This data is limited to the crop category, acreage, and farm numbers, as provided from certifying organizations on a voluntary basis.

According to Macey (2010), Ontario had 685 certified organic farmers in 2010, which represented 1.2% of all farms. In addition, 33 farms were in transition. A larger proportion of organic farms (442 or 64.5%) are located in Western Ontario than in Eastern Ontario (131 or 19%). Ontario's total organic acreage is 123,328, plus 5,700 acres located on transitional farms, and 11,600 wild lands used for the production of maple syrup, honey bee foraging, or wild berries.

While the total organic acreage increased by 6.7% from 2009 to 2010, the number of organic farms in Ontario showed a decline of 4.3% (Fibl 2012). Holmes and Macey suggest that this decline is the result of many smaller, direct marketing farms dropping certification because they are not required to be certified if they sell their products within Ontario (see next sub section for further details). The Canadian organic sector has "acute concerns" about this loophole between

provincial and federal legislation and is currently lobbying provincial governments to adopt organic regulations (Fibl 2012).

In horticulture production alone, organic certification bodies reported 133 organic vegetable producers, plus 16 certified CSAs (Macey 2010). The total farm area for these organic horticulture growers is 2678 acres. In contrast to other types of production in the organic sector, such as livestock (up by 17% since 2005), field crop (up by 40% since 2005), and vineyards (doubled since 2005), the number of organic horticultural operations is remaining stagnant[6]. Little is known about the acreage of different vegetable crops and the Organic Council of Ontario estimates that the field vegetables produced in the greatest amounts are potatoes, herbs, garlic, squash, asparagus, mushrooms, sweet potatoes, and onions. In addition, there are nine acres of organic greenhouse tomatoes and cucumbers.

There is no specialized organic horticulture commodity group in Ontario – the Organic Council of Ontario (OCO[7]) represents all types of organic growers in the province. However, it has not yet been fully recognized as a commodity group.

Direct marketing and Self-declared organic farms

The Organic Council of Ontario has recently estimated the market volume of self-declared organic farms in Ontario at $192.3 Million. This sum is distributed over farmers' markets ($140.9 million, 73%), on-farm markets ($44.1 million, 23%), and CSAs ($7.3 million, 4%). The Ontario CSA directory (http://csafarms.ca) lists approx 260 CSAs, and a study by the Organic Council of Ontario (OCO 2012) identified 210 vendors that use claims such as "chemical free" (33%), "naturally raised" (22%), and/or "grass fed" (14%). While direct marketing represents the bulk revenue for most of these operations, some farms also engage in small-scale wholesaling to restaurants, independent retailers, and other alternative distributors such as Fresh City (Section 4.3.4).

Small farms often have a diversified strategy that involves multiple crops and livestock. As such they do not fall within the standard categories for data collection of either the federal (agricultural census) or provincial governments (farm business registration). Furthermore, these diversified farms are also not adequately represented by Ontario's commodity groups. Some organizations exist in which "self-declared organic" farms are prominent: the Ecological Farmers of Ontario are the largest organization with 430 members (website, 2012 annual report). Another organization is the Collaborative Regional Alliance for Farmer Training (C.R.A.F.T.), which involves about 50 producers. Currently, the Organic Council of Ontario is investigating ways in which to offer associate membership to non-certified farms. However, the organizational representation of the "self-declared organic" direct marketing sector remains weak.

[6] OCO – Organic Production in Ontario http://www.gardenparty.ca/files/www/OCO_Production_2.pdf
[7] http://www.organiccouncil.ca

4.2.2 Retail and Distribution

Conventional retailers

Three national retail corporations dominate the retail landscape of Ontario: Loblaw[8] ($32 billion in sales, >1000 stores), Sobeys[9] ($16 billion in sales, 1500 stores), and Metro Inc[10]. ($3.6 billion in sales, >600 stores). Other retailers include the U.S.-based companies Walmart, Target, Whole Foods Market, and H Mart (Asian foods). The mainstream retail reports 45% of Canada's organic sales (COTA 2013). This volume has nearly tripled since 2006 and is now $1,350.3 million. Fruit and vegetables account for 40% of these sales.

Regional Retailers

Regional chains in the GTA include Galati Market Fresh (family-run, 3 stores), Longo Brothers Fruit Markets Inc or Longo's (family-run, 24 stores), Oceans Fresh Food Market (>$50 million in sales, 4 stores, Brampton & Mississauga), and Rabba Fine Foods (family-run, >30 stores). These small, often family-run chain distributors take a middle position between alternative distributors and conventional retailers. While it could be argued that the operation size makes them alternative distributors, the basic shopping experience is not unlike large conventional retailers. We are not aware of regional retail chains that exclusively sell organic produce. Such stores are rapidly evolving in countries in Europe, where organic certification has a longer history. For example, the German organic retail chain Alnatura operates nearly 100 stores under the motto "expedient for humans and the earth"[11].

Alternative distributors as components of regional food hubs

A regional food hub can be defined as an "organization that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional deman"(Barham 2012 for USDA. Compare SustainOntario for a wider range of definitions[12]).

In Canada, alternative distributors accounted for nearly 30% of organic sales in 2012. These alternatives include natural health stores and online retail ($864.7 million, 29%) and buying clubs ($15 million, 0.5%). Foodservice companies and institutional buyers purchased 12% ($371.0 million) of Canada's organic food & beverage sales in 2012 (COTA 2013).

Independent Grocery Retailers And Coops. Alternative retail markets and cooperatives are growing in Ontario. In Toronto alone, there are at least 29 retailers and cooperatives that source produce locally[13]. Unlike national-level retail corporations, these smaller enterprises are more

[8] Loblaw 2012 Annual Report

[9] Sobey 2012 Annual Report *The Power of One*

[10] http://www.cbc.ca/news/canada/montreal/competition-pushes-metro-to-reorganize-ontario-stores-1.1349314

[11] http://www.alnatura.de/de/ueber-uns

[12] SustainOnatio website (Avalon). The Popularity and Potential of Regional Food Hubs. June 18, 2012. http://sustainontario.com/2012/06/18/11046/local-procurement/regional-food-hubs

[13] Examples are: All The Best Fine Foods, Bonne Vie, Culinarium, Delight, Essence of Life, Fermentations, Fiesta Farms, Foodist Market, Foods for Life, 4 Life Natural Foods, Golden Orchard Fine Foods, Karma Co-op Food Store, Havaris Produce, Herbs and Nutrition, Le Caveau, LPK's Cullinary Grove, Multiple Organics Inc, Noah's on Bloor/on

able to make local food and specific geographic locations a core of their corporate identity (Packaged Facts, 2007).

Independent Grocery Distributors. A number of value-based distribution enterprises are emerging in Ontario that aim to reconnect consumers with local and sustainably grown food. One example is 100km Foods Inc, a partner of Fresh City. This company "pecializes in the sale and distribution of local, sustainable foods, with a comprehensive offering, including: fresh, harvested-to-order, in-season fruits and vegetables, farm-fresh dairy, free-run eggs, artisanally milled grains and flours, and pantry staples like Ontario maple syrup, honey and dried beans."(Website[14]). Such enterprises close the distribution gap between producers and wholesale customers, such as caterers, restaurants, or other suppliers. Thus, they are critical in scaling-up local and organic food systems in Ontario.

Buying Clubs. The largest buying club in Ontario is Ontario Natural Food Coop (ONFC), which was formed by joining a number of buying clubs and food coops in 1972. Today, ONFC operates under a triple bottom line (economic, social, and environmental) and offers "wide variety of products [which] are naturally processed"[15]. Their food products are "grown organically, locally, fairly traded and without the use of GMO's". As a cooperative, ONFC is owned by retail members as well as buying club members. The annual revenue of ONFC was $37 million in 2012. Other, smaller, buying clubs exist throughout the province with varying sizes and levels of organization. Examples include Marigold Organic and Natural Food Coop in Durham Region and Bailey's Local Foods in Waterloo.

Food Box Services. In addition to the province's CSAs, there are also foodbox home delivery services. These enterprises can be individual farms, not unlike the CSA program. However, such services usually source products from a combination of multiple farms, through packers and wholesalers (e.g. Pfenning's, 100km Inc., ONFC), from food auctions (e.g. Elmira Produce Auction Cooperative, Bruce-Huron Produce Auction), and from the Ontario Food Terminal. In addition to for-profit food box services in Ontario, FoodShare has operated a not-for profit program, called the Good Food Box since February 1994. This fresh fruit and vegetable distribution system operates like a large buying club with centralized buying and planning, and community volunteers as neighborhood coordinators (website[16]). Local food is given preference as it is available, and customers can pay a premium for an organic box. Today, Food Share deliver over 4000 Good Food Boxes each month in Toronto and similar programs have been developed throughout Ontario.

4.3 Characteristics and Activities of Fresh City

4.3.1 The Fresh City enterprise

Fresh City was established in 2011 and is rapidly evolving. The core of the enterprise is weekly food boxes. Customers order their boxes on-line and these are delivered to their home or to other convenient pick-up points, such as workplaces.

Young, Pape Foodland, Planet Organic Market, Summerhill Market, Sunshine Wholesome Market, The Big Carrot, The Healthy Butcher, The Natural Food Depot, The Sweet Potato, The Wholesome Market, Whole Foods Market, West End Food Co-operative, Witteveen Meats. These retailers all sell products that are LFP certified or produce sourced through Pfennings Farms Inc.

[14] http://www.100kmfoods.com/index.html

[15] http://www.onfc.ca/gms-message

[16] http://www.foodshare.net/good-food-box

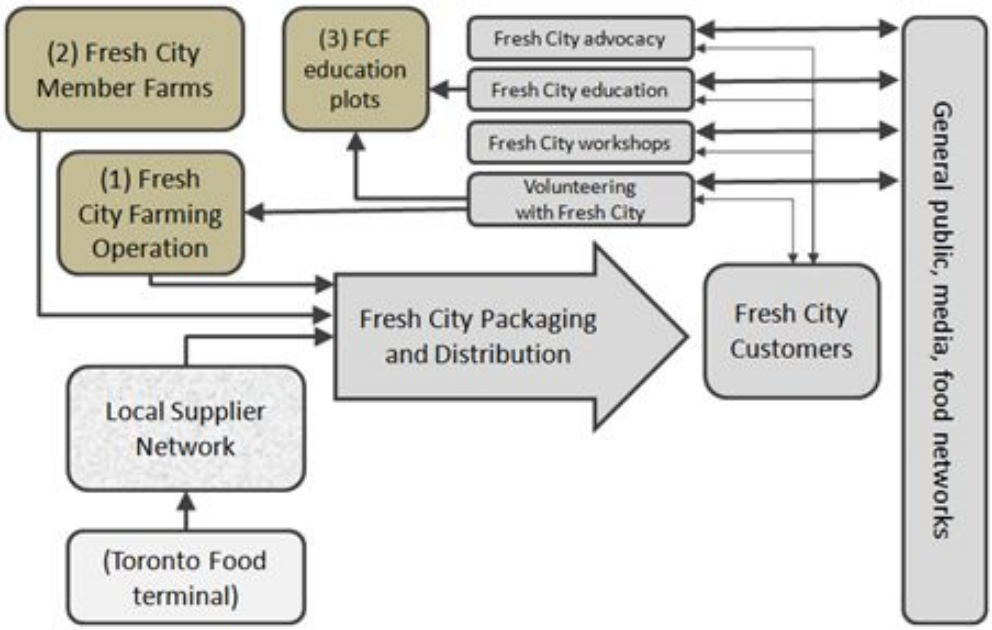


Figure 4.5 — *Structure of the Fresh City food system*

The company was founded by a group of young visionaries who were dissatisfied with environmental, social, economical, cultural, and institutional impacts of the conventional food system. Fresh City founders believe that an alternative system of production, delivery, and consumption is possible. And that this alternative system is capable of providing fresh and nutritious food to urban areas with a lower environmental footprint and better impacts on consumers, while empowering all members of the food chain to be active decision makers.

Fresh City Inc. consists of a farming operation, a packaging and distribution hub, partner farms that augment the products offered by Fresh City, supporting enterprises, educational and advocacy efforts, and ultimately, the customers that receive weekly food boxes.

4.3.2 Fresh City Farms as a Producer

The Fresh City farming operation rents 4.5 acres of farmland within the city limits of Toronto. There are three production sites: Downsview Park, Black Creek Community Farm, and a small vegetable and herb garden located at 369 King St. West. Three types of management schemes are used for the sites:

1. Production-oriented sites at Downsview Park and Black Creek Community Farm: These sites are operated by a farm manager employed to produce fresh vegetables. All harvest is marketed through Fresh City food boxes.

2. An incubator-oriented site at Downsview Park: This site is operated by "member farmers" who receive small plots (up to 2500 square feet) that they manage independently. Member farmers can sell their harvest through farmers' markets, personal networks, or Fresh City food boxes. In order to market through Fresh City food boxes, they must follow guidelines regarding food safety and packaging, and must pass an internal quality control. Fresh City started with six member farmers in 2011, and has increased to two dozen in 2013. Some

member farmers have founded their own independent enterprises. All produce is grown from certified organic seeds and growing materials, and farmers are trained in organic growing techniques and also share some equipment.

3. Education-oriented sites on King Street and Downsview Park: Educational elements include an eatable hedgerow and the new vegetable and herb garden at King Street. A range of workshops for the general public are held in the Greenhouses at Downsview Park.

Fresh City aims to supply as much produce as possible from their own production. During their second year of operation in the summer of 2012 (May to October), Fresh City supplied on average 33.7% of the value of food box contents, which includes produce from member farmers (Figure 4.6). This share was lowest in May (15.8% of retail value) and highest during the months of July (53.6%) and August (38.2% of retail value).

4.3.3 Fresh City Packaging and Delivery of Food Boxes

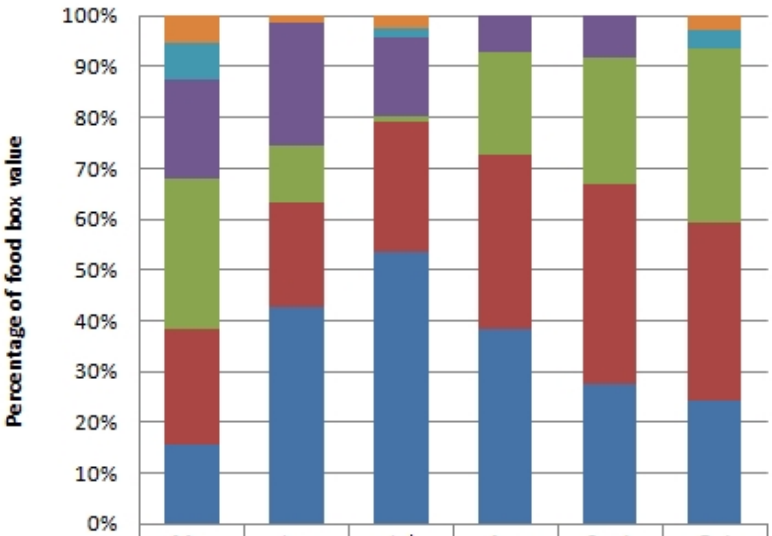
The heart of the Fresh City food chain is their packaging and distribution. Produce is sourced from Fresh City itself, member farmers, and various sources described in the next section. It is then re-packaged into customized food boxes, which are delivered by the Fresh City delivery service to pick-up points or directly to homes. The distribution is described and assessed in detail in the Technical Report *Assessment of Greenhouse Gas emissions by food box distribution*.

4.3.4 Suppliers to Fresh City

As a result of customer interest and rapid growth, the demand for fresh produce rapidly exceeded Fresh City's production capacity. To meet the demands of customers, Fresh City partnered with other farms in Southwestern Ontario. These partners are either certified under the Canadian Organic Standard, or – in a few cases – they operate small operations that follow organic practices, but are not certified (see Section 4.2.1). In such cases, the claim of sustainable production is verified through personal visits and a relationship built on trust. The two largest suppliers are Pfenning's Farm near Waterloo (average 29.5% of vegetable box content during summer of 2012) and Zephyr Organics in Durham Region (average of 20.2%). Both farms grow their produce, as well as packaging and distributing produce from other organic farms in their area.

Pfenning's Farms produces vegetables on over 200 acres and delivers directly to wholesale customers across the Greater Toronto Area. Pfenning's has a packing and shipping operation for organic produce and partners with other certified organic farms for this. This set up makes their delivery operation more effective and allows them to offer a more diverse selection of products. Similarly, Zephyr Organics produces on a large area of approx. 130 acres and delivers wholesale vegetables (and their own CSA food box program) into the City of Toronto. Like Pfenning's, Zephyr Organics also ships produce from neighboring organic farms.

A number of smaller farms supply specialized products for Fresh City food boxes. Suppliers include The Cutting Veg Organic (Sutton, York Region), Green Vision (Farmstart's Incubator Program, Toronto), Red Pocket (Fresh City member farmer, Toronto, Asian vegetables), and Sage Rising (Fresh City member farmer, Toronto, herbs). Other farms deliver through delivery systems such as Pfenning's, Zephyr Organics, or 100km Foods Inc. These farms include August's Harvest (Gadshill, near Stratford, organic garlic, ginger, and herbs), and Windmill Farms (Ashburn, near Oshawa, organic mushrooms).



	May	Jun	Jul	Aug	Sept	Oct
Windmill	5.4%	1.4%	2.4%	0.0%	0.0%	2.6%
August Harvest	7.4%	0.0%	2.0%	0.0%	0.0%	3.7%
100KM	19.4%	24.1%	15.5%	7.1%	8.2%	0.0%
Zephyr	29.6%	11.3%	0.9%	20.4%	24.9%	34.3%
Pfennings	22.5%	20.3%	25.6%	34.3%	39.3%	35.0%
FCF	15.8%	42.8%	53.6%	38.2%	27.6%	24.4%

Figure 4.6 — *Suppliers of Fresh City vegetables (Summer 2012)*

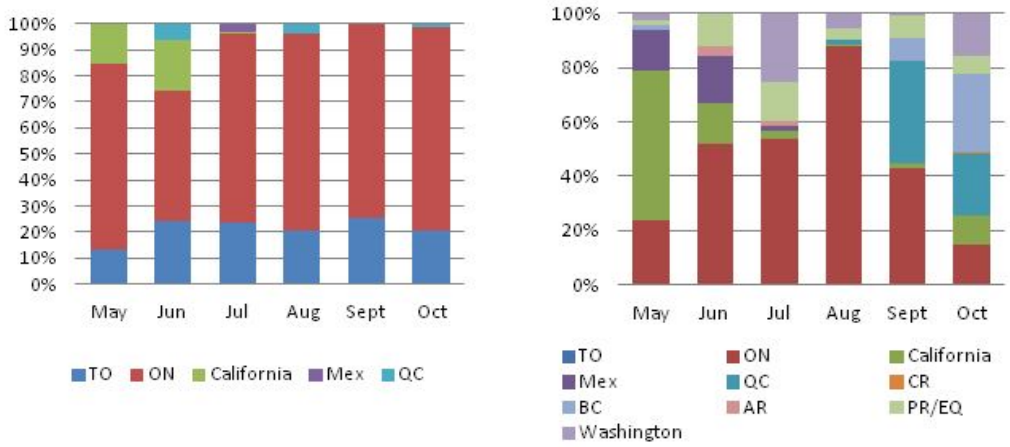
In terms of food chains, the two large suppliers (Pfenning's and Zephyr Organics) are distinctly different actors than the smaller farms.The latter enterprises are primarily direct marketers (some certified organic, others not) and their wholesaling activities with Fresh City are a sideline of their main income stream. In contrast, the main income strategy of the two large suppliers is wholesaling and distribution to a diversified customer base. Furthermore, Fresh City purchases goods through alternative retailers, such as 100Km Inc. In addition to their own operation, Fresh City thus supports three actors in the food system:

1. Small farms with and without organic certification that primarily market directly;
2. Large farms with integrated packaging and delivery systems for wholesaling;
3. Alternative retailers.

4.3.5 Consumers as Fresh City Customers

Consumers can become customers of Fresh City by signing up for weekly food boxes. Customers can choose between vegetable boxes, fruit boxes, or mixed fruit and vegetable boxes. Boxes come in two sizes (regular and large) to serve different household sizes and eating habits.

A survey of Fresh City customers was carried out as part of this impact assessment. The survey was sent to a total of 610 customers of Fresh City on July 3, 2013 and was open for two weeks. A total of 252 customers fully completed the survey. Most respondents to the consumer



(a) Vegetable only (b) Fruit only

Figure 4.7 — *Source of Fresh City produce (Summer 2012)*

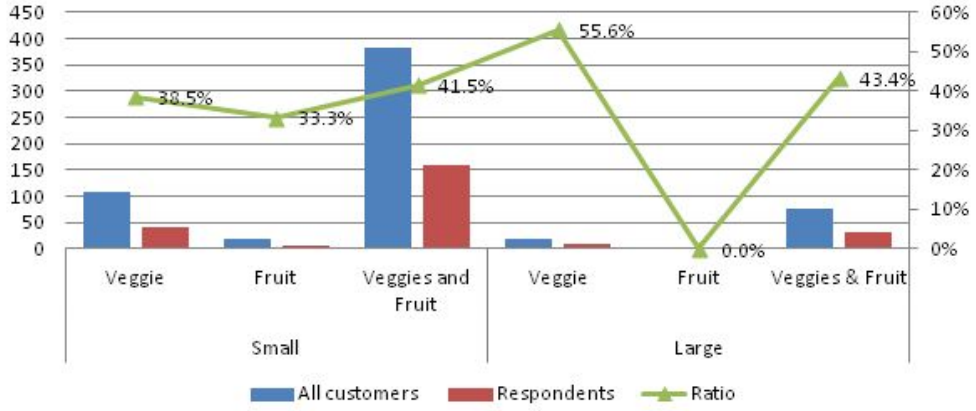


Figure 4.8 — *Number of boxes and percentage of respondents*

survey (60.3%) signed up to Fresh City in 2013, 35% in 2012, and 5% in Fresh City's first year of operation, 2011 (Figure 4.8). Based on customer numbers from April 2013, about 41.2% of all customers completed the survey, with somewhat higher numbers for large vegetable boxes (55.6%) and mixed boxes (43.4%), and lower numbers for fruit only boxes (small, 33%, and large, 0%), and small vegetable boxes (38%).

Many customers have higher-than average income and education. However, all income and education levels are represented. Household sizes range between 1-person households (singles, 18.7%) and households with three or more persons (26%), with the bulk of customers living in 2-person households (55.4%). The main age groups of respondents is 20 to 29 (40%) and 30 to 39 (43%). Ten percent are between 40 and 49, and five percent are between 50 and 59. Only two percent are 60 or older (see Figure 4.9). A full report describing customer characterisitcs and analysis was submitted to Fresh City; this impact report mainly focuses on a description on customers' behavioral changes (Section 7.2).

Customers were asked to rate eleven potential reasons for joining Fresh City. These reasons were derived from discussions with staff, the objectives of this impact assessment, and expert

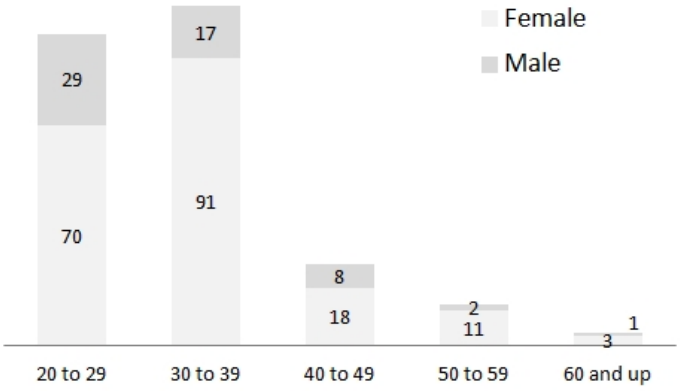


Figure 4.9 — *Age group and gender of respondents*

knowledge. Customers were asked to rate each of these reasons as *very important*, *somewhat important*, and *not important*. Categories were transformed into numeric values and normalized[17] in order to perform correlation and other quantitative analysis.

An absolute ranking of the reasons to join Fresh City is given in Figure 4.10. Food quality and freshness consistently ranks as the most important incentive to subscribe to the food box program. Several other reasons also ranked highly: *organic food,* the *convenience of home delivery*, *price*, and *altruism* (a composite of several reasons). *Improving eating habits* is ranked second-last, while *saving money* is by far the least important reason for joining Fresh City.

Comparatively high correlations (>0.3) exist for reasons that fall under the categories of:

1. **Food quality** including *quality*, *freshness*, and *eating local*;
2. **Altruism** including *carbon footprint* and *local economy*; and
3. **Improve eating habits** including *better eating* and *force me to eat healthy*.

All other categories had lower levels of correlation with each other.

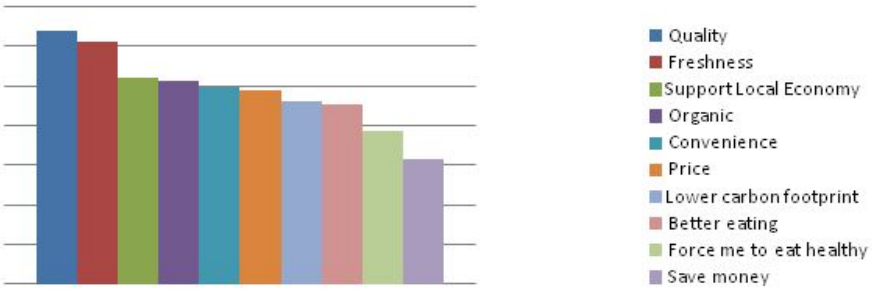


Figure 4.10 — *Reasons to join Fresh City by their relative importance. While values are normalized and carry no meaning, the distance between reasons reflects priorities.*

[17] Normalization is a mathematical technique that stretches data or distributions into the same interval, to make it comparable.

	Price	Freshness	Quality	Eat local	Convenience of home delivery	Organic	Better eating	Minimize carbon footprint	Supporting the local economy	Force me to eat healthy	Save money
Price	1	0.07	0.06	-0.03	0.07	-0.11	-0.18	-0.17	-0.26	-0.13	0.22
Freshness	0.07	1	0.50	0.12	0.06	0.15	-0.24	-0.23	-0.08	-0.25	-0.15
Quality	0.06	0.50	1	0.31	0.23	0.02	-0.25	-0.21	-0.11	-0.28	-0.25
Eat local	-0.03	0.12	0.31	1	0.00	0.09	-0.25	0.14	0.08	-0.31	-0.34
Convenience of home delivery	0.07	0.06	0.23	0.00	1	-0.13	-0.12	-0.24	-0.36	-0.02	-0.03
Organic	-0.11	0.15	0.02	0.09	-0.13	1	-0.06	-0.04	0.09	-0.15	-0.26
Better eating	-0.18	-0.24	-0.25	-0.25	-0.12	-0.06	1	0.01	0.03	0.46	0.10
Minimize carbon footprint	-0.17	-0.23	-0.21	0.14	-0.24	-0.04	0.01	1	0.42	-0.09	-0.03
Supporting the local economy	-0.26	-0.08	-0.11	0.08	-0.36	0.09	0.03	0.42	1	-0.04	-0.08
Force me to eat healthy	-0.13	-0.25	-0.28	-0.31	-0.02	-0.15	0.46	-0.09	-0.04	1	0.19
Save money	0.22	-0.15	-0.25	-0.34	-0.03	-0.26	0.10	-0.03	-0.08	0.19	1

Figure 4.11 — *Correlation Analysis of reasons to join Fresh City.*

4.3.6 Fresh City Education and Advocacy

Another important element of Fresh City's work is education and advocacy activities.

Fresh City provides practical learning opportunities to citizens about growing food through its operations in production, packaging, and distribution:

- The number of member farmers who manage their own plot has increased steadily from 6 in 2011, 12 in 2012, and 22 in 2013. At least three small-scale enterprises have been started by member farmers. Additional member farmers sell produce on farmers markets.
- In 2013, 92 regular volunteers devoted four to eight hours per week to Fresh City.
- Several hundred casual volunteers provide additional support as it is required.

In addition, a variety of workshops are offered by Fresh City to the general public. Topics range from basic organic gardening, to processing and canning, and value adding. Workshops and educational plots are open to the general public and are intended to promote awareness and understanding of sustainable farming principles and practices, engage interested people with an alternative food system, and offer hands on experience. Over 725 citizens have participated in workshops in the year 2013 until September (about 1,300 participated in 2012). Furthermore, Fresh City provides educational material through its newsletters, blogs and social media (2,438 'likes' on their Facebook page), their website and popular media. The newsletter to customers contains recipes, tips on cooking and food storage, and nutrition. Media exposure includes newspaper articles in the Globe And Mail, Metro magazine, The Grid, as well as interviews on radio (In-depth radio) and television (CTV, CBC).

Finally, Fresh City staff participated in a number of conferences, events, and advocacy for alternative food systems.

5 — Environmental Impact of Fresh City

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5.1 On-farm Management Practices and Resource Use

5.1.1 Scope and Method

Environmental practices on producing farms were assessed through interviews with the farm owner or manager. Before the interviews, Geographic Information Systems (GIS) and Google Earth were used to gain an overview over the farm, its production extent, land uses on the farm,

areas that are natural or currently not cultivated, as well as the surrounding landscape. Interviews were conducted in person, including a visit to the farm (with exception of Pfenning's, who were kind enough to give two hours for a phone interview).

Direct environmental impacts were assessed based on questions regarding land use, wildlife on the farm and habitat, pest control, soil management, nutrient management, energy uses, water management, and the production of waste. Personal observations were incorporated to specify questions further, and outcomes from discussions during a farm walk were incorporated as well. However, many topics were not targeted, such as the ability of farmers to prevent soil erosion, the timing of nutrient application, the extent to which field work contributes to soil compaction, etc. Interview results thus do not permit an objective quantification of environmental impacts on ecosystem services or long-term sustainability. However, the range of management practices and the types of environmental impacts were identified, as well as cross cutting issues and challenges.

Globally, no general consensus has yet emerged for how to quantify greenhouse gas emissions within agricultural production. Currently, the Greenhouse Gas Protocol[1] is developing an Agricultural Guidance to help companies measure their agricultural emissions and draft versions of this guidance are available online and open for comment. No quantification of emissions was attempted within this study.

5.1.2 Fresh City Farms: Production and Urban Farming

Fresh City Farms' environmental practices were determined through an interview and farm visit.

FARMING APPROACH

Like many other small farms, Fresh City Farms is not certified organic but exclusively uses organic production practices. The farm grows more than 20 crops and over 50 varieties on about 4.5 acres. The farm is located within the city limits of Toronto, in Downsview Park and Black Creek Community Farm, situated on Toronto and Region Conservation Authority land between Jane and Steeles and York University. At Downsview Park, a large portion of the land is divided into smaller plots that are managed by member farmers. Downsview Park also hosts a greenhouse of approximately 600 m2 (6500 sq.ft.).

While the larger surroundings of both sites are highly urbanized, the immediate neighborhood of both locations is fairly natural park or forest area. The migration of pests from near-by fields is not a relevant production consideration. Furthermore, there is no farm close to the sites that could use pesticides and would necessitate buffer strips.

The main farming operation is run by a farm manager whose tasks range from field work to the coordination of assistant farm managers, managing the greenhouse operation, supporting and educating member farmers, public relationships, workshops, and conflict resolution. For labour, assistant farm managers were hired to manage and execute field work. The primary machinery used is a walk-behind rotor tiller and hand tools, including wheel hoes. Different models of how to incorporate member farmers into the farm production are being tested. One method is to require a set number of work hours each week from member farmers in return for their plots. Several volunteers also offer their time.

[1] www.ghgprotocol.com

ENVIRONMENTAL PRACTICES

Fresh City Farms applies environmentally beneficial practices as feasible:

- A land use baseline scenario for the Fresh City Farms fields is difficult to establish, because neither Downsview Park nor Black Creek Community Farm are suitable locations for conventional farming. Downsview Park is in the immediate vicinity of residential areas and Black Creek Community Farm is located on Conservation Authority lands. Furthermore, long-term investments into natural and technical infrastructure are not practical because of relatively short rental agreements.
- Several small areas on both sites support urban wildlife. These include buffer strips, pollinator strips, and eatable hedgerows, as well as grass areas that are not mown. Member farmers are protecting nesting areas for birds.
- Pest control does not use synthetic chemicals, but instead is based on crop diversification, crop rotation, and physical barriers (row covers, caterpillar tunnels). In addition, simple remedies such as sticky traps are used. Weeds are managed through cover crops and manual removal. Fungal and bacterial tees are used in spring as biological pest controls to prevent plant disease and improve overall plant health.
- In terms of soil management, cover crops are used extensively for soil amelioration. The most frequently used cover crops are rye for its allelopathic properties as a weed suppressant; other cereals such as wheat and oats to increase organic matter; and annual legume such as vetch for nitrogen fixation. Currently, Fresh City farm managers are experimenting with how to improve the state of soil bacteria.
- Nutrient management is based on compost application from their own operation, compost purchased from Downsview Park, and cover crops for nitrogen fixation.
- Direct energy utilization on the field is minimal because most tasks are performed using manual labour. No data was available regarding indirect energy use associated with the energy footprint of Toronto city water. Further study would require obtaining an endorsement by the municipality and then contacting the water suppliers.
- In terms of water management, irrigation at Black Creek Community Farm uses surface water from a nearby pond, and at Downsview Park city water is used. In general, the frequency of irrigation is low in order to stimulate larger plant root systems.
- Regarding waste management, field production creates little waste because row cover, as well as irrigation tapes, are reused multiple years, and no annual plastic products are utilized. Packaging fully relies on re-useable plastic containers and thus bulk disposable packaging (cardboard or waxed cardboard) is not required.

Some practices are currently not optimal, and Fresh City Farms staff is searching for improvements:

- At Downsview Park, city water is used for irrigation because no other source of water is available. City water is not only costly, but requires energy to pump, treat, and pressurize. Also, chlorinated city water must be filtered to remove chlorine, which can be detrimental

to soil health and plant growth, especially for fragile transplants. At this point, the quantity of irrigation water used is not being monitored.

- The greenhouse is heated with propane to grow crops during the winter and to start transplants early in the growing season. It is double-walled and air-tight for basic insulation. High-quality entrance doors allow for complete control over ventilation. The quantity of propane used for heating is not monitored.

5.1.3 Environmental Management of Small-Scale Suppliers

Amongst a number of micro farms that supply specialty crops to Fresh City, a garlic supplier (Cutting Veg) and a rhubarb supplier (Elm Grove Organic Collective, EGOC) were chosen. Both enterprises operate collaboratively on the same 100 acre farm property and, for the purpose of this assessment, are treated as one farm and referred to as EGOC. The property follows a strongly diversified income strategy. Vegetables are mainly produced for a CSA, but the farm also sells at farmers' markets and to two restaurants. Furthermore, the farm property hosts Christmas tree plantations, perennial berry plantations, honey bee hives, laying hens on a mobile chicken tractor, some turkeys, and an extensive house garden. About half of the property remains in extensively used hay fields. The farm has a strong community orientation and draws on labour from over 300 volunteers, including a group of developmentally challenged persons. In addition, members of the collective supplement and diversify their incomes with off-farm labour, especially during the winter season.

- Regarding a landscape baseline, the area immediately surrounding EGOC is dominated by swampy bush and pastures, as well as intensive cash crop operations. The larger landscape is dominated by intensive sod farms, carrot and potato fields, regular cash crops, and residential encroachment around the shoreline of Lake Simcoe. With its diversified income strategy, the EGOC supports a rich diversity of annual and perennial plants and ecological niches. It is situated amongst wetlands, such that native pollinators and birds find all types of habitat. Hedgerows around the hay fields, a pond, and forest areas further diversify habitat.

- Pest management mainly relies on crop rotation and inter-cropping. As part of the poly cultures, flowers and other plants are used to detract harmful insects. The farm makes wide use of row cover. The main weeding is done with volunteer labour of CSA partners.

- Soil management uses cover crops for green manure, and intensive inter-cropping to foster diverse soil biology. Due to the flat topography, high water tables may cause crop failure in wet years.

- Nutrient Management mainly relies on compost, which uses scrap plant material and is augmented with manure from on-farm chicken and turkey flocks. Nutrients are imported to the farm through feed. The mobile chicken tractor fertilizes particular areas and is moved regularly.

- Regarding energy usage, the farm uses a small tractor and a walk-behind tractor for field preparation, which relies on fossil fuels. Otherwise, no major energy use is required.

- For irrigation, water is exclusively drawn from a surface water pond. Moderate to low irrigation quantities are applied to foster a large root system, and some yield reduction

is accepted. Reusable plastic containers for delivery are washed on the farm using biodegradable dish soap.

- The only waste that is produced during production is row cover, once it has been reused two or three times. Neither plastic mulch nor drip irrigation is used. For wholesaling delivery, reusable plastic containers were introduced in 2013 that make waxed or unwaxed cardboard boxes unnecessary and prevents waste.

5.1.4 Environmental Management of Wholesale Suppliers

On the production side, the two wholesale suppliers Pfenning's Farms and Zephyr Organics dominate Fresh City's supply of locally produced vegetables. Both farms are certified organic and have fairly large acreages in horticulture production (200/130 acres for Pfenning's and Zephyr Organics).

- Regarding the landscape baselines, Pfenning's Farms operates in a region where the landscape is dominated by larger-scale cash cropping with corn/soybean/grain crop rotations. Zephyr Organics operates several properties, some of which are surrounded by cash crops, others by natural swamp areas and extensively used pastures, many of which are being tile-drained so that they can be used for cash cropping. As such, both farms increase the crop diversity of their region.

- Regarding natural wildlife, both farms rely on native pollination for field crops, even at their large production scale. Both farms have ponds, water ways, and extensive buffer strips. Pfenning's Farms have improved their hedgerows in order to provide better pollinator habitat. Both farms have extensive areas with bush and forests. Visual analysis with a Geographic Information System has shown that both farms have more natural habitat area on their land than the average surrounding farms.

- For pest management, both farms invest in plant health to strengthen the resilience of their crops against pests. Zephyr Organics uses fertigation, irrigation, and sprays plant teas to continuously improve plant health. For pest control, both farms rely on crop rotation as the primary management tool. While Zephyr Organics also uses intercropping, this method was not found to be effective within Pfenning's Farms' production system. Zephyr Organics uses row cover for insect control and frost protection, and makes extensive use of plastic mulch for weed suppression. Pfenning's Farms uses neither row cover nor plastic mulch. Both farms use beneficial insects in biological pest control, notably bacteria, Trichogramma wasps (an endo-parasite for insect eggs), and soil nematodes.

- For soil management, Pfenning's makes extensive use of cover crops for soil amelioration, using allelopathic rye as a weed suppressant; cereals and oil radish as green manures to increase organic matter; and alfalfa for nitrogen fixation. Zephyr Organics is experimenting with a wide range of cover crops at a small scale. Unlike most other farms that rely on mechanization, Zephyr Organics minimizes erosion by carefully responding to the topography of the landscape and soil texture, thus departing from the common rectangular field outline.

  Pfenning's Farms increases the return of organic matter to the soil by including profitable field crops (grains) into their crop rotation, with varieties that simultaneously provide green manure (stems, roots) and some marketable harvest. For Zephyr Organics, it is

preferable to improve soils with compost and suppress weeds with plastic mulch, such that the majority of fields yield vegetables.

- Nutrient management at both farms mainly relies on compost. It is produced with on-farm plant residues and augmented with manure from neighboring farms. Pfenning's Farms uses horse manure, while Zephyr Organics uses turkey manure. Also, rock phosphate and other mineral fertilizers are added as required, which is permitted under organic regulations.
- Regarding energy use, both farms rely on several tractors of different sizes. They heat greenhouses with propane. To minimize this energy usage, Pfenning's Farms have installed an outdoor furnace which uses wood, to reduce reliance on fossil fuels for heating.
- Regarding water management, both farms use surface water for irrigation. Pfenning's farm is located close to a river. Zephyr's main property is located within a swamp area with natural ponds and secure access to groundwater. Zephyr relies on shallow groundwater for crops that are sensitive to bacterial contamination (leafy greens). Both farms have access to groundwater for times of acute water shortage.
- Regarding waste management, tractor-based field production creates some waste. Where utilized, drip tape and plastic mulch cannot be reused and must be disposed of. Zephyr Organics has tested compostable plastics but found that the four-fold higher costs are prohibitive.

For packaging, both farms rely on waxed cardboard boxes for produce that requires high humidity in storage. These cannot be reused because of food safety regulations and cannot be recycled because they are a composite material. Both farms have looked into alternatives like reusable plastic crates (RPC). The main obstacle for introducing RPC are high investment costs, complex logistics, and questionable environmental benefits, once water use for washing and back-haul is considered. To be effective, RPC would require standardization to simplify logistics and a convenient solution for washing (e.g. a central washing station). After an environmental impact assessment, Pfenning's Farms has started using waxed cardboard waste for heat generation using their outdoor furnace.

In summary, both farms aim to optimize environmental impacts within their financial constraints, which requires pragmatic compromises. Environmental problems remain within their operations and are known to the farmers, but cannot be addressed readily within the operation. Potential solutions include technological advancements or financial support to switch from plastic mulch to biodegradable mulch, collective action and financial aid to move away from waxed cardboard packaging, and improved municipal waste management to deal with the remaining waste.

5.1.5 Summary of Findings

In general, farms put high emphasize on environmental practices that is generally beyond certification standards, especially on the small farms. An in-depth assessment of environmental management practices on small farms is recommended, especially because these do not fall under certification inspections.

Some environmental impacts cannot be solved on the farms themselves and require collective or municipal action.

1. Waste can be avoided by shifting from waxed cardboard boxes to reusable plastic containers. This shift requires a large upfront investment for containers and a washing station that guarantees sanitary standards, minimizes water usage and guarantees proper waste water management. It is recommended to investigate options such as a standardized container used by many food boxes and retailers, in combination with a central washing station that is run as a separate business.

2. Other waste products are hard to avoid if farms remain profitable, mostly plastic. For these products, energy recovery would be preferable but requires modern and centralized waste incineration with high-quality exhaust filters.

5.2 Greenhouse Gas Emissions Within the Distribution System

5.2.1 Background

Many gases contribute to global warming. However, not all gases are equally potent in their impact. To make emissions from multiple gases comparable, the IPCC offers conversion factors that quantify their Global Warming Potential. By multiplying the amount of any gas with its Global Warming Potential, it is converted into Carbon Dioxide equivalents [kg eCO2], which is the quantity of Carbon Dioxide that would create the same global warming impact as 1 kg of the gas. The most relevant gases are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and halogenated carbons that are widely used as refrigerants. The global warming potential of refrigerants can be many thousand times stronger than carbon dioxide and emission of such gases make strong contributions to global warming.

Greenhouse Gases (GHGs) can be measured by recording emissions at the source through continuous emissions monitoring or by estimating the amount emitted by multiplying activity data (such as the amount of fuel used) by relevant emissions conversion factors[2].

5.2.2 Method and scope

For this study, a life cycle approach was chosen, in which one food box as a bundle of products was analyzed. The study focuses on transportation and refrigeration emissions during distribution, thereby addressing Fresh City's core product. This scope is feasible within the resources of this study and it provides a meaningful baseline to compare Fresh City with the conventional food chain. Agricultural emissions were excluded from this study because of fundamental challenges in accounting for emissions in this stage of the food chain and because a GHG accounting protocol for agriculture is in development but not yet available[3].

Emissions in the following stages of the food chain were quantified for both the conventional food chain and for the Fresh City system:

[2] 2012 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting

[3] A range of calculators exist to determine some part of farming emissions. However, these do not include emissions from soils and are disputed in their value. A GHG accounting protocol for agriculture is still in the draft phase (see http://www.ghgprotocol.org, Agricultural guidance).

1. Farm to retailer/Fresh City (sea and air freight transport, if applicable, road transport, mobile refrigeration)
2. retail/Fresh City (refrigeration energy use, refrigerant leakage, other electricity use)
3. Transport to consumer from retail/Fresh City (delivery and mobile refrigeration)
4. Transport by consumer from retail/pickup (transport only)

Transportation emissions stem from the combustion of fuel, as well as from indirect emissions that are caused in the extraction and refining of that fuel, and from the manufacturing and disposal/recycling of the vehicle.

Emissions are accounted for by the relevant GHGs (carbon dioxide, methane, nitrous oxide) and by indirect emissions. Refrigeration emissions are primarily attributed to two sources: leakage of refrigerants and emissions created during the generation of the electricity. For comparability, all calculations are based on one food box as a standard unit. Using Fresh City delivery data, the weight of one box was determined to be 4.47 kg.

5.2.3 Summary of findings

When adding all emissions related to the transportation, packaging, storage, delivery, and consumer pickup of each Fresh City food box, total greenhouse gas emissions are 1.057 kg eCO2. If the same produce were purchased at a regular supermarket, then emissions per box would be 4.246 kg eCO2.

Within the conventional food distribution chain, trucking from the farm to the retailer is the most relevant source of emission. These emissions are attributed to the trucking of produce from Mexico, Florida, and/or California. The largest per-unit emissions come from those items flown in from overseas, such as herbs from Israel or South America. Even though the conventional system benefits from economies of scale, larger trucks, and better capacity utilization of trucks, transportation within the conventional system causes nearly 15 times the GHG emissions as the Fresh City system. This difference is less pronounced for refrigeration during the trip. The most relevant factor here is less idle time of trucks, which reduces refrigerant leakage.

At the retailer and at the Fresh City packaging station, emissions also vary. Within the supermarket, emissions add 0.75 kg eCO2 from refrigeration electricity usage, leakage of refrigerants, other electricity use, and natural gas use. The same process causes 0.45 kg eCO2 at Fresh City for packaging its own produce and re-packaging wholesale produce into food boxes. Emissions at the retail level are about double in the conventional system, primarily because of longer refrigeration times and open refrigerators. Electricity use is the single most important contributor GHG emissions at retail stores (Table 5.1).

Nr	Stage in food chain	Fresh City	Conventional	Ratio
	Farm to retailer/Fresh City			
1	Transportation	0.193	2.809	14.6
2	Mobile Refrigeration	0.003	0.005	1.4
	Sub total	*0.196*	*2.814*	*14.3*
	At retail/Fresh City			
3	Refrigeration electricity	0.085	0.303	3.6
4	Refrigeration (refrigerant leakage only)	0.121	0.153	1.3
5	Other electricity use (Scope 2 emissions)	0.057	0.098	1.7
6	Emissions for natural gas usage, per box	0.224	0.196	0.9
	Sub total	*0.487*	*0.750*	*1.5*
	To consumer from retail/Fresh City			
7	Delivery vehicle	0.259	n/a	n/a
8	Mobile Refrigeration during delivery	0.000	0.000	n/a
9	Consumer pickup/shopping	0.114	0.681	6.0
	Sub total	*0.373*	*0.681*	*1.8*
	TOTAL	**1.057**	**4.246**	**4.0**

Figure 5.1 — *Total emissions per Fresh City food box and the equivalent box content purchased at a retailer or box store*

5.3 The Environmental Food Footprint of Consumers

5.3.1 Survey, Objective and Methodology

The objective of the consumer survey was to understand household characteristics of Fresh City customers, their motivation for ordering Fresh City food boxes, and what types of changes are taking place with regard to eating habits, shopping behaviour, and overall food-related interest. The survey thus scanned a variety of topics, without attempting an in-depth analysis of any one topic.

A link to the survey was sent to a total of 610 customers of Fresh City on July 3, 2013. The survey itself was available on-line using SurveyGizmo and was open for two weeks. A total of 252 customers fully completed the survey.

A detailed report was provided to Fresh City, which contains information that is confidential. It characterizes the households that participated in the survey (the respondents). Then, behavioural changes were analyzed in detail and the epistemic problem of linking observed changes with causes was discussed. This section will focus on those behavioural changes that have the potential to cause environmental and social impacts.

The results from the survey were downloaded as a spreadsheet. In many cases, it was necessary to edit and transform results. For example, frequency categories ("biweekly") were transformed into numerical values ("0.5" [per week]) to compute averages. Interval categories (e.g. "25%-50%") were transformed into numeric values (e.g. 36.25% = $\frac{25+50}{2}$) by choosing the centre of the interval. Often, manual answers were grouped and simplified. Change categories (e.g. "decrease", "increase") were converted into numerical values (-1, 1) to compute correlations. Ordered categories were re-organized such that the spread of statements were centred on 1 and had the same standard deviation ("normalization"), which makes distributions comparable. The original and edited tables were submitted to Fresh City.

For analysis, pivot tables were used to (a) compare categories and (b) transform categories into percentages intervals. This analysis allows for the comparison of the distribution of attributes within two or more groups. Also, correlation analysis was used to understand how attributes of similar characteristics depend on each other. Statistical significance tests were not performed within this analysis due to resource constraints. However, it was verified that any conclusions were based on reasonable sample sizes, which are generally stated within graphs.

5.3.2 Change of Shopping Behaviour

Shopping consumes time and requires some type of transportation, which has an environmental footprint.

When customers were asked about shopping behaviour, questions included: the frequency of shopping trips (number of trips per week); the type of stores where groceries are bought; the time spent shopping each week (hours/week, Section 2.4.1); whether the time spent shopping changed (decreased, increased, stayed the same) since signing up with Fresh City; how much households spend on groceries in addition to the food boxes; and how this changed since signing up with Fresh City.

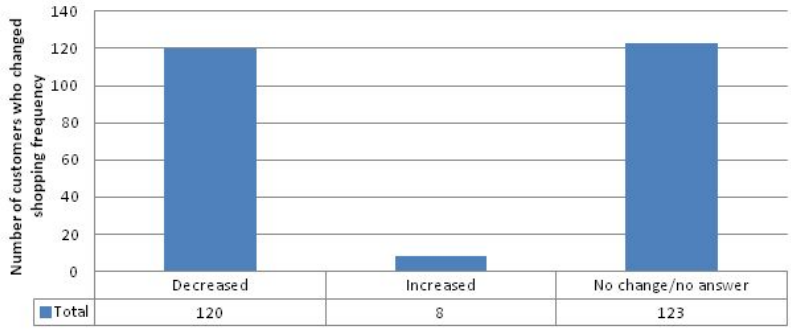


Figure 5.2 — *Number of respondents who changed their shopping frequency*

In total, 47.8% of respondents report a decrease in shopping frequency, while 3.2% report an increase and the rest either reported no change or did not answer this question (Figure 5.2). The group which decreased the number of monthly shopping trips shopped, on average, 10.6 times per month; the group who increased their frequency shopped 14.4 times per month, and those who reported no change shopping for groceries, 12.5 times per month.

The group whose shopping frequency decreased also indicated the most frequent visits to farmers' markets and on-farm stores, compared to the two other groups. It is thus possible that Fresh City food boxes substitute for other types of local food purchases. This group also relies least on specialty stores (1.8 times per month, in compared to 2.5 for "no change/no response"), while the group who increased shopping trips shopped at specialty stores 4.9 times per month. It may be that these shopping trips complement Fresh City foodbox produce, or that specialty stores happen to be located conveniently. Means of transportation (cycling, transit, car, walking) do not show a correlation with urban or suburban locations.

Regarding the frequency of shopping, it can be observed that those who shop most frequently (and on average spend the most time shopping, not depicted) have the smallest changes in their behaviour, while less frequent shoppers appear to be taking advantage of fresh produce delivery and shopping even less frequently.

It remains unclear how the observed decrease of shopping trip frequency translates into reductions in driving and emission savings. Potential substitution effects between Fresh City foodboxes and on-farm shops may cause stronger reductions of emissions due to longer distances to farms, but the frequency of on-farm purchases is low (0.3–0.5 times per month).

5.3.3 Changes in Meat Consumption and Indirect GHG Emissions

Ultimately, greenhouse gas emissions from food not only depend on how they were transported, distributed and shopped, but also on eating behavior: the nutritional composition of high-emission food (meat and poultry) and low-emission food (seasonal produce), the frequency of going out, food waste, and cooking behavior .

The not-for-profit organization ShrinkThatFootprint estimated annual emissions for 5 types of diets (see Figure 5.3). Depending on dietary choices, per-capita emissions for U.S. citizens vary between 1.5 t eCO2/yr for a vegan up to 3.3 t eCO2/yr for meat lovers, or weekly emissions between 30 kg eCO2 and 65 kg eCO2 respectively. The emission footprint of each average U.S.

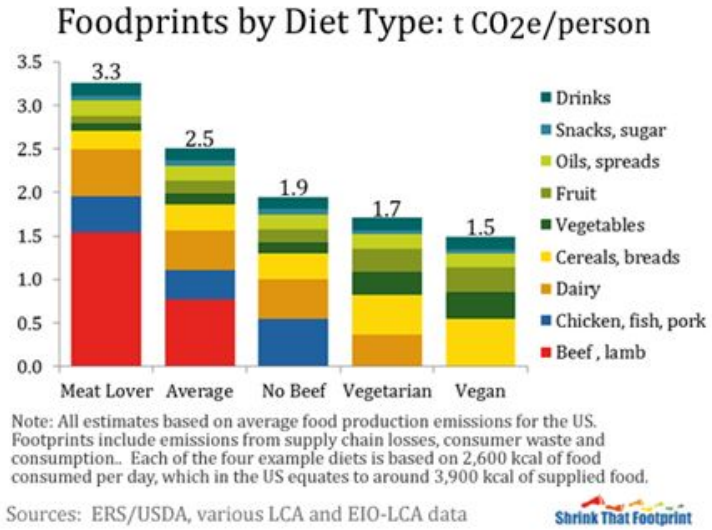


Figure 5.3 — *Footprints by diet type. Figure taken from Shrink That Footprint website . Please cite the original source.*

citizen's diet contributes 2.5 t kg eCO2/year or 50 kg eCO2/week.

After subscribing to Fresh City food boxes, respondents of a Fresh City customer survey clearly indicate changes in their cooking skills, their frequency of cooking from scratch, and most importantly, their dietary choices. For example, 49% indicate that their cooking skills have increased since they were confronted with a stream of fresh food every week (Figure 5.4). 48% of the respondents report that their consumption of meat, poultry, and fish products has decreased:

- Customers who consume meat and fish moderately or seldom (several per month or several per year) are more likely to reduce their animal protein intake than those who eat these foods daily or never (Figure 5.4).
- Consumption patterns of red meat and poultry are very similar, with some individual preferences that explain variation within the data. Increases in consumption of red or white meat are only sporadically reported. Decreased consumption is somewhat more frequent amongst those who eat chicken several times a week, compared to meat.
- Fish is generally consumed less frequently than other types of meat. Overall, a similarly high percentage reported changes in consumption patterns than for red/white meat. Against the general trend with red and white meat, several customers actually increased fish consumption. It is not clear if this change is part of an overall diet change for the customer, or if it is in any way influenced by becoming a member with Fresh City and receiving vegetable baskets.

The magnitude of these changes was not quantified, and it may be that many of these reported changes are either minor or temporary.

Each customer who started off with an average diet and, as part of complex changes that impact on their diet, has reduced his/her meat consumption, is saving Greenhouse gas emissions.

Emissions calculation	Unit	Quantity
Household size	[persons/household]	2.24
Average diet	[eCO2 t/y]	2.5
Vegetarian diet	[eCO2 t/y]	1.7
Average diet	[eCO2 kg/week]	47.95
Vegetarian diet	[eCO2 kg/week]	32.60
Reduced meat diet [4]	[eCO2 kg/week]	40.27
Savings per person	[eCO2 kg/week, person]	-7.67
Savings per hh	[eCO2 kg/week, household]	-17.18

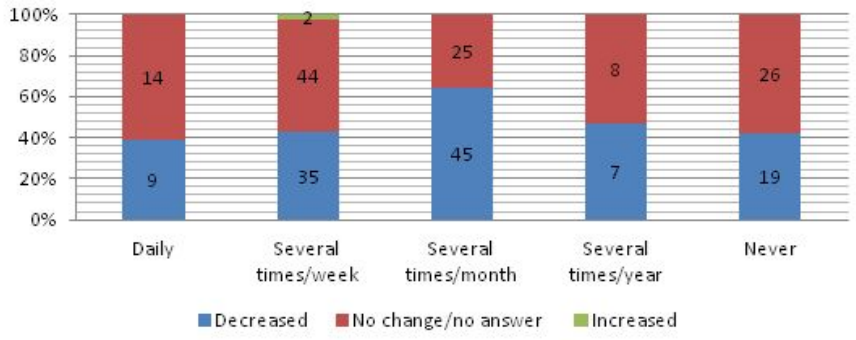
Table 5.1 — *Estimate of dietary emission savings per household*

With the limited data assessed within the consumer survey, it is not feasible to quantify how strong the reductions of animal protein are, or how consumers compensated their diet. However, with general dietary emission data, it is feasible to provide a first estimate of the magnitude of emission savings that behavioral change can have.

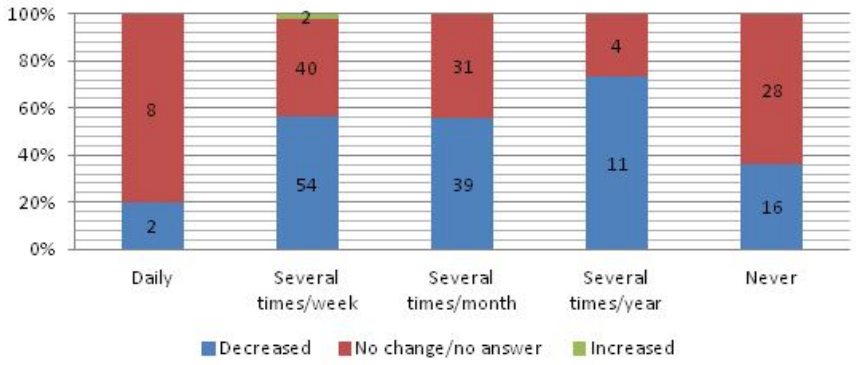
It is assumed that a customer starts off with an average diet of a U.S. citizen and cuts meat consumption by half, by substituting the meat gap with typical vegetarian choices. Using "Shrink That Footprint" data, each person would save 7.67 kg eCO2 emissions each week or 0.4 tons annually. Taking into account the average household size of Fresh City customers of 2.24 members and assuming that all members of the household shift their diet as described, then weekly savings would be 17.2 kg/household (Table 5.1).

It is insightful to compare the magnitude of emission savings due to dietary shifts with emissions within the food delivery system. For each household, emissions for each box were estimated at 4.2 kg eCO2 for a vegetable basket from a conventional store, or 1.1 kg eCO2 if ordering one Fresh City food box. The assumed dietary shift of consumption preferences outweighs the delivery savings 5.6-fold.

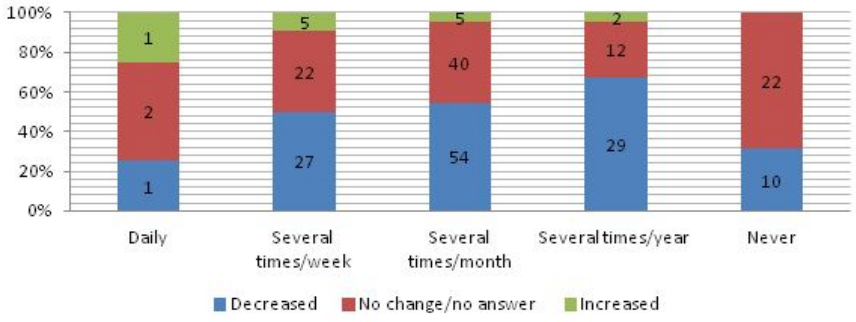
[4] Half average diet, half vegetarian diet



(a) Meat consumption



(b) Poultry consumption



(c) Fish only

Figure 5.4 — *Change in animal consumption since joining Fresh City. Percentage on the vertical axis, total number of respondents as data label.*

5.3.4 Change in Food Waste

Food waste proportionally increases the environmental footprint of food consumption. Globally, more than one-third of food produced for human consumption is lost or wasted along the food chain from producers to consumers, and more than 50% in North America (Gustavson et al.,2011). On a per-capita basis, much more food is wasted in the industrialized world than in developing countries. Gustavson and colleagues estimate that each consumer in Europe and North-America wastes on average 95-115 kg per year. Canada, consumer waste is estimated to generate 51% of all post-harvest food wastes (Gooch et al., 2010). As main reasons, Gustavson et al. (2011) identify "insufficient purchase planning and expiring 'best-before-dates' [...], in combination with the careless attitude of those consumers who can afford to waste food" (page v), while Gooch et al. identify "cooking/preparing too much, not using the food in time, and a lack of confidence to use leftovers". Price promotions not only lead to deal-seeking at the level of consumers, but also create inefficiencies along the food distribution chain that increase the percentage of waste due to lack of coordination (Gooch et al., 2010). In general, all studies stress a lack of data and monitoring of food waste.

In the consumer survey, respondents indicates an overall food waste percentage of 12%, which is significantly lower than Canadian average. For produce in the Fresh City foodbox, the waste percentage is on average nearly double as high at 23.3%. This percentage is slightly lower for families with one stay-home parent, with respondents who shop frequently, and for low income groups, but no strong cross relationships was found.

When joining the Fresh City food box program, the percentage of food waste generally increases for most customers. Households where a large portion of groceries goes to waste reports no further increase. Those households where little goes to waste mostly maintain this low level. The largest proportion of change is with households where between 10% and 25% go to waste. Here, nearly half of the respondents report an increase in food waste.

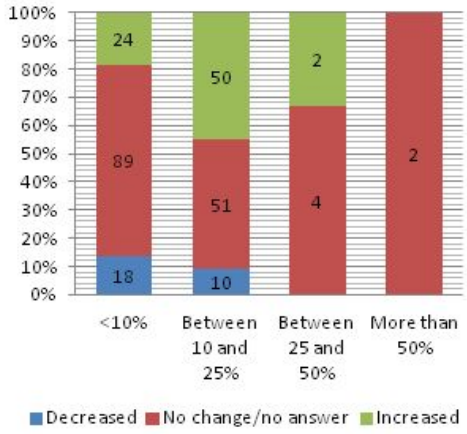
Like the overall waste percentage, the change in food waste is also not clearly related to household characteristics (income, education, etc). Those households who define *cooking from scratch* as making ingredients are far less likely to increase their food waste after joining Fresh City, while nearly half of those who are used to purchasing components (sauces, dough etc.) cannot make use of their produce deliveries before they go to waste (Figure 5.5).

5.3.5 Summary of Findings and Recommendations

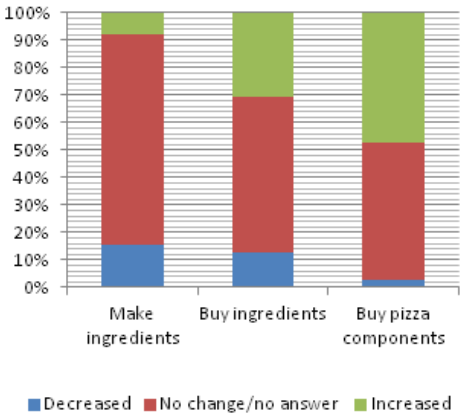
In general, changes of consumer behavior and eating habits are likely to have a larger overall environmental footprint than the delivery of food boxes itself. Behavioral changes are manifold and far beyond a simple substitution of one grocery shopping destination with another.

Regarding shopping frequency and distance, further understanding requires a detailed and in-depth study that not only measure average shopping frequency and locations, but should also take into account (a) whether grocery shopping actually increases driving or is done "on the way" to or from another activity, (b) the living environment of the customer, (c) the type of stores and consumer preferences.

It is recommended to quantify the dietary shifts of consumersand the permanence of these changes, especially regarding the consumption of meat and other animal proteins. Furthermore,



(a) Change in food waste percentage since joining Fresh City



(b) Household definition of "cooking from scratch"

Figure 5.5 — *Percentage of food waste*

it is recommended to assess reasons for the increase in food waste. Reasons may be sought within the cooling chain of box delivery, with cooking habits, or in customer's knowledge about storage of fresh vegetables.

6 — Economic Impact of Fresh City

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Direct local were derived from those businesses who immediately sell to Fresh City. In addition, regional direct and indirect economic impacts were estimated using results from the consumer survey. The design of the customer surveys was not geared toward a detailed quantification of local economic impacts. However, comparative analysis and correlation analysis highlighted that consumers' choices have a number of impacts on the overall food system, which exceed the direct impacts on suppliers. Further study is recommended to quantify these effects.

6.1 Impacts on suppliers

6.1.1 Impacts on Fresh City for suppliers and start-up businesses

As outlined in Section 4.3.4, Fresh City sources its vegetables from large certified organic farms, as well as from small, "self-declared organic" farms (compare Section 4.2.1). A third type of supplier is small start-up businesses that evolved from Fresh City member farms. The partnership with Fresh City serves different objectives for the three types of supplier farms.

Certified organic producers that mainly wholesale

The three large, certified organic farms that have responded to our economic survey or were part of in-person interviews are all wholesalers. Two farms relied on mainstream retailers as their primary customers for many years, but then decided to change their marketing strategy and have therefore diversified their customer base. Today, the largest single customer for one of the farms accounts for a maximum of 30% annual sales. For the other farm, no customer represents more than 4% of sale. Within this strategy, sales to Fresh City make up 5% or less of total sales for both farms. The third respondent has never relied on a single buyer and was always diversified. Sales to Fresh City for this farm also amount to less than 5% of total sales.

Even though Fresh City represents a small share of annual sales volume for each of its large suppliers, all three large suppliers stressed that foodbox programs are an extremely valuable marketing venue that offers stability and some independence from global price fluctuations. Respondents also highlighted that they see their future in collaboration with the alternative distribution chain, not the conventional food system. Reasons include good relationships and dialogue, shared values and an emphasis on a triple -bottom line, as well as a sense of fairness in negotiations on prices and procedures. Compared to small-scale retailers, food box programs request larger quantities of individual items, such that production and packaging is easier, even if it requires more advanced planning. However, respondents also pointed out that coordination with and between foodbox programs would be welcomed to manage peak demand.

Small farms

The small farm that was interviewed primarily relies on direct marketing, as welll as two restaurants, for annual sales. It also requires a different approach to crop planning, because Fresh City requests comparably large quantities of individual crops, whereas CSA and farmers' market venues require a more diversified production. Resulting from its partnership with Fresh City, our interviewee was encouraged to plant larger sections of individual crops that are harvested at once. It is regarded as important learning opportunity for future business expansion. At this point in time, the impact on labour need remains minimal and has not required additional hiring. However, the farmer pointed out that he is very content with the business relationship with Fresh City. Moreover, he can imagine a considerable part of his enterprise being targeted to wholesaling of specialty products in the future.

Start-up businesses

Two start-up businesses have evolved out of Fresh City member farms, both of which grow specialty crops and market a large share of their harvest through Fresh City. Both farms provide part-time employment to a single person. One of the farms is currently taking active steps to start their own farm business outside of Toronto. The current enterprise provides a learning experience in growing and marketing to a diversified customer base, while Fresh City provides a back up plan for selling the bulk part of its harvest. By marketing through Fresh City, member farmers and emerging start-up businesses learn how to meet quality standards for wholesale marketing. As such, Fresh City plays a role as an incubator farm that generates meaningful employment.

Respondents	Decreased	No change/ no answer	Increased	All respondents
Grocery store	4	5.3	4	4.6
Specialty shops	1.8	2.5	4.9	2.2
Health food store	1.3	1.6	1.1	1.4
Farmers market	1.3	1.1	1.5	1.2
Farm store	0.4	0.5	0.3	0.4
Conveni-ence store	0.5	0.5	0.8	0.5
Drug store	0.5	0.4	0.8	0.5
Box store	0.5	0.5	0.8	0.5
Buying club	0.2	0.3	0.2	0.3
Combined	10.6	12.5	14.4	11.6

Table 6.1 — *Shopping frequency of Fresh City customers, by destination [trips per month]*

6.2 Direct Impacts on the Regional Economy

6.2.1 Substitution effects with customers

Potentially, Fresh City could draw customers from similar foodbox or CSA programs, such that net benefits to the local economy and food system are low. However, the consumer survey indicates that 75% of all customers have never been part of a foodbox or CSA program. Of the 63 customers (25%) that had already been part of a CSA, most (21.5%) gave no specification whether this membership was recent or not. From the nine customers that did give details (3.5%), only one customer was part of another organic foodbox program, one customer received non-organic vegetable boxes, and two had previously received vegetables from a specific farm for a limited time of the year. All other respondents who gave specifications either moved into the area, or have not been participants in many years. However, with so many repeat CSA members not giving any information, it would be important to know how many of these actually were drawn from competing foodbox delivery services.

Competing foodbox programs are not the only part of the food system that could be impacted by Fresh City customers. If consumers purchase through a foodbox program such as Fresh City, shopping dollars could be taken out of the conventional retail sector, and also out of the direct marketing sector (farmers' market, on-farm stores). Both of these effects are somewhat supported by the consumer survey:

- 55% of all customers report that the money spent for grocery shopping elsewhere has decreased since being a member of Fresh City, and 6% reported an increase in grocery spending, while the rest indicated no change in spending. The exact quantity spent was not assessed.

- Most customers frequently shop for groceries at regular grocery stores, while, on average, customers purchase groceries from the alternative food chain (direct marketing, alternative distribution) only 1.6 times per month. Due to this low frequency, it is likely that previous to Fresh City membership, most fresh produce was bought at grocery stores.

- Those customers that decreased their shopping frequency, buy more often from direct marketers (farmers' markets, on-farm stores). It is likely that these venues are also impacted by the decrease in spending.

Vegetable Item	Countries of Origin, retail	Fresh City Farm
Beans	Canada, USA	Southern Ontario
Beets	Canada, USA	Southern Ontario
Brassica [Bok Choy]	Mexico, Canada, USA	Southern Ontario
Brassica [Cauliflower]	Canada, USA	Southern Ontario
Brassica [Kale/Chard/Collards]	USA, Canada	Southern Ontario
Corn	Canada, USA	Southern Ontario
Cucumbers	Canada, Mexico	Southern Ontario
Eggplant	Canada, USA	Southern Ontario
Garlic [Fresh]	China	Southern Ontario
Ginger	China, Peru	Southern Ontario
Green [Mizuna/Arugula]	USA	Southern Ontario
Green [Salad Mix]	USA	Southern Ontario
Greens [Romaine lettuce]	USA, Canada	Southern Ontario
Herbs [Green Onion]	USA	Southern Ontario
Herbs [Parsley]	Canada, USA	Southern Ontario
Herbs [Thyme, Marjoram, Basil, Sage, Lavender]	Latin America, Israel	Southern Ontario
Lettuce	Canada, USA	Southern Ontario
Mushrooms [Button]	Canada	Southern Ontario
Okra	USA, Honduras	Southern Ontario
Onion [Red]	USA	Southern Ontario
Onions [White]	USA	Southern Ontario
Peppers [hot]	USA, Dominican Republic, Mexico, Canada	Southern Ontario
Peppers [specialty]	Canada	Southern Ontario
Radish	Canada, USA	Southern Ontario
Tomato [Cherry Orange]	Canada, USA	Southern Ontario
Tomatoes	Canada	Southern Ontario
Zucchini	Canada, USA	Southern Ontario

Table 6.2 — *Country of Origin of vegetables typically contained in a food box within the conventional food chain (All retail data from August and September)*

Country of Origin	Loblaw	Metro	Walmart	Average	Average [%]
Canada	10.5	12.5	10	11	44%
USA	7	8.5	9	8.2	32%
Mexico	2	0.5	1	1.2	5%
Others	4.5	4	6	4.8	19%
All products*	24	25.5	26	25.2	100%

(a) Country of Origin

Country of Origin	Loblaw	Metro	Walmart	Average
U.S.	34.0%	34.7%	36.6%	34.8%
Canada	45.8%	55.1%	44.2%	49.3%
Rest of world	20.2%	10.1%	19.2%	15.8%
Total	100.0%	100.0%	100.0%	100.0%

(b) Value by country of origin

Table 6.3 — *Country of Origin of vegetables and value by country of origin of vegetables typically contained in a food box within the conventional food chain (Retail prices from August 2013)*

The country of origin of products in the 'conventional foodbox' was reviewed in three conventional retail chains (Loblaw, Metro, Walmart). The main countries of origin for vegetables contained in a typical summer food box is given in Table 6.2, and by retailers in Table 6.3(a). On average, during the peak harvest season (August, September), only 44 percent of food items were produced in Canada. The rest was sourced from the U.S.A, Mexico, or other countries. During this time span which is Ontario's harvest season, all items (100%) in the Fresh City foodbox are from southwestern Ontario. If Fresh City customers were purchasing these products in the conventional food system at this time of year, a large part of the spending would leave the country, whereas by purchasing from Fresh City, this money is put back into the Ontario economy. Thus, the shift to foodbox programs such as Fresh City maintains dollars within the region and strengthens the Ontario's alternative food chain.

6.2.2 Local Multiplier 3 (LM3)

The Local Multiplier 3 (LM3) was developed by the New Economics Foundation in the U.K., and published in their 2002 workbook "The Money Trail: Measuring your impact on the local economy using LM3" (available on-line as a free download1, see also Thatcher & Sharp 2008). The method is used to measure the flow of money in the local economy. The approach is based on the idea that the money that flows into an economy can have a multiplied impact on the rest of the economy. What impact the money flows have depend on how institutions, businesses, and individuals spend money, because they do not all spend money in the same way and in the same places. It is calculated by adding the quantity of locally spent purchases that are re-circulated within an area, by the consumer (round 1), Fresh City as the core company (Round 2), and suppliers of Fresh City (Round 3). Relevant spending in round 2 and 3 are necessarily less than in Round 1 because each company has expenses and takes profits from the system.

$$LM3 = \frac{Round1 + Round2 + Round3}{Round1} = round1\% + round2\% + round3\% \tag{6.1}$$

Full data was submitted for Fresh City retail and Fresh City farms. For suppliers from Fresh City, only three enterprises submitted partially completed response sheets needed for calculating a local multiplier. Each respondent is associated with a different supplier category. Respondents consistently reported that more than 90% of their expenses are with other Ontario businesses. However, these respondents did not account for many federal costs (taxes, EI, CPP) or expenses for general business service (banking, insurance), which are often with large companies that are not considered to be local spending (even if they have a local branch or office). Their responses are therefore not considered reliable or accurate enough to be used in a LM3 calculation.

Due to these shortages and for lack of additional data, two scenarios were developed. It is expected that the LM3 value of Fresh City fluctuates between these two scenarios, depending on ordering practices.

- The first, *Fresh City - small suppliers*, assumes that Fresh City food boxes are fully supplied by a small farming operation represented by Fresh City Farms itself. For small farms, round 3 expenditures are mostly for labour and with local dealerships who may order from non-local input manufacturers (round 4 expenditure, not accounted for within the LM3). Using Fresh City Farms data, the round 3 expenditure factor is 91.3% for small farms. The main inconsistency of this scenario is that suppliers of Fresh City (Pfennings, Zephyr Oranics) are relatively large farms who order many of their products directly from input manufacturers.

- For the second scenario, *Fresh City - large suppliers*, it is assumed that all suppliers are larger farms. Here, many round 3 expenditures are for migrant labourers or immediately with non-local input manufactures. These inputs include seeds [1], plastic material, machinery) and can be ordered in bulk quantity from non-local manufacturers, lowering the round 3 factor. To account for this shortcoming, a second scenario was chosen. Here, a round 3 expenditure factor is assumed as 50%, based on interviews with farm owners.

[1] It was pointed out during our interviews that even these relatively large suppliers are dwarfed by the size of US farms, such that they have trouble receiving good seed quality.

The Round 3 factor for farms is calculated from the percentage that the retailers purchases from Ontario (column *% Ontario sourcing* in Table 6.4) multiplied with the percentage of farm expenditures that are local (column *Local farm expenditures*).

As baseline scenario *Conventional - large suppliers*, the LM3 for the conventional retail chain was estimated. In their annual reporting, Sobey reports operating expenses in two cost categories (Sobey 2012 annual report, p. 68): (1) the cost for purchasing goods (the 'cost of sales', approximately 74.8% of total sales) and (2)'selling and administrative expenses' (approximately 21.9% of total sales). The remainder, 3.3%, are finance costs and operating income. It is assumed that Sobey's cost composition is characteristic for other conventional retailers, for which no data was found. Neither category is distinguished by local nor non-local, so additional assumptions were made:

- For the 'cost of sales', it was assessed where retailers purchase the content of a standard food box for August and September. For a list of vegetable items, prices and country of origin was identified at three retail locations (Metro, Loblaw, Walmart, see Tables 6.2 and 6.3). It was noted which percentage of the products in this standard box was sourced from Canada, from the US and from the rest of the world. During the peak summer months, about half of retail value of a typical foodbox items is sourced from Canada (Walmart 44.2%, Loblaw 45.8%, Metro 55.1%) while the rest is from the US (Walmart 36.6%, Loblaw 34.0%, Metro 34.7%) or the rest of the world (Table 6.3). On average, 49.3% of retail value was sourced from Canada. It is assumed that all Canadian products sold in Ontario also originate from Ontario, which is Canada's largest horticulture producer (compare Figure 4.1, p. 22). The percentage of retail value that was recorded by us is assumed to reflect the percentage of wholesale value that is paid to farmers.

- The data 'percentage for selling and administration' is not further specified. It is assumed that half of the costs are related to selling and are local expenses for staff and the maintenance of the building, while the other half are administrative costs which are assumed to be non-local[2].

- All operational incomes/shareholder value and finance costs are assumed as non-local.

- The resulting round 2 factor for conventional retail is $74.8\% \cdot 49.4\% + 21.9\% * 50.0\% = 47.9\%$ (Table 6.4).

Even less is known about the expenditures of those Canadian farms that supply to the conventional retail sector. It is likely that these operate at fairly large scale, such that the same local expenditure factor is assumed for these companies than was assumed for the scenario *Fresh City - large suppliers*.

Results are shown in Table 6.4. Depending on ordering practices, the LM3 of the Fresh City food chain is in the range between 2.44 and 2.84. In comparison, the LM3 from the conventional food chain is roughly estimated around 1.73. While the Fresh City value is for the full year, the conventional value is only valid for purchasing practices during the peak summer months of August and September. In other words, each dollar that a customer spends at Fresh City circulates between 2.4 and 2.8 times within Ontario, while each dollar spend for horticulture

[2]The main retailers differ due to their headquater location (Walmart: US; Loblaw: Ontario; Metro: Quebec, Sobey: Nova Scotta).

	Scenario	Round 1: Customer factor	Round 2: Retail factor	% Ontario Sourcing	Local farm expenditures	Round 3: Farm factor	LM3
a)	Fresh City - small suppliers	100.0%	95.9%	96.3%	91.8%	88.4%	2.84
b)	Fresh City - large suppliers	100.0%	95.9%	96.3%	*(50.0%)*	48.2%	2.44
c)	Conventional - large suppliers	100.0%	47.9%	49.3%	*(50.0%)*	24.7%	1.73

Table 6.4 — *Local multiplier 3 (LM3) for the Fresh City food chain and for a conventional retail chain (three scenarios, assumed values in brackets).*

products at a conventional retail store is circulated at the most 1.7 times within Ontario, using three assumptions that favour the conventional chain[3].

A general weakness of the LM3 is that money flow tracing is truncated after round 3. Additional spending during round 4 and further along are neglected because it is not practical to measure these. The cut-off may cause spurious behavior that needs to be taken into account during interpretation. For example, small farms rely strongly on local dealerships. This increases the value for local spending in round 3 and thus impacts on LM3, even if much of the spending by dealerships (round 4 expenditures) may not be local anymore but is not accounted for. In comparison, larger farms may directly order from foreign manufacturers. Their round 3 expenditure is accounted for, reducing the value of LM3. This limitation related to the cut-off after round 3 is well known and cannot be addressed easily in practice. Instead, a full economic sector model ('input-output model') could be parameterized, which requires extensive data acquisition and research resources.

6.3 Indirect Impacts on the Regional Economy

When becoming Fresh City customers, the direct substitution effect is not the only impact. Customers also change their diet, their cooking, and their eating behaviour. Customer survey results indicated several potential indirect impacts on the regional economy:

- Customers increased their overall vegetable consumption, while reducing their consumption of animal proteins (meat & fish). At the same time, many customers requested local meat. It was not assessed whether this reduced consumption of animal proteins impacts the local food economy or whether vegetables mostly substitute for imported meats. It would be valuable to assess whether Fresh City customers that reduce their meat consumption consume more locally produced meat than previously.
- 20.3% of respondents report that they eat out less frequently than before signing up with Fresh City, while 2.4% of respondents that they eat out more. It is not clear to which extent these changes are related with other lifestyle changes. However, it would be valuable to quantify the effect of foodbox-induced home cooking on eating out.

Next to these substitution effects, results also indicate that shopping at specialty stores may be complementary to signing-up with Fresh City, such that it may actually increase spending at specialty stores. While this effect is largely masked by other changes of shopping behaviour,

[3] *Assumption 1*: all produce from Canada is sourced from Ontario; *Assumption 2*: Retail prices are proportional to wholesale prices; *Assumption 3*: Over the full year, the same amount of produce is sourced from Canada as is during the Canadian peak harvest months of August and September for which data was collected.

changes of shopping behaviour are disproportionally related to the frequency of shopping in specialty stores. On average, customers who decreased shopping frequency go to specialty stores 1.9 times per month, while those customers who shop more frequently buy at specialty stores 3.6 times per month, nearly twice as often. Customers without changes of shopping frequency shop at specialty stores 2.5 times each month. Especially, those customers who also indicate that they cook more frequently from scratch and increased their shopping frequency also shop nine times per month at specialty stores. These results indicate the possibility that specialty stores actually benefit from customers who sign up with Fresh City through a complementary effects between fresh produce and specialty goods. Further research is required to validate these hypotheses.

7 — Social Impact of Fresh City

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7.1 Employees and Internships

Fresh City has both social and economic impacts through its growing staff. Currently, the company hires eight full-time positions and two full-time internships during the growing season. A survey was carried out with full-time staff to assess job satisfaction (including stress, work load, work-life balance), the value of their job as a learning experience, immediate impacts on health, as well as impacts on eating habits. Five out of eight employees participated in the survey.

Job satisfaction

Based on survey responses, the job satisfaction of management staff is consistently limited by long work hours, a lack of balance between work and life, frequent stress, and work overload. At the same time, management staff are also optimistic that pressures from work will be reduced within the next year. Other staff members indicated that they are satisfied with their work-life balance and do not experience work overload or unusual stress.

Furthermore, staff reported a wide range of mental benefits from their employment at Fresh City. These include a sense of fulfillment and passion for a job that is meaningful and has a higher purpose, as well as an enjoyment of the challenges of organizing complex work processes and decision making. Employees also emphasized the balance between mental and physical work that they experience at Fresh City. In general, all respondents felt positive about their work environment.

Remuneration (pay/benefits/vacation) and lower work hours were each considered by three staff members as options to decrease work stress.

Work & Health

Absenteeism is a general indicator for occupational health, though it should be recognized that unionization and supplementary medical insurance generally increases the rates of absences, whereas uninsured employees are encouraged to be at their work place even when sick (Marshall 2006).

Absentee rates for Fresh City were lower than the average workforce and average for management staff. According to Statistics Canada (Dabboussy and Sharanjit 2012), average rates for work absence of female full-time employees in 2011 were 11.4 days (9.4 for illness or disability plus 2.0 for personal or family demands). At Fresh City, the female respondents who are regular employees missed on average 3.5 days for illness or disability, and 1.5 days for personal demands[1].

Management staff missed only 0.33 days for illness or disability (average 4.2 days in Canada, for both genders), but a higher number for family demands (4.6 days). If only members without young children are considered, which typically have higher absence rates for family reasons, this number drops to 2.0, which is the Canadian average for management staff (Dabboussy and Sharanjit 2012).

Depending on their role within the enterprise, some staff members are exposed to heat or cold, grease or dirt, dust, noise, slippery ground, and dangerous machinery. Staff members have also noticed repetitive strain and extreme physical stress that has caused joint or other pain, for example when lifting produce. Other staff members are concerned about the lack of movement and bad positions during long work hours at the computer, which cause joint or other pain. Those who indicated that they experience pain at work cannot adjust their work environment to their height and size, and would welcome receiving ergonomic training. On the positive side, all staff has access to adequate protective gear. Staff and management reported a decrease in exercise outside of work since joining Fresh City, but for different reasons. For some, this can be attributed to work overload and long work hours, as well as increased family responsibilities. Others have sufficient movement during the work day and feel "in the best shape of their life", such that additional exercise is not required.

[1] Young age generally also has lower work absence rates (Marshall 2006).

Learning experience and subsequent employment situation

All staff claims to have improved their skills in team work, work flows, and planning. Most staff members have also improved skills in risk management and in physical movement.

Without exception, the Fresh City experience has motivated all staff to continue working in the food-related sector. All see a variety of opportunities within the Fresh City operation that provide room for personal advancement and have visions to expand Fresh City activities. Furthermore, staff members would like to maintain a wide variety of roles within the food chain: sharing their knowledge and continue educational work (three respondents), advocacy and policy activities (three respondents), and marketing/consumer education (three respondents). Four out of five respondents would like to be directly involved in farming and in food distribution.

Summary

Fresh City currently hires eight full-time jobs and both management and staff feel fulfillment within their occupations. Survey respondents also indicated high levels of commitment and associated stress levels, which are not unusual for newly established enterprises. At the same time, respondents were generally optimistic that this lack of balance between work and family life will improve in the future. In addition, respondents reported that they are learning a wide range of skills and feel qualified for future jobs in the food sector. Respondents see opportunities within Fresh City, even if remuneration (pay/benefits/vacation) is not optimal. Occupational health is within the normal range, but opportunities for ergonomic training and improving work place ergonomics exist.

7.2 Impact on Consumers

7.2.1 The Problem of Causality

Social impacts of Fresh City can also be found amongst its customers. Impacts are diverse, as the survey indicated. Behavioural changes include changes in customers' dietary composition, shopping, cooking, and eating. A majority of customers reported having learned about new food products and improving their ability to cook.

However, these behavioural changes with respect to food, cooking, and shopping are not necessarily causally linked to customers' participation in Fresh City. Instead, they are likely part of a larger transformation process of these customers. Root causes for behavioural changes may lie outside of the observable realm and may be very personal experiences that not only lead to the specific changes measured in the survey, but also the decision to purchase produce from Fresh City. This problem of proving causality from observations is well known in epistemology and philosophy and not easily resolvable. Hence, readers are asked to abandon the idea of linear cause-effect relationship or direct causality. Instead, Fresh City food boxes play a role within a complex and changing context of food preferences and culture. The survey attempts to highlight some aspects of this change and how Fresh City customers behave in it.

7.2.2 Immediate Impacts with Direct Causality

Perhaps the most interesting insights about behavioural changes related to Fresh City emerged from a question about past memberships in a CSA program. It is reasonable to assume that respondents who had already been CSA members were exposed to many of the learning experiences of a foodbox delivery program. With such a control group, immediate causality between impacts and the first exposure to a foodbox program can be examined. Moreover, with 62 past CSA members, the sample size is such that the observed differences in changes in behaviour have statistical significance.

IMPACTS ON KNOWLEDGE

Those respondents that are past members of CSAs, reported lower rates of increases in their cooking skills (35.5% versus 54.8% for those new to the foodbox concept). In other words, only a third of past CSA members reported to have increased cooking skills since joining Fresh City, while more than half of those respondents that had not participated in a foodbox program had increased their cooking skills (Figure 7.1). A similar conclusion could be drawn when assessing the impact of past exposure to food boxes against the number of new vegetables tried with Fresh City food boxes (Table 7.A). All but 20 customers had encountered new vegetables through their Fresh City foodboxes. On average, past CSA customers encountered 2.3 new vegetable types, while others encountered 3.6. Only 16% of past CSA members encountered more than 4 new vegetable types, compared with 42% of the other customers. Thus, it appears reasonable to conclude that participation in a foodbox program directly impacts individual's knowledge about vegetables and supports their learning of new cooking skills. In future research, it would be valuable to test whether customers that sign up with Fresh City are aware of this impact, whether they made a conscious decision to improve their cooking skills and food knowledge before signing up, and whether they are joining up with Fresh City in order to support their learning and skill development goals.

Figure 7.1 — *Change in cooking skills and past CSA membership*

New Veggies tried with Fresh City	No CSA experience [%]	CSA members in past [%]	Number of respondents in category
none	65%	35%	20
1	48.3%	51.7%	29
2	65.9%	34.1%	44
3	78.1%	21.9%	64
4	89.7%	10.3%	29
5	85.7%	14.3%	14
6 or more	88.4%	11.6%	43
Grand Total	**74.9%**	**25.1%**	**243**

Figure 7.2 — *Data and number of respondents*

7.2.3 Behavioural Changes with Complex Causality

Many other behavioural changes were reported by survey respondents. These changes were tested against the "control group" of respondents with past CSA exposure. For other behavioural changes, respondents did not show pronounced differences based on previous CSA membership.

GENERAL CHANGES IN BEHAVIOUR

In total, 12 questions addressed changes in the intake of meat and fish products, grocery shopping (number of trips, spending, total time spent grocery shopping), cooking skills, the frequencies of 'from scratch cooking', eating supper with the family, eating out, the percentage of food waste, and customers' activity in lobbying organizations. First, the total number of changes was counted for each customer. Below, a histogram shows how many changes typical customers have experienced since joining Fresh City (Figure 7.3). On average, customers experienced 6.2 changes. Some (15) customers did not experience changes in any behaviour, while 29 customers experienced changes in eight or more behaviours. Analysis by age group (Figure 7.4) indicates that both those who changed most and those who changed least tend to be younger respondents (20-39 years), but sample sizes may account for some of this effect.

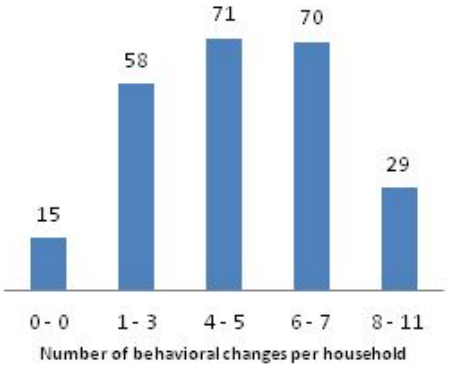


Figure 7.3 — *Total number of behavioural changes (increase or decrease) reported by respondents. Numbers above bars indicate number of respondents.*

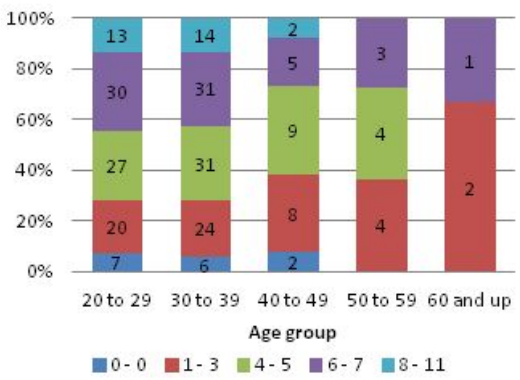


Figure 7.4 — *Total number of behavioural changes by age group. Numbers within bars indicate number of respondents.*

Figure 7.5 gives an overview of all behavioural changes that were examined, as well as the percentage who changed or did not change their behavioural patterns. In total, 50% of respondents report to have decreased the consumption of fish, poultry, and meat. Most of the other respondents provided no information for these questions, while a small number reported increases in fish consumption. With respect to grocery shopping, half reported a decrease in shopping time, frequency and spending .

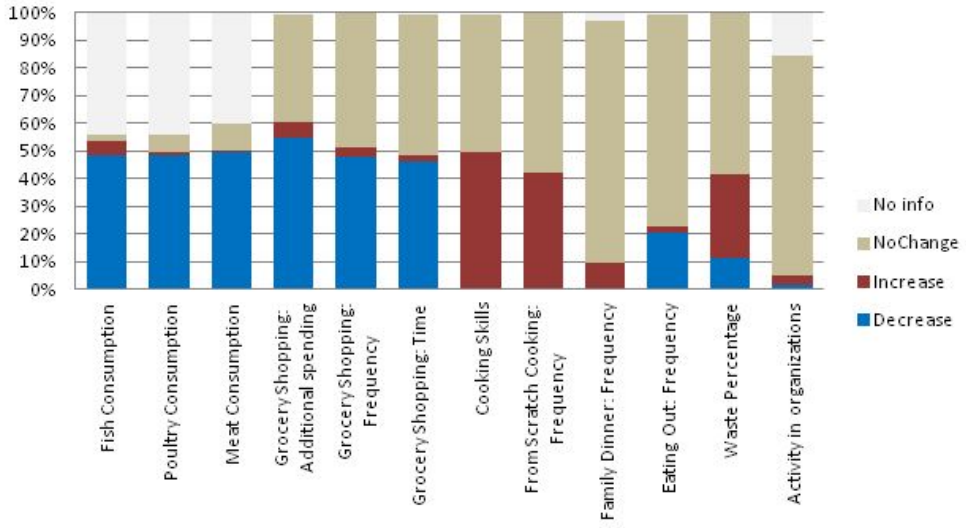


Figure 7.5 — *Overview of behavioural changes. Percentage of respondents who have increased, decreased or not changed food-related activities since they started receiving food boxes from Fresh City.*

Cooking skills and the frequency of from scratch cooking increased for 40-50% of all respondents, and the frequency of eating out decreased for about 20%. While 10% report less food waste since receiving food boxes, 30% have more food waste than previously. 10% reported that they eat with their families more frequently than before. Only three percent report an increased engagement in food-related lobbying organizations.

IMPACTS ON HEALTH

When eaters sign up with Fresh City and regularly receive food boxes, there are several benefits to their health. First, they have regular access to food that has the typical benefits of local food (see Section 3.2.1). In particular, produce was ripe at harvest, spent a minimal time within distribution (often two days or less) and is therefore as fresh as feasible, and was not processed or radiated. Varieties were not chosen for mechanized harvest and long-term storage, but for taste and its ability to grow in Southern Ontario. Second, it has the regular benefits of organic food (Section 3.3.1) and neither contains pesticides nor any other additives. With most food being grown outside and on diversified farms, it is likely that high nutritional value is as good as it can be.

However, health benefits not only result from the substitution of transported vegetables with higher-quality equivalents. Health benefits are manifold:

- Customers reduce the consumption of red and white meat, which is attributed with many health risks, is reduced. Based on the red meat intake of the average North American, the Harvard School of Public Health recommends reducing the intake of red meat and to avoid processed meat, because "eating even small quantities of these foods on a regular basis raises the risk of heart disease, diabetes, colon cancer, and weight gain" .

- Customers report eating an increased quantity of vegetables. According to the Harvard School of Public Health, "a diet rich in vegetables and fruits reduces blood pressure;

reduced risk of heart disease, stroke, and probably some cancers; lower risk of eye and digestive problems; and a mellowing effect on blood sugar that can help keep appetite in check".

- Customers are exposed to an increased diversity of vegetables. According to the Harvard School of Public Health, "variety is as important as quantity. No single fruit or vegetable provides all of the nutrients you need to be healthy".
- The Harvard School for Public Health (HSPH) advocates for a healthy diet that contains plenty of produce, whole grains, healthy sources of protein, and healthy oils. Many of these recommendations are associated with from-scratch cooking and the avoidance of processed food. In the consumer survey, nearly half of the respondents reported an increase in the frequency of from scratch cooking (41.8%), and the frequency of going out has decreased for 20.3% of respondents. Compared with processed food, from-scratch meals usually contain
  - less food additives, such as artificial colors, monosodium glutamate and artificial sweeteners (negative health effects are summarized in Section 2.4.1);
  - less unsaturated fat with trans-isomer (E-isomer) fatty acids (trans fats), which are caused by partial hydrogenation of plant oil during food processing;
  - less fast carbs. Even low-fat processed food is not recommended by the Harvard School of Public Health, because "when food manufacturers take out fat, they often replace it with carbohydrates from sugar, refined grains, or starch. Over time, these fast carbs can raise the risk of heart disease and diabetes as much as (or more than) eating too much saturated fat". Instead, HSOH recommends using vegetable oils, which is mostly used when cooking from scratch.

THE ROLE OF CONVENIENCE

For many customers who are content with their food habits, Fresh City provides convenient access to quality produce. Examples are customers who mostly or entirely eat vegan or customers who now shop less frequently in on-farm stores and, to a lesser extent, on farmer's markets. In general, convenience tends to be more important for customers who shop more frequently. However, detailed analysis shows that convenience is more important for those customers who most frequently shop at big box stores, at convenience stores and at drug store (usually once a week). Convenience is less important for those frequently using speciality stores or health stores (several times a week or daily) or buying clubs (once a week). Convenience is more important for couples with kids and for single households, and for households where a housekeeper is responsible for cooking[2]. It is least important for co-living households and for single parents[3].

7.2.4 Discussion of impacts and recommendations

The consumer survey clearly shows that the majority of Fresh City customers are in the process of re-configuring their food habits after signing up with Fresh City. Changes in behaviour were found in their diet, knowledge and skills, cooking habits, eating habits, and shopping behaviour.

[2] http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/fats-and-cholesterol/

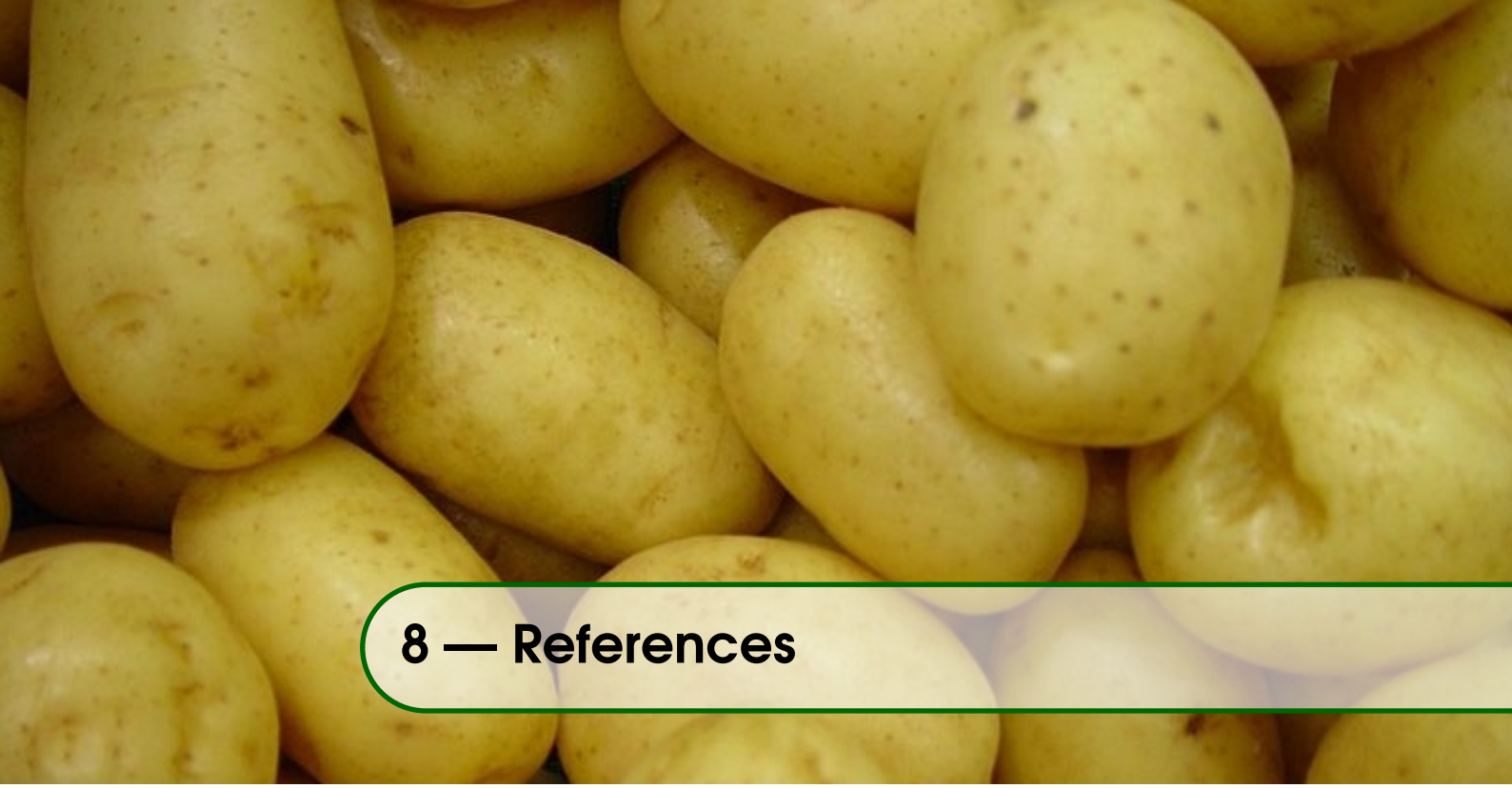
[3] While a low number of respondents leaves this specific result very uncertain, further consideration is warranted because a very strong preference was found among this group.

It is not clear which role the regular delivery of fresh produce plays within these changes. It may be that customers sign up when they have already had the desire to improve their food habits. Many changes may be triggered by a more fundamental change of behavior where signing up to Fresh City is just one component, while other changes are directly related to receiving regular food boxes. The regularity of food box deliveries may solidify decisions and facilitate the implementation of desired changes, by confronting households with fresh produce on a regular basis. Research is recommended that accompanies new customers and assesses how fundamental decisions on eating habits and signing up with a food box service interrelate and solidify each other.

7.3 Educational and Advocacy Activities

One of the least tangible impacts of Fresh City are those related to educational and advocacy activities. Educational activities range from full-time and part-time internships in urban agriculture, the member farmer program that has resulted in several micro enterprises, regular workshops in farming and food processing, and several hundred short-term volunteers. No assessment of the impact of educational activities was feasible within the resource constraints of this study. It would be very valuable to develop an educational strategy and implement monitoring programs to observe the impacts of educational activities.

Advocacy work was also not assessed explicitly within this study. However, several aspects were identified that warrant further investigation: a number of suppliers to Fresh City are also active on several organizational boards for local food and organics, and Fresh City staff and their business model have regular exposure on various forms of popular media. It would be valuable to monitor how this exposure is perceived by the general public and in the context of the local food movement, and whether it has impacts on sector strategies and policy.



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