Project Abstract

Project title: A fork in the road: The impact of eating locally

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Brief Summary of Project: In recent decades, climate change has increasingly entered public, scientific, and governmental discourse as an important topic. Climate change is now widely recognized as having major impacts on the environment, and is generally attributed to anthropogenic causes. Greenhouse gas (GHG) emissions contribute significantly to the phenomenon of climate change.

This project sought to explore the impact that the food life-cycle has on the production of GHGs. This cycle includes agriculture, processing, packaging, refrigeration, transportation, consumption, waste disposal, recovery and sequestration. Each and every part of the cycle was found to contribute to GHG production. One analysis postulates that agriculture accounts for about 40% of the CO_2 emissions derived from food, while transportation accounts for 9%, and both packaging and retail each account for 6% (Climate choices, 2007)

By choosing to eat more local foods we can potentially reduce our individual contribution of GHG emissions. By driving the market away from largely imported and processed foods, we will help to reduce emissions that originate from the life cycle of food. This paper discusses considerations related to eating locally, including benefits to the individual and the economy, as well as the effect on the global economy.

A Fork in the Road:

The Impact of Eating Locally

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Introduction

Greenhouse gases

In recent decades, climate change has increasingly entered public, scientific, and governmental discourse as an important topic. The potential impacts of climate change include rising sea levels and increasing air temperatures (Ledley, et al., 1999), phenomena that are already taking place. Average global temperatures have increased approximately 0.56° C over the past century (Demirbas, 2006). Climate change is now widely recognized as having major impacts on the environment, and is generally attributed to anthropogenic causes. Greenhouse gas (GHG) emissions contribute significantly to the phenomenon of climate change. Trends have shown increasing concentrations of carbon dioxide (CO_2) and methane (CH_4), two of the primary GHGs, in the atmosphere over the past 100 years (Environment Canada, 2007). The Montreal Protocol, beginning in 1989, has been successful in reducing the emissions of certain compounds, such as chlorofluorocarbons (CFCs), known to have a particularly harmful impact on the environment (Ledley, et al., 1999). However, there is substantial potential for further mitigation of climate change from GHG emission reductions.

It is noted that economic GHG intensity decreased by 6% from 2004-2005, meaning that "more goods were manufactured, more commercial activity occurred, and more travel took place per unit of GHG emissions" (Environment Canada, 2007, p.6). Since 1990, the overall trend has been an increase in GHG emissions.

In 2005, Canada emitted 747 million tonnes of CO_2 equivalent (eq). This represented 2% of the world's total GHG emissions, despite the fact that Canadians comprise just 0.5% of the world's population (Environment Canada, 2007). Canada's 2005 emissions were 32.7% above the Kyoto target. The energy sector is the largest emitter, contributing 81.6% of Canada's GHGs (Environment Canada, 2007).

The National Inventory Report, which is the Canadian government's submission to the UN Framework Convention on Climate Change (UNFCCC), reports that the emissions attributable to the energy sector come from stationary combustion sources (e.g. electricity and heat generation, fossil fuel industries, residential, agriculture and forestry), transportation (e.g. domestic aviation, road transportation, railways), and fugitive sources (e.g. coal mining, oil and natural gas). Transportation accounts for 27% of the total national emissions and 33% of the energy sector's contributions (Environment Canada, 2007). Within the transportation sector, CO_2 amounted to 190,000 kt, while CH_4 and N_20 contributed 600 and 8,000 kt of CO_2 eq, respectively. Within the rest of the energy sector, CO_2 contributed 354,000 kt, while CH_4 and N_20 contributed 53,400 kt and 2000 kt CO_2 eq, respectively (Environment Canada, 2007).

The agricultural industry contributes 8% of Canada's emissions, primarily through enteric fermentation (43.9% of agricultural emissions), manure management (15.1%), and agricultural soils (40.4%). The main GHGs from agriculture are CH_4 and nitrous oxide (N_20), having contributed 28,000 and 29,000 kilotonnes (kt) of CO_2 eq in 2005, respectively (Environment Canada, 2007).

Canadians are one of the highest per capita emitters of GHGs, at 23.1 t of GHGs per capita in 2005. This has increased fairly steadily from the 1990 level of 21.5 t per capita (Environment Canada, 2007). In order to reduce the harmful effects of global warming and climate change, efforts must be made to reduce GHG emissions.

While traditionally the analysis of GHG emissions originated at the industry end (i.e. measuring the contributions of the transportation sector), there is a new movement to calculate emissions based upon the final product or service. This method accounts for the contributions from all involved industries, from manufacturing to delivery, for all individual products and services. For instance, the end product 'TV' has emissions from electricity, glass, metals, and transport associated with it. These would all be summed to get the total emissions attributable to the product TV (Carbon Trust, 2006). A report that used this kind of analysis on the most

carbon-intensive products and services in the UK concluded that "[c]onsumer purchasing decisions are the ultimate driver of carbon emissions in an economy. All carbon emissions can be attributed to the delivery of products and services to meet the needs of the consumer" (Carbon Trust, 2006, p.3).

A similar kind of analysis, the food life-cycle (Heller & Keoleian, 2003), contributes a considerable proportion of GHGs (Appendix A). This describes the cycle of agriculture, processing, packaging, refrigeration, transportation, consumption, waste disposal, recovery and sequestration. Each part of the cycle contributes GHGs. Analyses have been conducted on individual food products (e.g. bread, corn); however, it is very difficult to accurately assess the contribution of the life-cycles of all foods in a given system, due to lack of appropriate data and methods (Stanley, 2007). The methods behind these calculations are not always transparent, so it is difficult to critically interpret the resulting numbers. However, one such attempt has postulated that agriculture accounts for about 40% of the CO_2 emissions derived from food, while transportation accounts for 9%, and both packaging and retail each account for 6% (Climate choices, 2007) (Appendix B).

By choosing to eat only local foods, or to eat more local foods, we can potentially reduce our individual contributions of GHG emissions. By driving the market away from largely imported and processed foods, we will help to reduce emissions that originate from the life cycle of food. This paper will discuss some of the issues around eating locally, including the benefits to the individual and to the economy, as well as the effect on the global economy. The authors also describe a project undertaken to promote local eating, specifically a tool that was developed for this purpose. It should be noted that the discussion is at times centred around the notion of local eating, and at other times around buying food from farmers' markets; each inevitably implies the other, but sometimes the discussion is better served by a focus on the behaviour of choosing locally produced and/or sourced foods, and at other times it is more relevant to discuss the place of purchase.

Ecological footprint

Developed by Mathis Wackernagel (2002), the "ecological footprint" compares the human demand on nature to the ability of the biosphere to produce the resources a population consumes and to absorb the corresponding waste, such as GHGs. The consumption of resources such as energy, biomass, building material, and water, are converted into global hectares. This measure of land (global hectares) equals approximately 100x100 metres, roughly the size of two football fields (Wackernagel, 2002). In 2002 it was estimated that the global ecological footprint was 13.7 billion global hectares or 2.2 global hectares per person (United Nations Environment and Sustainable Development Division, 2005). Currently, the global population is exceeding its ecological limit by 39% (Wackernagel, 2002). This means that over one third more than the earth's current biocapacity is needed to maintain the same level of global activity in future decades.

Studies indicate that improvements in the human development index generally result in higher ecological footprints (Appendix C). Canada and the United States have two of the highest ecological footprints compared to all other countries in the world (Wackernagel, 2002; Holmberg, et al., 1999). Taken into account with the data on GHG emissions, it is clear that there is a need for a dramatic reduction in human impact on the Earth, because the current state of affairs is unsustainable.

Hierarchy of controls

Intervention at three different levels can reduce GHG emissions related to the provision of our food: the source level, the medium level, and the individual level.

Source: Food that is imported into Canada comes from many different corners of the globe. As residents of this country, the highest level at which we can intervene is with policy-making. Presently, policies related to food importation tend to have a strong focus on food

inspection. However, there is a noticeable absence of policies and references related to the distances food travels when imported and the environmental impact of such importations. For instance, although we grow garlic locally, we continue the illogical practice of importing it from China, from the other side of the planet. Moving towards policies that tax imports of foods that can be grown locally would be immensely effective in reducing GHG emissions (Farnese, 1999).

Medium: The medium level can be framed as looking at local communities. To be able to increase the consumption of local foods, we need to have them available and easily accessible to the general public. For this to occur, partnerships with local producers need to increase. For example, the Canadian Federation of Independent Grocers (CFIG) is comprised of locally owned shops that compete with larger giants such as Safeway, Save-on-Foods and Wal-mart. CFIG launched a project in Ontario that matched 10 small food producers (e.g. local farmers) with 10 small-scale local food retailers in order to increase the availability of locally grown foods in locally owned grocery shops. This project was successful and the next phase went on to match 25 food processors with 25 retailers. CFIG is aiming to start the same project in BC (Love, 2007). By making locally grown food available, it will be easier for consumers to make the ecologically sound choice of sourcing their food more locally.

Individual: The last level at which Canadians can intervene is by encouraging individuals to seek out locally grown foods and to increase their consumption of these, thus reducing the consumption of imported foods. This will not only reduce the individual's ecological footprint, but has the potential to alter the importing practices of foods globally. In light of the project proposed to us by the Action Research eXchange (ARX), the focus of this paper is to increase the drive for the individual to eat locally.

Eating locally

With the growing awareness of climate change and the huge impact that we in Canada are having on the production of GHGs, more and more attention is being focused on the idea of eating locally. Alisa Smith and James MacKinnon have done a great deal to draw the public's attention to this idea. The couple decided to spend a year of their lives eating only locally produced foods. This was a much bigger challenge than they had expected. Although they live in Vancouver, BC, close to a very fertile farming valley, there was a lot of food that they could not obtain in this climate. Foods that are not grown in and around Vancouver include: sugar, rice, spices, tea and coffee.

Following the year of eating locally, Alisa and James wrote a book entitled "The 100-Mile Diet, a Year of Local Eating" (2007) which has become a best seller. This diet encourages people to eat only those foods grown and sourced within a 100 mile of where they live. People throughout the world have connected to the idea and have been drawn to the ideology that this diet encompasses. The main tenets of the 100-mile diet are to reconnect with where our food comes from; to eat healthier (less fast foods containing saturated fats, additives and preservatives); to reduce the environmental impact of transporting foods long distances to reach their markets; and to support local economies. This ideology has now become a movement in many parts of the developed world including in the community of Smithers, BC, where an organization called One Sky has developed an initiative called "Fork in the Road" that aims to promote local eating. This is the organization that presented the authors of this paper with the following project.

The project

ARX proposal

The ARX network of Simon Fraser University connects students doing research in classes to non-profit community organizations that need research done but have limited resources. In our case, we were introduced to an NGO called One Sky: The Canadian Institute for Sustainable Living, based out of Smithers, BC. This community group works both locally and internationally to promote sustainable living by linking the global, environmental and social challenges that citizens face with solutions that everyone can participate in. The relationship between energy and food security has been studied by One Sky, and gave birth to the project Fork in the Road. This initiative aims to promote local eating, to encourage citizens of Smithers to get to know their food, and to increase their awareness of the GHG footprint that is related to eating habits. The program objectives are:

- To increase local awareness about the links between GHG emissions and food production and transportation
- To encourage citizens to take action to reduce their energy footprints and to reduce GHG through their energy and food choices
- To provide incentives/recognition for getting involved and making a difference
- To improve local food security in the Bulkley Valley
- To service low-income residents with healthy, local food options in a sustainable way

This program has included a 100-mile community dinner, promotion of local farmers' markets, and a local eating pledge. One Sky submitted a proposal to ARX requesting help with developing a tool to measure the impact that eating locally would have on GHG emission reductions. One Sky requested that the tool be developed for Smithers, but that it also could be transferable to other communities of BC.

While transportation is important to consider, One Sky also wanted the GHG emissions from other activities related to the food cycle to be included, such as packaging and processing. The goal of the tool was to raise the awareness of how food choices impact climate change as well as to highlight other factors such as economic and health benefits.

Smithers

A brief description about the community of Smithers is necessary since the project is focused on the feasibility of increasing local eating within this small Northern BC community in the Bulkley Valley. Smithers is located approximately halfway between Prince Rupert and Prince George, with Terrace and Burns Lake being the closest neighboring towns (see map of Smithers in Appendix D). The population is about 5,400 (Statistics Canada, 2007). Local industries include forestry, agriculture, mining, the arts, and environmental protection. It is considered a well-educated community with the highest number of PhD's per capita of any town in BC (Skuce, personal communication). The median age is 33 and the median total annual income per capita is $25,000, approximately $3,000 above the national average (Statistics Canada, 2007). Being a young, highly-educated, and well-earning community are good indicators for residents of Smithers adopting the 100-mile diet and attempting to eat more locally. Through our research however, we discovered that not all essential foods can be found within a 100-mile radius of this small community, so food grown within a 250-mile radius was included when developing our tool. This includes Prince George and Prince Rupert and increases the availability of more essential food items (Appendix D).

Challenges to local eating in Smithers

Lack of access to basic foods in Smithers: While we were expecting that the residents of Smithers would not be able to source foods that cannot be grown in BC such as sugar, rice, spices, coffee, tea, etc., it was very surprising to discover that they are unable to

purchase foods that are grown in their very own valley, including meat, poultry and dairy products. This strange situation has arisen due to stringent regulations that have been imposed on all farmers in BC, whether large production oriented farms, or small farms catering to local communities. These regulations are safety oriented to ensure that all food produced and processed in BC meets certain standards.

While these regulations appear to make a lot of sense from the consumers' point of view, they do not appear to have taken into consideration the needs of small farmers and the huge impact that this is having on their economic sustainability. For example, the new meat regulations that came into effect on September 30, 2007 include "required licensing for slaughterhouses, which must meet design, construction and equipment standards" (Government of British Columbia, 2007). Because most small farms are unable to afford to upgrade their slaughterhouse facilities to meet the new, rigid safety standards, they cannot be licensed and therefore cannot sell their meat locally as they had done in the past. Consequentially, small and specialty livestock producers are being forced out of business.

These regulations will likely result in the reduction of small-scale, diversified farms in BC. Because these same farms often include fruit and vegetable production, this too will be impacted. This could lead to the selling of farms and the corrosion of rural communities, resulting in the loss of local food production capacity and an increased reliance on imported produce and meat at costs established by external forces and multinationals (The Food Democracy Network Society). According to Nikki Skuce from One Sky, these standards have effectively shut down the local meat industry in the Bulkley Valley (Skuce, personal communication).

This change in regulations may result in increased GHG production due to long-distance trucking and large-scale processing and packaging. Increases in GHG production are not only related to transporting animals to slaughterhouses, but also to bringing meat and poultry into Smithers. These new BC Meat Inspection Regulations threaten small-scale local meat

production and consumer access to locally produced, farm-gate meat and poultry. The impact of these new regulations is far reaching and will likely affect the lives of the rural population of BC.

The situation with dairy products is not much different. Although the Bulkley Valley is known for its dairy herds, farmers are not in a position to meet the strict dairy regulations. They are also not allowed to sell unpasteurized milk. As a result, milk is transported, at a great cost, to Burnaby, B.C., where it is pasteurized and packaged, and distributed back up to Smithers. This is true for other dairy products as well, including cheese, yoghurt and cream.

Similarly, eggs must be graded before being sold. There are no local egg-grading stations near Smithers, so farmers cannot sell their eggs at local stores, without first transporting them to a grading station. However, farmers can sell eggs at farmers' markets and at farm gates. Residents of Smithers are very resourceful in sourcing their foods and hunting and fishing has always been a fairly popular means of obtaining protein. These sports continue to complement the diets of many people in the valley (Skuce, personal communication).

Because Smithers is situated in a northern climate, there is a limit to what products can be grown locally. In the summer, a wide variety of fruits and vegetables can be harvested, both for personal use and to sell at the weekly farmers' markets. Unfortunately, the local stores cannot sell many of these products as they do not meet the strict guidelines pertaining to quality control. Many people have gardens where they grow their own produce, and the sharing of extra produce is common. In addition, wild berries grow abundantly in the valley, as do greens such as nettles and a variety of herbs (Skuce, personal communication).

Finally, no grains are grown in the Bulkley Valley. All grain products such as flour and cereals must be brought in by the local stores. Evidently some oats are grown but only for livestock feed (Skuce, personal communication).

Challenges to developing a tool

Scientific evidence: While a substantial amount of information exists about the production of GHGs through transportation of food supplies, there is a paucity of information about GHGs produced from processing, packaging, distributing, preserving, and displaying food. There is also a scarcity of information about the GHG emissions impact related to packaging waste, and disposing of spoiled or excess foods.

The project goals were to look at the impact of all these factors on GHG production. It became clear, however, that hard scientific evidence on these factors was not available that could be used to develop a tool to calculate the reduction in GHGs from eating locally. This was despite the recognition by the academic community that these factors do impact GHG emissions.

Conceptualization of the tool: Because of this lack of scientific evidence, and the scarcity of food products that could be sourced locally, we had difficulty developing a tool that could quantitatively measure the reduction in GHGs, as had been requested. Instead the decision was made to concentrate on the basic ideology of the organization, and what exactly they wanted to accomplish through the tool, which was to promote local eating. One Sky had also requested a tool that would be transferable to other communities and would be beneficial to a broader audience. In other words, the tool should be generalizable so that other communities could adapt it to their own particular situation.

The Tool

As we grappled with trying to conceptualize a tool that would fulfill these requirements, we decided to go back to the original proposal and the reasons behind it. We understood that the goal of Fork in the Road is to encourage residents of Smithers to eat locally as much as is possible. With this in mind, we began to conceptualize a tool that would give brief, pertinent

information about the advantages of eating locally, and would explain the rationale behind this concept. We came up with the concept of "reducing your **foodprint**" as a play on the better known concept of "Carbon Footprint" which many people are familiar with.

We decided to develop a tri-fold brochure that would include information about the area around Smithers, the health, economic, and social benefits of eating locally, as well as practical information related to this initiative in Smithers (Appendix E). We realized that residents may not know exactly where the 100-mile radius was, so a map that shows a 100-mile and a 250-mile radius around Smithers is included so residents can visually conceptualize this. We also wanted to emphasize that it is not necessary to eat only within 100-miles, as the well-known book suggests (Smith & McKinnon 2007) but that eating locally can be expanded to include other larger centers in the general area such as Prince George, Prince Rupert and Terrace. This map also contains boxes which illustrate what foods can be found in each of these surrounding communities, based on the two available documents detailing local food availability (Kitchen 2006; Ministry of Agriculture and Lands, n.d.).

On the inner left-hand section we include a rudimentary tool to measure the difference eating locally can make to GHG production when compared to imported foods. We decided to use pictures showing specific foods that can be obtained locally to make it easy to read. Food mile values were included as per Kitchen's (2006) comparisons of local and non-local sourcing of foods in the Bulkley Valley. Our original vision, however, was to format this tool so that it used a visual representation of the GHG emission magnitude (for example, a truck would represent a particular value of GHG emissions, and each food would be worth a certain equivalent of "trucks") to make the brochure more accessible for those who are put off by calculations. However, we found that this is a difficult undertaking in a small-format brochure, and we were not able to fit the tool within the format. We feel this is an important area for future design improvements.

The front of the brochure is designed to draw people's attention and hopefully entice them to look at it in more detail. The back panel has basic information about the Fork in the Road Project, and contact information for the project coordinators. The major focus of the back and right flap is to communicate the other benefits of local eating, including health, environmental, waste reduction and economic benefits. We hope that in the future, a list of local farmers and food producers (bakeries, sausage factory, etc.) is also included on the back flap so that people can be more aware of where to source food locally.

Benefits of eating and buying locally

There are numerous positive reasons for promoting the concept of eating locally. Our research focused on the benefits derived from: health impacts; food safety; improvements in social cohesion; a reduction in transportation, packaging, food waste, and energy use; and local economic gains.

Health benefits of eating locally

Eating locally can benefit the health of individuals as well as whole populations. The benefits of eating locally include: a reduction in air pollution and consequently a reduction in the ill health effects associated with air pollution; improvements in nutrition; and decreased risk of food contamination.

Air pollution: The by-products of fossil fuels are the primary contributors to air pollution and contribute to climate change. These by-products include: ground-level ozone, particulate matter, CO_2, CH_4, carbon monoxide, nitrogen dioxide, and sulphur oxides (Air Pollution, 2002). Eating locally can help to reduce the amount of air pollution, especially GHGs, in the environment because fewer fossil fuels will be used for the various activities involved in the food cycle including production, packaging, storage and transportation.

Research shows that air pollution is attributed to various negative health impacts, including: reduced lung function; new or recurring cases of respiratory illness; cardiovascular disease; and the development or aggravation of asthma and allergy symptoms (Air Pollution, 2002). Air pollution is also linked to increases in doctor and emergency room visits, hospital admissions and medication use (Air Pollution, 2002; Solving Global Warming, 2007). Climate change, or global warming, can contribute to increases in vector-borne diseases transmitted by rodents, ticks, or mosquitoes, because of changes in precipitation and temperature. For example, in 1998, "drought followed by heavy rains in western North America led to a sharp increase in the population of deer mice, which carry the hantavirus" (Solving Global Warming, 2007). Climate change also contributes to severe weather events, including heat waves, storms, floods and tornadoes. These weather events can cause various hazards to health such as heat stroke or contamination of drinking water. Water sources are also threatened by climate change due to drought and the depletion of glaciers (Air Pollution, 2002).

Health care systems are greatly impacted by air pollution and climate change in Canada. It is estimated that in British Columbia, $85 million is spent annually on hospital visits attributed to poor air quality alone (News and Announcement, 2007). A study in Ontario showed that in 2005, the estimated healthcare costs attributed to air pollution were $507 million in that province. This figure does not include the loss of productivity attributed to the damaging health effects of air pollution (Ontario Medical Association, 2005). According to the BC Lung Association, air pollution is linked to an estimated 16,000 premature Canadian deaths each year (Environment Canada, 1998). Recent studies estimate that "close to 8% of all non-traumatic mortality in Canadian cities is attributable to air pollution" (Solving Global Warming, 2007). A reduction in air pollution is therefore beneficial to the health of populations; reducing GHG emissions by eating locally will contribute to a reduction in air pollution.

Nutrition: Eating locally is more nutritious for various reasons. Considering that the average meal travels an average of 2,400 km, there is normally a large lag time between when

the food is harvested and when it is ingested by the consumer (Pirog, et al., 2001). By eating locally the time and distances traveled between harvesting food and ingesting the food are considerably less. This ensures that the nutritional content, which degrades after harvest over time, is kept intact.

Eating locally will also help to encourage a high intake of plant-based foods and fresh ingredients because these are often the most readily available type of local food. Studies have shown that a diet rich in fruits and vegetables decreases the risk of many diseases, including cardiovascular disease, stroke and several common cancers (Lampe, 1999; Bazzano, 2002). Fruits and vegetables have many protective functions including: antioxidant activity, modulation of detoxification enzymes, stimulation of the immune system, alteration in cholesterol metabolism, blood pressure reduction, and antibacterial and antiviral activity (Lampe, 1999).

Most processed foods and fast foods are imported into Canada, which is obvious when reading the labels to see where items were manufactured or processed. Even when food is processed or manufactured locally, there is a high likelihood that at least some of the ingredients have been imported. Eating locally will significantly reduce the intake of these largely unhealthy foods. The average adult in BC gets about 25% of their total calories from foods that are not in the Canadian Food Guide (Act Now BC, 2006). According to a study by Joffres and colleagues (2007), approximately 80% of the sodium Canadians eat comes from processed food or food prepared in restaurants. Approximately five million Canadians (a quarter of the adult population) have hypertension, which is major risk factor for stroke and heart attack. According to Statistics Canada, Canadians ingest an average of 3,092 milligrams of sodium each day; this is one third more than the recommended daily intake (Joffres, 2007). It is estimated that a 20% decrease in hypertension would result by reducing the average sodium intake by only 1,840 milligrams a day (Joffres, 2007).

Obesity is becoming an epidemic in Canada and has been linked to heart disease, cancer, stroke, diabetes, and serious diseases. Fast foods typically consist of adverse dietary

factors including “saturated and trans fat, high glycaemic index, high energy density, and, increasingly, large portion size” (Ebbeling, 2002, p.2). Additionally, these foods tend to be low in fibre, micronutrients, and antioxidants which have all been shown to reduce the risk of cardiovascular disease and diabetes. According to a study by Ebbeling and colleagues (2002), “a large fast food meal (double cheeseburger, french fries, soft drink, dessert) could contain 9200 kJ (2200 kcal), which, at 350 kJ (85 kcal) per mile, would require a full marathon to burn off” (Ebbeling, 2002, p.1). Clearly, the nutritional benefits of eating locally are significant when considering the reduction of eating these unhealthy foods and the increased consumption of plant based foods.

Food Safety

Eating locally may reduce the amount of pesticides and other harmful agents in food. Produce grown in home or community gardens can be done so organically, or decisions can be made to only buy from those local farms that do not use pesticides. Pesticides are believed to have adverse health effects including suppressing the immune system (Kaferstein, 1999). Also, according to the World Health Organization (WHO), “large farms and processing plants have a higher chance of releasing toxic chemicals into the environment by industrial processes and agricultural practices which may enter the human food chain (Kaferstein, 1999, p.3).

Eating locally lowers the risk of food contamination during processing and packaging because these steps are often skipped altogether. Also, fewer people handle food when it is bought locally which reduces the risk of sick workers infecting the food (e.g. with Hepatitis A). The WHO cautions that with the “expansion of international and interregional trade in human and animal foodstuffs” there is an increased risk of contaminants being carried for long distances (Kaferstein, 1999, p.3). Foodborne diseases are mostly caused by bacteria, viruses, helminths and fungi. These diseases are often more prevalent in developing countries though they are increasingly being seen in both developed and developing countries. While not

explaining this phenomenon entirely, the globalization of the food industry is a significant contributor (Kaferstein, 1999). A recent local example of this phenomenon was in 2006 when carrots and spinach contaminated with E Coli were imported from California to British Columbia causing an outbreak. Eating local foods therefore reduces the health risks associated with food contamination and with the use of harmful pesticides.

Social cohesion

Eating locally also has social benefits. In the late 1970s, children in the United States ate 17% of their meals away from home; by the mid to late 1990s the proportion of meals eaten away from home nearly doubled to 30% (Ebbeling, 2002). By choosing to eat local foods, Canadians will likely increase the number of meals they prepare and eat at home. This will hopefully result in increased time spent with family and loved ones which benefits everyone involved.

When people purchase their food locally and are part of a movement to do so, they tend to take more pride in what they are eating and to create opportunities to use the products creatively. This leads to sharing of recipes, motivation to grow one's own produce, and even the sharing of plant cuttings. These shared values often lead to potluck meals and other occasions which help build community cohesion.

New forms of gardening are developing, especially in urban centers where patio and community gardens have become very popular, particularly amongst those who live in condominiums or apartments. Community gardens are a great way to meet new people and to develop mutually beneficial relationships (ActNow BC, 2006). Here again, people share ideas and conversations, and communities are brought together with a common goal and ideal of eating their own home-grown food. Not only does this promote community cohesion, but it also improves confidence in being able to grow one's own food and to cook good, nutritious meals.

Many farms offer the chance for consumers to pick their own fruit and vegetables at a lower rate than the picked price. This is a great way to get exercise and to have fun while garnering fresh, local food (ActNow BC, 2006). Parents may also take more pride in cooking food for their families that was acquired from their gardens or from the local farmers' markets.

By eating locally, people are able to reconnect with local farmers, and, through local farmers, to reconnect with the earth. Many people first begin to understand the critical need for this lost sense of connectedness when they develop personal relationships with farmers and actually visit the farms where their food is produced. As Ikerd (2005) says, "we cannot build a sustainable food system until people develop a deeper understanding of their dependency upon each other and upon the earth."

Transportation reduction

The transportation of goods, both domestically and internationally, accounts for a substantial portion of GHG emissions. Eating locally will help to reduce the use of fossil fuels and GHG emissions that are associated with transporting food far distances. The elements of a typical North American meal travel an average of 2,400 km to the dinner table. Food miles have been the usual method of calculating the cost in emissions of transporting foods from farm to table. The usual food mile method is a weighted average source distance (WASD), which is "a single distance figure that combines information on distances from producers to consumers and the amount of food product transported" (Pirog, et al., 2001, p.10).

Transportation includes land, rail, air, and sea travel modes. Preliminary data from 2005 (North American Transportation Statistics (NATS), 2006) show that in terms of monetary value, 12.5% of Canada's imports came by air, 18.3% came by water, 57.1% came by road, and 7.3% came by rail. In 2005, Canada traded approximately US$14.7 billion (imports and exports) with Mexico (NATS, 2006), and approximately US$478.7 billion with the United States. About 69.8% of the monetary worth of Canada's imports from Mexico was by road, while 16% was by rail and

7.7% was by air. Canada's value of imports from the United States was 76.8% by road, while 10.5% was by rail and 7.3% was by air (Note: the reported modes represent the last mode of transport by which the cargo was transported to the port of clearance in Canada) (NATS, 2007). These different modes of transport have implications for the effect of GHGs, as the harmful effects from their respective emissions of GHGs differ. Road travel is estimated to cost 2,890 KJ/Tonne-km in emissions, while air costs 15,839 KJ/Tonne-km, and rail and water cost 677 KJ/Tonne-km and 423 KJ/Tonne-km, respectively (Pirog, et al., 2001).

A UK study estimated that up to 40% of all road freight is transporting food (Bentley & Barker, 2005). Transporting food by air has the highest CO_2 emissions per tonne. Although air transportation of food currently only contributes 1% of food tonne kilometers, "it produces 11% of the food transport CO2 equivalent emissions" (Watkiss, et al., 2005, p.4). Air freight is the fastest growing mode of food transport. Food transportation by boat and rail is currently decreasing despite the fact that these methods contribute the least CO_2 emissions (Bentley & Barker, 2005). Eating locally will decrease the distance food travels, thereby reducing the emissions produced by the transportation of food.

Packaging reduction

Packaging makes up nearly one-quarter of household waste, of which 70% is food related (Friends of the Earth, 2005). A study in the UK showed that shopping in producer-consumer cooperatives (e.g. farmers' markets) creates 75% less waste than shopping in supermarkets where food comes from large producers and utilizes copious amounts of packaging (Stagl, 2002). Furthermore, this 75% reduction in waste translates into 72% less energy, 63% less air pollution, and 48% less wastewater pollution (Stagl, 2002).

Recycling, which is often thought of as a popular solution to deal with excessive packaging, is not able to catch up with the large amounts of waste produced. Both plastic and paper have very low recycling rates: 10 to 15% for paper and 1 to 3% for plastic bags/packaging

(Boisvert, et al., 2005). Also, supermarkets selling organic vegetables are required to make sure organic foods do not mix with non-organic foods. This is done by packing organic fruits and vegetables separately in plastic or paper. Because of this, large amounts of packaging materials are used (Friends of the Earth, 2005). Choosing to eat local foods that have not been packaged to travel long distances and choosing to buy from farmers' markets will decrease the need for excessive packaging.

Food waste reduction

Fruits and vegetables that are imported must meet very high appearance standards, such as size, shape, colour, and uniformity to be sold in large supermarkets. These requirements often force farmers to use environmentally damaging practices and also cause a lot of food wastage, as imperfect food is thrown away. One survey of fruit growers showed that:

- fruits were rejected because of too much colour, too little colour, wrong size, wrong shape or because of blemishes that did not affect eating quality
- some growers stated that they couldn't even harvest their fruit and had to dump fruit that was fit to eat because of these stringent requirements
- more than half of growers surveyed used additional pesticides to meet the appearance specifications of supermarkets
- it is estimated that between 40 to 50 percent of raw vegetables and salad are rejected at some stage of the production line before reaching the shopper

(Friends of the Earth, 2005)

Buying from local farmers' markets will help reduce the amount of food wasted because produce does not need to conform to these strict standards.

Reduction in energy use in supermarkets

Supermarkets consume enormous amounts of energy (>800 kWh/m^2/year) and approximately half of this energy is to keep foods cool or frozen (Pajani, et al., 2004). The refrigeration system that cools display cases, through kilometers of jointed piping, uses 1,000 to

2,000 kg of hydro-chlorofluorocarbons (HCFC) per store; 10-30% of this energy leaks through the pipes (Pajani, et al., 2004). As mentioned previously, local foods that are typically picked ripe do not need to travel long distances. Consequently, they are not refrigerated for prolonged periods of time which helps save large amounts of energy and once again reduces GHG emissions.

More for the local economy

The New Economics Foundation, a global food resource based in London, England, has undertaken numerous studies over the past 20 years, related to food and economics. According to a study done by The New Economics Foundation: "a dollar spent locally generates twice as much income for the local economy" (Taylor, 2005, p.5). They point out that businesses not owned locally tend to withdraw money from the local area as the profits are not usually reinvested into the community. Even though individuals living in the community are spending their money at these businesses, the money still leaves the community.

On the other hand, those who sell locally also tend to spend locally, both for their personal and farming needs, which contributes more to the local economy. Farmers are more likely to buy their farming supplies and machinery from local sources if they are available. In addition, businesses locally owned and run provide employment for individuals in the community, who themselves then spend in the community. In this way the local economy is stimulated to grow and develop further (Ikerd, 2005).

According to farmers, on average they receive only 20 cents of each food dollar spent by those purchasing their produce or meat; the rest is pent on transportation, processing, packaging, refrigeration and marketing. Farmers who sell food directly to local customers, on the other hand, whether at farmers' markets or at farm gates, "receive the full retail value: a dollar for each food dollar spent" (Ikerd, 2005).

Being able to sell their food locally creates economic opportunities as farmers with small farms are encouraged to use the local farmland for farming and to keep it in the agricultural reserve, which is becoming threatened as more and more land is needed for our growing population. This helps keep development in check and ensures that farmland will be available for future generations of Canadians who may need to become more self sufficient with food production, as the issue of GHG reduction becomes more supported.

Eating locally does not only apply to food that can be sourced locally. In some cases, food might be sourced from further afield in bulk and then used to produce local products. The bakery is a typical example of this; the flour, milk, whole grains and other items, like nuts and raisins, are brought into Smithers and then made into delicious breads and baking goods which are sold to the local residents. This business again provides employment to numerous individuals and the profits usually stay within the community if the business is locally owned. Another example is the sausage factory which produces wonderful local sausages. In sum, eating locally contributes to both the local food and farm economies.

Global governance

National policy, corporate entities, and global governance

As our food travels an average of 2,400 km to get to our plate, it crosses borders, jurisdictions and international trade boundaries, often without a hitch (Phillips, 2006). Despite the very practical role food has in our everyday lives, our eating habits do not exist in a vacuum. The modern human diet is part of a complicated web of relationships that extend from local to global, and from individual actors to international health policy. Above all, local eating affects, and is affected by, global food and trade policies.

National: Many western nations continue to pursue a policy of dumping foods on the market out of surplus or as a result of steep subsidies that devalue crop prices below production

values in many places (Lee & Collin, 2005). Farm subsidies in higher income countries, and drops in crop values or gluts of certain crops, can cause dumping onto the market, which can prevent low- and middle-income country (LMIC) farmers from earning a living wage from their crops. Subsidies from the West allow crops to be put on the market at well below production cost, which depresses commodity prices (Lee & Collin, 2005). It is unclear what effect a local eating movement would have on these subsidies. It is possible that farmers from low and middle-income countries would do better financially if more people ate locally, and thus would not need subsidies (or not to the same degree). Fewer subsidies would ensure that food commodities would not sink below the production cost in other countries, and possibly maintain the return developing countries need (Lee & Collin, 2005). Ironically, these national subsidies also affect local farmers in western countries, directing subsidies to larger, factory and commercial farms instead of local producers that would support the local foodshed (Institute for Agriculture and Trade Policy (IATP), 2007).

National farm policy often also affects the policies of neighbouring, or even distant, countries, due to globalization. For example, the United States revises a Farm Bill every 5-7 years, which can radically alter the governmental support of the local foodshed from year to year (Schoonover, 2007). Traditionally, US Farm Bills, though strictly a domestic legislation, carry far-reaching effects. Although the 2007 Farm Bill has been expressly designed to coordinate with World Trade Organization (WTO) agreements, Canada, along with Brazil, is set to dispute the Bill at the WTO dispute resolution panel. At issue is the way US farm subsidies distort trade by fostering overproduction, thus lowering the commodity prices of farm products to below production prices. (IATP, 2007)

Corporate entities: Unprecedented aggregation in farming has concentrated market share and power in the hands of a very few corporations globally; these Transnational Corporations (TNCs) are seen as the driving force behind the restructuring of the global food system that is currently at work (Murray, 2001). Indeed, food-related TNCs represent another

level of governance, sharing the characteristic of "having global investments in the food industry and controlling much of how food is grown, processed, distributed, and/or purchased" (Phillips 2006, p.336). This poses a direct threat to local independent or small-market farmers, whether from wealthier countries or low and middle-income countries, as they lose the ability to defend themselves and their livelihood against TNCs and the influence they hold.

TNCs have been known to inhibit the possibility of true "local" farming in Canada. For example, since a landmark lawsuit against a Saskatchewan farmer was won by multinational giant Monsanto, all Canadian canola has been found to have stray engineered genes from Monsanto GM crops, brought in by stray pollen grains, and eventually contaminating all of Canada's canola crops. A local farmer these days may be forced to pay steep fees each year to a multinational seed corporation like Monsanto, which may, in turn, restrict their ability to sell at a reasonable return, to pay a reasonable wage, to sell locally and to support a farm business (Council of Canadians, 2004).

The very commercial nature of trade in food and agricultural products, and the concentration of the market in just a few commercial hands, has had a profound effect on the eating habits of people worldwide. Given total market saturation, the way for these corporations to make money is to push "value added" foods, the sort of processed, packaged, convenience foods that are loaded with fat, salt and calories. This is just the sort of food that a habit of local eating would necessarily avoid (Kingsolver, 2007; Lee & Collin, 2005).

Global governance: There are several major international treaties and forms of governance that govern food trade, though all display similar trends that are representative of global governance trends since the 1970s; toward liberalization of trade, freer flow of goods over national borders, and greater flexibility in regulation in favour of corporate profit. The global expansion of food exports is inextricably linked to the lowering of trade barriers with the Uruguay Round of the Global Alliance of Trade and Tariffs (GATT) in the 1980s (Phillips, 2006). As global governance has become more structured, corporations have sought to develop their

practices in order to avoid regulation (Lee & Collin, 2005; Phillips, 2006). The WTO, a complex, 190-member union of trading countries (Phillips, 2006) operates on the premise of Most Favoured Nation (MFN) Status and the principle of competitive advantage: if another nation produces a particular food product as well, signatory nations can not practice preference to their own or another item, but must rely on trading for products from the country most able to produce them.

Another form of global governance affecting local food sustainability is the development of global food standards, a process in which developing countries have played a very small role. Documents such as the WTO's Codex Alimentarius, and the Agreement on the Application of Sanitary and Phytosanitary Measures (SPS), international regulatory agreements on acceptable standards in food and animal safety, are geared toward facilitating the global trade in food (Ranson, Beaglehole, Correa, et al. 2002). "These agreements raise questions about the future availability of land for local food production as more land is devoted to export agriculture, and about the social and economic consequences of standardizing agricultural practices and food products" (Phillips, 2006, p.42).

The main drawback of global governance currently affecting local food sustainability is the threat to local food sovereignty, or the loss of ability for nations or regions to set their own food regulations in our globalized world. International trade rules prevent nations from encouraging and making decisions about domestic and local food production. There is great potential for many forms of national food sovereignty, such as decisions on labeling, procurement, and quality standards that could be construed as barriers to trade and protested to the WTO (Halweil 2002). For example, when the EU banned hormone-treated beef in 1988 due to some developing evidence of health risks associated with it, it was challenged in court by the US as inconsistent with a multi-lateral agreement, the SPS (Ranson, Beaglehole, Correa, et al., 2002).

Support for local eating

All is not lost. Studies have shown that despite the effects of TNCs on food culture and production, and despite their power to influence global trade regulations, food trade is still geographically variable, and sensitive to cultural framing. One study reported that personal knowledge and trust between customer and food vendor is still the most important element to food sales in Chile (Phillips, 2006). Globalization, too, has brought about trade agreements that have also maintained safeguards for local food production.

The 1947 GATT agreement allowed countries to use agricultural tariffs if they managed their production and did not export; prevented countries from using food aid to dispose of surplus stocks and undermining production in poor countries; and ensured governments' trade policies are transparent and subject to scrutiny (IATP, 2007). As one author put it,

> "These studies help remind us that what we see today as a global corporate power in the food industry is not a given, but is instead a product of actions taken by a whole series of actors, including laborers, growers, traders, professional marketers, investors, financial advisors, and grocers" (Phillips, 2006, p.41).

Ostensibly, intervention could occur at any one of those levels to bring about policy change in food governance. "By simplifying food supply in local food systems, knowledge about how to produce and distribute food can be restored to a community rather than being held exclusively by interests outside that community" (Anderson & Cook, 2000, p. 236).

The global effect of eating locally

What would happen if local eating were to again take hold as a habit among the millions in the West? This question is not easy to answer. There are two main possible outcomes: either that farmers in developing countries would lose their market as Westerners increasingly turn to local food production, or those developing country farmers may then have the opportunity to grow locally-suitable crops to support local populations given the loss of a Western market.

However, it is uncertain whether it is possible now to convert large commercially-farmed lands into local crops again. Almost 20% of the Earth's arable land is now known to be depleted through desertification, and other processes, while salinization has resulted in 30% lower crop yields in developing countries (Anderson and Cook, 2000).

National and global changes in support of local foodsheds

The WorldWatch Institute (Halweil 2002) proposed several suggestions that could guide future policies toward supporting local foodsheds:

- Eliminating subsidies
- Enforce antitrust legislation to prevent consolidation of agribusiness
- Restructure agricultural education, research and extension
- Tax fossil fuels instead of subsidizing them
- Eliminate food dumping
- Reform world trade rules to ensure food sovereignty

The US Farm Bills of 2002 and 2007 have both included some small supports for Community-Based Agriculture Initiatives, and many US, Canadian, and European regional regulatory bodies have enacted legislation to use only local foods in their schools, hospitals, and even prisons (Phillips 2006; IATP 2007) which has served to strengthen regional and local food systems.

Conclusion

Secondary and tertiary measures may also be beneficial to mitigate the harm from GHGs; however, we are advocating for a primary preventative measure. Our position is that we must reduce emissions of GHGs, in order to avoid the negative impacts these emissions cause. Promotion of a diet of locally-grown and locally-sourced foods will reduce our emissions of GHGs, thus helping to protect our environment. This will also protect our health, and improve social and economic conditions locally. Several considerations must be acknowledged when advocating for a move to local eating, in particular the sustainability of such a movement, the

feasibility of restricting sourcing of those foods from within a local area, and the personal cost associated with such a commitment.

A couple of clarifications are therefore in order. First, while the concept of the 100-mile diet is attractive, it may be unwise to market it solely as such; it will be more beneficial and attainable to frame the concept as local eating. For instance, given population growth, urban use of land, and the climate, the land in BC may not be able to support the production of enough food to sustainably feed the local population. Although at one point in history, people would have 'lived off of the land,' this may not be entirely possible anymore. Add to this the fact that people have become used to eating more exotic foods, and may not be prepared to totally eliminate these from their diets, and it is unlikely that the population could be persuaded to change to an entirely local diet.

However, local eating can still be promoted and practiced. Raising awareness about the issue will encourage consumer pressure to change the market availability of local foods. This point ties into the second consideration, which is the feasibility of such a diet. As the book by Smith and McKinnon depicted, the challenge of eating the 100-mile diet was substantial. Although it became easier with time, practice, and awareness, it is a real concern that certain foods are simply not available.

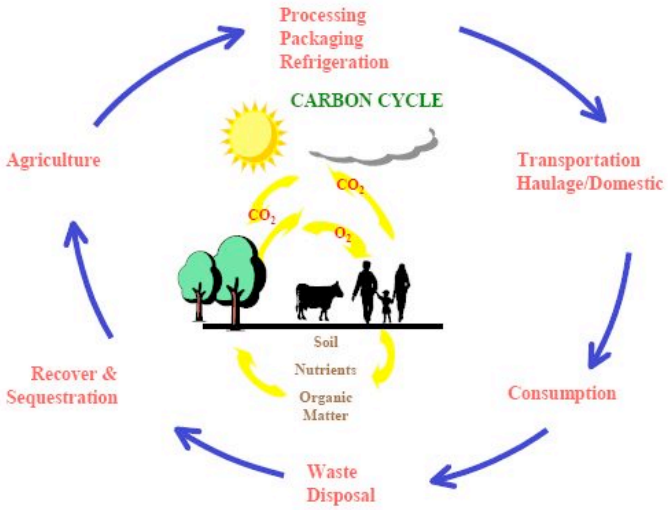
Finally, it must be acknowledged that a commitment to this way of eating will demand time, energy, and personal resources as certain foods are sought out. We hope that our tool will help to raise awareness and highlight the benefits of eating a local diet, and provide resources (contact information, lists of seasonal produce, etc.) for people considering this way of eating. While general awareness about the effects of GHG emissions is growing, tools that empower individuals to make effective personal changes are needed. This tool will help individuals to see the benefit that their personal choices can make. Hopefully, as consumer demand for local products increases, the pressure on governments will also increase to change policies to be

more supportive of this movement. In the long run, choosing to eat locally might be one of the most powerful ways we can reduce GHG emissions.

Appendices

Appendix A

More than transportation and agriculture: the food life cycle

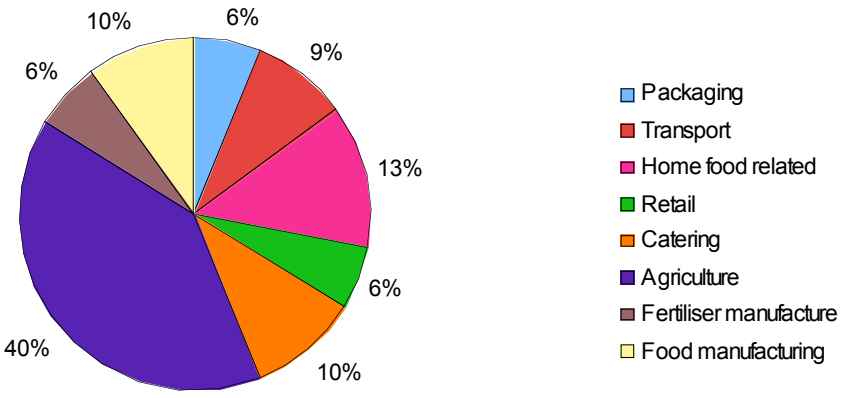


Source: Stanley, e3 Consulting, 2007

Appendix B

Climate costs of food

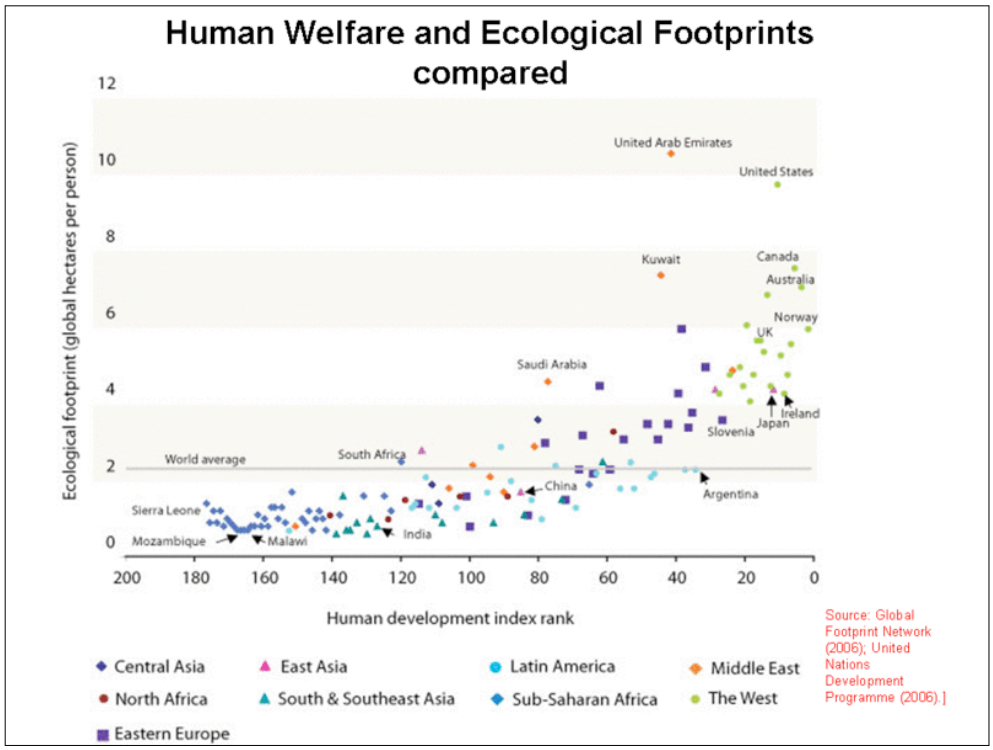
Contribution of food -related CO_2 emissions in the UK



Adapted from Climate Choices UK: http://www.climatechoices.org.uk/pages/food3.htm
Data from the Food Climate Research Network, University of Surre y, England:
http://fcrn.org.uk

Appendix C

Ecological Footprint

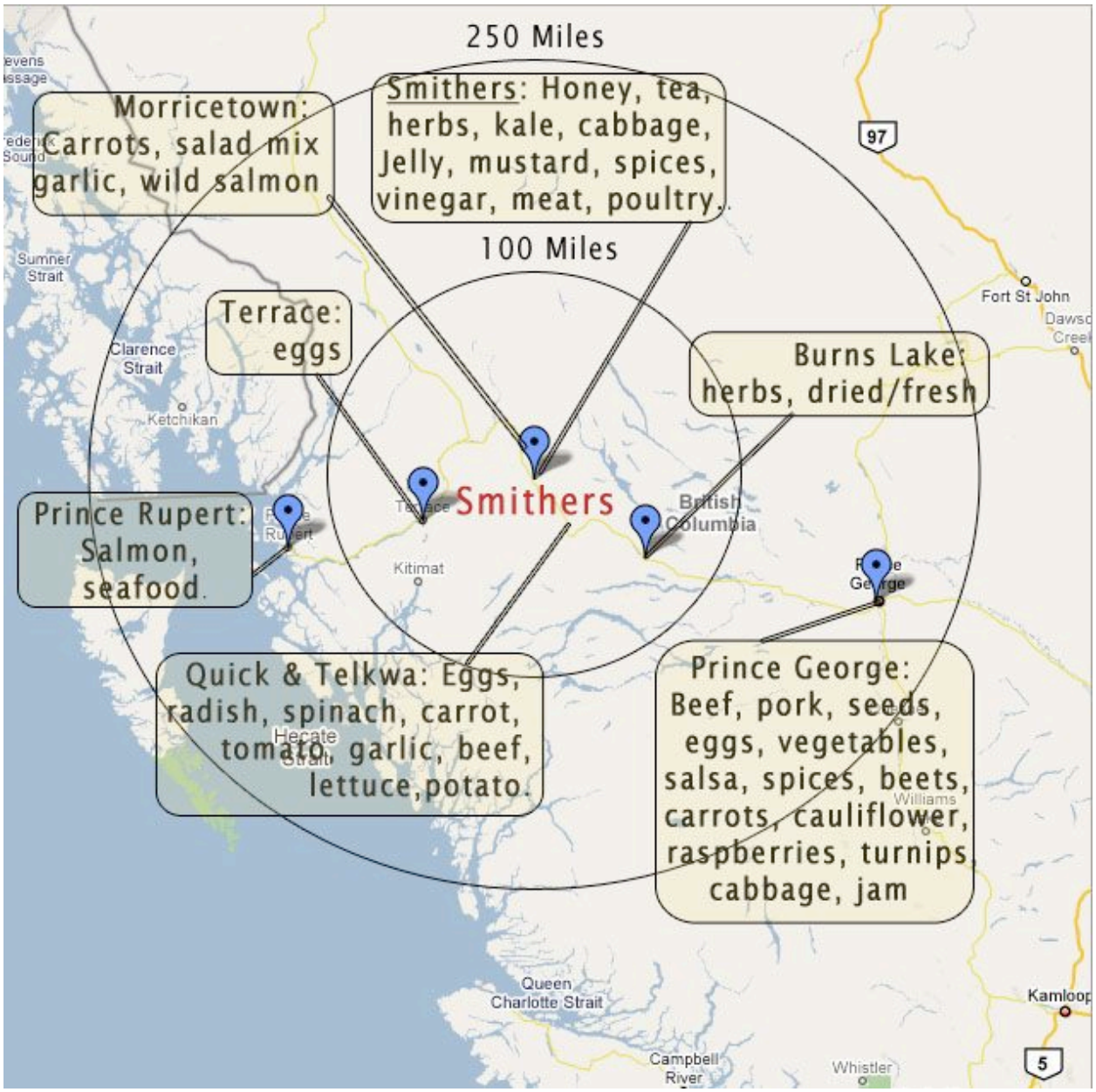


Wackernagel et al. 2002

Appendix D

Map of Smithers

(Google Maps 2007; Food locations: Ministry of Agriculture and Lands 2007)



(right flap front)

why eat local?

Local economy:
- A dollar spent locally generates twice as much income for the local economy.
- Local sellers tend to spend locally, contributing to the local economy.
- Farmers not selling locally receive only 20 cents of each food dollar spent.
- Farmers who sell food directly to local customers receive a dollar for each dollar spent.

Health:
- Eating locally reduces environmental impacts on health such as air pollution from food transport.
- Meals sourced locally reduce your intake of processed foods which are responsible for 80% of the salt in our diet!
- Reduces processed food also reduces fat, salt and sugar intake, which contribute to hypertension and cardiovascular disease.
- Local eating increases your intake of fruits and vegetables, which can boost your immune system!

(back)

Reducing Waste:
- Shopping at a farmers' market creates 75% less waste than in a supermarket
- Packaging makes up nearly 1/4 of household waste, 70% of that is food-related.
- Produce is often rejected by supermarkets or wholesalers due to poor appearance of blemishes that do not affect taste or quality.
- 40-50% of raw vegetables are rejected at some stage of the production line before reaching the shopper.

Environmental:
- Agriculture and transportation contribute 35% of Canada's greenhouse gas emissions.
- Buying locally reduces emissions from transport, packaging, preservation and refrigeration of foods.
- Reducing each step from farm to table can have a positive impact on GHG emissions.

NE SKY

(front)

Calculating Your Foodprint

A Fork in the Road

Supporting Valley Grown

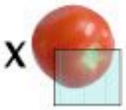
Quick ways you can:
- Reduce the environmental impact of the food you eat
- Support local farmers
- Eat healthier
- Learn more about the food you eat
- **Get connected with your food!**

Brochure Mock-up (Inside)

Calculate your foodmiles:

find your GHG "foodprint:"

1: Enter the number of servings you eat of each food per week, in the blue boxes.

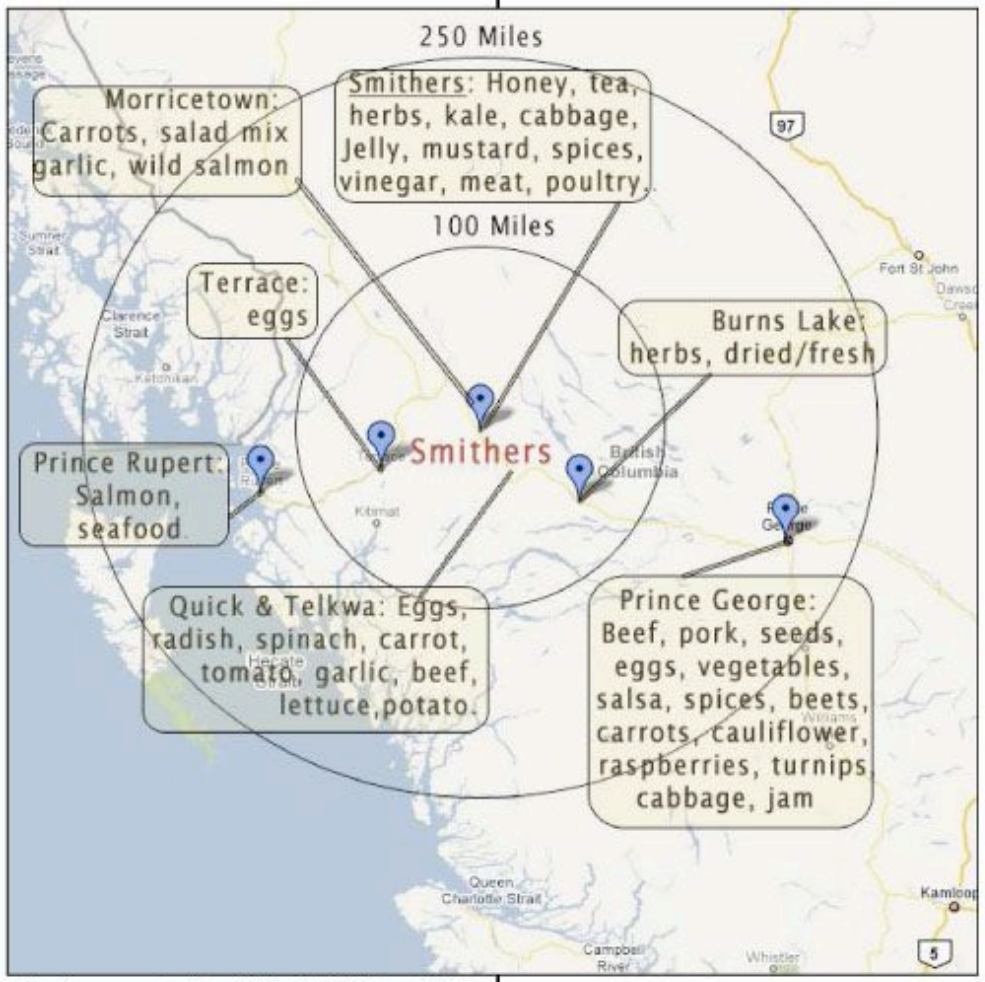
The "average" diet:		# of servings you eat per week:		100 miles around Smithers
0.22	x		x	0.12
0.36	x		x	0.06
0.19	x		x	0.05
0.26	x		x	0.10
0.42	x		x	0.29
0.38	x		x	0.08

2: Multiply each food's servings by the GHG food miles value.

Tonnes GHG/Km

Sum of food-miles: eating locally

Great food within 100 miles (160 kilometers)!



Map image courtesy Google Maps 2007. Content added.
Food locations: 2007 BC Food Processors Directory and Kitchen, 2006

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