

School of Community & Regional Planning
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planning for post-carbon food systems

opportunities for
British Columbia

**This is not a
traditional report.**

**Rather it is not a report at all,
but an
INVITATION**

**FOR YOU
TO AN EVENT
SOMETIME
IN THE FUTURE.**

**The date is still unknown, but the
occasion is clear,
it is a chance to come
together for
a post-carbon meal.**

SUMMARY :

Our world is undergoing a great change that is expected to proceed at an increasingly rapid pace for the next 40-50 years. The realities of peak oil are challenging us as individuals and as communities to rethink how our future may unfold and what we would like it to look like. I would like us to re-approach food and the systems that support it, production, distribution and consumption with the everyday actions of our hands and our hearts so that we can further cultivate the spaces between people, place and food. I am interested in transforming our food systems by remembering to listen and intentionally look at how we sustain and are sustained. For me, it is about the relationships we form, the process that takes us forward and the transformation it inspires.

The potential of what could be is both exciting and unknown. Many others have written and are writing about our current state of food – Sharon Astyk, Lisa Hamilton, Wendell Berry, Cathleen Kneen, Vandana Shiva, Michael Pollan are among some of the names I look to and which I recommend you too as well. Much of this document contains the names of projects and people who are leading the edge of innovation regarding the re-localization of food. Following on their bright leadership, I put forward my own assertions expressed as opportunities and invitations.

It is my hope that the ideas included will provoke conversations, between either you and me (wouldn't that be great!) or you and another. I see this as another invitation for us to come to the table and share in the collective potential of what we can create by opening up the possibilities with questions and dialogue and allowing new and unimagined futures to emerge.

“Receive with simplicity everything that comes to you”
- Rashi

“The two toughest challenges facing humankind at the start of this 21st century are Climate Change and Peak Oil. The former is well documented and very visible in the media. Peak Oil, however, remains under the radar for most people. Yet Peak Oil, heralding the era of ever-declining fossil fuel availability, may well challenge the economic and social stability that is essential if we are to mitigate the threats posed by Climate Change.”
- Rob Hopkins - Transition Towns

**Change is inevitable,
planning is needed,
lets begin now.**

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INTRODUCTION

“Out of all human activities, agriculture has arguably been the source of greatest human impact on the environment.” (Heinberg 2009:2) As omnivores, humans are highly adaptive, and able to accumulate knowledge increasing our ability to manipulate and change the natural landscape. Today in 2010, we are not only the world’s top carnivores, but if we consider the demands of ‘industrial metabolism’ “we are also the dominant herbivore in grasslands and forests all over the planet.”(Rees 2003a)

Three characteristics currently define modern agriculture: domestication of crops and animals, modern crop improvement (genetic modification and monoculture production) and mechanization of agriculture (through use of machines, fertilizers and pesticides). (source) Agriculture or the production of food has become an industrialized process of mechanization, commoditization and consolidation. In addition to the increased centralization of farming in the last 50 years, Richard Heinburg points out how, “Fuel-fed machines now plow, plant, harvest, sort, process, and deliver foods. The near-elimination of human and animal muscle-power from the food system has reduced production costs and increased la-

bor productivity—which means that there is need for fewer farmers as a proportion of the population.”(Heinberg 2009:2) Having embraced a “doctrine of limitless” i.e. increased our competitive efficiency through the canon of get big or get out, the average farmer in North America, 60 years or older, now manages 2000+ acres using machines that cost an average of \$300,000 a piece and producing food that is transported around the world. (Hamilton 2008) Given the importance of food in our daily existence, it is unfortunate that it is managed at such an arm’s length by people and machines who most often have very little physical contact with the plants and animals they are growing. As noted by the National Research Council (1989):

“One of the most salient characteristics of the global food system is the economic and social distancing it creates and the wide variety of problems associated with it. Perhaps the most obvious problem is the amount of energy required to move agricultural and food products from field to table. But the extensive environmental costs associated with the recovery and combustion of fossil fuels are regarded largely as externalities in conventional accounting. Mistaking the

price of energy for its true cost effectively subsidizes the concentration of production in monocultures and confinement systems irrespective of their distance from consumers. Cheap energy further facilitates such concentration by lowering the cost of the fuel, fertilizers, pharmaceuticals, machinery, irrigation, packaging, and refrigeration so essential to industrial farming and food manufacture. Ubiquitous and over-intensive use of these inputs and technologies has resulted in widespread degradation of soil and water resources and in erosion of the health and vitality of our own and our fellow species.”

PROJECT PROBLEM STATEMENT

Our modern food structures are built on the easy availability of cheap energy - fossil fuels. The emergent energy scarcity combined with global climate change offer an unprecedented opportunity to reinvent how we approach food system planning. As a critical yet undervalued component of the human realm, industrial food production has contributed to making urban human settlements, “the most vulnerable social structure ever conceived by man.” (Oppenheimer, 1969) Dependent on a single source of energy, system of exploitation, each of us is equivalent to 100 – 200 pre-industrial human beings (Rees, 2002). Our energy consumption is grossly out of balance with the servicing ability of the ecosphere, the moral grounding of equity and the simplicity of self-determination.

Humans (particularly those in North America and Europe) embracing rhetoric of entitlement have built empires through the appropriation of resources across the globe. “The enormous purchasing power of the world’s richest nations enables them to finance their ecological deficits by extending their ecological footprints deeply into exporting nations

and throughout the open ecosphere” (Rees, 2002b). An equitable distribution of the world’s resources allocates 0.8 ha of productive ecosystem per capita for the entire planet. “Citizens of deficit countries [those who consume more than their share of resources] live, in part, on life support services imported from other countries and by imposing a disproportionate load on the global commons” (Rees, 2006). And whereas the ecosphere is a non-growing entity, by and large, the economy is a growing entity that has commodified not only natural resources through global commerce but also those who serve the system – farmers. In the increasing disparity of economic, social and ecological access and distribution, “crisis is a misnomer” for it is not a transient phenomenon, but has “developed over a very long time as a result of relentlessly increasing demand pushing against a shrinking natural resource base.” (Federoff 2010) If we are to take responsibility for our consumption as global citizens, we will need to reduce our energy usage by 80% reduction and decrease our ecological footprint to 2 gha/person. (Rees 2010)

Hence, this project aims to examine the linkages between people, food systems and a post-carbon future. It will address the primary question:

**How can we
as
community planners,
teachers, activists,
citizens,
anticipating the changes
to come, work towards
transforming our current
linear food structure
(fast food drive thru)
into a
resilient integrated food
system
(slow food sit down
meal)?**

**Where do we begin to
plan for a post-carbon
meal?**

STATEMENT OF PURPOSE AND OBJECTIVES

We are all consumers and therefore, we must all begin to account for where and how our resources are sourced, taking active involvement in the decision making and planning. Local self-sufficiency is not the goal, (though global is), we will still need to exchange and engage with our neighbours. But the reality of current geo-political uncertainty demonstrates that high-dependence on trade is not wise (for example, Vancouver is said to have only 3 days of food supply if trade were to discontinue). Nor is this a call to trade in our cars for carts, bunker down and return to pre-industrial standards of living. Rather it is an invitation to recall simpler practices of living that use our innovation of today in combination with the wisdom of a conserver culture. And perhaps making best use of local resources is becomes not only a moral but also an intelligent move forward.

Given our current reliance for food on fossil fuels for all stages of production, processing, distribution, storage and marketing, it is critical that we take steps to strategize our way out of dependence. With a decline in oil availability and the subsequent increase

in prices, the transport of food and the necessary industrial inputs will be unreliable and we must develop alternatives.

The purpose of this project is to identify a selection of alternative strategies that can be used to help guide and shape post-carbon food system planning. Human communities, like any biological community depend on a diversity of skills and abilities, not just a singular ability to manage or theorize. Therefore, it is not the intent of this project to encourage standardization, but rather local customization to circumstances that encourage creativity and innovation.

Using the questions identified above, the project will outline current key issues and constraints and then respond with a discussion of the opportunities within each area: values and learning; governance; health and nutrition; jobs and services; land use; resource management; processing, distribution and storage; land use; jobs and services.

Additionally, the project has the following more specific objectives:

1. Articulate the current impact of the externalities and inefficiencies of the industrial food structure
2. Identify the above 7 working areas to help guide and shape planning for post-carbon food systems.
3. Articulate opportunities and strategies for building a more reliable food system that is viable in a post carbon world.

M E T H O D S

I collected some of the data for this project through a review of relevant literature on peak oil and climate change adaptation. These sources were augmented using multi-media i.e. films, blog posts and web-based articles. Finally I refined the focus and enhanced any findings through informal discussions, interviews and public presentations.

CONTEXT:

PEAK OIL, FOOD SOVEREIGNTY, CLIMATE CHANGE, ENERGY, WASTE & WATER

This study reflects a BC perspective. The ideas are intended to be sufficiently broad to be used as guidelines and points of references applicable to communities of all sizes. That said, it is the larger urban areas (i.e., Vancouver, Surrey, Abbotsford, Chilliwack, Richmond, Saanich, Kelowna, Prince George) that consume the largest share of the provinces resources, demanding the greatest amount of energy and consideration.

For much of the world, human scale (less than 50 acres), direct market agriculture is in decline. And yet in BC, while there are farmers among the same demographic, we are fortunate to still have a culture (albeit relatively small) of small-scale family owned farms, with a large portion of our food consumed locally (as opposed to being exported and then importing our food supplies). (Ministry of Agriculture) BC farmers produce 48% of all foods consumed in BC and 56% of foods consumed that can be econom-

ically grown in BC. (Ministry of Agriculture 2008) In addition, BC leads the Canadian market for growth of the organic foods sector and has a burgeoning demand for farmer's markets. (Statistics Canada 2009) "Consumers are now prepared economically and politically to support an agri-food system that is environmentally sound, promotes a sustainable and secure regional food system and contributes to building economically vital and socially coherent communities." (Condon 2009)

There is an exciting opportunity growing across the province of BC to engage local communities in building the foundation for a strong, sovereign and resilient post-carbon food system.

A post-carbon world will be defined by the availability or lack of high quality water, food and shelter. In today's world, inundated by a convergence of "peak" phenomena, namely peak oil, peak water, peak phosphorus, peak grain and peak fish, it is becoming increasingly difficult to maintain or establish adequate food security. The concept of Peak Oil was originally raised in 1956 by M. King Hubbert who predicted that the curve of oil production (or extraction) would be shaped like a bell, rising until it peaked and then descending over a period of years. For

oil, there is current speculation about when the global peak will be reached; for some the spike in oil prices in July 2008 was a sign that reserves had peaked. Others, those more optimistic suggest that peak oil will not happen until 2020, allowing enough time for technical alternatives to be created. Whether or not peak oil arrives with a boom or a whimper, there is an opportunity being offered for forward thinking and planning.

Two years ago, our world became a predominantly urban place with over half the population (approximately 3.3 billion) now living in urban centres. Globally, while we continue to transition from rural to urban, we have failed to sufficiently create the systems and protect the resources needed to support these burgeoning entities. John Michael Greer, author of the *Long Descent* (2008) explains that our cities' current 'addiction' (complete dependence) on fossil fuels requires a constant and increasing supply of oil and will result, if not mitigated soon, in a short, steep descent that is punctuated by economic seizures resulting from the increase in oil prices. Greer goes on to emphasize that the speed of descent can be reduced by a decrease in consumption and the transition towards a non-fossil fuel-consuming lifestyle. This is particularly relevant to the current industrial agricul-

ture production systems which are highly dependent on the availability of cheap and abundant fossil fuel and whose output will be greatly impacted by a decrease in oil supply. But it is not simple about losing our cheap energy source, it is also about recognizing that we have moved so far from our basic cycles of sustenance that 'food security' is as important to the individual who does not know how to grow vegetables as it is to nations that are scrambling up land across the globe for fear of an uncertain future. There is a significant disconnect between those that consume (urban dwellers) to those that produce (rural dwellers), from nutrient flows to individual awareness of how food is grown. "The ultimate consumer of the food is thus several steps removed from the producer, and food systems in most nations or regions have become dominated by a few giant multinational seed companies, agricultural chemicals corporations, and farm machinery manufacturers, as well as food wholesalers, distributors, and supermarket chains." (Heinberg 2009) Any disruption in this fragile linear system may generate a uniquely urban food crisis in a relatively short time. It is imperative that society begin post-carbon food system planning now, and to prepare for the changes to come.

ENERGY CONSIDERATIONS

As humans, we are "engaged in a competitive struggle for energy" within and between species. We 'appropriating' the bio-energy that would otherwise be used by: 1. Displacement 2. Elimination 3. Appropriation. (Rees 2002) Richard Heinberg states (2009:4), our current level of industrialization presents an interesting paradox reversal, "Before the Industrial Revolution, farming and forestry were society' primary net producers of energy. Today the food system is a net user of energy in virtually every nation; this is especially so in industrial countries, where each calorie of food energy produced and brought to the table represents an average investment of about 7.3 calories of energy inputs."

Industrial agriculture has become a grossly over-consumptive sink of energy as a result of cheap and abundant source of fossil fuels, fueling not only the machines but also being the source of inputs – fertilizers and pesticides. The current energy consumption of industrial agricultural practices has created an unprecedented imbalance of pollution and disorder that takes the form of ecological contamination (including the products themselves), greater complexity of functions and social disregard.

As Professor William Rees suggests, if we continue to "convert non-human biomass and other resources into human biomass and the material infrastructure of our industrial economy at a great increase in global entropy (e.g., pollution and disorder)", we are building a food structure that has over-extended itself and will be unable to support itself as the limitations of the system increase. (Rees 2002) Thinking ahead, what do we need to change to insure that there is sufficient energy to move our food from our sources (fields, oceans, lakes) to our sinks (consumers)?

WASTE & POST-CARBON FOOD

One of the grounding assumptions of a linear waste management system is that at either end of the line (the source and the sink), there is an unlimited supply of either the raw material needed for production or the space to hold the discarded products. The model of Municipal Solid Waste (MSW), separating organic and non-organic industrial & residential by-product deemed no longer useful, can be divided into 5 waste streams: municipal, commercial, industrial, agricultural, and hazardous. (www.epa.gov) (for further discussion on Integrated Resource Management please see section 6)

WATER FOR POST-CARBON AGRICULTURE

Agriculture is the largest user of water in most areas of the world. Whether through the inputs required to grow feed or produce fertilizers or process and transport, the virtual water or amount of the water needed to grow the finished food requires a high level of energy intensity. In the BC, the agricultural sector accounts for up to 70% of the surface and groundwater consumed. (Living Water Smart 2008). Most water sources are managed by irrigation licences, there are approximately 44,000 active water licences in British Columbia, which are attached to specific parcels of land and grant access to surface water. Water resource management, also an integral part of food system planning, includes supply of potable water and the management of wastewater and storm water. Assuring a reliable source of potable water and irrigation water will be one of the fundamental needs of a healthy post-carbon food system. Additionally where there are examples of high-intensity production of food (urban areas, kitchen gardens) irrigation can be supplied from the re-use of grey and black water.

The average BC resident consumes about 358 litres of potable water on an average day (l/cap/day). Currently, the

majority of this water leaves the system as wastewater through toilets and drains. Extensive infrastructure is required to store and deliver potable water for consumption, to remove and treat the resulting waste and to effectively dispose of the treated wastewater into our natural water systems.

Design for post-carbon food systems will require efficiency and integration of our water distribution, wastewater and storm water management systems. Harvesting and treating rainwater for use as a source of potable water is one example of an integrated system that is responding to energy scarcity. This would reduce the demand on the municipal water supply, lower the risk of damage to the surrounding ecological systems and urban infrastructure, control the water quality of discharge off the site and create a source for agriculture production. Black water (raw sewage) and grey water (non-black water component of sewage) both could both be captured to serve food production needs.

Estimates of water needed to produce one kilogram of food product are: 2,300 litres – rice 100-200litres—manyvegetables

(cabbage, eggplants, onions) 2,000-4,000 litres – legumes (peas, beans) At least 4,000 litres – chicken meat At least 10,000 litres – boneless pork At least 15,000 and as much as 30,000 litres - boneless beef (for all meat figures include water needed to produce feed, and provide drinking and sanitation) (Gallon Letter 2009)

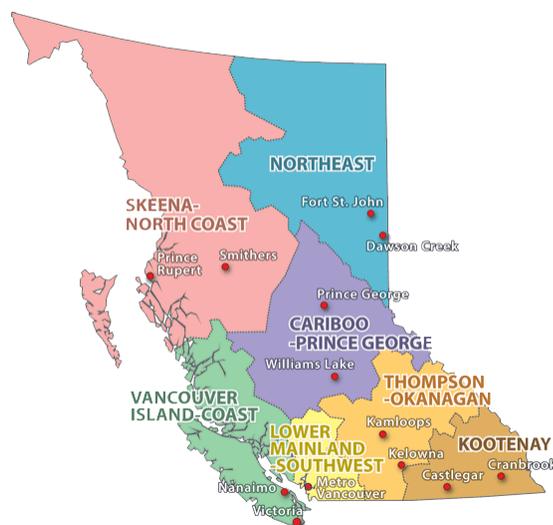


Figure 1: Map of BC's Bio Regions

V I S I O N

My vision for BC's food system is a locally defined responsive, sovereign system that is resilient, redundant and creative in its integration of resources (human and non).

What does this mean?... please read on and find out.



1. WHY IS THIS IMPORTANT? (VALUES & LEARNING)

O B J E C T I V E :

To re-connect to a story bigger than the individual. Moving towards a culture of “Enlightened rationality” – compassion for life and compassion for other humans and non-human nature.

P R O B L E M A T I Q U E

We seek happiness in our society. We search for it in power, the accumulation of wealth, the perfection of form and the perpetuation of youth. And yet, evidence shows us that happiness does not correlate to per capita income or economic growth and in fact there is much research to show that happiness actually declines as income levels rise (Rees 2002). In North America and Europe and increasingly throughout the rest of the globe, we live not within rational, moral or ethical bounds but rather on a doctrine of economic growth and corporate expansion. This is problematic, as our ecological and social systems can no longer sustain the limitless consumption fuelled by such thinking. There is no balance between those that have not and those that have. We that have, are consuming a gross proportion of our resources

and it is time for us to reorganise our lives and the way we live. William Rees of UBC’s School of Community and Regional Planning is empathic that we as a human society must use our skills and talents not to further relationships of self-interest and competition but to shift our values and ethics towards cooperation, communalism and deep integration with nature. (Rees 2002) We have a choice about how we can move forward. We can continue to force our individual interests and demand our perceived rights or we can choose a new way to engage.

“Calling the Earth “sacred” is another way of expressing humility in the face of forces we do not fully comprehend. When something is sacred, it demands that we proceed with caution. Even awe.”

Gulf oil spill: A hole in the world
Naomi Klein, June 19, 2010 The Guardian

OPPORTUNITIES :**a. WHAT STORIES ARE WE TELLING OURSELVES?**

We have as humans a remarkable ability to write our own narratives, stories that guide and shape our lives. Our capacity for myth making can unify and divide, lift us up and pull us down. We live in a time, where we need to, in the words of William Rees (2002: 95), “frankly acknowledge the weaknesses in the expansionist global development model with its emphasis on efficiency, competition and survival of the few and replace it with a new myth that fosters equity, cooperation and mutual sustainability.” The emerging constraints of energy scarcity offer an exciting opportunity to reconsider the impacts of this model from all angles. Lets ask ourselves – what stories drive this machine of success and growth? What are we, as autonomous free-thinking beings promoting with our choices for consumption of food, material, belief & media? And are these actions and stories the ones that will support and sustain us as we move into a time of change and unknown – or is there something else that we can imagine? From the perspective of food – the industrial model sets us up for a distant, distracted relationship

with the systems that sustain us – what is the alternative?

There are numerous studies (Feenstra (2009), Feagan (2007), Bregendahl (2006)) publications (100 Mile Diet, Long Descent) and movements (Slow food Movement, Local Food Movement) that can attest to the emergent value and quality of life that is achieved through more localized living – small integrated communities or neighbourhoods that move more slowly, capturing the beauty of the mundane. Patrick Condon of the UBC School of Landscape Architecture has worked with communities in the Lower Mainland attempting to reintegrate agriculture into the urban realm and speaks specifically to the value of localized agricultural communities. He says:

“The nature of a community’s agriculture sector profoundly influences its social and economic character. Communities dominated by smaller, family owned farms and agriculturally related business, compared to one dominated by consolidated, trans-national agribusiness, have been found to have overall higher standards of living, lower crime and poverty rates, more retail trade and independent businesses and more parks, school, churches, newspapers and citizen in-

volvement in democratic processes.” (Condon 2009)

To build such systems, we need transparent access to information (what seeds are most viable in this climate?) and experience (how do we save seeds?) if we want to re-define the “very underpinnings of our culture”, and build new narratives.” (Rees 2002) What could this new model include?

- A revolutionized education system with a focus on creativity (as equivalent to literacy) (Robinson 2010)
- Integration of local and traditional knowledge with formal dissemination
- Greater empowerment and advocacy of women to claim a loud voice in the discussion of care and nurturing the land
- Champions to promote and network innovation and ideas

The wide-ranging predictions of a post-carbon food system suggest that we will need to be ready for anything, that flexible and adaptable skill sets will be most useful as we prepare for the unknown. Here again the garden and growing food offers a holistic opportunity for integration and training. The garden of the post-carbon city will require continuous revisions and preparedness for all

types of weather and conditions. Building intense adaptive productive systems that include practices such as:

- Quick crop rotation,
- Continuous production,
- Seasonal extensions,
- Full cycling of nutrients,
- Research (observation and seed selection) of crops viable in a diversity of climates and conditions (heavy rain, drought, cold, intense heat)
- Increase transparency and accountability by sharing and discussing techniques and findings
- Provide seed saving support to small growers particular those who specialize in heritage and non-gmo, open pollinated varieties

• M a n d a -
tory food label-
ing mandatory

W h e r e ?

Schools and universities could be redesigned to responsibly serve the needs of community. Farmers must be part of the scientific process and research, and

also between urban and rural dwellers both should have an interest and involvement in the other. Plant seeds literally and figuratively that are value based not policy or market based. Patent and intellectual property rights must be reversed allowing communities to reclaim all aspects of food preservation and production.

b. CHANGING THE RELATIONSHIP:

In her book, *Deeply Rooted* (2009) reporter Lisa Hamilton shares the stories of three farmers who are working against the conventional industrial agricultural tide to retain their livelihoods as small producers deeply connected to their work and land. One of her stories is of the Podolls in North Dakota. David Podoll is a grain grower who is passionate about integrating the experiential ele-

ment of farming into his work. While much of their farming is done with machines, he laments the disconnection that results when he is unable to be in direct contact with the plants and soil. Synthesizing his thoughts on the difference between farming and gardening, Podoll says,

“We made a bad turn in agriculture when we took food production away from women and gave it to men, when we went from the hoe to the diesel engine. Ever since we have been on a power trip, and I think it’s been really bad for the land – it’s been bad for a lot of things.” (Hamilton 2009:227)

Strengthening local food systems requires a concerted effort to enrich our relationship as consumers to food. This is the opportunity to slow down and bring a new consciousness

Table 1 Localized Food System vs. Industrial Agriculture

Viable Agricultural Economy	Productionist Paradigm
Community involvement with focus on localized relationships	Corporate & capital concentration with focus on estranged profit generation
Direct, independent distribution	Mass, centralized distribution
Coordinated systems driven	Industrialized commodity driven chains
Spatial and temporal independence	Standardized dependence
Sense of knowing & trust	Sense of alienation
Embedded in place	Transient and disconnected

into how we engage with our food, our bodies and our communities. It is about building intricate relationships through time and attention. Ron Plowright, former coordinator of the Urban Aboriginal Community Kitchen, says that we need to, “Put good energy into food, make decisions that are culturally and community appropriate, include wisdom and knowledge of elders, and teach from the heart.” (2008) It is not enough to fix all the leaks and build all the boxes, we need to be building a new paradigm and giving focus and priority to food can do that.

Table 1 summarizes different attributes of two agriculture paradigms – Localized Food systems that support viable agricultural economies built on community involvement, direct distribution, small-scale operations and far-reaching diversified movements. Comparatively, industrial agriculture is built on distance, corporate concentration of management and technological interventions, large-scale operations and served by far-reaching diversified operations. The later has taken us away from food, to the point that children today do not associate food in a grocery with its origin whether it is a chicken (meat), cow (milk) or the earth (carrots).

In the United States, there is a campaign to “Know

your farmer, know your food” with the goal of building connections, knowledge and compassion for the work of growing food. Rees (2003b) tells us that; “Modern humans – particularly city dwellers – are so psychologically alienated from nature that they rarely think of themselves as animals let alone as dependent components of the world’s ecosystems.” Recognizing our current predicament of energy dependency and environmental exhaustion is related to our social-ecological and economic distancing, how do we build the opportunities for people to reconnect? The local food movement in the form of “Buy local campaigns”, “One Hundred Mile Diet”, Slow Food Movement” is one way in. “Many of those in the local food movement encourage consumers to become more familiar with where their food comes, to build connections with the food producers, and to make better choices overall for personal, social, economic and environmental benefits.” (Gallon Letter 2009) Is this enough to rebuild our cultural narrative and reconnect an ecologically alienated population? Hopefully, because we need to go further and integrate healthy food in all aspects of our lives.

As a necessity of life, food should be considered along with healthcare. Benefit packages could incorpo-

rate garden plots, good food boxes, farm membership or even training opportunities in agriculture. As seen in Cuba during the ‘Special Period’ that marked the country’s radical readjustment off oil, those who have skills and agricultural land have become more valued in post petroleum world as they have become a necessity to the survival of society. (Power of Community 2006)

c. CONNECTING TO A LARGER PICTURE:

How do we connect to a story that is larger than ourselves, I believe it is largely through relationship to our self, each other and the systems that sustain us. “People cooperating and caring for each other are main factors we need to encourage, not the technology. It is the human relationships, that will recreate the culture and social fabric.” (Power of Community 2006) The invitation to the post-carbon meal is intended to strengthen such relationships and contribute to the nurturing and support needed to build the social fabric of our communities. It is an invitation to call upon yourself, and your neighbour and listens to the ideas and possibilities that come forward.

Returning to Hamilton’s collection of narratives (2009), she tells the story Harry Lewis an independent dairy farmer

from Texas. Lewis lives and breaths his ethics which for him can be summarized in the principle of pasture, which is not simply grass, but the integrated, continuous cycle of food and nourishment. For Lewis, pasture equates to a moral understanding and placement in the natural order of the world, it reminds us of who we are and how we are sustained.

“Every person, I believe possesses in their soul an inherent moral code. We know deep down what’s right and what’s wrong, but to judge between the two we must stop and think about it. Instead most people just accept things. Well, I don’t just accept things. I’ve got stop and think about them. And when I do, realize how much in our society is just based entirely on a money economy, with no thought for a moral or ethical response to what we are doing.” (Hamilton 2009: 52)



2. WHO WILL WE INVITE & HOW? (GOVERNANCE)

O B J E C T I V E :

Design regionally based systems – supporting and coordinating localized governance that prioritize food and agricultural policies and programmes.

P R O B L E M A T I Q U E :

In responding the question of who gets invited to the table (meaning who decides what we will eat and also potentially who will eat) it is important to recognize that currently in BC we are at a significant global advantage and live in resource abundance – we have land, water and energy (hydro). In the next 20 years, BC is projected to grow by 30% to a population of 5 739 500 people. To maintain current levels of self-reliance BC farmers must increase production by 30% of 2001 levels. According to provincial reports, this will require a 23% increase in access to secure land, water and the necessary infrastructure (cite source in a footnote). This report by the Ministry of Agriculture assumes business as usual, and does not consider the increasing likelihood that global eco-political uncertainty will precipitate an in-migration of people fleeing starvation, disaster and unrest. It is likely that current population trends will increase at minimum two-fold, but times are uncertain and it is of course difficult to predict with any certainty.

Given the uncertainty - why not plan with a margin of error that allows for the unexpected, why not leave an empty seat at the table for the unexpected guest. In the face of such insecurity, all levels of government must champion food security and sovereignty to government and private sector partners, creating an integrated and cooperative network of support that stimulates radical democratic intervention and full citizen participation. We must all come to the table to discuss and strategize. Using the tools we have (taxation, regulation and trade policy) we can effectively implement and maintain secure food systems. Incentives, grants and development cost charges can support current and future food producers. And it is important to recognize structures such the Agricultural Land Reserve (ALR), which while they have provided a buffer against development pressures need to be augmented and strengthened to provide a foundation for increased food system resilience.

AGRICULTURAL LAND RESERVE :

About 4.7 million hectares of agricultural land in BC are currently protected through the provincial legislation of the ALR. The establishment of the ALR in 1976 created an important growth buffer against the encroachment of municipalities. As urban areas continue to expand, the competition for ALR land increases, making government mediation ever more critical. Legislative revisions are needed to ensure that ALR land is kept affordable (prohibit speculative purchasing), for food production (not for churches, wineries or tree farms – all currently permitted within the allowable “non-food use” and available (limit the building footprint constructed on ALR land).

The Provincial government’s current strategy on agriculture and food security, i.e., The BC Agriculture Plan, is designed to provide a vision and direction for the agricultural policy in BC. (Ministry of Agriculture 2008) It is unfortunately insufficient regarding such key topics as the Agricultural Land Reserve. The Plan makes clear that progressive forward thinking agricultural policy is not the current government’s mandate, by dedicating one strategy (of 23) to the preservation of agricultural land. The 21st strategy of the Plan

states the proposal of “preserving agricultural land for future generations of farm and ranch families”. The two paragraphs written in the Plan regarding this strategy do not sufficiently articulate the necessity of increasing the protected agricultural land, particularly given the expected growth in population, and the basic number of the hectares that are required to meet our regional food needs.

O P P O R T U N I T I E S :

a. LOCAL/MUNICIPAL:

- Fostering a strong local Food Culture: Municipal governments can foster a culture and ethic that inspires the support for local food producers and programs through practices that celebrate and redefine purchasing and consumption priorities (eg. food procurement policies, buy local campaigns, farmers markets). With support (distribution and marketing structures) and integration (farm tours, farm gate sales) smallholder operations offering a diversity of products and services can easily respond and adapt to the changing needs of community and environment.

For such a system to be successful, local governments must advocate for both the consumer and the producer, using its position to facilitate relation-

ships and sharing of information.

- Reinforce with a Plan – what’s the menu du jour? Clarity of direction and method is critical. Local governments working with a broad base of stakeholders can develop the vision and objectives to identify the steps forward. Citizenship participation can be gathered through a variety of channels from neighbourhood potlucks, to the green streets program, to food policy councils, to public meetings and open houses, to interactive websites that gather responses and surveys. A plan can take a variety of forms including Food Charter (see Kaslo, Manitoba, Vancouver), Gail Southall, columnist for the Creston Valley recently defined the importance of food charters in her article, “Thought for Food: the Politics of Food” (July 12, 2010)

“The charter is used as an information tool when governments are developing binding policy on food, land use, the environment, and economic development, as these policies relate to food access and security.”

Additional advocacy initiatives can take the form of Action Plans for Creating a Just and Sustainable Food System (Toronto), Green Streets and Country Lanes Programs (Vancouver), Urban Agriculture

Policy (Seattle), Street Tree By-law, Agricultural Land Reserve legislation. Diverse openings for input, with accessible avenues for information offer important opportunities for decision-making and accountability.

- Using the tools: The following tools are available to local municipalities to further support food system integration.

ZONING REGULATIONS

There will be an increased necessity to accommodate greater diversity of operations within areas, as the boundaries between private and public become blurred by the necessity to increase the functional use of spaces. Commercial (produce sales), light industry (canneries) will sit next door to increasingly dense residential neighbourhoods. Collective space will need to be allocated for shared resource management (storage) and food production (processing and preserving). Single use of space will be ineffectively redundant (see Section 3 for further discussion). Zoning (by lot or by block – see Section 4) could be determined by the spatial requirements of growing food and collecting water. This adjustment may indirectly increase density, as homes become more compact, potentially clustered and designed to maximise solar exposure.

Municipalities can also renegotiate the calculation of floor space ratio (FSR) creating an incentive for developers. Seeing food production as a local amenity, municipalities can encourage developers to build/allocate growing spaces into their designs without losing liveable/profitable density.

DENSITY BONUSING

Use density bonus (offering increased density in exchange for public amenities) to support the protection of ALR land, see it as an important common good akin to community centre and playgrounds. Such a model is proposed by Patrick Condon and Kent Mullinex within a peri-urban zone that yields “10 to 15 dwelling units per double gross acre” sufficient to support transit and local commercial activities, as well as protecting substantial tracts of land for agricultural use. (Condon 2009)

BYLAWS (“stick”)

Establish bylaws that prohibit the use of pesticides, regulate water consumption, and promote edible landscaping, native vegetation, increased forest canopy and habitat preservation (for bees and birds). As well, communities could be allocated a certain ‘waste’ quota, much like current individual dwelling system, but that would ideally

generate a sense of collective responsibility, encourage localized management of waste (compost, grey water recycling, sharing of building materials)

FURTHER INCENTIVES (“carrot”)

Incentive programs (neighbourhood grants, extension support – see Section 5) to convert yards & boulevards into edible areas could be created (like Vancouver’s green street program). Promotion can include city run workshops on growing food and water conservation. Food producing homes could receive a property tax rebate, while products such as grass seed and lawn care supplies can be charged a levy.

b. REGIONAL:

- Advocacy & Political Leadership

Regional authorities have a unique opportunity to oversee a coordinated promotion of local food system. As potential advocates for local producers, agricultural lands and consumer awareness, regional districts can design and implement initiatives that highlight the importance of farmers and give value to the work they do. Following on the precedent of Belo Horizonte in Brasil, farmers could be recognized as civil servants for providing a pub-

lic good, food. (Rocha 2008) They would thus be incorporated into municipal structures and giving not only financial support, but also further political access and agency.

- The art of hosting - building networks & community

By working with multi-sectoral agencies and organisations, regional districts are in the position to use their perspective build linkages that connect communities. One current example comes from Metro Vancouver's Sustainability Breakfasts which have been meeting monthly since 2006. This network could further facilitate the sharing of resources (storage and processing facilities), increased coordination with local distributors, and support mechanisms such as farmers' cooperatives, business associations. Historically and increasingly today, cooperatives offer an important opportunity in the work of food production. (Hamilton 2009) The benefits that result from collaboration (sharing the burden and expense of the rules and regulations, maintaining high industry standards and self-monitoring), and sharing of knowledge and resources (dissemination of new research) are significant to small-scale farmers. (Gallon Letter 2009)

- Promoting a new model for governance

There is a need to re-envision our rural-urban relationship (see Section 2 for further discussion) as one no longer maintained by highway corridors and municipal boundaries, but as one that prioritizes the ecological needs of a region, and thereby planning within its limits. Bio-regions are a model of governance and resource management that can build the foundation needed for a cooperative future. Giving recognition to the function and scale of ecosystems, bio-regional frameworks are being adopted because they are seen as more effective for conservation and planning, because residents are asked to live within the ecological bounds and shape their lives accordingly (Feagan 2007). BC is roughly divided into 6 bio-regions: Interior, Island, Kootenay, North, Okanagan and South Coast and while they have no political authority, there are growing grassroots efforts on Vancouver Island and in the Okanagan and Kootenays to have consumers and growers supporting their local 'food shed'. Locals are being asked to inhabit and align with their region through a conscious act of consumption. Networks for the exchange of product and information are being established, regional meetings and most recently the West Kootenay Regional District is funding the creation of a local agricultural area

plan that will focus on regional integration. (RDCK, 2010)

c. PROVINCIAL:

Education and leadership – creating policies and building the structures, providing information

- Trade & Marketing

The provincial government needs to engage with the movement for local food and post-carbon planning. Economically, there is a need for leadership towards redistribution and increasing equity. Equitable trade reform with federal and provincial flexibility is necessary. The Provincial government must reduce inappropriate subsidies that keep prices of oil at artificially low levels, unfairly supporting the industrial agriculture model. Food and its services must fairly priced: Real food at real prices. The economy can be used effectively as a tool to encourage and promote consumer (as opposed to consumer) behaviour.

- Education

As mentioned in Section 1, awareness is critical in post-carbon planning. Engaged and active citizenship requires an informed population able to make choices based on accessible and accountable information. As supply chains are shortened, the concentration of capital,

- Identify strategies: How do we get there?

The Provincial government in collaboration with Federal, Regional and Municipal governments has the opportunity to support a strategic effort that is cooperative and unified, but sufficiently flexible to specifically meet the needs of the local context; local initiatives working within a common framework – most likely through such mechanisms as the Local Government Act. Provincial strategies may include promoting alternative models for land ownership, establishing tax incentives (MSP for food purchasing), regulatory streamlining and efficiency, policies and investment to support women in farming. Local initiatives may include promoting enterprise zones, permit expediting, recruit and incubate new food businesses, building shared facilities for – butchering, freezing, canning, milling. Encourage policies that support diversity of production and distribution. Examples of problems include Whole Food Markets and Wal-Mart contracts with local producers, which although seemingly in favour of small producers, have contracts stipulating that farmers produce specific products in specific (i.e. large) quantities, significantly threatening farmer autonomy and diversity. Conversely farmers markets not only allow for

the sovereign production and distribution of food (for both producer and consumer), but also encourage it. Consumers seem to be willing to pay a premium for a wide range of variability. The infrastructure of farmers markets and farm gate sale requires a continued supply necessitating the dismantling of entry barriers for young farmers (price of land, price of quotas, lack of knowledge and experience) (Pawlick, 2006)

Where does the money come from?

Strategic use of re-zoning applications from agricultural (ALR) to urban use to create a economic shift that generates revenue that could then be captured by local governments on condition that the funds are re-invested into an agricultural endowment. Local governments can capture value by reinvesting the revenue into an endowment or *Community Trust Farming* or another mechanism supporting local food security, such as farmers markets, incubator kitchens and extension research and education support services. (Condon 2009) Although untested as of yet, Patrick Condon goes on to propose a model of innovation on how Development Cost Charges (DCC) could used to support local agricultural initiatives. Similar to how DCC are used in Vancouver currently to fund amenity spaces, they could

also finance the infrastructure and services requirements associated with municipal growth and support, “the creation and stewardship of municipally focused agri-food components”. (2009) In addition, new variations to Development Permit Areas have allowed local governments to zone areas for greenhouse gas reduction. A DPA could blanket the entire city, or certain areas (peri-urban agricultural zone) where an application would have to be put forward to the planning department showing that the requirements for edible areas are met.



3. WHAT WILL WE EAT? (HEALTH & NUTRITION)

O B J E C T I V E :

Access (grow or import) high quality, nutrient dense foods with minimal levels of mechanization (movement of materials, artificial inputs and storage).

P R O B L E M A T I Q U E :

Consumers are offered an unprecedented quantity and availability of foods by industrial agriculture. The success of this model has virtually eliminated famine in many parts of the world. (Heinberg 2009) And yet while the hunger crisis has been significantly reduced, the industrial food structure has failed to offer access to high quality (nutrient dense, low fat, low sugar, low salt) food products. In the Post Carbon Institute's report - Food and Farming Transition, Richard Heinberg (2009:5) states, "Hundreds of millions of poor, middle class and even wealthy individuals in industrialized nations suffer from malnutrition, often hidden and sometimes paradoxically accompanied by obesity resulting from the consumption of highly processed foods low in essential nutrients." It is often said that we in the North are at risk of being overfed, but not necessarily by nutrient rich foods that support our functioning but by caloric rich foods that are high in sodium

and sugar. This diet is making us sick. According to the US Department of Health and Human Services, obesity threatens to reduce the life expectancy of children born today to less than their parents as a result of diet related diseases such as heart disease, stroke, type 2 diabetes and cancer. (Heinberg 2009) While this striking statement is more a result of North Americans' increased consumption of 'fast foods' (sugar, fat and salt), there have also been studies indicating that the increased use of fertilizers, namely nitrogen, has increased the nitrate content in vegetables and produce. (Chimada 2004) A direct relationship exists between healthy food consumption levels and poverty. In North America, chronic obesity targets those who have limited access to fresh fruit and vegetables or those that consume a diet of predominantly junk food. (Food Inc 2008) Processed foods made from subsidized ingredients such as soy and corn products

are often more readily available without alternative options or the information as to the health impacts. (Kenner 2008) Families with the financial resources to escape poverty rarely suffer from chronic hunger, while poor families not only suffer the most from chronic hunger and malnutrition, but are also the demographic most at risk during food shortages and famines. In addition, cultural 'norming', limited access to health coverage and low wages create a cycle of cheque-to-cheque existence (and subsequent malnutrition and disease) that prevents people from making long-term health conscious lifestyle changes. (Food Inc 2009)

As has been mentioned elsewhere, one of the most significant characteristics

of the industrial food system is the economic and social "distancing" it creates and the wide variety of problems associated with it. (www.foodshedproject.com) These include isolation and disconnection, no knowledge or awareness of how food is grown, what good food tastes like and even the basic awareness of how to feed one's own body. In other words, it is not only the food product, but also how is being processed, marketed and distributed. Thus, in addition to improving the basic nutritional composition of food (using better growing practices), care and attention must also be given to our relationship to food and to the resources that produce it (i.e. people, water, seeds and land).



Figure 2: Recommended Post-Carbon Plate: 1/2 vegetables, 1/4 protein, 1/4 carbohydrates

OPPORTUNITIES :

a. NUTRITION: At this post-carbon meal, what should we eat that sustains the health of the land, the air, the farmers and our bodies?

Michael Pollan, author of the *Omnivores Dilemma* (2006) and *In Defense of Food* (2008), answers this question with the following guidelines:

- Don't eat anything your great-grandmother wouldn't recognize as food
- Avoid food products containing ingredients that are (a) unfamiliar, (b) unpronounceable, (c) more than five in number, or (d) that include high-fructose corn syrup
- Shop the peripheries of the supermarket and stay out of the middle
- Get out of the supermarket whenever possible
- Eat mostly plants, especially leaves
- You are what you eat eats too
- If you have the space, buy a freezer
- Eat like an omnivore
- Eat well-grown food from healthy soils
- Pay more, eat less
- Cook and, if you can, plant a garden

Looking more specifically at the individual compo-

nents of the post-carbon meal, the next section considers the three primary food groups – fruits & vegetables, protein and carbohydrates. Emphasis is placed on fruits and vegetables, because in BC, like most industrialized places, we over consume our share of animal protein and carbohydrates (105% of recommended protein (meat based) and 115% of recommended carbohydrates) and under consume the recommended daily intake of fruits and vegetables (25% and 78% respectively). The impact of over consumption can be seen not only on the average body but also on the increased environmental degradation caused by industrial production of meat. The production phase of meat and grain (mostly used as animal feed) represents 83% of Green House Gas (GHG) emissions, i.e. not only is this phase a major contributor of pollution but it also requires vast levels of energy to sustain it.

In fact if we are to consider the words of Dr. Rajendra Pachauri, Chairman of the Intergovernmental Panel on Climate Change:

“The UN Food and Agriculture Organization (FAO) has estimated that direct emissions from meat production account for about 18% of the world's total greenhouse gas emissions. So I want to

highlight the fact that among options for mitigating climate change, changing diets is something one should consider.” (FAO 2010)

Animal agriculture is responsible for 4.5% more of the world's GHG emissions than all the world's transportation put together, including cars, buses, trucks, planes, ships and trains. In addition, raising animals for food produces 65 % of the nitrous oxide and 37 % of the methane related to human activity (respectively, these have 296 and 21 times the global warming potential of CO₂).

The post-carbon meal builds on the recommendations of BC's Best Chance program – a healthy diet consists of ½ vegetables /fruit, ¼ carbohydrates and ¼ protein (see Figure 2): and includes the recommendation a 30% decrease in meat consumption and then goes further to strongly encourage the consumption of plant based protein sources. As per Figure 2, fruits and vegetables therefore represent the 50% of the post carbon plate. (www.bestchance.gov.bc.ca)

1. Fruits & Vegetables

The discussion on Land Use (Section 4) presents the physical designs for how a predominantly vegetable based diet could be substantially ac-

commodated within the urban boundaries of our cities and towns. Following the suggestions of Section 4, most vegetables and fruits and some dairy and small protein needs can be within a 5-block radius of our homes. The proposed meal would involve an intensive production of nutrient rich crops such as nightshades (e.g. tomatoes, peppers, potatoes, eggplant), root crops (e.g. carrots, beets, parsnips, turnips), brassicas (e.g. cabbage, broccoli, kohlrabi, kale, brussel sprouts), squash, legumes (beans, peas, garbanzos), onions, salad greens and some starches (e.g. quinoa and amaranth) and protein from chickens (meat and eggs), rabbits (meat), goats (milk and meat), and insects.

2. Carbohydrates

Canadians are great grain growers. But much of our grain and grain producing land and water is devoted to the production of feed for animals. According to Amy Sapp of the Harvard School of Public Health and Shannon MacDonald of Harvard Medical School (2001), meat production poses serious implication for the global environment and human health. About 5-10 times as much water is consumed to produce a kilo of meat as is required to produce a kilo of grain, animals raised for food in the U.S. consume 90 % of the soy crop, 80

% of the corn crop, and 70 % of its total grain. (Sapp 2001, Federoff 2010) And in terms of water usage: a kilo of wheat requires between 500 and 2000 L of water (mostly lost through transpiration) – mostly fed to animals. Growing the crops necessary to feed farmed animals depletes nearly half of the United States' water supply and 80 % of its agricultural land. (Sapp 2001, Federoff 2010)

As producers, we are able to grow sufficient grain, but through the industrial food chain, we have misallocated our resources and created a very inefficient system from the mass consumption and contamination of resources. Sapp and MacDonald explain that the vegetarian diet is more efficient because it like a localized food system reduces the supply chain – the sun-to-food conversion of energy is more efficient in plants than animals.

3. Protein.

The average Canadian consumes 56 kilograms of (carbon-intensive) red meat per year, a much higher level than that recommended by health authorities. (White 2010) New studies show that it is increasingly important to make dietary changes away from red meat, (at times more than changing our mode of transport) in the interest of reducing demand

and dependency on fossil fuels. (White 2010) Building on the discussion in carbohydrates, red meat production has 150% GHG-intensity compared to fish or chicken, meaning that it is 150% more fossil fuel dependent than fish or chicken. (Gallon Letter 2009) And it is further explained by Sapp and MacDonald that a,

“A vegetarian diet, by virtue of its inherent efficiency, can alleviate hunger by acting upon food supply and poverty. If widespread vegetarian practices were adopted, the energy, land, grain and other resources currently used to feed food animals could be channeled into direct human use. It is estimated that world food production could sustainably support a population of 8 billion vegetarians (Sobal 1999).”

As consumers, we must change of consumption patterns to less meat so that we are able to distribute our necessary carbohydrate needs more evenly and balance our ecological demand more fairly. The post carbon diet will not be able to sustain current levels of meat production. It will be necessary to not only choose alternative forms of production (i.e. free range versus feedlot) but also decrease the demand for meat, particularly red meat.



**4. FROM FIELD TO TABLE –
WHERE WILL OUR FOOD COME
FROM?
(LAND USE, FORM & SHELTER)**

O B J E C T I V E :

Determine an appropriate form that places urban and rural in direct relationship, re-prioritizing land use based on ecological food system servicing.

P R O B L E M A T I Q U E :

“the city as human feedlot”

“Urban dwellers don’t “live” in their cities; urbanization simply separates us from the productive ecosystems that sustain us but lie far beyond the urban boundary”. (Rees 2002) From a food perspective, this urban appropriation means that globally there is an inequitable distribution of resources to meet the food needs of cities. There is proportionally, greater demand for land, water and energy and greater production of waste, than any city is currently able to produce and process in its own limits. “Great cities are planned and grow without any regard for the fact that they are parasites on the countryside which must somehow supply food, water, air, and degrade huge quantities of wastes”. (Odum 1971) Vancouver, for example, uses three times the per capita global biocapacity (i.e. the available supply of natural resources) of

cropland to meet its own food needs, with the average Vancouverite using 1.53 global hectares (gha) /person (Figure 3). (www.footprintnetwork.org) And yet, within the global biocapacity of cropland, each person has only 0.53 gha/person available or ¼ hectare of actual cropland. (www.footprintnetwork.org)

Vancouver, like all cities, having grossly exceeded its own carrying capacity is now living off the resources near and far (mangoes in December). There is an ecological (and social) imperative to re-evaluate and reduce our over-consumptive patterns. In addition, the decreased mobility and availability of resources, namely energy, will not be able to support the importation of foods from South America, China or Australia, meaning our dietary components (carbohydrates, protein, fruit and vegetables) will need to be sourced closer to our homes and communities (A discussion of the proposed

post-carbon diet can be found in Section 3). Such a model could shift its focus regionally, requiring a gradient of more localized production: urban, peri-urban and rural, working within the energy limits of a post-carbon food system. “Bioregionalism and permaculture provide pre-formed philosophical and conceptual models for reintegrating heartland and hinterland.” (Rees 2009) As form follows functions, the shape and size of our communities will shift to accommodate the necessary resources (land and water) and services (storage, composting, movement) needed to supply our food and handle our waste. The BC Ministry for Agriculture and Land states that, “given the production technology available today, over half a hectare of [BC] farmland (0.524 ha) is needed to produce the food for one person for one year”. (Ministry of Agriculture 2008) Fortunately, this number corresponds with the global

allocation of cropland, offering BC the opportunity to be relatively autonomous in its food supply. Of the total 2.15 million hectares required for food production in BC - 10 % needs to be irrigated. Unfortunately, this prediction is based on the assumption of the easy availability of cheap energy. And so, to meet the projected population growth in the next 30 years, this will need to increase by 30%. Therefore an additional 218,000 hectares of irrigated land are needed to produce vegetable, fruit and dairy needs (approximately 0.053 or 5,700 square feet hectares/person). And what if there is no fuel to power the pumps?

OPPORTUNITIES :

a. **INSIDE THE CITY:** vegetable, fruit and small scale protein (e.g. chicken, goats, rabbits, fish and insects) This section will consider the spatial needs required to support the re-integration of food system servicing within the city limits.

1. Neighborhood production

Using a combination of locally sourced inputs, such as coffee grounds, compost, soy mash, human and animal manure, with intensive planting, active rotation and living green mulches, many vegetables (nightshades, roots crops, brassicas, squash, legumes) and some staple starches (quinoa, potatoes, amaranth) can be grown within our immediate vicinity. The diet fills out more completely with a source of protein from chickens (meat and eggs), rabbits (meat), goats (milk and meat), insects.

There is a growing movement of SPIN (small plot intensive) farmers who are producing remarkable amounts of food on small areas of land. (www.spin-farming.com) According to several local producers – an average city block (120' x 30') of 3,600 square feet will produce 15 family size (2-3 people) boxes per week per season (Figure 4). Boxes include a variety of 10-12 different types of high nutri-

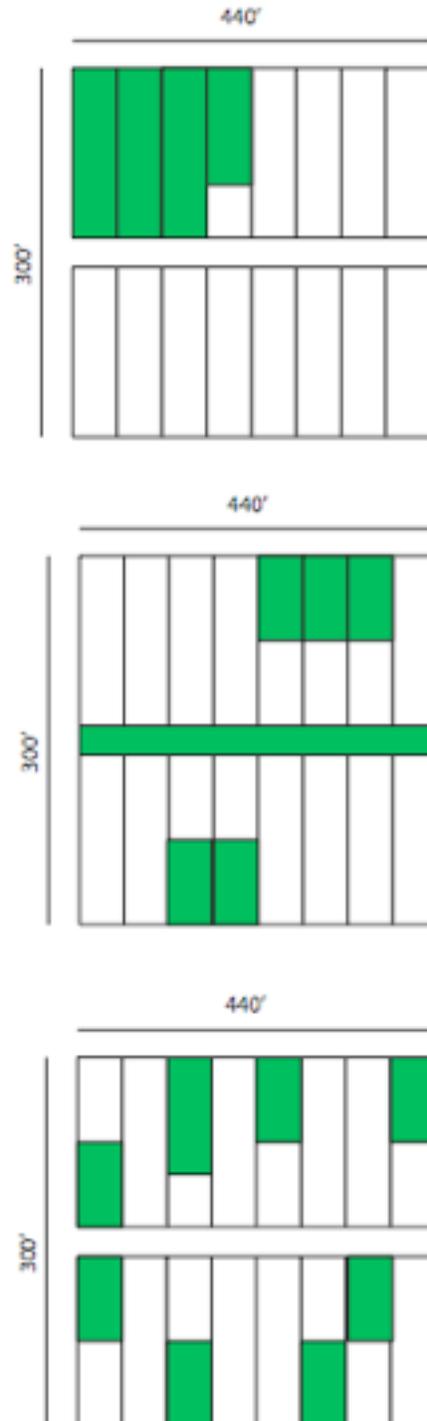


Figure 4: Post Carbon Residential block – 16 lots with 3.6 lots for agriculture needs of residents. (0.033 ha or 3,600 square feet = 1 city lot)

ent vegetables including tomatoes, root crops, brassicas (kale, broccoli, chard), onions, salad greens, squash and legumes (beans & peas). (Hamir 2010)

2. Food commons

Beyond the boundaries of individual lots, many municipalities have areas that can be easily converted into common growing plots. In addition to community gardens, there are several examples internationally of alternative land sharing models. Following Cuba's model of neighbourhood plots, each block could have land that is allocated for local growing, water collection and treatment and composting. (Power of Community 2006) Larger plots of land (e.g. 5-10 acres) could work from the traditional Mexican model of land sharing called ejidos, the notion of the commons that includes balance of autonomy (individual plots) and accountability (governed by regional authority). (Hamilton 2009) In municipalities with larger tracts of available land (e.g. 10+ acres parcels) consideration could be given to leasing land for small scale food producers, serving as a critical avenue for incorporating and educating young farmers with limited skills and land access. (Condon 2009)

Last spring, Kwantlen College in Metro Vancouver

launched the first university based urban agriculture school in North America. Designed to “encourage enhanced human-scale agriculture on land within municipalities and in particular on the urban-rural fringe”, participants in the Farm School will have subsidized access to incubator plots (e.g. 1-5 acres) in the City of Richmond following completion of the 2-year program. (Condon 2009)

In addition to land, creative adjustments can be made to vertical and horizontal built surfaces to accommodate additional growing space. Rooftops serve as excellent venues for bee, bird and butterfly habitat creation, important to agriculture. In addition, there are an increasing number of innovative models of low input technologies that have been developed for lightweight food growing on rooftops and walls. (www.rooftopgardens.ca)

Schools and parks can share portions of their land for food production, also serving as a critical component of training and education for youth. UBC Farm (www.landfood.ubc.ca/ubcfarm) located at the point campus of the University of British Columbia, is a unique opportunity to build the relationship between academia and community through food as Vancouver’s last working farm. The 24-hectare teaching, research and community farm is exceptionally diverse in its offerings as it includes cultivated fields, teaching gardens, forest stands, hedgerows, and orchard plantings. The potential of the Farm in such a time of transition has been continuously threatened by a limited vision of the academy’s administration, seeing greater opportunity for housing development than food security.

While UBC Farm is unique, there are throughout examples of elementary and high schools partnering with community organizations such as elder centers, day care centres or simply groups of neighbors who will manage the school garden during the summer months, building relationships not only with their local school but also with the local community (e.g. Sooke Community School, Hornby Island Community School and Crawford Bay School) Finally, public-



Figure 5: Garden City Lands Proposal for Urban Agriculture (www.gardencitylands.ca)

ly owned boulevards and right of ways can be used for edible or ornamental gardens. Hanging baskets filled with strawberries or tomatoes, planters filled with kale and peas also promote the conservation and celebration of wildlife.

3. Food hubs

With all the food activity in and around each community, there will be a strong need for a place to gather, share, trade, exchange and meet. Food hubs can either be formal structures where retail, processing and storage take place or informal structures that emerge every weekend to fill parking lots or vacant fields, New City Market in Vancouver is one such example, as is the proposed Garden City Lands (Figure 5) urban agriculture model that would incorporate training and small lots for start up farming (www.gardencitylands.ca). There are also the numerous farmers markets that are successfully supporting local food systems across the province (compostdiary.com/2009/12/10/food-hubs). A very successful model that has integrated education, community and food is The Stop— a community food centre in the heart of downtown Toronto (www.thestop.org). The B.C. Association of Farmer's Markets states that farmer's markets strengthen the "bond between farmers and their cus-

tomers" and this relationship can be further supported through increased urban agriculture and the creation of neighbourhood kiosks that are set up on every block selling the produce from the local community. (The Power of Community 2006)

b. OUTSIDE THE CITY (peri-urban) – larger scale protein (cattle and dairy) and small scale carbohydrates (potatoes)

A localized diet (within 300 kilometres) is possible in Metro Vancouver and would most likely contribute to an increased standard of living not only from the healthier (less processed, more diverse) nutritional bio-availability of what will be grown but also from the increased social and human capital (see Section 6 for further discussion). The edge or peri-urban area surrounding cities represents the greatest opportunity for the diversity and intensity of activity needed to support cities. For such production to happen, a buffer will need to be established, such as an urban growth boundary (requires increased support for the Agricultural Land Reserve (ALR)) with modifications (A more detailed description of the ALR can be found in Section 2).

1. The Agricultural Land Reserve (ALR):

The original intent of

the ALR was, "to promote viable farming, not function as an urban growth boundary". (Condon 2009) And while it has been both a tool for urban containment and food security, there is criticism that it meets neither of those goals successfully. If regional food security (as basis for a resilient post-carbon food system) is to happen, there is the need to support and enhance the ALR, so that it can continue to remain, "a tool for smarter land-use planning as urban development is guided away from rural agricultural lands and towards existing urban areas." (Ione Smith, Smart Growth BC 2009)

2. Edge planning:

Inquiring into what a more porous urban/rural relationship could look like - Kent Mullinix (Kwantlen College) and Patrick Condon (UBC) pose the question, "Can we not incorporate and utilize good land use and urban design principles and practices that integrate food production and food security into the ALR, particularly at the urban-ALR interface, to enhance agriculture at the metropolitan edge and more effectively address this challenge?" (Condon 2009) The project goes on to suggest a variety of zoning modifications to ameliorate the current urban-ALR relationship including establishing a buffer

zone (500 metres) that would incorporate both urban (residential, commercial and light industry) and agricultural (high value, organic, small-scale, locally destined production) activities. Tenure would come through a municipally governed covenant entitled, "Community Trust Farming" (see Section 2 for more information).

3. Communities built around farms:

Building on the strength and potential of peri-urban agriculture to meet the needs of both urban and rural communities, there is an opportunity to refocus the planning the typical suburban community towards the role of negotiating the rural-urban divide. One example comes from the city of Damascus in Oregon State which, has recently redefined its growth boundary to include a 145-acre working farm. Farmer Larry Thompson says that, "What's needed is for fertile farm areas perched on the edge of urban centers to start providing the nutrition -- the food security," and "for residents living inside those centers. Food-producing farms, far from being excluded from urbanized areas, would be integral to them." (www.oregonlive.com) The Thompson's agricultural endeavours will be viewed, under Oregon land-use laws, as an urban economic use akin to commercial

or industrial activity allowing on site commercial activity – restaurants, sales, processing etc. (www.oregonlive.com) Issues of smell and noise often challenge to the urban/agricultural relationship, "The pattern of development could be configured such that the acreages close to home would be farmed in the most unobtrusive ways (i.e. labour intensive and reduced chemical/noise) to reduce potential conflicts". (Condon 2009)

c. REGIONAL INTEGRATION (rural):

1. Food shed:

"Bioregionalists have championed the utility of the concept of the watershed as an organizing framework for thought and action directed to understanding and implementing appropriate and respectful human interaction with particular pieces of land. In a creative analogue to the watershed, permaculturist Arthur Getz has recently introduced the term "foodshed" to facilitate critical thought about where our food is coming from and how it is getting to us." (Kloppenborg 2005) In his 1991 Urban Foodsheds article in *Permaculture Activist*, Arthur Getz uses the analogy of a watershed to describe 'the area that is defined by a structure of supply'. As a concept, foodsheds can serve both a practical and theoretical func-

tion, providing both "a frame for action as well as thought". Further discussion continued in a more recent article:

"While corporations that are the principal beneficiaries of a global food system now dominate the production, processing, distribution, and consumption of food, alternatives are emerging that together could form the basis for foodshed development." (Permaculture Activist 2009)

While many are outlined here as the possible building blocks for a post carbon food system, it is critical that within the regional land use discussion, such alternatives are integrated and promoted building a network of social and political capital that reinforces the structural readjustments of bio-regionalism.

"Recognition of one's residence within a foodshed can confer a sense of connection and responsibility to a particular locality. The foodshed can provide a place for us to ground ourselves in the biological and social realities of living on the land and from the land in a place that we can call home, a place to which we are or can become native." (Kloppenborg 2005:34)

2. Additional mechanisms:

In addition to working within a regional framework that brings together municipal and regional governments and communities, tools such as smart growth planning, redesigning zoning systems, using Official Community Plans (OCP's) and protecting and preserving our fertile land base for generations to come will facilitate an increasingly integrated and resilient food system. (Newsom 2009) Looking to the south, the United States has recently taken on a strong mandate to support local producers and strengthen rural urban linkages. Under the "Know your farmer, Know your food" campaign, initiatives to strengthen rural communities include: building linkages between government, industry and labour, creating educational partnerships with the academy and growers, offering micro loans and grants for small construction projects, seed & equipment investments and business skill development opportunities. (www.usda.gov) Such support is crucial for Canadian farmers who are expected to be not only productive growers, but also small business owners, marketers and distributors and current of the latest technology and research. In a recent town hall meeting in Creston, 49 local farmers were vocally adamant that they needed support

in the form of regional infrastructure and networks to facilitate marketing and distribution of their goods. "We are farmers", they said, "not marketers or distributors." (Mungall 2010)



5. HOW WILL WE PROCESS, DISTRIBUTE & STORE OUR FOOD? *

O B J E C T I V E :

Increase accessibility and autonomy of the post-carbon food system by using storage, processing and distribution systems less dependent on fossil fuels.

P R O B L E M A T I Q U E :

The industrial agricultural model has resulted in increased specialization and decentralization of our food system: “Food is transported long distances averaging 1640 km directly and 6760 km indirectly for the life-cycle supply chain. Greenhouse Gas (GHG) emissions generally for this transport represent about 11% of the total GHG impact of food. The final delivery from producers to retail is only about 4% of the total GHG.” (Gallon Letter 2009) While, transportation represents only 15% of total GHG emissions for food production, most emissions come from storage areas for feed, manure, and wastewater, animal housing; and the production or processing of the animals - cropland where manure is applied, the use of machinery on site and the emissions from decomposing manure. (Gallon Letter 2009) There are 2 critical issues, first that the industrial food production model of transportation, storage and processing is a signifi-

cant contributor to GHG production, but more importantly with reference to this report, the production of emissions is the result of the high use and subsequent dependency on fossil fuels, increasing the vulnerability and fragility of the system. The reality that our global food system is highly dependent on cheap fossil fuels primarily for transport and distribution presents the frightening scenario that “if high fuel prices, or a cut-off in supplies due to a sudden geopolitical event were to keep trucks from delivering food to supermarkets”. Cities such as Vancouver have no more than 3 days of food storage. (Heinberg 2009:10) Increasing energy costs will result in a change of availability, but as Richard Heinberg (2009:10) warns, “protracted absolute scarcity would be a nightmare almost beyond contemplation”. And yet such a scenario need not happen, if the resources currently used are re-allocated more efficiently. Another means of mea-

Caloric Consumption of Industrial Agriculture Model

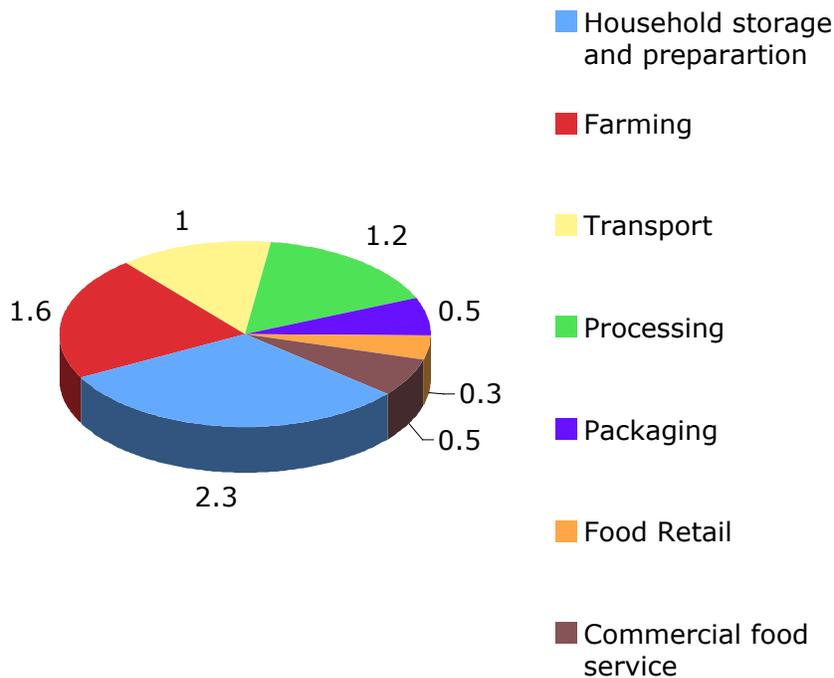


Figure 6. Energy expended in producing and delivering one food calorie. Approximately 7.3 calories are used by the U.S. food system to deliver each calorie of food energy. (www.postcarbon.org)

surement in terms of caloric consumption is illustrated in Figure 6. There is a gross over-expenditure of energy, 7.3:1 calories, to produce, process, transport, store, package and distribute our food.

While still consuming more energy than it delivers, farming (production) only accounts for less than 20% of the energy expenditure. The transportation, storage and processing of food that consume 80% of the necessary energy. (Heinberg 2009) There is a critical imperative for the post-carbon food system to redefine its modes of transportation, storage and processing in the interest of increased resilience. The question therefore is what high quality, high nutrient dense foods can be grown with minimal mechanization (movement of materials, artificial inputs, products)?

* Food processing is the set of methods and techniques used to transform raw ingredients into food such as canning, dehydrating, refrigeration freezing, drying, salting, pickling. Food storage includes root cellars, refrigerators, freezers and dry storage.

O P P O R T U N I T I E S :

Building on the model outlined in Section 4, 3 areas of intervention are identified – inside the city, outside the city and the region.

a. INSIDE THE CITY: fresh produce - bicycles & feet

1. Neighbourhood nodes: fruit, vegetables and small dairy & protein

In the post-carbon diet outlined in Section 3, it is recommended that vegetables and fruit make up 50% of daily consumption. The production requirements (namely irrigation) of fruits, vegetables and dairy, can effectively be met through high-intensity urban agriculture (see Section 4 for further discussion). Therefore, the neighbourhood (backyards and community plots) can produce a significant share of the required fruits, vegetables and dairy/small scale protein needs. From a transportation & storage perspective this requirement also makes sense. These products are quite perishable and require cold storage for transport (milk), are delicate (lettuce, tomatoes, peaches) and are often heavy (squash, apples). Therefore the closer the place of production to the place of consumption the better.

As energy becomes increasingly scarce, the physi-

cal and spatial requirements of transporting, storing and managing food and waste will face greater challenges and require more creative and localized alternatives. Post carbon food will not be shipped thousands of kilometres to reach customers. There will be less need for preservatives and packaging, but more need for localized capacity to process and store. In addition to a shifting of cultural norms from single purpose neighbourhoods (i.e. residential without commercial), the zoning regulations will also need to change to accommodate an increasing diversity of uses (see Section 2 for further discussion). For most communities in BC, the introduction of small-scale manufacturing and resource recovery re-introduces a market that is currently under represented. Street foods

2. Urban Hubs

The necessity for processing facilities such as canneries and slaughterhouses will arise, and the small scale manufacturing of products will be needed. In many places these needs can be brought together under one roof, layering uses over time and space. With creativity, there will be opportunities to merge seemingly incongruent operations that can use different hours of the day (daytime = cannery, night time = storage of transportation

equipment (bicycles & carts) used during the day) and different forms of the space (the loft of a warehouse is used for seed saving, while the floor is used as a training center). In the book, *The Long Descent* (2008), author John Michael Greer lists a variety of skills necessary for a smooth post carbon transition. With increased localized processing, Greer states that this resurgence will require skills (see Section 5 for further discussion) and accommodations of the necessary transport and spatial needs - retrofitting of buildings into suitable places for processing centres (e.g. mobile abattoirs and kitchen cooperatives) and storage facilities.

As described in Section 4, local food hubs offer the opportunity to support the diversified needs of small-scale producers using collective resources for transport, storage and processing. Such needs might include incubator spaces that can be rented for small-scale food activities – e.g. someone experimenting with a new recipe for commercial distribution, community kitchens, demonstration spaces for re-skilling (canning, pickling, baking). Another example is the storage of communally owned and operated equipment such as dehydrators, grain mills, canners, and meat processors. In Portland, Oregon, one example of such a collective op-

eration is the North Portland Tool Library, “a community resource dedicated to building community and fostering sustainability by providing residents with tools and the

delivery stops. This is an important point in the reduction of fossil fuel consumption, as the ‘local food movement’ is often criticized for encouraging an increase in car trips as eager

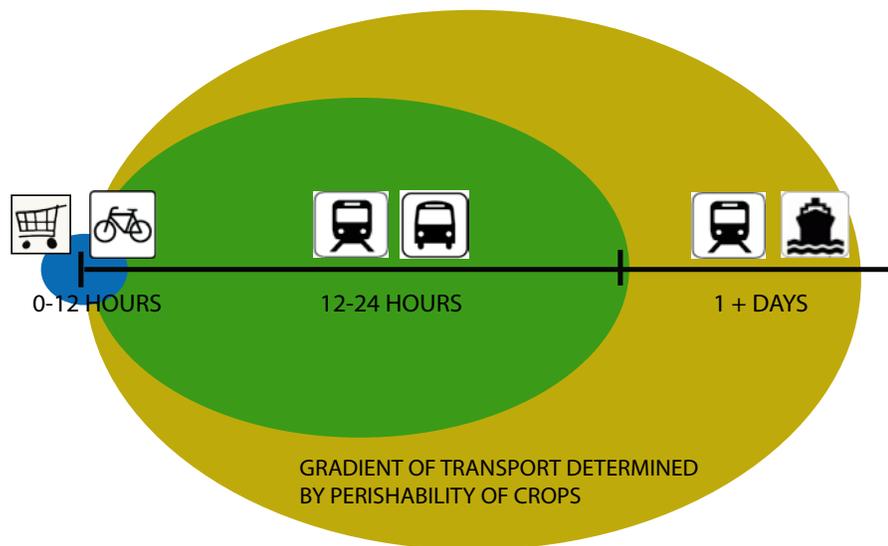


Figure 7: Using the blue circle as reference for concentrated points of consumption and production (i.e. neighborhood hubs) - the movement of goods will be determined by water content of products - length of time vegetables can remain fresh without refrigeration. Greater water content, greater rate of perishing therefore produced closer to home. Food degradation limits length of transport.

power to use them.” (www.northportlandtoollibrary.org)

Finally, local food hubs (whether as neighbourhood kiosks or farmer’s markets) provide a centralized point for distribution. Such that Community Supported Agriculture (CSA) or buying club members have one spot for pick up, eliminating many individual trips to farm or many individual

consumers drive out to purchase from the farmer. (Gallon Letter 2009)

3. Bicycles and Feet

Within the city, transportation of food could easily be done with some creative engineering of bicycles to equip them with carts to carry and trailers to haul. This means redesigning bikes to be ‘work

bikes’. There are many ideas that exist on the various ways of retrofitting bikes. Some include the quadricycle is one robust model with four wheels making it able to carry more weight and the Danish Christiania model with a large bucket on the front designed for transporting goods or children. One group that has taken this idea into action is Pedal Power Produce in California which delivers food from a local CSA on bikes. (culturerecharge.org/pedalpowerproduce) There is also Fast Food Couriers located in Vancouver, that offer delivery of prepared food from restaurants. (www.cargocollective.com/fastfood)

b. OUTSIDE THE CITY (peri-urban): meat & dairy - bus & train

Following the gradient of spatial requirements for growing needs, how perishable or dense (heavy) a product is, and how long it can be stored – the peri-urban edge is seen as an excellent place for larger meat and dairy production. While chickens and goats can work well in dense urban areas, cows, horses and sheep require more space. In addition the feed needed for and manure produced from these animals can be more easily used and managed with larger tracks of land (10-20 acres). While this peri-urban edge serves an important buffer function the urban/rural divide, (see Sec-

tion 2 for further discussion), it is also critically addresses the anticipated difficulties and cost of transportation. Rapid transit in the form of buses and train can quickly move meat and dairy products to consumers with minimal need for storage and packaging. Avalon Dairies in Vancouver is one example of a supplier that imports its raw product from the peri-urban fringe, to be processed and sold within the urban limits. In addition, not having to make long trips, products can be brought in to neighbourhoods for delivery with smaller trucks that could be operated electrically or on bio-diesel.

c. REGIONAL CONNECTIONS (rural): grains, legumes and pulses - train & boat

Grains, legumes and pulses require vast tracks of land to be grown economically. In addition, they can be dried, stored for long periods of time and transported without refrigeration. This makes them first, ideally suited for rural production and second, a crop that could be imported (high ratio of nutritional value to weight) and traded, particularly during times of transition. Currently in the Creston Valley there is a grain CSA model that grows quinoa, wheat, spelt, polish wheat and oats. (www.crestonfarmfresh.ca) Given the location of Creston at the southern end of Koo-

tenay Lake and the location of communities along the Lake, growers have experimented with distributing the grain by boat, greatly reducing any need for fossil fuel. This model also exists in Washington, where a local CSA delivers all its produce by sailboat. (Steinman, 2010)

As mentioned above, Vancouver and the surrounding region have the capacity to produce and store significant amounts of food. But if it is not accessible when it is needed, then it will do little to serve the vulnerable urban populations. In response to such possibilities, it is critical that BC begin to re-instate alternative transport routes (train and boat) strengthening and building connections to the rural hinterland.

Area	Size & population	Time travel budget	Production possibility	Travel Mode
Local neighbourhood nodes	7x7 block radius (7,000 people)	15 minutes	Fresh vegetable	Foot, Bicycles, Skytrain & Bus
Urban hubs	5-8 km radius (20,000 people)	30 minutes	Meat & Dairy	Bicycle, Skytrain & Bus
Regional Connections	30km radius (175,000 people)	60 minutes	Grain and staples	Rail & Boats

Table 2: Multi-modal transportation distribution



6. WHAT IS THE CYCLE? (INTEGRATED RESOURCE MANAGEMENT)



O B J E C T I V E :

Reducing waste and inefficiency through integrated resource management & full-lifecycle analysis.

P R O B L E M A T I Q U E :

“US food waste represents 80% of the average daily food supply in Bangladesh” (Gallon Letter 2009)

Ecologically thinking food is part of a larger system, as we as humans are also part of a larger system. Ecologically speaking, the natural world provides services to our food system that are not accounted for economically or ecologically. Consideration and appropriate measures must be given to how resources, particularly land, air and water provide these free services, such as sinks for unwanted bi-products of our system. (Rees 2006) Issues include the contamination of food or water by pathogens as a result of insufficient sinks (crop land) to metabolize waste in the form of manure, volatile organic compounds (VOC's), nitrates and phosphorus leaching. (Gallon Letter 2009) We have maximised the capacity of our ecological systems to serve

as sinks - holding and rebalancing the pollution that we produce through our process of extraction and purging.

As illustrated in the Figure 8, our resource use currently follows a linear structure that limits by its very nature understanding and awareness of any relationship to the larger ecological systems. There is no feedback. And without it, all populations follow a pattern of growing (by extracting, exploiting, polluting, degrading) exponentially to a point that a critical resource (top soil, water ways, animal population) is destroyed and then the population collapses. (Rees 2002) Evan Fraser, Co-Author, “Empires of Food: Feast, Famine and the Rise and Fall of Civilizations argues that we have made three mistakes in how we have built our food systems – first, we have become dependent on a top soil to produce our food, and it is a delicate and fragile resource. Second, we have be-

come dependent on food that grows in nice climates. And third, we have through the increased industrialization of food, pressured farmers into specializing in one or two crops. And as Fraser say, “while this makes wonderful economic sense, it’s terrible ecology.” We have lost touch with how our systems operate, because we have been looking at them linearly. Rees (2002) affirms this argument by stating that it is absolutely necessary to have a resource system that incorporates (negative) feedback so that we are able to live within the natural limitations of the system at hand. We must create a system that is responsive and circular, feeding back into itself.

Agriculture, like all systems, must increase its ability to serve multiple purposes; it must be viewed as multi-functional. (Gallon Letter 2009) Following on perma-culture principles, agriculture must be viewed within a dynamic system that incorporates not only the production of food but also greater ecological services (habitat, water & energy conservation, biodiversity). The bi-products of the food system – bio-solids (manure and food scraps), grey and black water are mostly treated as waste to be collected and discarded. A re-consideration of these products as important sources of nutrients allows us to redesign the system to capture our

‘waste’ and re-integrate it into the cycle. At an institutional level, the need is to provide adequate policy and legal frameworks, sufficient planning, training and support staff, room for public participation and education, and mechanisms to capture cost recovery initiatives. At a structural level, waste management facilities must be upgraded and developed to offer sophisticated and de-centralized source separation, collection, transportation and resourcing and recovery. But most importantly the underlying goal of an Integrated Resource Management System (IRMS) is to promote an overarching systemic change that localizes resource management and re-connects the community (i.e. consumers) with the cyclical nature of consumption.

Circular resource management systems place ‘natural capital’ as an integral component of consumption and recognizing the natural boundaries of ecological systems. In addition these systems challenge consumers to reorient themselves within the cycle and become increasingly aware of their own behaviour and the implications of maintaining a disposable lifestyle. Zero-waste is a set of guiding principles that many communities have embraced in the interest of moving towards greater ‘eco-intelligence’, designing products that are efficient and naturally smart.



Figure 8: A linear or 'throughput' diagram of resource management



Figure 9: A circular or 'cycleput' diagram of resource management

OPPORTUNITIES :
a. INSTITUTIONAL**1. Zero Waste Communities:**

Effective development, implementation and management of an Integrated Resource Management System (IRMS) requires a multi-layered, multi-stakeholder approach that links, “communities, businesses and industries so that one’s waste becomes another’s feed-stock.” (Recycling Council of BC) IRMSs significantly reduce consumption by working with sophisticated design that uses our ecological intelligence harmonize our actions and products with the world around us. (Goleman 2009) Achieving a zero waste community requires designing products and industrial processes so that their components can be dismantled, repaired and/or recycled. (Recycling Council of BC) This means moving consumers away from the disposable lifestyle that permits 80% of what is purchased to be used only once. (Hawken 2000)

- Cradle to Grave Production

Examples: Avalon Dairy - With the average life span of 40 - 50 uses, each glass milk bottle is able to greatly reduce the need for alternative cardboard or plastic packaging, presenting a

solution at its source rather than finding methods of dealing with it at the end. (Hawken 2000)

- Policy & Governance
Stricter regulatory guidelines, more precise terminology and staffing support to develop active programming, leadership that would stimulate and support behavioural changes. Create policy specific to the needs of the users designed by the users. Provide ample opportunity for public participation.

- Create Economic Incentives - Cost recovery based on “Polluter Pays Principle” Use taxes and subsidies as intervention tools to create pressure points that will support efficient resource use. Rather than using the tax base to build new landfills or sewage systems, invest in integrated management systems that recover and reuse. Subsidize products and companies that prioritize lifecycle packaging. Invest in re-usable plates and cutlery for school cafeterias etc.

- “True Cost” Accounting – Bringing ‘natural capital’ into the economic equation, so that current externalities of ecological servicing (environmental degradation & public health burdens) are calculated fairly. Implement at both an institutional and individual level. Each residence should receive an itemized account of the contents

of their waste or the weight of their waste and the cost of the disposal, similar to a phone bill.

b. COMMUNITY

Collection, storage, transportation and safe disposal of waste are among some of the issues that must be negotiated when planning post-carbon food systems. As communities decrease energy consumption, such challenges must be re-imagined within alternative solutions that frame waste not as a problem to overcome but as an opportunity. As mentioned above, waste can be redefined as resource and the inputs and outputs of our conventional linear model reworked as ‘cycleputs’ or components of a circular regenerative system. This next section proposes that through similar examples of creative thinking, the complete integration of needs, effective interventions and development of responsive support mechanisms opportunities can be created.

1. Water and Liquid Resource Cycling

Many municipalities have the potential to have a water supply and liquid nutrient management system that manages water flows, minimizes use of potable water, recycles runoff and wastewater (as appropriate and permitted), and minimizes the amount of liq-

uid nutrients produced. An alternative system builds on the re-allocation of resources and the smart design of products and systems that get maximum resource efficiency. This system recognizes that water is an intricate and essential element to a healthy community and advocates for responsible use. (Kaslo Food Charter)

2. Technological vs. biological nutrients

By building circular systems for different types of inputs that differentiate between technical and biological 'nutrients', "eco-effectiveness leads to human industry that is regenerative rather than depletive". William McDonough (1998) proposed that it is an opportunity for creative design. For example, "Products composed of materials that do not biodegrade should be designed as technical nutrients that continually circulate within closed-loop industrial cycles -- the technical metabolism." Emphasis is placed on the importance of taking care to maintain separation and avoid contamination; the biological system must be protected against threats such as "mutagens, carcinogens, heavy metals, endocrine disrupters, persistent toxic substances, or bio-accumulative substances." (McDonough 1998:6)

The design of such a

closed-loop circular system transcends the current practice of waste management at two critical junctures. First, it stretches the conventional understanding of recycling to avoid 'downcycling' inputs into inferior grade products and instead preserves the embodied energy by re-sourcing the product or nutrient. Second, it renegotiates the current relationship that exists between supplier and consumer, placing the responsibility of management on the manufacturer not the consumer. Customers purchasing a product would in fact be leasing products and purchasing the service, creating a relationship with the manufacturer to guarantee the life of the nutrient, not the product.

- Designing for life with Eco-Intelligence - Placing responsibility on the manufacturer to prioritize durability, reusability and recyclability. Building a circular lifecycle into the design of the product and integrating "extended producer responsibility". There is also a need for increased emphasis on agro-ecological approaches and use of appropriate technologies. (Gallon Letter 2009)

- Reduction at the Point Source – Eliminate disposal packaging from all commercial food centres, including grocery, restaurants and retail outlets: plastic bags, paper/

plastic food storage containers, vending machines, waste free lunches & cafeterias. In addition, to provide high quality, uncontaminated nutrient sources, there must be a ban on use of synthetic pesticides, fertilizers and pharmaceuticals.

- Alternative practices for food production (organic, biodynamic, permaculture, no-till) should also be encouraged that increase biodiversity, and reduce carbon and nitrogen release. No-till systems have lowest global warming potential (14 tons of CO₂/year), organic (41), low input (63) and conventional (114). Organic systems also contribute to reduce nitrate leaching by converting it to N₂, which is benign. (Gallon Letter 2009)

- Support and implement the separation of organic materials from the waste system to be recycled and be made available to nurture soil fertility while reducing compost and food-stuffs garbage that have other unwanted results e.g. attract bears. (Gallon Letter 2009)

c. STRUCTURAL REQUIREMENTS for processing and utilizing organic “resources” close to their source:

1. In-Vessel composting system: A closed system that can accept 5 tones of organic input / day and through temperature control and aeration, speed up the aerobic composting process. After an initial 14-day period in the processor and 3-month maturing process, B-grade compost safe for landscaping use is produced. In-vessel composting is used in Squamish, UBC (currently running at capacity), New York, Colorado, and other regions across North America. (UBC Waste Management, 2009)

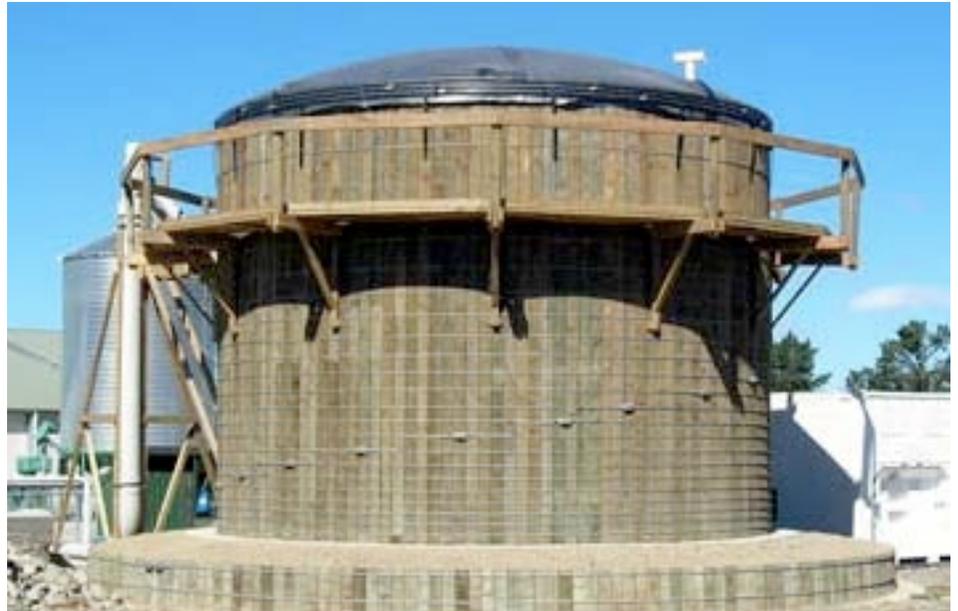


Figure 11: Methane Bio-Digester

2. Methane Biodigester:

A methane biodigester can be used to process biosolids through an anaerobic process that generates methane. This methane can be collected and used as an energy source to generate electricity. A local model could include the creation of District energy sites that exhaust CO₂ into neighbourhood greenhouses



Figure 10: In-Vessel Composting System



Figure 12: Living Machine at Findhorn.org

3. Living Machine:

The living machine system developed by Worrell Water Technologies (2008) supports the decomposition of biosolids (sewage) through a similar, though more intense process, as the in-vessel composter. This system mimics a wetland environment and removes hazardous microorganisms, filters sediments, and reduces the macronutrient content that cause eutrophication in lakes and rivers. (Worrell Water Technologies 2008)

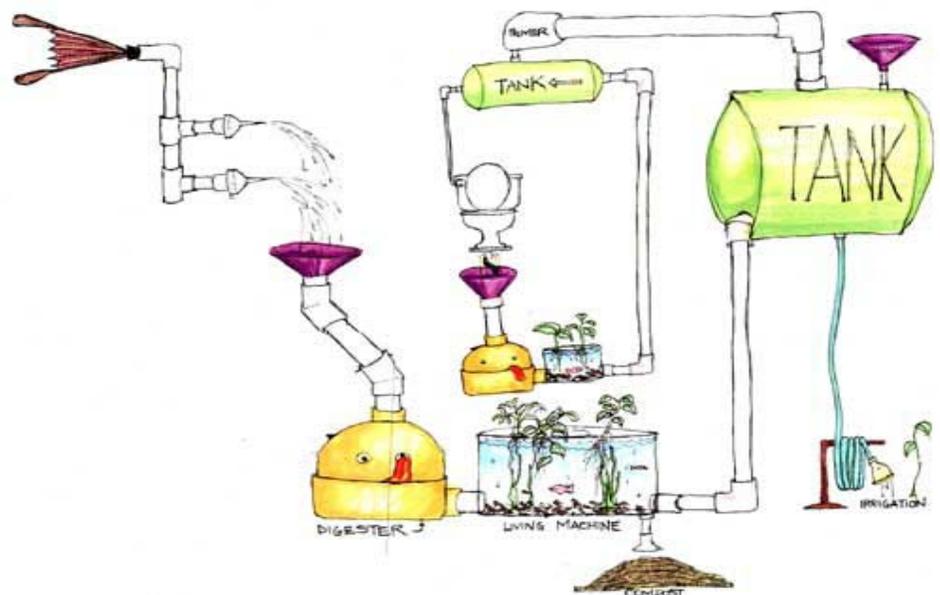


Figure 13: Living Machine System (jellobrain.org)

“...regarding the world economy and the consumptive patterns within it, as long as the laws of physics apply, infinite growth within a finite system (such as planet earth) simply isn't possible.” (Hopkins 2008)

“It took cheap, abundant fossil fuel energy to make transportation so cheap that centralized production and distribution of commodities could take the place of local production for local use.” (Greer 2008)



7. HOW DO WE SHARE THE WORK? (JOBS & SERVICES)

O B J E C T I V E :

Create a responsive localized food system that enables individuals/communities to produce their own food while still maintaining an equitable standard of living. Reorganize and redefine nature and structure of employment.

P R O B L E M A T I Q U E :

The post-carbon food system will necessitate a transformation of our industrial economic model of perpetual growth and within it our role as consumers and producers. Our current employment sector is driven by an exponential growth culture. (Power of Community 2006, Greer 2008) The unrestrained economic growth of the last 150 years is no longer feasible. As has been discussed elsewhere in this document, we are increasingly recognizing the natural constraints of the current economic mode of over-exploitation and extraction, and with such awareness our consumer based lifestyle and the activities associated must change. Such a change will involve a re-orientation of how time is allocated as activities are re-evaluated according to their functional necessity (ie. food production). Redefined by principles of redistribution, increased equity and access, the post-carbon food system could facilitate the emergence of new era of jobs and services that are grounded in the local, tangible and socially equitable. Most likely the average 9-5 workday will shift as employment becomes increasingly diverse and contextually-driven – the prescriptive approach will not work as people increasingly take control of their daily means. In the context of growing food,

while much will still be service provided (there is no need for everyone to learn to mill their own grain), there will be an opportunity for individual households to spend greater amounts of time preparing, producing and consuming food, as well as managing water and compost. In addition to making time for the mundane, there will be increased opportunities and demand for re-skilling – the practice of re-training and re-learning the skills required to grow food. These changes will require not only the structural framework of re-adjustment (discussed here) but also shifts of behaviour and consciousness (see Section 1 for further discussion).

One major shift regarding the current practices of agriculture will be moving away from managing food structures to stewarding food systems – nurturing the skills of observation, care and patience. (Hamilton 2009) The changes, while potentially daunting, have the ability to create unexpected employment within and around city limits as new opportunities arise in food producing, processing and packaging industries increase as petroleum based products and services are no longer economically viable. The following section outlines 3 areas of consideration for post-carbon food system – the workday, re-skilling and services.

OPPORTUNITIES :

a. WORK DAY

In order to provide food for ourselves, i.e. produce sufficient food as a society within the constraints of energy scarcity, the framework and concept of a “days work” will most likely change. The “9 – 5” workday is constructed around our industrial economic system that supports the generation of monetary capital. If the source of capital value began to change, then the structure of the work would also change. If food, clothes, shelter, relationships become the focus of our attention and investment, then so too will our time. As such the ‘work’, an activity distinct from leisure that is externalised and begins and ends each day may become more of a collection of activities that range from personal expression, functional existence and community servicing. (Greer 2008)

With a shift in access to cheap energy and a rationing of oil, all fuel dependent activities will be re-prioritized. Taking the example of Cuba’s ‘special period’ (i.3. the socio-economic and political transition period in the early 90’s) – 2 sectors radically affected by the loss of oil where transportation (see Section 5 for further discussion) and agriculture. Both Sectors were heavily dependent on im-

ported oil from the former Soviet Union. Going from an annual consumption of 10 barrels/person for food (compared to 9 barrels/cap for cars and 7 barrels/cap for homes) Cuba re-oriented its large scale mechanized production model to a more localized small-scale labour intensive model for food.

During the ‘special period’, Cubans spent more time on growing, processing and transporting food and less time at their daily jobs, as food became more important and more relevant than money. As we have used petroleum to increase yields and decrease manual labour, the decline of petroleum will do the exact opposite. Machine labour will decrease and manual labour will need to increase in order to maintain current yields.

With fewer people being able to work what are now considered full time hours, incomes may be subsidized by working on small-scale agricultural plots. At the turn of peak-oil smaller scale of employments will rise throughout the developed world. As in developing countries, citizens will have to subsidize the amount of food they can purchase with the food they can grow. A new (informal) economy of trading and selling products to neighbours from homes will create a new mode of business at the

neighbourhood level. From a more localized scale of production and consumption, there is the opportunity for many other agriculture related services to exist as re-found forms of small-scale employment.

b. RE-SKILLING

“It’s not enough to line your shelves with books about organic farming; you need to start buying tools, digging garden beds, and growing your own crops, and you need to do this as soon as possible, because mastering the craft of organic farming takes time” (Greer 2008)

In the US, there are approximately 2,000,000 farmers, less than 1% of the population. Without mechanization, it is estimated that we will need 50,000, 000 farmers. (Mullinex 2009) In addition to those that grow the food, people will be needed to distribute, market, process, transport and manage the waste. As we build a new culture, new skills will be needed in all aspects of the food system. Training centres such as School of Artisan Food in the United Kingdom will be important components of the re-skilling process. (www.schoolofartisanfood.org) The following excerpt is taken from a blog post on Transitiontown.org by Rob Hopkins after listening to an interview with one

of the graduates of the school on BBC4, April 26th, 2010.

“The part that really struck me was the guy interviewed who had set up a cheese businesses, who said that when he got started, he could find loads of courses on how to double your herd size, how to scale up, how to reimagine your business for the export market, how to grow your business, but none on how to set up a small business designed to stay small and to generate a good living for a few people. This programme offers a taste of the more localised, better skilled, more resilient future that will inevitably alter how we conceive training and the setting up of new businesses.” (Hopkins 2010)

Small-scale innovative operations that respond to local demand will be a significant component of the new working culture. In many cases, people will find themselves doing numerous pieces of the whole, as the informal sector takes on greater importance. Informal configurations and locally developed models such as ‘Free Schools’ found in Vancouver offer an opportunity to learn skills and build community, “in a non-hierarchical, anti-oppressive and holistic education environment where not only the ac-

ademic is addressed, but also the social, political, creative and personal”. Skill learning sessions may include anything from goat herding to discussions on sexuality to voluntary simplicity.(www.freeschool.vcn.bc.ca) Concurrently, organizations and institutions like O.U.R eco-village on Vancouver Island, Linneae Farm on Cortes, the Terra Nova Schoolyard project in Richmond and the Kootenay Permaculture Institute will become increasingly relevant institutions for reviving, learning and innovating practices.

Finally, it is important to remember the skills and knowledge that exist nearby. Our parents, grandparents, neighbours and community are excellent resources for fostering the skills needed for a conserver culture. First Nations throughout the Province could share traditional practices and culture with non-native communities seeking more balanced, less exploitative lifestyles. There is much to learn across cultures. Many immigrants to Canada come from environments that are less technology dependent and more closely integrated with natural systems and cycles. Some come from cultures that have already crossed the urban/agriculture divide (think of urban Italian or Chinese gardens). Integration and celebration of this wealth of experience and intelligence as

asset is important for not only those starting from scratch but also as a way of bridging and embracing cultural diversity. In Cuba, recognizing the knowledge held by elders of using animal traction held, created an opening for inter-generational exchange and learning.

c. SERVICES

“The approach to food security has a number of blind spots and biases. The biggest blind spot is neglecting food production and food producers as a core element of food security, from the household to the national level. You cannot provide food to people if you do not first ensure that food is produced in adequate quantities. And to ensure food production, the livelihood of food producers must be ensured. The right of food producers to produce food is the foundation of food security. This right has internationally evolved through the concept of “food sovereignty.” (Shiva 2009)

As the food is increasingly more fairly valued for the time and resources it requires, the land and people which support the agricultural sector will also be given greater value. Whereas today, it is the farmer that typically subsidize their work and contributions through

low mark-ups and off-farm income that underwrite the invisible ecological, social and economic services provided by their livelihoods. There is an incredible opportunity in post-carbon food systems to not only give value to the work done by those that maintain the food system, but also to recognize the services they provide as beneficial to society. We can begin as a society to offer value to our food and sustenance through support for farmers and their work. The following are the types of services provided by small-scale non-industrial farmers:

Observation & research:

- Of new varieties of crops that are highly adaptable and withstand the diverse climate changes we now experience – “alternative forms of agriculture based on plants not now used in agriculture, but capable of growing at higher temperatures in dryer conditions or monsoon conditions, using brackish water or salt for irrigation” (Federoff 2010)

Agency:

- Farmers could be hired or given benefits that recognize that they are producing a common good. If food were to be seen as a public good, farmers could be employed and benefited as civil servants. Further, if their farming activi-

ties support ecological servicing, farmers should receive payment for their contribution. (see Section 2 for further discussion). (Kaslo Food Charter)

- Mechanisms such as cooperatives that offer shared benefits, consistent and stable pricing and payment could be recognized and supported, independence and freedom. Interviewing small scale farmers across the United States, Lisa Hamilton (2009) writes about the role of cooperatives in their lives: “[the farmers] had a common thread, these people were dead-set on saving their farms, and knew that in order to do so they had to escape the conventional market. They simply could not compete in a system that calculated value only in numbers. They were drawn to the cooperative because its core goal was to create just such an alternative market in which farmers and their careful work were valued and rewarded.” In addition to the financial stability of cooperatives - farmer organisations, business associations, scientific organisations also provide important support for the needs of small-scale farmers to decrease the commodification of farmers and food. (Gallon Letter 2009)

- Allow residents the access and opportunity to make healthy choices and reduce environmental causes of diet re-

lated illnesses. (Newsom 2009)
Environmental Servicing

- In France, Luxemburg and Costa Rica, farmers are hired for their protection of environmental services. The post-carbon food system could include transfer payments to farmers for their environmental servicing – protection of water systems, carbon sequestration, sustainable land practices and biodiversity. (Newsom 2009)
Education & training

- Recognize farmers and food growers as those who can help foster policies that encourage and assist communities to produce their own food in their gardens

- Create opportunities to build strong linkages and curriculum integration with elementary, secondary and post-secondary institutions

- Provide and Increase investments in R&D and extension services – farmer participation, integrated pest and nutrient management (permaculture, biodynamic crop rotation, inter-planting), improved water management (grey water catchment, drip irrigation), plant and animal breeding e.g. City Farmer (Hamilton 2009, www.cityfarmer.info)

Marketing & Distribution:

The post-carbon food system with a focus on localized trade will require a more equitable approach with guidelines ensuring national flexibility and limiting international dependence. (Gallon Letter 2009) We will need to find mechanisms in the form of infrastructure, networks and alternative economic models that will re-develop local economies. One example is CSA, a relatively new socio-economic model of food production, sales, and distribution aimed at both increasing the quality of food and the quality of care given the land, plants and animals, while substantially reducing potential food losses and financial risks for the producers. (www.crestonfarmfresh.ca) Further support for localized distribution and processing can follow the lead of farmers markets and farm gate sales, increasing marketing opportunities for locally grown through buy local campaigns and support events that highlight the region's diverse food shed.

Additional interventions could include:

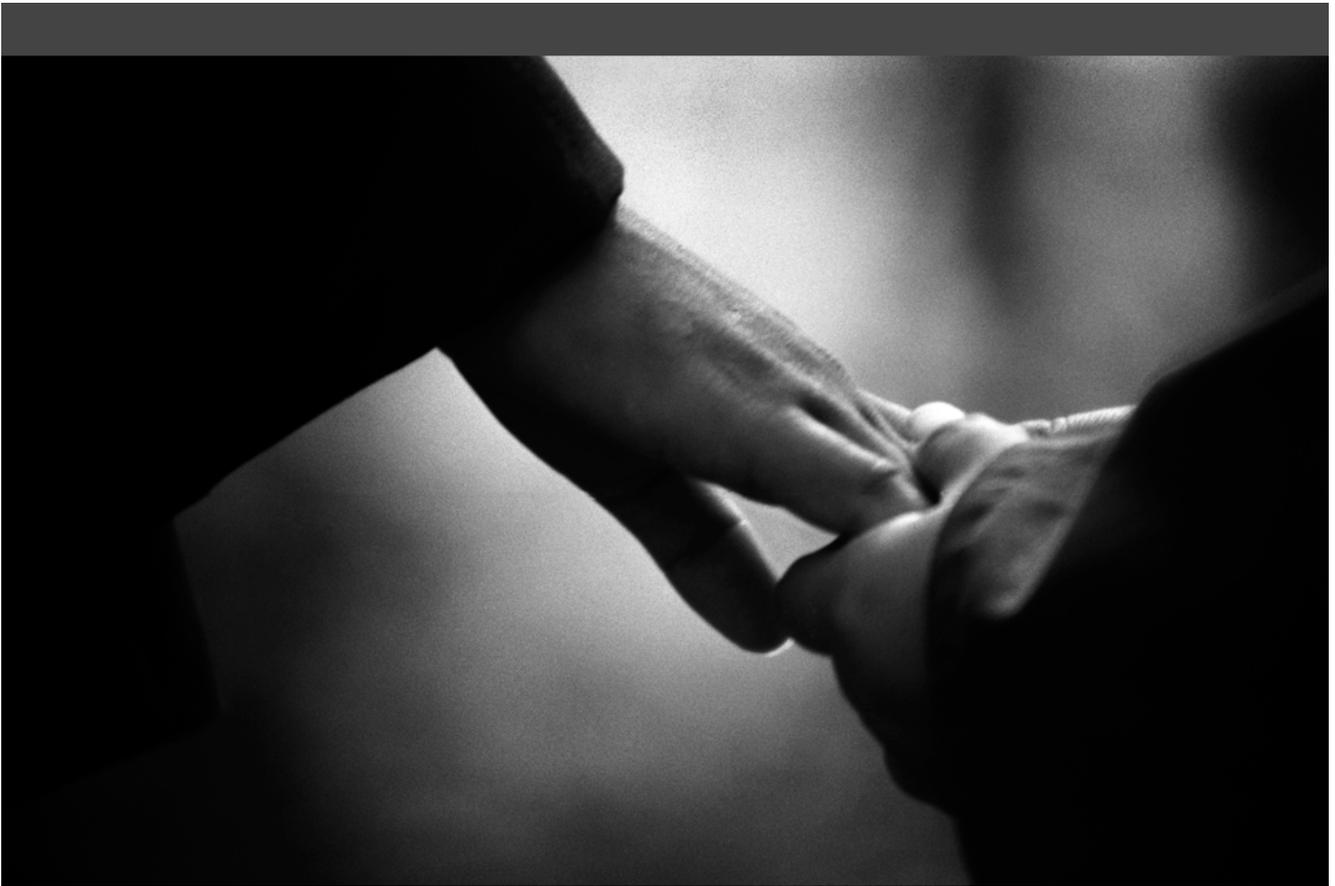
- Partnering with local producers, community, cooperatives, business and government organizations to increase the availability of healthy local foods
- Creating guidelines for local food procurement strategies for all public facilities

- Reducing regulations for processing of meat and vegetable allowing small producers to sell from home and also hold potlucks – churches etc...

As not all professionals and employed people can be expected to stop working in order to do manual labour in food production, there will need to be other avenues created for people to build connections with local farmers (much like one would build a relationship with a local doctor). Employers can provide support for such relationship by investing in local farms or buying shares in CSA's as part of benefit packages. There has already been a small movement towards this model.

Some employers across North America are partnering with farming cooperatives as a way to provide information and educational sessions to employees on healthy food choices. As part of corporate social responsibility (CSR) campaigns, companies are partnering with local farms, encouraging their employees to use company time to engage with local food projects. In Richmond BC, Telus, Fairmont Hotel and Greymont Mining employees annually join volunteers with the Richmond Fruit Tree Sharing Project to grow food for the food bank. (www.richmond-fruittree.com/projects.) Such

initiatives could be further supported with vacation time morphing into summer harvest time.



8. CONCLUSION - WHERE DO WE GO FROM HERE?



“To pay attention, this is our endless and proper work”

Mary Oliver *New and Selected Poems* (1992)

I write from my desk at Yasodhara Ashram, a yoga retreat and education centre on the east shore of Kootenay Lake in South Eastern BC. From this small corner of the world that I call home, I am working to transform how I relate to myself and to others by building integrated, resilient and intentional relationships with food. This summer in addition to working on this project I have been managing our food flow (orchard, kitchen, summer kitchen and garden) and also working with the local MLA to respond to the regional food movement by identifying the infrastructure and networks needed to move it to the next stage. It has been a perfect setting to imagine alternative approaches to our food systems.

I believe we are past the point of simplistic efforts; the time has come for radical adjustments that create integrated and efficient results. Adjustments in the form of actions and inquiry that encourage us to seek balance with the unknown and unexpected. The conversation must involve all levels of society, calling for reform and support from government, cooperation and creativity from the private sector and leadership and imagination from citizens. Most importantly the transformation has to happen today.

Considering how to embrace the change, the concept of resiliency (the ability to bounce back and thrive) is at the forefront of many discussions. Increasingly practitioners, activists, aca-

demics are discussing what resilient communities could look like, and are talking about not only the practical tools that are needed but also acknowledging the social and spiritual void that plagues much of the urban experience. Two questions summarize my own process:

- What are the powerful and practical tools that we need?
- What systems do we need to be strengthening?

With resilience in mind, I think of the words of Quaker activist Parker Palmer when he asks how can we better respond to “the heart’s longing to be connected with the largeness of life”. Looking specifically at food, I am curious about how to re-imagine a system that can bring forward the connection and community that my heart so desires.

My imagination lands at the base of a row of parsnips in the garden I have been tending this summer. Tiny and delicate, these seemingly robust tubers, require hours of careful attention to gently pull away the fierce competitors and give the seedlings the room to gather the energy they need to grow. Volunteers who work with me here gather in, heads bent and hands busy to free these precious leaves of green.

We work together to re-

veal the gifts, building on each other’s contribution until the job is done. Through our careful attention, these parsnips will increasingly strengthen until come next February, after bravely surviving a winter in the ground, they will be pulled up and celebrated as winter’s fresh produce.

In my own life, I also recognize this generosity of space and care as it is given to me so that I too can cultivate my energy, shed away the competing desires and listen with precision to what my heart truly wants. I come back to the two questions, and again think about how I want to focus my energy at a personal and communal level.

The skills required to grow, process and preserve food are of course essential to daily existence. But the act of growing, processing and preserving food offers us much more than nourishment on the table. It offers us the time to engage in relationship not only with each other, but also with ourselves and the environment that supports us.

Food provides a medium for building community and rediscovering a place of magic and wonder – a place that I think presents a powerful point from which to bounce back and thrive. As Swami Radhananda (president of Yasodhara Ash-

ram) has said, “The way things grow in the garden shows us the potential of the seeds of light within us all. The determination of plants is an example for us to carry forward into our own lives and into the world.”

In working with producers around the world, I have, in each setting, experienced how food links culture and identity. Through its embedded sense of comfort and security, food also provides an immediate orientation to the local culture by its invitation to engage with the land and its people.

In each case, it is people coming together, connecting with one another and moving away from nourishment that is impersonal, processed, or unconsciously driven, to an experience that engages ritual and relationship. The physical, mental, emotional and spiritual spaces created through food production, processing and distribution are vital to healthy and vibrant communities, as are the relationships that guide them.

I am often reminded here at the ashram, that it is the quality and consideration that I bring to my actions that unravels the mechanical and inspires the intentional, creating a place for the divine to enter in. In the garden, that opportunity is offered daily.



In the last years, the information and interest in food has exploded across North America. Today there is an incredible, plethora of efforts and innovation to reconnect people with food, who grows it and where it comes from. And while I have attempted to showcase some of the examples relevant to this topic, I have by no means exhausted the list. And so this document is a contribution to the discussion, a piece that may encourage you to pause today, think forward 20-30 years and imagine where

and how you would like to be.

As Vandana Shiva reminds us, through her work with her organisation - Navdanya, it is from the simple act of planting a seed, to layering a compost pile, to harvesting the abundance that we are quietly revolutionizing how we engage locally and globally.

Radical acts of change through beauty, quality and community.

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