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Toward Food System Sustainability through School Food System Change: Think&EatGreen@School and the Making of a Community-University Research Alliance

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Abstract: This paper describes the theoretical and conceptual framework and the research and practice model of Think&EatGreen@School, a community-based action research project aiming to foster food citizenship in the City of Vancouver and to develop a model of sustainable institutional food systems in public schools. The authors argue that educational and policy interventions at the school and school board level can drive the goals of food system sustainability, food security, and food sovereignty. The complex relationship between food systems, climate change and environmental degradation require that international initiatives promoting sustainability be vigorously complemented by local multi-stakeholder efforts to preserve or restore the capacity to produce food in a durable manner. As a step towards making the City of Vancouver green, we are currently involved in attempts to transform the food system of the local schools by mobilizing the energy of a transdisciplinary research team of twelve university researchers, over 300 undergraduate and graduate students, and twenty community-based researchers and organizations working on food, public health, environmental and sustainability education.

1. Introduction

This paper describes the theoretical and conceptual framework and the research and practice model of the first funded year of the Think&EatGreen@School project: a sustainable food system community-based action research initiative housed at the University of British Columbia, Canada. The paper reports on the experience of forming a community-university research alliance to foster food citizenship in the City of Vancouver and to develop a model of sustainable institutional food systems in public schools. Think&EatGreen@School is exploring how food policies, food practices and food learning within the Vancouver Board of Education and its schools can support a transition towards a more sustainable food system in Vancouver, Canada. The project is an example of a specific, local action that addresses global concerns about food system sustainability, food security, and food sovereignty.

School food systems are embedded within complex institutional frameworks with significant impacts on health and the environment. The Think&EatGreen@School initiative is informed and characterized by the concepts of food system sustainability, food security, and food sovereignty. Making explicit connections across these concepts from an experiential and educative perspective is a key goal of Think&EatGreen@School. The project promotes an educational process focused on schools as important agents of socialization in the shaping of children's food habits. By working closely with school authorities, teachers, parents and youth, the project intends to help students (and all project participants) reconnect with the sources of their food, becoming engaged food citizens. It is our belief that by enhancing the food citizenship of the City, the goals and objectives of the three foundational concepts are more likely to be demanded, supported and achieved by the residents of the region.

The first section of the paper presents the current context of the global food system and its detrimental impacts on the environment, with particular emphasis on contributions to climate change and human health. This section also briefly describes the rationale for selecting the public school system as the venue for food systems initiatives, as well as the organizational structure of the curricula and food systems in Vancouver schools. The next section describes the theoretical framework of the Think&EatGreen@School Project, based on the concept of integrative community-engaged scholarship and community-based action research methodologies. The following section further defines food system sustainability, food security, food sovereignty, and food citizenship as they combine to form the conceptual framework for the project. The fifth section of the paper describes the research and practice model of this community-university research alliance as a concrete example of how grassroots efforts can work to enhance institutional food system adaptations toward sustainability, food security and food sovereignty while reducing environmental impacts of schools. This includes a description of the local context of the research alliance as well as an explanation of Think&EatGreen@School's structure and an overview of our project activities. We then discuss the challenges inherent in attempting to overcome the separation between university and communities and between research, teaching and

service in the community. We conclude by sharing some observations of the Think&EatGreen@School project's evolution over its first year.

2. Context

2.1. Global Food System and Its Local Manifestations

This project emerges from concerns about the vulnerabilities and sustainability of our global food system and its local manifestations [1-5]. According to a recent High Level Conference on World Food Security, "securing world food security in light of the impact of climate change may be one of the biggest challenges we face in this century" [6]. In the past, food security was associated primarily with obtaining sufficient food; however, the concept has evolved to encompass a broader set of social, ecological and economic considerations. Although food security issues may be most apparent in developing countries, issues including hunger, obesity, access to sustainable food sources, and vulnerability to ecological crises, are prevalent and increasingly visible in Canada and North America [7-10].

It is through an environmental sustainability paradigm that our project confronts the need for systematic change in how societal institutions function in order to avoid the potentially devastating impacts of climate change. Initiatives that address food security have positive, congruent outcomes that coincide with efforts to address climate change. For 70% of the Canadian population, food is the most significant contributor to household ecological footprint [11]. In the EU the concerns are similar as over 30% of greenhouse gas (GHG) emissions from consumer purchases come from the food and drink sector [12,13]. The latest conservative estimates from the Food Climate Research Network in the UK suggest that almost one-fifth of the UK's total GHG emissions are associated with their food and drink [5,14]. And, a recent study in London has identified public institutional food procurement as having a particularly large part to play in the GHG emissions in the city [4]. The analysis also shows that London's food system overlaps with all other major sectors that contribute to overall GHG emissions in the Climate Change Action Plan, demonstrating that actions taken to mitigate climate change in the food sector will coincide with efforts in other sectors [4].

Our project also addresses the health consequences of the current food system, which in Canada include high incidence of diet-related chronic diseases such as cancer, cardiovascular disease, and diabetes. Increasing levels of obesity are of concern, particularly among children. Childhood obesity has tripled in Canada over the last 25 years, with one in four Canadian children now considered overweight or obese. Diabetes, associated with obesity, is also rising dramatically among children. Despite these indicators of overconsumption, recent diet surveys have shown that many Canadians do not consume the recommended number of servings of vegetables, fruits, whole grains, and dairy products [15]. In addition, many Canadians do not appear to be meeting their needs for nutrients such as calcium, Vitamin A, Vitamin D, and fibre [16]. The co-existence of overconsumption of calories and underconsumption of certain nutrients relates to high consumption of energy-dense/nutrient-poor foods such as sugar sweetened beverages and 'junk foods' like potato chips, chocolate bars, and candy.

To achieve food security, which is inseparable from health and environmental sustainability, it is crucial to overcome the 'distancing' and disconnection that characterizes the current global food

system. Spatial, temporal, economic and social distancing contribute to epistemological and psychological distancing: "few consumers have much knowledge of the biological, social or technical parameters and implications of food production in the global village" [17-20]. As Wendell Berry [21] states, we need people to begin to "eat responsibly". An understanding of the complexity of our food system and its impacts on ecosystems is a necessary precursor for this change to occur. This is also the initial step towards fostering a food culture, in which consumers are 'food citizens' who understand the impacts of their food choices on social, ecological and economic sustainability [18].

2.2. Schools as a Site for Food System Transformation

The educational system has proven to be a highly effective medium through which issues of important social change influence the youngest members of our society, and this influence can be used to change our food culture. Schools in British Columbia (BC) have campaigned successfully against racism, homophobia, and smoking. Schools are avenues through which students have learned about the 3Rs (reduce, reuse and recycle) and many have had a long history incorporating agriculture into the classroom. The problems we are facing require a profound change in the cultural fabric of our society, and it is natural that the educational system, as one of the most powerful agencies of socialization, be considered a key avenue through which such change can be spearheaded. Food offers great opportunities to integrate knowledge and skills across disciplines because it provides a palpable connection between humans and nature. The BC Agriculture Plan identifies the growing divide between youth and the origins of their food, and stresses the need to reconnect young people with the land, link urban and agricultural communities together, and provide hands-on learning opportunities to the leaders of tomorrow as a key strategy [22]. By increasing food and sustainability literacy together in our educational systems, we can begin to overcome passivity, and the uncritical and dependent consumerism that characterizes our society's relationship with food.

Public schools are the sites of massive consumption of food. Their food procurement practices, the diets that they directly or indirectly promote, the physical distance of their food sources, and the ways they dispose of food waste have ecological, social and economic impacts on local communities and on the local food industry. Schools are also places where children have the potential to engage in the entire food cycle through growing, harvesting, preparing, cooking, eating and composting. The goal of school food system transformation is not to create wholly self-sufficient, food-producing schools, but rather to provide opportunities for students and staff at all levels to reconnect with the sources of their food and to learn to see food as the grand connector of all aspects of human life, including the relationships between humans and nature. The ways we learn about the connections between food, health and the environment at school—both explicitly and implied by the modeling of behaviors—have a lasting influence on the health of children, the school community, and the ecosystems within which schools are located. Children learn about the relationships between food, health and the environment through the school curriculum, by the methods that teachers and the school community choose to teach about food, health and the environment, and by experiencing the places where food is taught, consumed and disposed. From the direct effects on children and community learning about food, health and the environment, to the cumulative effects on food systems through procurement, production, consumption

and disposal, school food systems are important contributors to the overall impact of humans on the planet.

Our project has been informed by examples of successful policy and initiatives documented locally and elsewhere [22-27]. In California, the *School Lunch Initiative* in the Berkeley Unified School District [28] has had tremendous success in promoting healthy, seasonal, locally grown food in school cafeterias. They have created district-wide food- and garden-based curricula and have made remarkable changes to district food policy. One of the keys to their success is the ongoing collaboration with community-based food security organizations, which provide specific support and expertise that is often difficult to find in a school system. Similar initiatives are occurring at Cornell University through their *Discover the Food System* initiative, which targets youth between the ages of 12–18 with guided experiential learning programs focusing on understanding how food gets from the farm to the table, and how eaters are involved in the entire system. In England, the *Food for Life Partnership* has created a network of schools and communities committed to transforming food culture. The partnership emphasizes the importance of engaging schools and communities in the entire food cycle through providing access to seasonal, local and organic food as well as facilitating the development of the skills needed to cook and grow fresh food. In Finland, there are two advanced food system education projects studying the connection between education and the food system: the *Sustainable Food Education for Self-Efficacy Development (SEED)* project and the *School Goes to the Farm* project. *SEED* is exploring ways to encourage students to act for a sustainable society through enhancing awareness and self-efficacy in environmental and socio-cultural questions associated with food production, consumption and health on the local and international levels. The project provides research-based models for teachers interested in innovative methods, learning environments and curricula for education for sustainable development. In 2006–2007, the *School Goes to the Farm* project connected local schools with local farms, where lessons were co-created by teachers and farmers. A guidebook has been created with teacher materials and practical tips for developing future programs focused on rural-sustainability education.

2.3. The British Columbia School Context

In Canada, education falls under provincial legislation, meaning that each province in the country determines its own educational standards. In BC, the provincial Ministry of Education sets the education standards for students in grades K (kindergarten) to 12 through the provincial curriculum. These standards are called Prescribed Learning Outcomes (PLOs), which outline the expectations for what students should learn and be able to do at each grade and within each subject area [29]. The PLOs provide a framework within which teachers create their personal education programs for their classes. For example, there are three PLOs for the Grade 3 (student age: 7–8) Life Sciences unit: (1). Compare familiar plants according to similarities and differences in appearance and life cycles; (2). Describe ways in which plants are important to other living things and the environment; (3). Describe how plants are harvested and used throughout the seasons [30]. It is within the professional autonomy of the classroom teacher to decide how these broad learning outcomes are met, allowing for a diversity of pedagogical approaches to be employed within the province. In addition to the provincial curriculum, education boards have the authority to develop the local curriculum in areas where a provincial curriculum does not exist.

Funding for school food in BC combines market-based and subsidized models, the latter targeting low-income areas, determined vulnerable by socio-economic metrics. In the Vancouver school district, 22 schools out of 109 receive provincial funding for meal programs reaching approximately 15% of the city's student population [31]. Another 13 elementary schools have food programs externally funded through parent or community groups involved in the school. There are 18 secondary school cafeterias in the Vancouver school district, 8 being operated as teaching cafeterias, 8 operated by private sector contractors, and 2 operated through school district employees alone.

Since 2010, provincial legislation in BC requires all public institutions to be carbon neutral; school boards across the province are required to report on their operational and behavioural efforts to decrease their overall greenhouse gas emissions based on fuel, energy, and paper usage, and have to pay to offset the remaining emissions, making the net effect of activities carbon neutral. Food systems contribute significantly to institutional carbon footprints, and policy and program initiatives that deal with their role will therefore be of great importance.

3. Conceptual Framework

The following concepts and approaches, Food System Sustainability, Food Security, Food Sovereignty, and Food Citizenship, combine to guide the conceptual framework of the Think&EatGreen@School project. The Sustainable Agriculture Research and Education Program (SAREP) at UC Davis defines a sustainable community food system as "a collaborative effort to build more locally based, self-reliant food economies—one in which sustainable food production, processing, distribution and consumption is integrated to enhance the economic, environmental and social health of a particular place" [32]. The goals of this system include "improved access by all community members to an adequate, nutritious diet; a stable base of family farms that use more sustainable production practices; marketing and processing practices that create more direct links between farmers and consumers; food and agriculture-related businesses that create jobs and re-circulate financial capital; improved working and living conditions for farm and other food system labor; and food and agriculture policies that promote local food production, processing, and consumption" [32].

The United Nations provided the conceptualization of *food security* upon which many debates have been constructed. It states that food security "exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" [33]. To achieve food security, all four of its components must be present. These are:

- Availability of food, *i.e.*, the quantity of food available for a given population;
- Stability of supply, *i.e.*, how reliable the food source is over time;
- Accessibility of food, *i.e.*, the ease with which a population may obtain available food;
- Utilization of food, *i.e.*, the nutritional, cultural and culinary acceptability of the food, as well as the extent to which people have the skills to properly utilize it.

Whether in wealthier Northern countries or the global South, food security issues are tightly coupled to climate change concerns: food production practices impact climate and the changing climate affects food security. In a detailed and massive review of the literature on climate change and food security

focused in British Columbia, Ostry [34] concluded that the effects of global warming, although difficult to predict to a final degree of certainty, will be long-lasting and potentially devastating to the province's farmland, forests and water ecosystems. Food security will be a growing concern for all communities across the province as the land- and sea-scapes in which we grow and harvest our food will become increasingly unstable. Approximately 45% of food consumed in BC is imported and therefore "in the future, climate change may affect the food security of BC communities due to its impact in places outside our borders" [34]. It is necessary for current governments to understand the extent to which these changes will affect the province and plan appropriately in order to mitigate and adapt to these adverse impacts.

Key voices responding to these transformations of the food system on a global scale have challenged that formulation of food security as an organizing concept, and have, as an alternative, proposed the concept of *food sovereignty*, defined as "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods" [35]. A critical issue emphasized by advocates of food sovereignty is that the chosen style of development of the global North alongside most southern governments has caused the erosion of the conditions that would allow the global South to attain real food security [36-39]. They argue that a development model marked by the dumping of food surpluses from Northern countries has created a number of serious problems. Southern countries have become dependent on surpluses of cheap food, which may increase the availability of calories but with the consequence of inducing a dietary transition that displaces the production and consumption of local traditional staple foods. The traditional staple foods are historically anchored in local culture and local ecosystems, as well as healthier and lighter on the planet than the surplus foods transferred from North to South in the name of development. The evidence supporting these claims is rapidly growing [12,40,41].

The global food policies that have driven this dietary transition in the global South have developed hand-in-hand with the promotion of liberalized trade relations [42]. National policies in wealthy countries offer certain crops a global competitive advantage, which results in food producer specialization and in the creation of agricultural export platforms for products that meet North American dietary expectations: heavy in carbohydrates, fat and animal protein. The foods produced for North American tastes have a relatively heavy greenhouse gas emissions burden, and the mass demand often results in the displacement of local, sustainable, traditional peasant agriculture in the global South. The rapid spread of Northern diets has also affected environment and health at each level of the food system—production (soil and water, air contamination, worker poisoning and loss of land); intensive use of oil in processing, transportation, distribution, consumption and end disposal—causing epidemics of malnutrition in both the North and South. The current situation has negatively affected those that export as much as those that import, and is now further complicated by the realities of climate change.

Jennifer Wilkins defines *food citizenship* as "the practice of engaging in food-related behaviors (defined narrowly and broadly) that support, rather than threaten, the development of a democratic, socially and economically just, and environmentally sustainable food system" [43]. In order to create a sustainable, secure and sovereign food system, we need an educated citizenry that is food literate. A food citizen is an individual with duties and responsibilities as well as rights in relation to food choices.

The impacts of these choices on human and environmental health will depend both upon food citizen's understanding of the food system and the many implications that precede the act of eating, *i.e.* considerations of how food arrives on one's plate.

Learning and acting to address these global problems at the local level—that is, where ordinary people can make a direct difference—requires a participatory approach because the dynamics of the globalized food system prevent the development of food citizenship by causing a physical and psychological distancing between people and the origins of their food. Food citizenship, like food sovereignty, emphasizes the right of people to decide the shape of their food systems, not only as consumers in the marketplace but as citizens influencing all levels of decision-making that determine what ends up in their bodies and in their environment. However, the right to participate in the process of decision-making about food is not only a right to vote with one's dollar: to buy 'local' or buy organic. It requires the creation of the conditions that make the food system responsive to people's collective decisions and needs. The rights of food citizens therefore require a bottom-up approach to creating sustainable food systems, in which food is produced, processed and traded.

Rather than embracing a single foreclosed definition of food system sustainability, food security, and food sovereignty, the members of the Think&EatGreen@School research alliance have framed its work using a flexible concept of *food security* with six dimensions: **A**ffordability, **A**vailability, **A**ccessibility, **A**ppropriateness (nutritionally, culturally, and morally), **S**afety, and environmental **S**ustainability (AAAASS). There is some overlap between the concepts within each of the dimensions, which is unavoidable due to the complex and interdependent nature of food systems. For example, sustainability commonly refers to more than ecological and environmental issues. The social and economic elements of sustainability are embedded within the other dimensions of the AAAASS, in *Appropriateness* specifically, as culturally and morally appropriate food is produced by workers that receive fair compensation for their labour. The strength of this multi-dimensional conceptualization of food security lies in its emphasis on the reciprocity of human and ecological health in which food system sustainability plays a critical role [18,44-46]. The concept of food **S**overeignty further strengthens and highlights the pervasive social and political aspects of our characterization of food security, and is understood as "the right of each nation to maintain and develop its own capacity to produce the staple foods of its peoples, respecting their productive and cultural diversity" [47]. Food sovereignty has entered the discussions of the Think&EatGreen@School teams, and has become an additional "**S**" in our conceptualization of food security. "The heart of food sovereignty is reclaiming decision-making power in the food system. This means that people have a say in how their food is produced and where it comes from. Food sovereignty seeks to rebuild the relationships between people and the land, and between those who grow and harvest food and those that eat it" [48]. Think&EatGreen@School advances these goals through concrete school projects ("Community Impact Projects") in the areas of food production at school (*i.e.*, food gardens); food consumption, preparation and procurement at school (*i.e.*, assessment of school diets and eating spaces); and through curriculum and pedagogical innovations.

4. Theoretical and Methodological Framework

An essential characteristic of the Think&EatGreen@School community-university research alliance is the diversity of perspectives and academic, professional and organizational backgrounds of its members. An action-research collective of this nature, which is substantially different than an advocacy social movement or a political organization, cannot be constructed within a single theoretical and conceptual framework. On the contrary, it must work within a pluralistic approach that accepts many possible ways of articulating its shared goals. Moreover, theoretical and conceptual differences are used as a driving force to generate research, revise or sustain research questions and develop specific action-research projects.

Our project is a form of integrative research, combining interdisciplinary and transdisciplinary food system studies that include academic and non-academic participants in the creation of new knowledge and theories [49]. This interdisciplinary food systems research blends sustainability, public health and pedagogy research approaches. Within the scientific community, there is recognition that in order to address complex problems there is a need to combine disciplinary expertise [50]. This non-traditional approach makes use of the skills and perspectives of multiple disciplines in the creation of knew knowledge [50]. Through the integrative lens of a food system approach, we attempt to understand the emergent properties of food when it is studied holistically. This facilitates consideration of the many intricately related factors involved in getting food from farm to consumer, and from there, to its productive re-integration into the food cycle. By acknowledging food systems as an elaborate terrain of scientific investigation, our approach requires interventions that have multiple dimensions of expertise and an appropriate level of complexity. This complexity is best investigated in collaboration with interested communities, and the more profound the engagement of stakeholders from these communities, the deeper and subtler the knowledge thus obtained.

Community-based action research (CBAR), a process with dual goals of scholarship and social change, has become increasingly appealing to university researchers interested in investigating real-world complex systems characterized by diverse, intergenerational stakeholders, multiple areas of expertise, and the interests and agendas of public, academic, government and not-for-profit organizations [51]. CBAR engages in iterations of learning and change that require community collaboration to define the problem, generate locally-produced knowledge, and devise and implement locally-appropriate actions to create mutually acceptable change [51]. From our perspective, CBAR enables researchers to engage in systemic research (knowledge creation) that can be applied to other contexts (knowledge mobilization) while at the same time, develop supportive networks of collaborative relationships within a community (knowledge co-production and translation). This process increases the potential for replicating the successful outcomes of a project, while ensuring a high probability of continuation of project objectives from within a community [52].

Think&EatGreen@School frames its collaborative work as a process of *community-engaged scholarship*, after Ernest Boyer's [53] call to recognize a diversity of scholarships, including a scholarship of engagement with social, civic and ethical problems. Our development of a map of community-university research approaches (Figure 1) provided us with a common language by which to articulate our progression through the landscape of engagement. Rojas, Valley and Sipos [54] developed this map as a means of encapsulating our attempt to understand changes in the CBAR projects which, after a decade of evolution and trial and error, led to the formation of

Think&EatGreen@School. This graphic representation is one of our articulated achievements of grappling with *community-engaged scholarship* (CES) thus far, insofar as it helps us to demonstrate movement towards CES over time. Although our model greatly simplifies the components of CES into two axes, we have attempted to distill the key components as a means of stimulating discussion, alongside the visual demonstration. We have identified two axes, where the x-axis runs from "inquiry" to "engagement," while the y-axis moves from university- to community-generated research agendas. The former describes the continuum of activities that can take place in research programs, such as gathering information from secondary sources, observation, surveys, and structured interviews to rural rapid appraisal techniques and co-developing, facilitating and evaluating outreach interventions with community partners. The latter particularly describes *who* initiates and determines the research question(s).

Think&EatGreen@School can claim that all members of the alliance articulated the research agenda and its objectives, methods and expected outcomes. Due to the large nature of the project, not all of the research activities fall along the right-hand side of the spectrum from inquiry to engagement; however, the map allows us to articulate where our current (and future) activities fall along the continuum. This provides a valuable perspective when planning; a type of research compass that allows us to verify that our research is in the realm of "action". Based on our experience, the two continua in the map have a positive relationship on one another. For example, we have observed that, as the projects that preceded Think&EatGreen@School traveled along the x-axis, growing from community inquiry to community engagement, the agendas driving those research projects became increasingly community-driven (for details about the projects, see [54,55]).

Figure 1. Map of community-university research approaches.
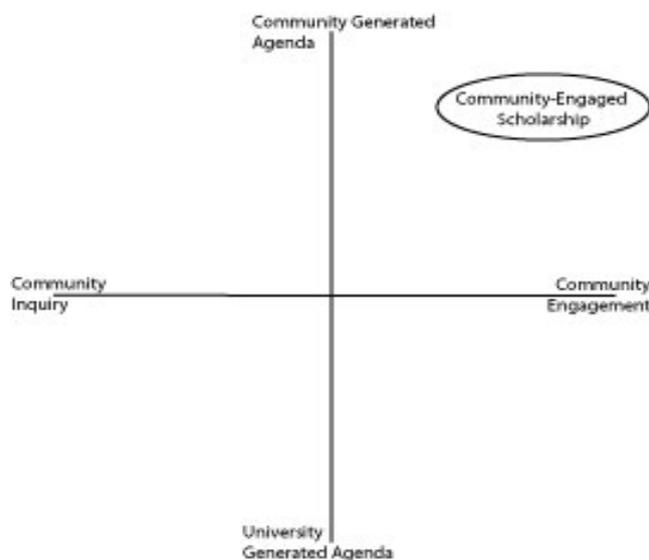
5. Think&EatGreen@School

The Think&EatGreen@School project is a collaboration amongst a wide range of regional and local food security, health, education and environmental organizations as well as university-based partners. It is supported by a $1 million grant over five years from the Social Sciences and Humanities Research

Council of Canada (SSHRCC) through a Strategic Research Grant from the Community-University Research Alliance (CURA) for Canadian Environmental Issues program. The grant award itself came as recognition of the successful process of building and developing the action research alliance, both in the short term, as we created a formal structure for the Think&EatGreen@School project, and in the long-term development of relationships of mutual trust that laid the foundation for the research alliance.

Think&EatGreen@School aims at fostering *food citizenship* by providing its entire community of learners—from pupils to professors, teachers to chefs—with opportunities to be involved in all aspects of the food cycle, to learn how to regain the right to participate in the decisions that shape the food system of public schools and educational institutions, and by extension, the food system of the City of Vancouver. The project creates an experience of collaborative learning amongst a multitude of stakeholders, from university students and scholars, health and educational institutions to a network of community-based and community-supported nonprofit organizations working on food and environment, linking farms to schools, city dwellers with farmers, school cooks with successful green chefs, restaurateurs, restaurant designers, gardeners, school authorities, teachers and students. It is a kind of learning (research, teaching, community service and community engagement) that aims at having a transformative impact, by means of experiencing food from its origins in soils, to its preparation, procurement and consumption, and end products disposal by means of recycling and composting. The project is working to deepen a sense of place within school communities and to help children and youth in elementary and secondary schools, parents, teachers, researchers and professors to reconnect with our sources of food, nature, and the social relationships that shape culture.

Think&EatGreen@School intends to identify and address at the local level the contribution made to climate change and to environmental degradation by the food system. It intends to mitigate and adapt to the general impacts of climate change and environmental degradation *on* the food system at the local level. Without strong links to regional farmers, cities will lack the safety net in times of crisis to protect their inhabitants against the worst effects of a vulnerable global food system. A large proportion of city dwellers are trapped in an illusion of food system success resulting from an impressive globalized capacity to produce large quantities of food and to transport it quickly to and from all points of the world, making it possible to consume any food from anywhere (nowhere) at any time.

The question addressed by Think&EatGreen@School is whether the hundred of thousands of people that make up complex institutions such as a public school system can participate in a process of social learning, creation and action capable of influencing the food system to contribute to a transition to sustainability. The working assumption, shared by the individuals and organizations involved in our community-university research alliance, is that it is possible. Thus, Think&EatGreen@School is a local effort to live out the concepts embodied in the AAAASSS model towards the transformation of a regional food system. The project addresses regional food system sustainability, food security and sovereignty, and institutional adaptations to climate change within the context of Vancouver schools by:

a. Exploring how the public school system can reconnect food, health and the environment;
b. Promoting theoretical and practical understanding of food system sustainability and opportunities for students to connect with the sources of their food through curriculum development and integration;

c. Developing concrete policy recommendations for individual schools and the Vancouver School Board for mitigating the environmental impacts of institutional food systems;

d. Strengthening networks of food security organizations to enhance regional access to sustainable food procurement sources, enabling key stakeholders in the local food system to be actively engaged in the making of more sustainable food systems in complex institutions.

5.1. Local Context and History of Think&EatGreen@School

Think&EatGreen@School is a culmination of a number of trends in the Lower Mainland of British Columbia, including the City of Vancouver, the University of British Columbia (UBC), and the state of scholarship, policy and public interest in sustainability and food security. These trends have been mutually reinforcing and influential, and have set the stage for the development of the action research alliance.

The Lower Mainland region of British Columbia includes the City of Vancouver, several other smaller but rapidly growing urban centers, and the Fraser Valley river basin, a swath of rich arable land fed by the Fraser River. The City of Vancouver itself is a highly dense, diverse metropolis, organized into neighbourhoods with distinct characters. The city and surrounding area ('Metro Vancouver') has experienced dramatic growth; the population of Metro Vancouver, at just over two million, is almost double in size from the early 1980s [56]. In addition, by 2006, 41.7% of the City of Vancouver's population belonged to a visible minority group [57]. Urban expansion is encroaching on a significant belt of farms that surrounds the City and it is protected by legislation embodied in an Agricultural Land Reserve [58].

Over the past decade, Vancouver has experienced a renaissance of interest in urban agriculture, food security and sustainability, at the front of a curve that has swept across North America. The city has a Food Policy Council tasked with providing policy recommendations to enhance the operation of regional food systems. In 2006, the city issued a challenge to residents to establish 2010 new community-shared garden plots by 2010, a goal that was exceeded by December 2009 [59]. Vancouver has five farmers' markets, including a winter market, as well as several backyard growers' markets, a "guerilla gardening" movement, and a thriving local foods movement. The 2007 book, *The 100-Mile Diet: A Year of Local Eating*, which helped popularize the local eating movement, was written by two Vancouver writers [60].

Think&EatGreen@School was incubated at UBC, building upon three large ongoing projects that involved undergraduate and graduate students in the Faculty of Land and Food Systems (LFS) in food security research and social change activities. The LFS core curriculum includes a sequence of three courses in Land, Food and Community that involve undergraduate students in community-based inquiry and research. The second-year course in the sequence, LFS 250, has involved 2000 students over the past ten years in the *Food System Project in Vancouver*. From 2000–2004 and 2007–2008, seven cohorts of students were involved in conducting food security assessments in Vancouver's 23 'communities' [61].

In 2004–2005, the students focused on Vancouver high schools with the permission of the Vancouver School Board (VSB). That year, 60 UBC teams of seven students developed a research design for investigating food security in planning, home economics and French immersion science classes in two of the 18 Vancouver high schools and their catchment areas. The pilot projects conducted in the two schools

included 60 focus groups and pre-testing of a questionnaire with 300 high school students, with the intent to elaborate and refine a methodology for subsequent stages of study. The faculty members and partners involved in the Food System Project in Vancouver were deeply concerned after realizing how little elementary and high school students knew about food, and the poor food choices they were making. Concern for children as most vulnerable and an awareness that the 108 schools in Vancouver have a significant impact on the health of the children and the environment was the impetus for the creation of Think&EatGreen@School.

As of 2006, the UBC-based Community Food Assessment Project (CFAP), also known as the BC Food Security Project, has been situated primarily in LFS 350, the third-year Land, Food and Community II course. This project grew out of the Food Security in Vancouver project (in LFS 250), and is an attempt to provide students with a province-wide perspective on food system questions across urban, suburban and rural communities. Community partners therefore include leaders in their field of food system sustainability, including rural and urban farmers, community gardeners, politicians, health authorities, teachers, food distributors, and resource and waste activists.

At the same time, in the fourth-year capstone course of the Land, Food and Community series, LFS 450, advanced undergraduate students engage in research and action projects on the UBC campus, as part of the *UBC Food System Project*, looking at the campus as a living laboratory for creating a sustainable and secure food system [55]. By 2009, after eight years of engagement on campus, the UBC Food Systems Project had acquired its own momentum and the UBC faculty and partners were ready to turn to the Vancouver schools where they perceived a wealth of untapped resources and interest in improving food-related health and learning for Vancouver's children. The process of creating transformative change across the entire UBC campus food system has resulted in a series of lessons that have informed the development of the Think&EatGreen@School action research alliance, including how to engage partners, how to successfully involve students in research and community change, and how to avoid fragmentation of efforts across a multiplicity of projects and partners.

5.2. Governance Structure and Organization of Think&EatGreen@School

The governance structure of Think&EatGreen@School uses a tree as a metaphor to reflect the values of the project participants (see Figure 2). This is an organic image used for conceptualizing the governance structure of the project and it emerged through consultation with community partners during the process of developing the project's grant application.

The roots of the tree represent the origins and the foundation of the project, the past and continuing efforts of the partner organizations as well as the broader history of environmental and food advocacy in the city [62]. This includes all of the 'underground' contextual foundation that has made it possible for the project to emerge, including the food security and environmental movements locally, regionally and beyond. The roots anchor the project in place and acknowledge its historical specificity in place and time.

Figure 2. The governance structure of Think&EatGreen@School depicted with a tree metaphor.
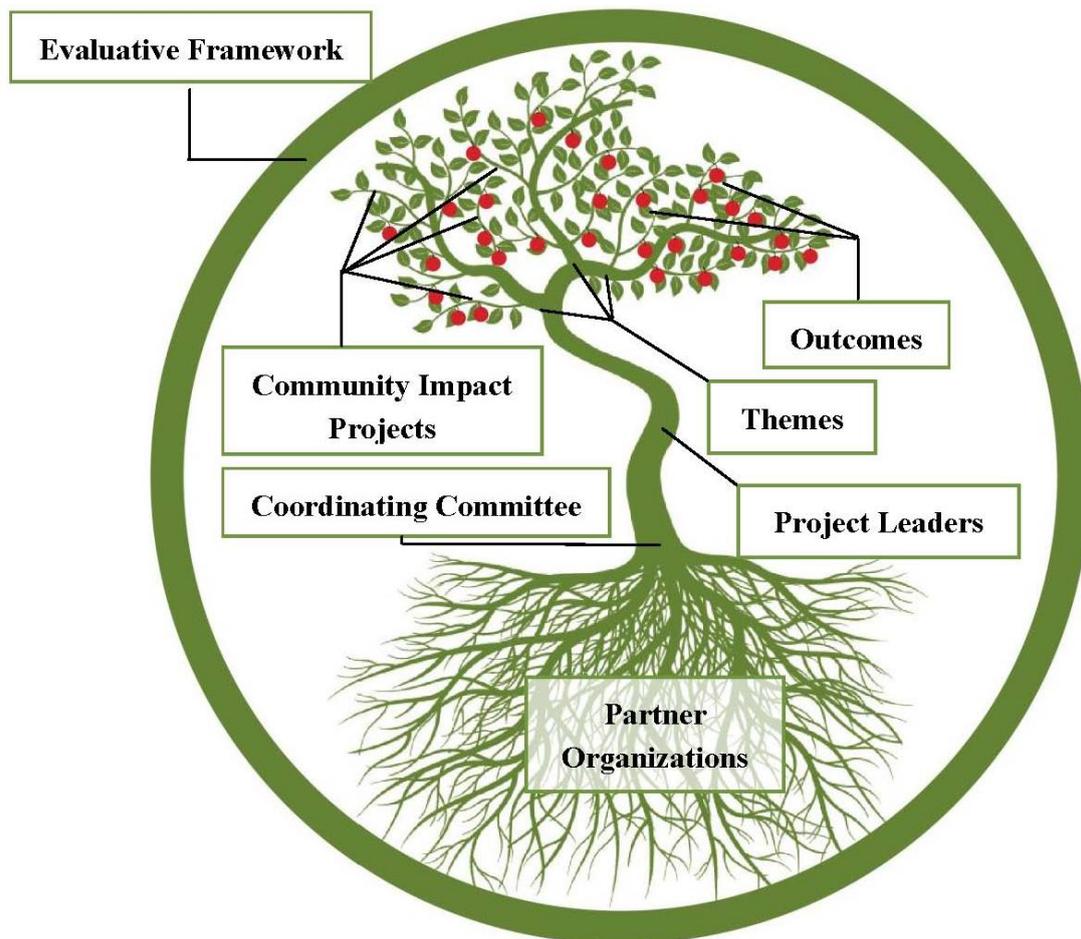
The Coordinating Committee (CC) represents the **root crown** of the tree. The role of the CC is to lead the implementation of the project, administer the CURA grant, facilitate communication between the project participants, organize the various project meetings and workshops, implement knowledge mobilization and contribute intellectual guidance. The members of the CC are entrusted by the whole team to maintain the vision for the project and are able to provide resources to all other parts of the project. The CC includes the Principal Investigator, a Co-Investigator, the Project Manager, the Project Coordinator, the Community Liaison, and the Graduate Research Assistants (GRA). Although the GRAs function in coordination with the CC, they do not regularly attend CC meetings.

The trunk of the tree comprises university- and community-based co-investigators as well as co-investigators from city governance institutions responsible for health, education and policy making who are the project leaders in each of the three themes: pedagogy, practices and policy, further specified into the themes that provide a focus for the Community Impact Project, that is, the specific projects delivered in the schools. Those themes are Food Production at school (which includes composting and disposal of end products); Food Consumption at school (which includes food procurement, preparation and cooking) and Curricular and Pedagogical innovations aiming at integrated learning on the whole cycle of the food system. Each theme has a university-based and a community-based or governance institution-based Project Leader.

Project Leaders ensure continuity in the activities of each theme as well as maintaining communication for the overall project. They advise the CC and help guide the overall vision of the project alongside the CC. The members of the trunk, like the roots, are responsible for knowledge mobilization and intellectual guidance, but with focus in their field of expertise (academic project leader) or organizational focus (community-based project leader). In this paper, we refer both to 'partners' and 'co-investigators,' as the lead contact people in most of the partner organizations have become full co-investigators and collaborators on the project. The trunk is responsible for coordinating, integrating and harmonizing the outcomes of Community Impact Projects (CIPs) in each of the three themes, which are the actual vehicles that contribute to processes of transition, from the bottom up, towards sustainable food systems in the city and the region.

From the trunk of the project emerge the main branches of the tree, which represent the next level of specialization and concentration of expertise: the three themes of the project, directed by specific co-investigators. The expertise of the co-investigators in these themes contributes to the development of the CIPs that address the research questions pertaining to each theme. These co-investigators are responsible for sharing the knowledge generated through their academic or professional research with the rest of the project participants and the specific communities of impact. They are also responsible for directing and developing the activities and research of the graduate research assistants associated with each theme.

Smaller branches grow from the main branches, represent the Community Impact Projects, the more specific school projects. Under the direction of the co-investigators, the graduate research assistants lead the implementation of the CIPs and it is at this level that UBC undergraduate students and students from the Vancouver K-12 schools are to be most involved. Students are engaged in diverse projects related to: food production at schools through food garden and orchard development, building and maintenance; evaluation of the health and environmental impacts of food consumed at school, determining best practices in curricular and pedagogical innovations; and composting and productive disposal of end products of the food system of the school. Other projects evaluate the nutritional quality and GHG emissions of different diets, evaluate cafeterias and eating spaces, both from a design perspective as well as the type of social interactions they facilitate or prevent.

The leaves of the tree are manifestations of the actions and experiences of all the project participants, from the roots through the trunk and branches. The activity and energy of a branch will create leaves in that area of the tree. It is through the accumulation of the positive experiences of the project participants that we will see the fruits of the tree—successful project outcomes. Within each fruit is a seed, which represents knowledge mobilization efforts. These seeds will be able to germinate, take root, and replicate elsewhere.

The graduate research assistants represent the circulatory structures of the tree, connecting co-investigators and partners as well as coordinating the on-site, school-based efforts of the undergraduate students involved in each theme, delivering a constant flow of information (water and nutrients) to all aspects of the project. The outer circle of the diagram represents the evaluative framework of the Think&EatGreen@School project, measuring the impacts that the tree has on its surrounding environment. Co-investigators and graduate research assistants will be responsible for adapting and creating evaluative tools and indicators for measuring the project outcomes.

The Think&EatGreen@School project comprises a wide range of partners that can be described in five general categories:

1. Local community-based organizations that focus on food security, sustainability, and related issues, like the Environmental Youth Alliance (EYA), Farm Folk/City Folk, Growing Chefs, and the Society for the Promotion of Environmental Conservation (SPEC);

2. Permanent city-wide organizations and bodies, involved in governance, service delivery and policy-making, including the Vancouver School Board, the Vancouver Food Policy Council, and Vancouver Coastal Health;

3. Community-based organizations that serve the entire Province of British Columbia, or beyond, including the Public Health Association of British Columbia, Canadian Centre for Policy Alternatives, and the Evergreen Foundation;

4. Individual city schools (22 in the first iteration of the project in the Fall of 2010); and

5. University-based partners, including Simon Fraser University, the University of British Columbia, and Ryerson University. This category also includes the multiple units within these institutions; for example, within UBC partners include the Schools or Faculties of Community and Regional Planning, Education, Landscape Architecture, Land and Food Systems, and the Centre for Sustainable Food System Research at the UBC Farm.

These five categories are permeable; there are organizations that cut across the boundaries, or that fit only loosely within them. However, the categories are helpful for understanding the scope and multiple kinds of relationships involved in Think&EatGreen@School.

5.3. Community Impact Projects

The activities of the project are organized into three themes—pedagogy, practices and policy—each of which is associated with different Community Impact Projects (CIPs); at the centre of each theme, CIP and the project as a whole, are outcomes that seek to increase health and lighten environmental impacts. The CIPs aim to address particular research questions as well as to create change on the ground. There are five primary research questions; the first four are within the domain of the pedagogy and practices themes, and the fifth is directly associated with policy:

1.   What are the best methods for building, managing, sustaining, and integrating into the curriculum school vegetable gardens and fruit orchards?

2.   What are the best methods for increasing food and sustainability literacy amongst teachers and students?

3.   How can cafeterias and other school food services be integrated in the school curriculum to provide learning opportunities for all students to obtain fundamental skills of planning, preparing, cooking and consuming healthy, nutritious and wholesome meals within an agreeable, community-enhancing and inviting physical space?

4.   How can community-engaged scholarship enhance undergraduate and graduate student learning of food systems sustainability?

5.   What policy changes can be developed to create a healthy, sustainable school food system and at which appropriate level (school, school board, city, province) will these changes need to take place?

Particular CIPs are coordinated and co-directed by university- and community-based co-investigators who have a history of involvement in the schools. The CIPs are animated by the thematic research questions,

the overarching goals of the Think&EatGreen@School, and the particular needs and interests that energize specific school communities. The schools that are involved with the project have been part of an on-going consultation and have articulated their interest in working with project stakeholders. Only schools with supportive administrators have been enagaged in CIPs. The Vancouver School Board is an official partner in the project and the associate superintendent of learning services of the school district and the district sustainability coordinator are both co-investigators in the project; however, school participation in CIPs is entirely voluntary. The first year of Think&EatGreen@School saw the scoping of potential community impact projects (see Table 1), and the initiation of several; year two will see more CIPs developed and implemented.

Table 1. Potential community impact projects (CIPs) by theme.

Pedagogy	Practices	Policy
▪ Strengthening the connection of gardens to classroom and subject curriculum; ▪ Developing in-class food system resources that focus on sustainability across the curriculum; ▪ Developing methods to incorporate more local, seasonal ingredients into home economic, cooking classes and teaching cafeterias; ▪ Investigations of the food provided in establishments of the catchment area of the school; ▪ Developing a program of awareness of climate change and its relationship with the food system across the curriculum	▪ Developing a district wide Food Garden Maintenance and Management Plan based on agroecological and landscape multifunctionality theory. ▪ Creating new and/or maintaining old school gardens and fruit trees; ▪ Developing composting systems within schools; ▪ Establishing and/or continuing school salad bars that incorporate produce from local farms; ▪ Implementing initiatives that reduce the environmental impacts of the food system at school and contribute to reduce GHG emissions	▪ Investigating ways in which local food can be more easily procured through the existing relationships with food distributors; ▪ Investigating the implications of connecting school gardens and community members for summer maintenance requirements; ▪ Reviewing current agricultural regulations in school policy; ▪ Identifying potential barriers to future projects; ▪ Investigating and implementing policies that reduce environmental impacts of food across the education system

6. Discussion: Challenges of the Model and Project

Despite the potential benefits of community-engaged scholarship to academic scholars and community stakeholders who have real-life problems to solve, the implementation of university-community collaborations often face challenges that Lord and Church [63] describe as 'partnership shock.' Some of the barriers to successful community-university partnerships include differences in objectives for the research held by community and university partners, inequities in the sharing of resources between community and university partners, and attitudes of superiority by university scholars [64]. Indicators of success for projects may also differ: community partners would

like to see enhanced outcomes for their communities; the currency for successful scholarship in academia is the production of academic peer reviewed papers. For this reason, CBAR is of particular risk for junior academic researchers struggling to achieve tenure. Nevertheless, many scholars engaging in community-university partnerships do so for a range of personal and professional rewards that may or may not be recognized by their institutions. In addition, research questions for university partners typically build from prior research and theory while community partners are focused on questions that will help them build capacity and create social change [65] and resolve problems affecting them directly. The 'cultures' of research, practice and policy are fundamentally different, and thus meaningful collaboration must acknowledge and account for these differences [66], including different rules of evidence and differences in the role of ideology and values in their work. Shonkoff [67] maintains that university-community research partnerships require an intercultural approach to be successful. At the time of this writing, the Think&EatGreen@School Project is only ten months old and needless to say, it is too early to draw conclusions other than the ones that made the process of formation of the alliance a success. Although the achievements, shortcomings and challenges of the first year are the subject of coming papers and reports, we can state with confidence that the scope and depth of the collaboration among members of the research alliance is intensifying.

One of the central challenges facing Think&EatGreen@School is managing the very large scale of the project while continuing meaningful engagement with all co-investigators and creating change in the schools. This challenge of overcoming fragmentation is key to the success of the project, and the Coordinating Committee takes an approach based on a tripartite conceptual framework that the Land, Food and Community series of courses uses to ground its pedagogy: an 'ecology for the integration of knowledge' constructed by a 'community of learners' in the context of 'learning with life' [67] and 'transformative sustainability learning' [68].

The ecology of knowledge "refers to how knowledge is created and re-created in the diverse contexts in which it emerges, as well as how it is distributed and shared" [67]. It places the construction of knowledge in context of its surrounding environment and influences. In the Think&EatGreen@School project, the ecology of knowledge is explored through an investigation of the places where school children and university students learn about food and the extent to which learning is linked to origins and to the entire cycle of food (production, processing, transportation, distribution, consumption and end disposal). The 'community of learners' approach recognizes diversity of background and perspective as the most valuable resource for the health of a learning environment—or an action research project. A dialogue amongst a diversity of perspectives and paradigms results in deeper and more complete understanding, because each perspective illuminates something that otherwise might not be visible. Through the decade of experience with the Land, Food and Community courses, the faculty members in Land and Food Systems have learned that "[t]he practice of this principle requires endless patience, personal vigilance and the ability to truly listen to others, paying full attention while suspending judgment. So the challenge […] is to develop forms of group facilitation that ensure individual contribution and expression have equal opportunities" [67]. These learnings have been transposed to the process of facilitating the Think&EatGreen@School project. Our approach to conceptualizing food security using a flexible and multi-dimensional model

that is open enough to allow all of the project stakeholders to bring their particular perspectives to the table is an example of how the project strives to respect the diversity of our community of learners.

Finally, 'learning with life' refers to recognizing and locating the source of knowledge: (a) knowledge derived from personal and team experiences (memory); (b) knowledge located in scholarly literature based on systematic investigation (a picture of reality as 'it is'); and (c) knowledge based on imagination and visioning (reality as 'it should be,' or utopias and dreams). Rather than distorting reality by sending subjective experience and vision into exile in the attempt to be 'objective,' subjectivity is brought into the realm of knowledge in a disciplined, systematic manner. In Think&EatGreen@School, this means that the co-investigators are invited to work collaboratively towards a shared dream which includes a move towards a more organic, more local, more sustainable, relatively re-localized food system [17]. Although the vision has not yet been articulated in detail by the project participants, the shared values, goals and dreams have animated the action research alliance, and different participants have been able to bring in their knowledge based on both scientific literature and hands-on, personal experience.

One of the reasons Think&EatGreen@School has been able to form a successful, cooperative action research alliance is because of the broadly shared goals of the partners, even though they represent a wide diversity of backgrounds and values. Although not all of the co-investigators are operating in their day-to-day work with the 'ecology of knowledge' model as their conceptual framework, they were introduced to it in an early full-team meeting, and all the partners have been able to recognize how this model aligns with their own values. The Coordinating Committee (CC) uses the conceptual model as a guide for structuring the process of community-engaged scholarship. Partners have seen that their needs and interests are integrated into the design of the project and the grant proposal. Everyone recognizes that they have something to gain as well as something to offer to others. Although there is relative centralization in managing day-to-day coordination with the CC operating the administration of the project, the 'ecology of knowledge' and 'community of learners' approach underpinning the process of community engaged scholarship has meant that all partners have the capacity to bring their voices to the table and participate in decision-making around all substantial activities of the project, from the way resources are allocated, to the actual content, scope and focus of the Community Impact Projects delivered at the schools, including the participation of community partners as co-leaders of all the projects.

7. Conclusions

As we write these final reflections in early December 2010, some 250 undergraduate students from UBC (Land Food and Community I and II, LFS 250 and 350 respectively), guided by a dozen graduate students and their professors, are back from brief but intensive fieldwork placements in 21 public schools in the City of Vancouver. They have reported on their projects on school food gardens; on the quality of diets consumed at the schools; on food procurement and preparation, nutritional value and environmental impacts; on the places where people eat at school and the social relations that unfold in those spaces; and on the ways the school curriculum integrates or fragments learning about food and environment from the lives of students and the school communities. One team of students acted as the chroniclers of the Think&EatGreen@School story and produced a film that narrates the students'

experiences in the project and reported on the strengths and weaknesses discovered in the process. We will soon begin our first round of visits to the schools to elucidate what has been learned.

Think&EatGreen@School partners have been involved in every aspect of the project. Their experience has provided useful advice and support in the conceptualization and ongoing planning and implementation of the project. All partners have participated in large team meetings (six in total) and contributed to all aspects of the work, including: decisions on sampling criteria (which schools to involve); indicators and evaluation criteria to evaluate the success and impacts of the project; discussion of the nature and scope of community impact projects conducted in the schools; and review of the actual writing of school projects. Partners also visited, guest lectured, and met with working groups of undergraduate students from Faculty of Land and Food Systems classes involved in the project, and attended final student presentations about their work in 21 Vancouver schools. Additionally, staff from six partner organizations have facilitated and accompanied UBC students in their fieldwork experiences at school sites. New partners and co-investigators from university, community and governance institutions have joined in the project and more university courses, from a wider range of disciplines, have also joined the project since September 2010.

As we 'learn with life' through our engagement with and contribution to scholarly literature on food system sustainability, security and sovereignty, and our engagement with day-to-day action research projects at school settings, we also allow ourselves to articulate utopias and dreams, the world as it could be. We imagine the outcomes of Think&EatGreen@School at the end of the project, and we know we will feel successful when we see after five years that many schools are embracing an explicit orientation towards environmental and food system sustainability and encouraging healthy diets. Schools will boast a functional food garden and/or orchard where vegetables and fruit are grown to be prepared, consumed, disposed and studied in great detail. The school will have a cafeteria, or rather, a dining hall, as characterized and designed by one of the green chefs involved in the team. There will be meal programs that serve healthy food and balanced diets, and both cafeterias and meal programs will use products from the garden to illustrate the functioning of a food system. School food will be increasingly procured from local farmers engaged in sustainable agriculture. Schools will productively manage food end products. Gradually, sustainability innovations in curriculum and pedagogy linking classrooms with all of the school food system activities will stimulate green thinking for green eating. These schools will establish links with the surrounding community through food sustainability projects.

These appear ambitious goals now but are simply in line with the growing realization at all levels from the UN down to neighbourhood associations that food system adaptations must take place sooner rather that later to address the challenges posed by climate change and its severe impacts on food systems. School food systems are reflections of vulnerable food systems at the global, national and regional level. What can an alliance of this nature contribute to the critical dialogue on food sovereignty, security and sustainability in the city of Vancouver, and in particular in its schools? At its most basic, an action research alliance involving key stakeholders in all three areas of food sovereignty, food security and food system sustainability creates important synergies that amplify the impact of each individual or organization and generates knowledge that is different in kind from what each player can accomplish in isolation. It enhances mutual support and creates a kind of food citizenship through mobilization and production of community-engaged scholarship. Involving young people in all aspects

of the food system may provide evidence that the process of reconnecting with the sources, health and environmental impacts of food can contribute not just to the transformation of food habits but also to the emergence of a new culture of sustainability, sovereignty and food security.

In fact, a successful 5-year community-based action research project like Think&EatGreen@School can contribute to the realization of a number of the five key themes of the BC Agriculture Plan [22]: producing local food in a changing world; meeting environmental and climate challenges; building innovative and profitable family farm businesses; building First Nations agriculture capacity; and bridging the urban/agriculture divide. The plans and processes of Think&EatGreen@School contribute to a vigorous regional movement working for long-term goals where emerging markets for sustainable products, policies and the greening of the city can defend or restore ecosystems booming with biodiversity, a key condition for the sustainability of vigorous regional and local food systems, the foundations of food sovereignty and food security.

Acknowledgements

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