SOCIAL ENTERPRISES AND ALTERNATIVE AGRO-ECOLOGICAL FOOD NETWORKS: A CO-OPERATIVE BUSINESS MODEL FOR AGRO-ECOLOGICAL VEGETABLE SEED PRODUCTION

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SEPTEMBER 6, 2012

REPORT OF A MAJOR PROJECT SUBMITTED TO THE FACULTY OF ENVIRONMENTAL STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN ENVIRONMENTAL STUDIES, YORK UNIVERSITY ONTARIO, CANADA.

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FOREWORD

The focus of the research in my MES program at York University has been to understand how to overcome the barriers that exist to successful transitioning the Canadian food system to one that supports regionally-based agro-ecological farming. By facilitating the expansion of ecologically damaging monocultures and economically marginalizing the needs of small- to mid-scale farmers, the concentration of the food industry by corporate agribusinesses is one of the barriers that inhibit the widespread adoption of agro-ecological farming. As a result, I have sought to understand what kinds of autonomous market-based initiatives that agro-ecological farmers can adopt to hedge against these ostracizing market pressures. Consistent with the interests in my Plan of Study, I contend that social enterprises – particularly, co-operatives – are one of the types of economic institutions that can help farmers reclaim market power in the food system, and further assist in moving forward an agro-ecological transition.

After studying Canadian food systems over the past two years through different disciplinary frames and after completing a seminal field experience at Everdale Organic Farm, I have been inspired to research how to build the capacity of regionally-adapted agro-ecological vegetable seed varieties in Ontario. Researching how to implement a vegetable seed co-operative in the Greater Golden Horseshoe region, was one of the ways through which I felt I could contribute to the agro-ecological transition. As a result, this research is expected to be useful for both existing and emerging agro-ecological growers who would like to support regionally-based and ecologically diverse seed systems.

I would like to sincerely thank all of the research participants interviewed and surveyed for taking time away from their already overburdened schedules to help with this project. In particular, I would like to acknowledge Bob Wildfong (Seeds of Diversity), Daniel Brisebois (Tourne-Sol Co-operative Farm), Jane Rabinowicz (USC Canada), Gavin Dandy (Everdale Organic Farm), Micaela Colley (Organic Seed Alliance), and my supervisor, Dr. Rod MacRae, for their knowledge, patience, and wisdom, throughout this project. Hopefully the research findings from this report can contribute in some small way to helping the farmers and the advocates that are working tirelessly to redesign our seed systems, and our food systems, to ones that are more economically equitable and ecologically restorative.

EXECUTIVE SUMMARY

Alternative agro-ecological food networks (AAFNs) are being advanced by farmers, civil society organizations, academics, and other concerned citizens, who understand the current agri-industrial food system to be ostracizing the socioeconomic needs of small-scale farmers and damaging the ecological processes required for food production. Advocates of AAFNs support transitioning towards a food system that consists of differentially-scaled farms that prioritize food security, community development, and ecological restoration. The transition towards regionally-populated AAFNs is partly constrained by corporate consolidation in all sectors of the food industry and by government policies that favour large-scale industrial farming.

Maintaining a diversity of regionally-adapted agro-ecological seed varieties is an essential component to building AAFNs. Yet, the proliferation of hybridized varieties and their requisite agro-chemicals, the implementation of intellectual property rights on seeds, and the concentration of agricultural inputs by corporate agribusinesses, have disrupted the ability of farmers to reproduce agro-ecological seed varieties in Canada. The responsibility for preserving these types of seeds has been assumed by seed banks and small-scale seed enterprises; however, due to the oligopolistic pressures exerted by dominant market actors in the seed industry, these organizations face a variety of economic difficulties in scaling up their socio-ecological missions. Co-operatives are an alternative form of social enterprise that agro-ecological farmers can implement to better hedge against these market pressures and to reclaim ownership of agro-ecological seed production.

The research in this report analyzes the feasibility of a regionally-based agro-ecological vegetable seed co-operative in the Greater Golden Horseshoe region of Ontario. The findings reveal that by pooling production from different vegetable seed growers in the region, a seed co-operative can economically sustain the preservation of agro-ecological seed varieties through a democratically-owned mission-based enterprise. In doing so, it is hoped that the co-operative can indicate to the market, the state, and the general public, one kind of organization that can meet the underserved needs of agro-ecological growers, and more broadly, begin to better facilitate a national transition towards regionally-based AAFNs.

SECTION 1: CONTEXT

1.1 ALTERNATIVE AGRO-ECOLOGICAL FOOD NETWORKS

Through the development of high-yielding crop varieties, the application of fertilizers and agro-chemicals, and the modernization of irrigation and cultivation techniques, the industrial model of food production since the Green Revolution has helped to reduce food insecurity in many regions and has generated economic growth in several sectors at a global scale (Pingali & Raney, 2005; O'Gorman & Pandey, 2010; Horlings & Marsden, 2011). With the pressures of feeding an unprecedented human population growing each day, many advocate for a "vibrant rejuvenation of the agri-industrial model" to initiate greater technological advances and to increase food production, in order to address perceived global food shortages (Horlings & Marsden, 2011, p. 442). The logic behind this belief is that advancements in biotechnology will enable farmers to produce food in a cost-effective way through higher quality farming inputs, and – with proper research and development – in an equitable and ecologically sound manner (Horlings & Marsden, 2011).

However, the adverse ecological, social, and economic impacts that have been caused by the agri-industrial food system have exacerbated the very problems of food security, food quality, and farmer income that it sought to improve (van der Ploeg, 2010; O'Gorman & Pandey, 2010; Horlings & Marsden, 2011). Despite global food surpluses, issues of hunger, food insecurity, and food access are still prevalent (Woodward & Simms, 2006; van der Ploeg, 2010), and challenges to stable farmer income continue globally (van der Ploeg, 2010; Dethier & Effenberger, 2012). Moreover, it is becoming increasingly clear that impacts of intensified soil erosion, denitrification, resource depletion, biodiversity loss, and greenhouse gas emissions, are direct fallouts from practices of the agri-industrial model (Tegtmeier & Duffy, 2004; Horlings & Marsden, 2011; Gomiero et al, 2011). Among some, it is understood that the agri-industrial paradigm, will no longer be adequate to facilitate positive change in the food system (McMichael, 2009; Horlings & Marsden, 2011). In the Canadian context, several writers have discussed the problematic impacts of Canada's food system (Kneen, 1995; Koc & Dahlberg, 1999; MacRae, 2011)

and how the adoption of alternative methods of food production and distribution addresses those issues (MacRae et al, 2004).

With increasing ecological stresses on the waste assimilative capacities of the planet and the shift to a post-fossil fuel economy forthcoming (Lawn, 2001; Victor, 2008), *agro-ecological farming practices*[1] are often sought as alternative methods of food production. Agro-ecological farming is generally understood as farming systems that integrate the elements of natural ecosystems into food production and optimize those elements within the biophysical limits of the earth (Gliessman, 2007; Altieri, 2009; Tomich et al, 2011). Adopting agro-ecological farming practices can also reduce financial pressures on farmers by reducing input and equipment costs, lowering crop failure risk through crop rotation and crop diversity, and reducing risk of ecological restoration costs (Renting et al, 2003; MacRae et al, 2004; Horlings & Marsden, 2011 Gomiero et al, 2011). The different methods of production, distribution, and consumption surrounding agro-ecological farming practices have often been labelled *alternative food networks* (Renting et al, 2003). Alternative food networks can be understood as, "a broad embracing term to cover newly emerging networks of producers, consumers, and other actors that embody alternatives to the more standardised industrial mode of food supply" (Renting et al, 2003, p. 394).

In other words, it is not enough to replace the current practices of food production with agro-ecological farming; nor is it adequate to reform the current relationships of food distribution without changing the way in which that food is produced – both aspects need to be redesigned in order to fully transition out of the agri-industrial model. Accordingly, the term *alternative agro-ecological food networks* (AAFNs) can be used to denote not only alternatives food distribution models, but also to assert the primacy of agro-ecology in these networks. Ultimately, a redesigned food system should represent a diversity of differentially-scaled growers practicing regionally-adapted forms of agro-ecological food

[1] The term *agro-ecological* is used in the context of this paper to refer to the broad spectrum of ecologically-oriented agricultural practices. While much of the literature in alternative food network research focuses on organic agriculture, the use of the term "agro-ecological" references organic agriculture, as well as numerous other agricultural systems that adhere to similar principles, such as, biodynamics and permaculture (King, 2008). However, when the term *organic* is used in the report, it will refer to *certified organic* practices.

production, that are economically viable, while engaging in equitable food distribution with high levels of democratic engagement (Dahlberg, 2001; Renting et al, 2003; King, 2008; Horlings & Marsden, 2011; MacRae, 2011).

1.2 BARRIERS TO IMPLEMENTING AAFNS: THE CORPORATE FOOD REGIME

AAFNs are often promoted by agro-ecological farmers, civil society organizations (CSOs), farmers' unions, academic/research institutions, and social enterprises, with a common interest in reforming the food systems' problems at various levels of agency (Koc & Dahlberg, 1999; Koc et al, 2008). These actors relentlessly engage with governments to increase support for policy initiatives that facilitate AAFNs and encourage food citizenship among the general public (Koc et al, 2008; Lockie, 2009). However, AAFNs have yet to be adopted in a widespread manner by farmers, agribusinesses, policy makers, and citizens (Renting et al, 2003; Carolan, 2006; Rodriguez et al, 2008). Several theorists have explored the epistemic (Carolan, 2006), psychosocial, informational, land-use, governmental (Rodriguez et al, 2008; Gomiero et al, 2011), and corporate barriers (MacRae et al, 1993; Howard, 2003-2004; Burch & Lawrence, 2009), that inhibit greater adoption. All of these barriers are important and interconnected, but some argue that the barriers corporate agribusiness present require particular attention (MacRae et al, 1993; Kneen, 1999; Howard, 2003-2004; Burch & Lawrence, 2009).

Food regime theory (McMichael, 2009; Burch & Lawrence, 2009), which analyzes the past, and existing, power relations in the food system, helps to contextualize the systemic barrier that agribusinesses represent to food system redesign. McMichael (2009) argues that the central power dynamic of the current food regime (the 'corporate food regime') has been the transfer of social, economic, and political power from the state to the most economically successful actors in the market. The *corporate food regime* is characterized by a dependence on fossil-fuels and agro-chemicals to support large farming monocultures, the consolidation of actors in the food system through vertical and horizontal integration, and the conflation of state and market objectives (McMichael, 2009). Several theorists contend that the corporate food regime, and the practices of industrialized agriculture that characterize it, have led to detrimental effects on rural communities (Lobao & Stofferahn, 2008), reduced food

sovereignty in economically impoverished nations (Burch & Lawrence, 2009), and negatively impacted human health and ecosystem services (Tegtmeier & Duffy, 2004; van der Ploeg, 2010; Gomiero et al, 2011). It is therefore important to identify what kinds of actions can be taken by AAFN advocates to hedge against the dominion of the current food regime. Institutions that operate in the *social economy* present one of the many forms of socioeconomic mobilization and resistance.

1.3 CO-OPERATIVES IN THE SOCIAL ECONOMY: THE ORIGINAL SOCIAL ENTERPRISE

In the discourse of critical social theory, it is common to attribute contemporary socio-ecological dilemmas to the structural flaws of capitalism and private property. This debate is beyond the scope of this paper, but there is a growing body of literature on how the capitalist agri-industrial model is incompatible with the goals of AAFNs (McMichael, 2009; van der Ploeg, 2010; Horlings & Marsden, 2011). If this is true, in what contemporary social and economic space can AAFNs thrive? Several theorists would contend that the *social economy* is where AAFNs can find sufficient traction:

> People participate in the social economy…not to be non-profit or non-state, but to actually make a difference in their own lives and in the lives of others. They do so because they feel that the existing options available in the capitalist market are not sufficient to their needs or to their community's needs, however minor or major their understanding of this insufficiency (McMurtry, 2010, p. 30).

The socioeconomic marginalization of agro-ecological growers, the declining income of small-scale farmers, and the inability of the market to appropriately compensate farmers for the ecological services they provide, can be interpreted as a failure of market forces (Belcher et al, 2005; Rocha, 2007). Moreover, the current economic system has limited penalties for activities that are ecologically damaging and has offered few incentives for activities that are ecologically restorative (Weersink et al, 1998). Consequently, it is extremely difficult for any market actor to engage in ecologically restorative initiatives because the short-term financial impact of those activities is either marginally beneficial or – more often than not – financially injurious (MacRae et al, 1993; Weersink et al, 1998; Lawn, 2001; Pelletier, 2010). Similarly, with state policies increasingly being made to favour the agri-industrial model, the state is either unwilling or unable to appropriately support the range of issues AAFNs seek to solve (Dahlberg, 2001; Burch & Lawrence, 2009; McMichael, 2009). Therefore, the responsibility for solving the majority

of socio-ecological problems of the food system fall on CSOs and concerned citizens, since the dominant market actors, the state, and the general public, have either abdicated, or proven inadequate at, taking on that role (Scharf et al, 2010). As a result, the advancement of AAFNs is – at least for the time being – dependent on actors operating in the social economy (McMurtry, 2010).

Although a widely accepted definition of the social economy has not yet been formulated, McMurtry (2010) proposes that it can be broadly understood as, "economic activity neither controlled directly by the state nor by the profit logic of the market, activity that prioritizes the social well-being of communities and marginalized individuals over partisan political directives or individual gain" (p. 4). Therefore, in the absence of adequate services provided by the private and public sector, some have pointed to the social economy as the sector that can potentially address social and ecological needs that are not being met (Fontan & Shragge, 2000; Uluorta, 2009; McMurtry, 2010). It should not, however, *remain* the responsibility of actors in the social economy; rather, by addressing the failures of the market and the state in this realm, the social economy can signal a movement towards more broad-based socioeconomic and socio-ecological reform:

> By opening up this alternative theoretical frame of life, we can start to liberate our practice and theory from the no-alternative dogma of the 'free market' with its 'iron laws' and productivist demands to the actually experienced life-needs of a membership or society at large (McMurtry, 2010, p. 29).

Conventional understandings of organizations that comprise the social economy are institutions such as, non-profit organizations (NPOs), CSOs, credit unions, foundations, and *social enterprises*. Social enterprises are generally understood as for-profit organizations or NPOs that *engage in market-based activities* for the purposes of addressing a social problem or a market failure, rather than generating a profit (Alter, 2007). Indeed, it is the *enterprise* component of these organizations – the willingness to enter into free-market dynamics – that differentiate them from the other actors in the social economy.

Co-operatives have long been viewed as the original form of social enterprise (Develtere, 1993). Develtere argues that co-operative movements in industrialized countries in the late-19th and early-20th century were unique in their "use of enterprises and economic participation as means to achieve the objectives of [social movements]" (p. 187). In the history of agriculture in Canada, co-operatives have

been adopted because of their capacity to aggregate the resources of differentially-scaled growers in a democratic manner to achieve a collective socially-driven economic goal (MacPherson, 2011). As such, co-operatives – and more broadly speaking, social enterprises – present one of the many tangible forms of economic organization for change advocates to achieve goals consistent with AAFNs.

1.4 SOCIAL ENTERPRISES AND AGRO-ECOLOGICAL SEED SYSTEMS

One of the major structural barriers for emerging and existing agro-ecological farmers remains the lack of suitable farm inputs – in particular, the infrastructure for the production, processing, and distribution of *regionally-adapted bulk quantities of agro-ecological vegetable seed varieties*[2] (Howard, 2009; Lammerts van Bueren et al, 2010; Jarvis et al, 2011). Consistent with the trends of other actors in the corporate food regime, commercial seed companies have increasingly centralized and consolidated their operations (Howard, 2009). In doing so, these companies contribute to the economic conditions that pressure farmers to engage in large-scale monocultures, and impede extensive adoption of small-scale[3] agro-ecological farming (Kuyek, 2007; Phillips, 2008; Howard, 2009). The proliferation of commercial conventional seeds in agricultural markets also results in increased economic obstacles (i.e. higher input costs for farmers; increased debt) (Kuyek, 2007; Howard, 2009), detrimental effects on farm sociocultural dynamics (i.e. declining seed-saving practices of farmers) (Kloppenburg & Kenney, 1984; Abaidoo, 2000; Kuyek, 2007; Phillips, 2008; Howard, 2009; Jarvis et al, 2011), and adverse ecological impacts (i.e. reduced genetic diversity of cultivars; increased use of crop varieties requiring synthetic chemical inputs) (Kuyek, 2007; Jarvis et al, 2011).

The research presented in this project further elucidates the impacts of corporate concentration in the Canadian seed industry, and elaborates on how these trends are reflected in the Greater Golden Horseshoe (GGH) region of Ontario. The major focus of the research has been to (1) assess the context of seed production and distribution for existing and emerging agro-ecological growers in Canada, and (2)

[2] *Agro-ecological seed varieties* will refer to varieties that generally consist of traditional, heritage, and heirloom varieties of seed – also known as landraces. Landraces have been cultivated over centuries, and have naturally developed different nutrient requirements, pest and disease tolerances, quality and post-harvest characteristics, than those bred for high-input industrialized farming (Lammerts van Bueren et al, 2010).
[3] Please see Appendix 1 for a definition of small-scale agro-ecological farmers.

analyze the potential effectiveness of a social enterprise designed to address the market gap for regional agro-ecological vegetable seed production in the GGH Region. Ultimately, this project proposes a theoretical framework of how co-operatives could advance regional agro-ecological vegetable seed production, and then applies that theoretical framework to formulate a preliminary business plan for a vegetable seed co-operative in the GGH Region.

1.5 RESEARCH METHODOLOGY

Given that there are inherent power dynamics that accompany some academic research methods and strategies (Smith, 1999; Nabudere, 2002; Miskovic & Hoop, 2006), there are some qualifications that need to be made in the context of the methodologies used in this project. First, methods that inherently help to hedge against these power dynamics, such as participatory action research or collaborative community research, have not been used given the limited timeframe of the project. Second, the agenda that drives this project is inspired by anecdotal research with agro-ecological farmers who have identified the need to build the infrastructure for regionally-produced agro-ecological vegetable seed varieties. Third, to limit the scope of the research project, and in acknowledging the time available to complete the project, the research has been geographically focused on the Greater Golden Horseshoe (GGH) region of Ontario (please see Appendix 2 for a full list of counties included in the GGH area for this project). As a result, there will be limitations to the sociocultural and geopolitical applicability of the analyses and conclusions. However, the research conclusions presented are expected to be applicable to comparable geopolitical regions that are seeking similar types of reforms to the seed system.

1.5.1 Primary Research Methods

Direct Observation:

Through a field experience at Everdale Organic Farm in the 2011 summer term, I have gained a preliminary technical comprehension of agro-ecological farming practices and a more nuanced understanding of the socioeconomic realities that face agro-ecological growers. I had the opportunity to explore numerous other farms and organizations involved in advancing AAFNs, which expanded my perception of the social context of AAFN advocacy. With respect to my research methodology, I engaged

in *complete membership observation* during my field experience (Baker, 2006), where I immersed myself in the context I was observing, and empathized with the values and norms that were prevalent in that context. Some researchers observe that this form of participant observation can influence the bias of the researcher due to one's intimate engagement with the subjects (Sanchez-Jankowski, 2002; Baker, 2006). I recognize that this bias might implicitly influence my research, but I have attempted to temper my emotive connection to the efforts of agro-ecological farmers by engaging with actors with contrary viewpoints, and supporting my argument with thorough objective research.

Primary Market Research:

The primary market research methods for this project were conducted through surveys and interviews applied to the following five research groups: (1) existing and emerging agro-ecological vegetable growers, (2) non-agro-ecological vegetable growers, (3) seed companies distributing seeds to agro-ecological vegetable growers, (4) CSOs involved in supporting AAFNs, and (5) representatives from industry associations in the seed industry. By combining the perspectives of regional farmers in the GGH area, seed companies, and advocacy organizations, I have gathered a balanced understanding of the needs of agro-ecological growers, while situating their interests in a broader socioeconomic context.

Surveys:

Survey questionnaires were distributed electronically to 70 agro-ecological vegetable farmers, 34 conventional vegetable farmers, and 20 vegetable seed companies in the GGH area of Ontario. These surveys sought to obtain (1) a contextual understanding of the main obstacles farmers/seed companies are experiencing, (2) an initial overview of the conditions of seed procurement, production, and distribution by these farmers, and (3) the opinions of these actors on the role that co-operatives can play in advancing AAFNs (please see Appendix 3 for both survey questionnaires).

Of the 104 farmers surveyed, 33 farmers responded (32% response rate). 31 farmers (94%) practice some form of agro-ecological production, and 15 farmers (45%) are certified organic. The majority of farmers that responded (24) farm less than 15 acres of vegetable production, 6 farmers farm between 15 to 50 acres, and 3 farmers use over 100 acres for active vegetable production. Of the farmers

surveyed, 18 farmers (55%) save their own fruit/vegetable seeds and 15 farmers (45%) do not save their own seed. A larger response rate – particularly from conventional farmers – would be able to produce more relevant results. However, the qualitative data that has been collected can serve as some preliminary insights into the trends and opinions of vegetable farmers on the seed industry in the GGH region.

Of the 20 seed companies surveyed, only five companies had responded (20% response rate). Four of the seed companies practice some form of agro-ecological vegetable seed production, and two of the producers are certified organic. Four of the seed companies practice small-scale seed production, with an average of 1.06 acres in active production, while the other seed company is a reseller of procured seeds. The low response rate from seed companies impacted the significance of the research in terms of aggregate data that could be used for market-based projections and financial statistics. However, the qualitative data that has been obtained from these seed companies have proved to be very meaningful and relevant for the project.

Interviews:

For the interviews conducted, I have adopted a combination of neo-positivist (neutral and objective), and romantic (conversational and relational), interview techniques (Roulston, 2010) that have allowed for equitable participant engagement without compromising the requirements of my research agenda. A total of 13 interviews have been conducted for this research project (please see Appendix 4 for a full list of interview participants). Semi-structured interviews have been conducted with members of CSOs and/or associations involved in agro-ecological advocacy to develop a deeper understanding of the barriers facing agro-ecological farmers and the advancement of an agro-ecological vegetable seed industry. Semi-structured interviews have also been conducted with specific agro-ecological growers that had expressed interests during my field experience at Everdale on improving the current availability of vegetable seed (please see Appendix 5 for the interview question template).

1.5.2 Secondary Research Methods

Literature Reviews:

The literature reviews conducted for this project encompasses four main categories of research: (1) the conceptual aspects of seed systems in AAFNs (e.g. socioeconomic relationships, policy discourse, political economy of food systems, etc.), (2) the technical aspects of vegetable seed production (e.g. agro-ecology, seed processing requirements, legal regulations, etc.), (3) conceptual groundings of social enterprises in the social economy, and (4) the political, economic, and social contexts of co-operatives in agriculture. I have used the literature review to frame a process of creative inquiry (Montuori, 2005), and to generated an integrative synthesis of ideas (Torraco, 2005), between seed systems in AAFNs and co-operatives as social enterprises.

Secondary Market Research:

Secondary market research data has been compiled on agro-ecological farming and seed production from Statistics Canada (2012), Canadian Organic Growers (COG) (Macey, 2005; Macey, 2007), Organic Council of Ontario (OCO) (OCO, 2008), and the Organic Value Chain Roundtable (OVCRT) (Lessard et al, 2011), to develop a more robust assessment of the economic market for agro-ecological vegetable seed. The main report that complements the primary market research for this project is the OVCRT's *Analysis of the Market Potential for Organic Seed in Canada* (Lessard et al, 2011).

1.5.3 Presentation of Results

Although traditional academic research methods have been used for this project, the presentation of results will follow a format that is more conducive to clearly presenting the research in an integrated manner. Through a combination of the aforementioned primary and secondary research methods, I have synthesized all areas of inquiry to develop the remaining sections:

- Section 2: A comprehensive review of agro-ecological seed production in Canada;
- Section 3: A literature review of social enterprises and co-operatives;
- Section 4: An integrative theoretical framework of how co-operatives can facilitate agro-ecological seed systems;
- Section 5: A preliminary business plan for an agro-ecological vegetable seed production co-operative in the GGH region; and
- Section 6: Concluding remarks and further research opportunities.

SECTION 2: ROBUST AGRO-ECOLOGICAL SEED SYSTEMS

2.1 VALUE AND IMPORTANCE OF SEED DIVERSITY AND AGRO-ECOLOGICAL SEED VARIETIES

Extensive research over the past two decades has provided substantial evidence that open-pollinated and hybrid seeds cultivated over generations under agro-ecological conditions are more suitable for agro-ecological production than conventionally-bred varieties catered to high-input, large-scale monocultures (Zimmerer, 2010; Lammerts van Bueren et al, 2010; Jarvis et al, 2011). Agro-ecological landraces are more capable of adapting to marginal and diverse agro-ecosystems, developing greater soil fertility and health, attracting a diversity of pollinators, building natural resilience to pests and disease, acclimatizing to rainfall and temperature variability, providing greater nutritional value, and maintaining better flavour than conventional varieties (Zimmerer, 2010; Jarvis et al, 2011). Additionally, maintaining a diverse crop profile of landraces for farming communities decentralizes economic risk, and provides more opportunities to meet changing dietary and ethnocultural preferences (Abaidoo, 2000; Jarvis et al, 2011).

Maintaining seed diversity is important for all farmers; however, with the impending risks of climate change, resource depletion, and biodiversity loss, it is pertinent to preserve seed varieties that support the type of farming associated with ecological restoration. The reality however, is that the number of agro-ecologically propagated cultivars available from commercial seed companies is still very limited (Lammerts van Bueren et al, 2003). Guthman (2000) notes that for organic farmers, "it is challenging to find non-treated seed for certain crops, as commercial seeds are often covered with fungicides and the organic seed industry is extremely underdeveloped" (p. 263). This is mostly true for grains and field crops, but it is also becoming the case for fruit and vegetable varieties (Lammerts van Bueren et al, 2003). Given that many agro-ecological farmers are small-scale vegetable growers, it is important to build the capacity of their respective regions to provide suitable agro-ecological vegetable seed[4].

[4] The research in this project will not focus on building capacity for grains and field crops, but for vegetable seed varieties. The establishment of agro-ecologically grown grains and field crops requires significant attention, but currently present greater market-oriented and regulatory barriers than vegetable varieties, and are beyond the scope of this paper to analyze.

Most companies that provide seed to vegetable growers offer a limited selection of certified organic varieties, and a broad selection of both treated and untreated varieties (Lammerts van Bueren et al, 2010; Lessard et al, 2011). While untreated varieties are acceptable for use in certified organic production, these seed varieties are generally not well adapted to agro-ecological growing conditions, limiting their capacity to perform in low-input farming environments (Lammerts van Bueren et al, 2010; Jarvis et al, 2011). It is well documented that landraces have slowly been replaced by modern, uniform, high-yielding varieties worldwide, decreasing agrobiodiversity across all countries (FAO, 2010). In Canada, of the landraces that remain, only 10% are in circulation by seed companies, while the other 90% are in seed banks, generally inaccessible to farmers and gardeners (Seeds of Diversity, 2011; Wildfong, 2012). Government-instituted and non-profit seed banks provide the essential public service of preserving these varieties *ex situ* ('out of place'), but many argue that there needs to be *in situ* ('in place/on-farm') conservation by bringing these cultivars into active circulation. These varieties need to be grown out, tested, and used by farmers in order to truly adapt to present and future regional settings; in doing so, growers can begin to build a network of regionally diverse and resilient seed systems for Canada (Jarvis et al, 2011; Dillon & Hubbard, 2011; Seeds of Diversity, 2011; Wildfong, 2012).

2.2 CONSTRAINTS TO SEED-SAVING IN CANADA

There are many reasons why regionally-adapted agro-ecological vegetable seed varieties are not in active circulation, but the simple reality is that there are not enough growers and breeders cultivating, saving, breeding, and exchanging these seeds. In an analysis of seed systems in economically impoverished countries, Jarvis et al (2011) developed a heuristic outlining several constraints as to why farmers might not be sustaining the use of landraces. The heuristic delineates four main constraints: (1) regional seed diversity does not exist, or exists in insufficient quantities, (2) regional seed diversity is inaccessible to farmers, (3) farmers do not value and use regionally-adapted seeds, and (4) farmers do not benefit from the maintenance and use of regional seed diversity. For each seed-saving barrier, Jarvis et al (2011) have defined different dimensions and underlying factors. In Canada, there are some truths in each of these constraints, but to varying degrees and with different dimensions. For the purposes of this

research project, the heuristic has been adapted for the Canadian context and explained in more detail below.

Constraint 1: Regional agro-ecological seed diversity does not exist, or exists in insufficient quantities

de Boef et al (2010) categorize a variety of different seed conservation strategies that exist globally in order to provide regionally-based agro-ecological seed diversity to farmers. *Figure 1* summarizes the different types of strategies and how they have manifested in Canada in the *vegetable seed industry*. In Canada, there are a small number of seed banks, CSOs, and small-scale seed growers that are working to make agro-ecological landraces more available so growers can multiply these materials and grow greater quantities of seed. However, these organizations and growers operate at a small scale and do not have the capacity to expand their operations economically due to ostracizing market dynamics or lack of government support. As a result, while regional seed diversity exists because of the efforts of these actors, it does not exist in sufficient quantities as it is not being scaled up appropriately.

Constraint 2: Regional agro-ecological seed diversity is inaccessible to farmers

The inaccessibility of regional seeds manifests itself in Canada through three main ways: (1) a restriction of seed availability through both state policies and pressures from the industrial seed sector, (2) decreased number of farm operators and declining farmer income, and (3) the climactic variability in Canadian regions that increases the challenges to grow quality seed crops.

Constraint 3: Farmers do not value and use regionally-adapted agro-ecological seeds

The same actors and organizations that preserve seed varieties are working on providing farmer education on the value and benefits of agro-ecological seed varieties, as well as how to save seed at various scales of production. However, there is minimal financial support from both the state and the seed industry to support either private or public breeding to test the agronomic performance of these seed varieties (Macey, 2005). As a result, growers do not have the appropriate knowledge infrastructure established to pursue seed-saving and seed production in an economically viable way.

FIGURE 1: SEED CONSERVATION STRATEGIES IN CANADA

STRATEGY	DESCRIPTION OF ACTIVITY	CANADIAN EXAMPLE
Farmer management	Individual farmers develop informal networks of seed-saving and seed exchanges with no market engagement to save regionally-adapted crops	Informal seed-saving and seed exchanges exist between farmers in the GGH region (Dey, Organic Seed Survey for Ontario Farmers, 2012)
Community management	Farmers organize as a community to engage in informal seed networks to save regional crops and varieties, and build community resilience	Saugeen River's *Seed CSA*: A community of small-scale growers grow seed for each other for their own small-scale/hobbyist gardener production in Durham and Owen Sound, Ontario (Eichman, 2011)
Community gene/seed banks	Local institutions are established by the community, or CSOs create a back-up system of small quantities of seeds to build local resource conversation and use, and to improve food security, but not for bulk production	The following CSOs are actively running seed conservation programs in Canada: Seeds of Diversity, Seed and Plant Sanctuary for Canada, and USC Canada's *Seeds of Survival Program*
Farmer-based seed production	Individuals or groups of farmers engage in contractual arrangements with seed companies to develop a formal seed market; the crops and varieties to be grown are dictated by the seed company, and not the farmers	Some farmers in Ontario are contracted growers for differentially-scaled regional and non-regional seed companies (Swaren, 2010; Lessard et al, 2011)
Village/community-based seed production	CSOs test local and improved seed varieties in a participatory manner with farmers, cultivating demand among farmers for local crops and varieties to serve community demands and to support informal seed-saving networks	The following CSOs are actively running these kinds of programs in Canada: Seeds of Diversity, Seed and Plant Sanctuary for Canada, and USC Canada's *Seeds of Survival Program*.
Farmers' or small-scale seed enterprises	Growers establish small-scale seed companies to grow regionally-adapted crops and varieties for different scales of production	Numerous small-scale vegetable seed companies exist in Ontario: The Cottage Gardener, Dominion Seed House, Hawthorn Farm, Ontario Seed Co., Stokes Seeds, Urban Harvest, etc. (Swaren, 2010; Lessard et al, 2011)
Community Based Seed Enterprises	Community-based seed enterprises are embedded in existing community structures that take a business approach to seed production to ensure seed availability and access at local or community levels and to contribute to local seed security, rather than being driven solely by market forces or profit	Eastern Canadian Organic Seed Growers' Network (ECOSGN): ECOSGN is not an enterprise, but it is a community-network of experienced seed growers working under Seeds of Diversity helping farmers and seed growers to produce more high quality seed through technical assistance, education, marketing collaboration, advocacy, and shared facilities
Commercial production and marketing	External private organizations develop commercial seed enterprises to sell crops and varieties that are defined by the global market	Any regional or non-regional seed company selling conventional, untreated, or organic vegetable seed in Canada

(adapted from de Boef et al, 2010, '10 Common Strategies Supporting Seed Supply', Table 1, p. 514-515)

Constraint 4: Farmers do not benefit from the maintenance of regional agro-ecological seed diversity

While the aforementioned group of growers and associations are actively working to advance agro-ecological seed production, the market and the state do not appropriately reward the socio-ecological value of their work: "In areas where genetic diversity is significant, but farmers have few market or non-market incentives to maintain it, different public activities will be necessary to help support the conservation of this valuable resource" (Jarvis et al, 2011, p. 126). In Canada, farmers are not realizing market benefits from preserving agro-ecological landraces, and must rely on other agents to assume that responsibility.

2.2.1 Summary of Constraints

The responsibility for the continued maintenance of agro-ecological varieties has been assumed by the organizations listed in *Figure 1*. However, the level of *in situ* conservation and propagation – the type of propagation necessary for regional adaptation – is severely constrained, and is supplemented by *ex situ* conservation through genebanks. Therefore, aside from the knowledge barrier that farmers face on seed production, pressures from the both the industrial seed sector and state policies contribute to the existence of each of the other listed constraints. The mutual constitution of policy construction by the state and larger industrial agribusinesses[5], is an issue that needs to be addressed if there is to be any material advancement in building regionally-based agro-ecological seed systems for Canada. Consistent with the barrier of the corporate food regime, corporate concentration in the seed industry is one of the primary contributing factors to constraining the circulation of regionally-adapted agro-ecological landraces in the market, and solutions need to be developed on how better build that infrastructure. The remainder of this section will expound on how the dynamics of the corporate food regime shape the constraints to preserving regional agro-ecological vegetable seed in Canada.

2.3 SEED REGIME THEORY

The impacts of corporate concentration in the seed industry have been examined by different theorists (Kloppenburg & Kenney, 1984; Kneen, 1999; Howard, 2009), but one of the most insightful

[5] McMichael (2009) argues that 'mutual constitution' refers to the fact that the interests of dominant market actors come to dictate state policies, and state policies continue to benefit the most dominant market actors.

explanations of the complexity of these dynamics has been provided by Kuyek's (2007) *seed regime theory*. In line with the ideas of food regime theory, Kuyek elucidates how seed production and seed security in Canada has shifted from the sociocultural practice of seed-saving and seed-exchanging by farmers, to public breeding programs organized by the state, and finally to the privatized production of hybrid, genetically engineered (GE), and genetically modified (GM) crops by corporate agribusinesses. Kuyek depicts the current seed regime as one where the state serves as a facilitator for large transnational corporations that, "seek proprietary control of seeds as a way to build new markets and secure their positions in a restructured global agri-food system" (p. 32).

To those familiar with food regime theory, Kuyek's claim serves to reaffirm the oligopolistic tendencies of the agri-industrial paradigm. However, to groups unfamiliar with these critiques, the impacts of this form of corporate concentration in the seed industry are not as apparent. The commonplace understanding of corporate concentration in the seed industry is generally viewed through the neoliberal rationale of the agri-industrial paradigm: through high levels of investment in biotechnology, continuous development of agricultural tools and equipment, and ongoing research on less ecologically harmful agro-chemicals, commercial seed and input companies will be able to efficiently provide high-yielding crop varieties and complementary agricultural inputs to improve farmer productivity (Horlings & Marsden, 2011). In doing so, these companies can continue to increase shareholder profitability, but also generate economic revenues for the farmers that: (1) purchase those inputs; and (2) sustain the levels of food production needed for a food system that is reliant on those inputs. Moreover, through the growth of multinational seed companies, enormous investments are made in biotechnology and agricultural research; these investments provide job opportunities in numerous agriculture-related fields which give these forms of business more lobbying power via the state (Vanloqueren & Baret, 2009).

Those in favour of the agri-industrial paradigm would argue that the process of corporate concentration should intensify to encourage more innovation in agriculture, which will ideally be able to help farmers that are currently disadvantaged by this process. The logic of this paradigm follows that by

purchasing agricultural inputs from actors that can provide it most efficiently, farmers can practice methods of agriculture that enable them to engage in more profitable global markets and reap increasingly favourable economic benefits (Horlings & Marsden, 2011). However, it is important to understand the problematic dynamics of the current seed regime in order to evaluate whether the intensification of the seed regime works for all parties involved and to propose whether alternatives to this process are worth pursuing. The impacts of increasing consolidation in the seed industry are complex, and the ramifications of these shifts in power are interrelated. More importantly, the problems are continuously evolving, resulting in scenarios that take on increasingly unpredictable dimensions. The following section will provide a brief historical overview of how the seed regime has developed in Canada, and then detail its economic, political, sociocultural, and ecological impacts on the seed industry and farmers.

2.4 HISTORY OF THE SEED REGIME

An analysis of seed production and distribution in Canada – or anywhere in the world for that matter – cannot be conducted without appropriate recognition of the contributions of indigenous cultures. The Aboriginal groups of Canada have cultivated, selected, and bred, different crop varieties for generations, and continue to do so today. Taking note of the efforts of indigenous cultures is important not only to rightfully acknowledge their endeavours, but to also demonstrate how the work of all farmers who helped to build the agrobiodiversity of Canada is often undervalued and overlooked (Kuyek, 2007). The practice of saving seed is an essential socio-cultural practice of growers that demonstrates a reciprocal engagement between human beings and their food systems (Abaidoo, 2000; Jarvis et al, 2011).

Indeed, it is because farmers were willing to experiment with new varieties of seed, and had cultivated landraces over time, that the state took interest in plant breeding in the early part of the 19th century (Kloppenburg & Kenney, 1984; Kuyek, 2007). The *in-situ* development of disease-resistant and high yielding varieties – most notably in field crops and grains, such as, Red Fife wheat – signalled to the state that farmers were capable of seed innovation. Accordingly, the state invested in on-farm experimentation in order to cultivate new varieties, and slowly developed the public breeding sector. During this shift into public breeding, the practice of discovering or testing new varieties from other

regions or from open-pollination, lost favour with the rise of Mendelian genetics, that, among other things, influenced breeders to begin intentionally crossing varieties to achieve hybrid vigour (Kuyek, 2007).

The use of Mendelian genetics is not problematic in itself – the benefits that have been appropriated through hybridized varieties can be seen through several positive agronomic characteristics. However, as this form of plant breeding became more widespread in the early 1900s, it laid the foundation for the productivist paradigm that permeates modern agriculture, and hybridization began to co-opt all other forms of seed development (Kuyek, 2007; Horlings & Marsden, 2011). The immediate benefits of hybridized varieties that could be realized through improved yields provided sufficient rationale for agricultural actors to rapidly adopt these varieties, as they generated both predictable agronomic results and short-term economic benefits. The long-standing tradition of informal seed exchanges and on-site farmer cultivation shifted to the top-down technology transfers from public breeding programs to farmers (Kloppenburg & Kenney, 1984; Kuyek, 2007; Phillips, 2008). Kuyek (2007) defines this period of state-led plant breeding as the 'second seed regime', where public plant breeding was still part of the national interest, and attempted to benefit farmers, consumers, and industry actors. Farmers were content to relinquish a portion of their responsibility to the state, as they were realizing benefits through these breeding programs, and the state could still be held accountable for their actions. However, during this transition, both the practice and the value of farm-based seed cultivation and informal farmer seed exchanges decreased significantly.

The success of public breeding programs enabled numerous opportunities for agriculture by generating investment in farmland and machinery to keep up with the increased agronomic productivity from new varieties. However, the increased yields of new varieties pressured or enticed farmers to grow more crops on more land. As a result, more farmers began to adopt monocultures creating the conditions for greater numbers of pests/diseases, and with it, the increased use of agro-chemicals. Consequently, businesses capitalized on the need to further research agro-chemical production, and supply more and more off-farm inputs for growers. It is during this stage of increasing agribusiness involvement, where the

seed regime began to transform into its 'third stage', where the control of farming inputs became increasingly centralized in the hands of fewer and fewer agribusiness corporations. Following the two World Wars, and furthered by the advances made in the Green Revolution, "agricultural research became simply a matter of applying modern science to increase profit and production, with all other potential indicators and alternatives being deliberately excluded" (Kuyek, 2007, p. 37).

The adverse effects of this process encouraged uniform approaches by public and private breeding programs – and understandably so, given the immediate benefits of the prevailing paradigm. In fact, in the mid-1970s, the Canadian government provided support to private breeding systems that would work in mutual co-ordination with the public sector. The government realized that the process of releasing varieties into the market place was a money-losing venture (Stoner, 2012), so they gradually shifted the responsibility of researching, developing, testing, and propagating varieties to private corporations that were more efficient in providing this service (Kuyek, 2007). Consistent with the gradual decline of agricultural extension services by the government (Milburn et al, 2010), investment in public breeding programs steadily decreased. Research developments that had been generated from public plant breeding essentially went on to indirectly subsidize the private sector, as firms strengthened their market position through the control of seed development and the commercialization of proprietary input packages (Kloppenburg & Kenney, 1984; Kuyek, 2007; Phillips, 2008). Many of these private breeding companies were subsequently acquired by larger agribusinesses, igniting the accelerated centralization of the seed industry (Kuyek, 2007; Howard, 2009).

In so doing, the roles of private and public breeding programs began to conflate, without realizing that the primary objectives of the two arenas were originally completely different:

> The Canadian government seems to assume that corporate objectives are in the national interest, and with this assumption it continues to act to revise various regulations and policies as well as provide monetary and in-kind support to the seed industry (Phillips, 2008, p. 6).

As for-profit enterprises, private breeding organizations have to prioritize profit generation over all other objectives; conversely, public breeding programs should ideally be prioritizing providing a public

good/service. Indeed, it is the co-option of public interests under private objectives that characterizes the third seed regime most distinctly:

> State seed policy in the third seed regime is conditioned by the corporate restructuring of the food system, or by the *state's perception* of the corporate restructuring and its ideas for how Canada should position itself within the changing context (Kuyek, 2007, p. 41, emphasis added).

The following section will outline how Canada's legislation on seed policies have increasingly favoured the interests of private breeding and large seed companies, and have subsequently diluted the control of seed production by farmers.

2.5 LEGAL CONTEXT OF THE THIRD SEED REGIME

2.5.1 Overview of Seed Legislation and Regulations

Through a complex set of regulatory mechanisms supporting the intellectual property rights of plant breeders, corporate actors have effectively influenced the state to legally prevent farmers from saving patented varieties of seeds (Kloppenburg & Kenney, 1984; Kuyek, 2007; Howard, 2009). Canada's *Seeds Act*, the *Plant Breeders' Rights Act*, and their signatory role in the *International Union for the Protection of New Varieties of Plants* (UPOV), establishes the legal context of the third seed regime in Canada. Through these legal arrangements, Canada has taken a stronger position on intellectual property rights on seeds, and these stances have ostracized farmers that choose to engage in seed-saving at socioeconomic and political levels (Kloppenburg & Kenney, 1984; Kuyek, 2007; Phillips, 2008). This section will provide an overview of each of these legal arrangements, and will discuss the cumulative implications of these agreements on the seed industry and farmers.

The Seeds Act:

The *Seeds Act* (R.S.C., 1985, c. S-8) provides the rules surrounding the testing, inspection, quality, and sale of seeds. The Seeds Act was implemented in 1923, to protect farmers and other actors in the food industry from poor quality seed being sold and distributed. The state prescribed minimum standards of purity, germination, quality, and diseases for seeds. Issues surrounding grading, labelling, and marketing, of seed were also covered. The most important dimension was establishing variety

registration in Canada, which ensured that if a variety was to be sold it had to be registered and meet certain quality standards, or meet the criteria of the certifying bodies approved by the Canadian Seed Growers Association (CSGA).

The Plant Breeders' Rights Act:

The *PBR Act* (S.C. 1990, c. 20) was designed to protect the interests and reward the work of plant breeders. Essentially, the legislation ensures the exclusive rights of plant breeders to engage in commercial activities with their varieties, and penalizes individuals who attempt to sell or propagate that variety for commercial purposes.

International Union for the Protection of New Varieties of Plants (UPOV):

In 1991, Canada became a signatory member of the International Union for the Protection of New Varieties of Plants (UPOV) (CFIA, 2010). The UPOV is a system of plant variety protection to extend intellectual property rights across international borders, and develop an international variety registration system. Any variety that is registered under the UPOV cannot be propagated for commercial purposes without permission from the rights assignee, ensuring that patent holders receive royalties for any sales of those protected varieties.

2.5.2 Implications of Regulations

Each of these regulatory frameworks is influenced by the "commodification of the seed" logic that is consistent with the third seed regime (Kloppenburg cited in Kuyek, 2007, p. 32) [6]. Borowiak (2004) – commenting more generally about international intellectual property agreements – outlines the risks that come with adopting the logic of mass commercialization of seed varieties:

> That commercial profitability and its association with progress could be made the centerpiece of [trade-related aspects of intellectual property rights (TRIPS)] with such far-reaching implications for farming communities illustrates the extent to which farmers have been displaced in the discourses and, increasingly, the practices of agricultural production (p. 520).

[6] The discourse surrounding the legal implications of patenting life forms has been written extensively elsewhere, and will not be discussed in this paper; instead, the focus will be on the impacts of this type of legislation on the farmers' ability to save seed.

The impact of this rationale should not be understated, because regulations have become increasingly geared towards protecting private interests of profit accumulation, while limiting the broader social interest of seed-saving and seed exchanges of farmers.

From the perspective of proprietary seed companies, it is completely reasonable that the investments of plant breeders should be protected and rewarded:

> The shift from agricultural research as a public good that provides farmers with seeds incorporating advanced traits to the granting of temporary monopoly privileges to plant breeders and patent holders through the tools of intellectual property, is essentially defended as a means to reward, and thus incentivize, research and innovation in plant breeding (De Schutter, 2011, p. 311)

Yet, the assumption that the interests of plant breeders – or rather, those who own the products of plant breeders – are equivalent to the best interests of farmers is problematic. In fact, Phillips (2008) notes that, "farmers indicate that plant breeders' rights are, on the whole, not benefiting them but rather are serving seed corporations by ensuring higher seed prices, less grower control, and limits on selling or purchasing saved seed" (p. 9).

Beyond ensuring that farmers continue to purchase proprietary seeds each year, and that previously registered varieties are not undermined unnecessarily, there are minimal incentives and few standards for private breeders to ensure that they consider the broader socio-ecological impacts that using these varieties might induce. Indeed, Belcher et al (2005) argue that, "the first generation of [genetically modified] crops represent autonomous (technology-push) rather than induced (demand-pull) innovations" (p. 390). Since the companies that offer these seeds are becoming increasingly consolidated, the ability for farmers to choose alternative options becomes less and less viable. As Phillips (2008) notes, "corporate concentration breeds catalogue concentration" (p.11); as a result, proprietary seeds are concentrating seed catalogues, regardless of whether they are the best economic options for farmers, or for the ecology of the land that they farm.

While the aforementioned issues speak to the hardships of conventional farmers, the interests of agro-ecological growers are all but ignored in Canadian legislation. In 2005, the Canadian Organic Growers (COG) released a response to amendments being made to the PBR Act, and levied criticisms

about how the PBR Act is inhibiting the advancement of organic agriculture (Macey, 2005). By encouraging the development of proprietary seed, the PBR Act reduces the capacity for varieties to be produced for organic production. Genetic engineering and genetic modification have become the dominant practice in proprietary plant breeding; however, GE and GM seeds cannot be certified organic, nor can they be saved for commercial propagation in organic production. Therefore, not only are the quantity of varieties available for organic production being limited, but the availability of plant germplasm – that is, any living plant tissue from which new plants can be grown – to organic farmers is significantly reduced (Macey, 2005).

Moreover, for untreated conventional cultivars that perform well in agro-ecological systems, these breeding materials are not leased to organic seed companies or agro-ecological farmers, disallowing these actors from improving these varieties for agro-ecological production (Dillon & Hubbard, 2011). A more lenient position by the state on intellectual property agreements, could enable farmers to save and exchange seed without penalty, and consequently, broaden access to plant germplasm for development. Instead, private and public breeding programs are "focused on GE varieties which are prohibited in organic systems and also create a serious risk of contamination and subsequent loss of organic crop status and markets when grown in the vicinity of organic farms" (Macey, 2005, p. 8). Lammerts van Bueren et al (2010) accurately summarize the need for plant breeding for agro-ecological farming:

> Organic plant breeding follows the concept of naturalness, by avoiding the use of chemical inputs, by stimulating the agro-ecological self-regulatory ability of organic farming systems, and by respecting the integrity of plants based on respect for their natural reproductive ability and barriers, and their relationship with the living soil (p. 94).

Among organic plant breeders, the sentiment holds that while breeders need to be rewarded for their work, the current system unfairly penalizes the informal seed development systems of farmers. Lew-Smith (2012), Director of Research and Production at High Mowing Organic Seeds (High Mowing), develops hybrids through classical breeding; however, High Mowing has yet to patent any of their open-pollinated or hybrid varieties, because they believe that they are "breeding open-pollinated varieties, so they live on". Similarly, an organic plant breeder and seed grower at the Family Farmers' Seed Co-

operative (FFSC Member-Farmer, 2012), explicitly voices a concern about the problematic nature of patenting seeds:

> When I take corn and I start creating new varieties out of it. I realize that I'm working off of tens of thousands of years of selection that other people did. To patent that, is to basically spit in their faces and say 'I made it – *mine*' (emphasis added).

This is not to say that the Canadian government does not understand the importance of the maintenance of a diverse national seed-bank to ensure seed germplasm is conserved. *Canada's Plant Germplasm Network* facilitates the coordination of the few genebanks across the country to preserve Canadian agrobiodiversity. However, the capacity for these genebanks – and the CSOs that primarily support them – to reproduce, test, and propagate, seed varieties in Canada is limited (Seeds of Diversity, 2011; Wildfong, 2012). Therefore, although policy reform is necessary to better support building a more cohesive seed system for Canada, much of this reform is dependent on a complete re-orientation of state objectives and philosophies concerning agriculture as a whole. Given that this level of political transformation is unlikely in the near future, farmers must reclaim this responsibility and establish their own alternatives, in lieu of services that are not being provided by the state. However, the increasing consolidation in the seed industry that is indicative of the third seed regime creates several challenges to pursue these kinds of opportunities. The following sections outline the impacts of corporate concentration of the seed industry in Canada.

2.4 CORPORATE CONCENTRATION IN THE SEED REGIME

2.4.1 Corporate Acquisitions and Mergers

With 56% of global proprietary seed markets controlled by the top four seed firms in the world (i.e. Monsanto, Dupont, Syngenta, and Bayer), the global seed market is no longer considered competitive as the commonly accepted concentration ratio of 40% in the industry has been exceeded (Howard, 2009) (please see Appendix 6 for a visual consolidation of the seed industry). Essentially, the third seed regime is characterized by these large agri-businesses co-opting the services of private breeding, seed production, and seed distribution. Industry actors further sustain their influence on market dynamics by maintaining leading membership roles in industry consortia that represent the interests of major efforts of seed

companies (e.g. Canadian Seed Trade Association (CSTA), Canadian Seed Alliance (CSA), etc.) (Phillips, 2008). These consortia are powerful lobbyists that can affect state policies on seed, compromising the ability of the state to implement regulations that acknowledge the economic, social, and ecological interests of disadvantaged farmers and members of AAFNs (Kuyek, 2007; Phillips, 2008).

Monsanto's recent acquisitions of Delta & Pine Land ($1.5B), Cargill's International Seed Division ($1.4B), Seminis ($1.4B), and Holden's Foundation Seeds ($1.02B), are clear examples of corporate consolidation in the sector (Howard, 2009). These larger agribusinesses also tend to pay significant premiums for acquired seed companies; as a result, higher rates of profit are expected following the acquisition (Howard, 2009). This implication is consistent with McMichael's (2009) observation about financialization in agriculture: smaller companies, once purchased, come to represent profit centres and appreciable assets for the acquiring corporations, rather than being service providers for society. In turn, for smaller seed companies that have been acquired, their operations can easily be suspended – or more likely, co-opted – if they are not generating desirable rates of return. Whether these firms are providing seeds that actually help farmers economically, socially, and ecologically, is a secondary priority for the acquiring corporations.

From the microeconomic perspective of the firm, engaging in this form of vertical integration in the seed industry is an astute method to ensure short to medium-term profit maximization:

> The goal of vertical integration is to own both the biotechnology research and development companies that hold the patent protections for key traits, as well as the seed companies that sell the actual delivery vehicle for these technologies (Howard, 2009, p. 1271).

Large agribusinesses may very well understand the intrinsic value of genetic diversity and the ecological importance of agro-ecological landraces. Yet, the imperatives of increasing profitability and unabated market growth are incompatible with the maintenance of diversified – often, less profitable – seed operations (Kloppenburg & Kenney, 1984). As such, seed companies set their own breeding agendas according to the only criterion that matters: *shareholder profitability*.

So far, the majority of acquisitions have been in the realm of conventional grain crops and field crops – crops that are the most conducive to the agri-industrial paradigm of large-scale, intensive

monocultures. While the seed industry for field and grain crops clearly requires reform, the regulatory barriers and corporate concentration make it extremely difficult to do so. However, Monsanto's acquisition of Seminis, and other small vegetable seed companies, and Cargill's sale of its international seed division, signals that "vegetable seed is following a similar consolidation trajectory as corn, soybean, and cotton" (Dillon & Hubbard, 2011, p. 36). This process of consolidation has downstream effects on the infrastructure for building agro-ecological seed capacity: "[Larger seed firms] have a clear strategy of purchasing independent seed companies, many of whom once served the organic market with untreated conventional seed and certified organic seed" (Dillon & Hubbard, 2011, p. 37). As such, Howard (2009) wisely cautions about the risks that come from increasing oligopoly power in the seed industry – particularly if it results in raised seed prices: "Those with strong commitments to sustainability, rather than narrow economic goals, may be most economically vulnerable to falling off the farming treadmill" (p. 1281).

2.4.2 Agricultural Seed Treadmill

Based on the concept of the technological treadmill (see Cochrane, 1958), the *agricultural seed treadmill* (Howard, 2009) is a theoretical frame that explains the paradoxical dynamic between farmers and commercial seed companies. Due to both the concentration of the seed catalogue and the inability to save proprietary seed, most farmers are locked into purchasing seeds from elsewhere which increases their operating costs. Consequently, farmers generally need to increase the scale of their production in order to cover their growing input costs and/or debt. As stated earlier, following the Green Revolution, and the proliferation of biotechnology in the 1990s, farmers began to rapidly adopt high-yielding varieties in order to achieve greater yields and revenues. The widespread adoption of these varieties increased agricultural production which outpaced both population growth and demand; therefore, the relative prices that farmers received for their crops subsequently dropped[7].

[7] Since the price of food is relatively inelastic (i.e. consumers will continue to purchase roughly the same quantities of essential foods regardless of price), increases in production (i.e. downward shifts in the supply curve) result in reduced prices for farmers (Howard, 2009).

The attractiveness of these high-yielding proprietary seed varieties is naturally compelling for most farmers – farmers can realize increased revenues, greater production efficiencies, and more predictable yields. However, the financial benefits accrue primarily to early adopters and large-scale farmers (Howard, 2009). Small-to-mid-scale farmers, and those that choose to adopt this form of production when the market is saturated, are often disadvantaged economically. Moreover, accompanying the proliferation of these commercial varieties are the associated agro-chemicals required for pest/disease tolerance; and the agricultural technologies to generate greater efficiencies in the production process. By adopting proprietary seed varieties and the subsequent costs that accompany those varieties, farmers' input costs increase on an annual basis and their profit margins continue to erode, if gross revenues do not increase to the same degree:

> The net effect of…treadmills is a tendency to spend constantly increasing amounts of money to operate a farm, even if net revenues decline. These rising expenses are paid to upstream participants in the commodity chain, as well as 'passed through' to downstream participants (Howard, 2009, p. 1270)

Abaidoo (2000) notes that contract arrangements between seed companies and farmers intensify this process. Farmers, who purchase proprietary seeds from large-scale seed companies, establish contracts with these firms for the continued use of these seeds over a certain period of time. Under the terms of the contract, growers cannot exchange seeds purchased, nor are they allowed to save seeds for re-planting. They are also either encouraged or required to purchase the requisite agro-chemical inputs that best accompany the acquired seed varieties. Abaidoo terms these farmers 'quasi-employees' of agribusinesses, where the 'wages' for the growers are realized in the expected increases in revenues from using these inputs.

Therefore, in order for farmers to realize ongoing economic profitability, farmers need to increase the scale of their production to cover their operating costs, constraining the ability of farmers to apply agro-ecological techniques (Howard, 2009). Although it is not impossible to practice agro-ecological farming on a large-scale, the practices are more easily compromised, because large-scale farms are simply more difficult to manage, require greater mechanization, and warrant the use of agro-chemicals (Guthman, 2000; Gomiero et al, 2011). Large-scale industrial farms tend to have heavy fertilizer and

pesticide use, and generate large amounts of GHG emissions, and are subsequently not easily converted to agro-ecological production (Gomiero et al, 2011). However, because these farms can produce at higher volumes and more widely spread their operating costs, they are the types of farms favoured in the food system (Christianson et al, 2010). This trend is reflected as the number of farms in Ontario have been steadily decreasing from 57,211 in 2006 to 51,950 in 2011, while the average size of farms has increased from 233 acres in 2006 to 244 acres in 2011 (please refer to Appendix 7 for an overview of declines in number of farmers and increases in average farm size in Ontario) (Statistics Canada, 2012). This system effectively disadvantages small-scale producers (of all farming practices) because they simply cannot produce large enough quantities of food without changing the scale (and consequently, their farming practices) of their operations.

In Ontario, farmers have recorded steadily declining net incomes for decades. While gross farm revenues for Ontario farmers have increased, expenses have risen disproportionately, resulting in lower percentages of the consumer dollar for farmers (NFU, 2011) (please refer to Appendix 8 for an overview of declining farmer income in Ontario). The results of the farm income crisis have affected smaller farmers the most, forcing most farmers to maintain off-farm employment or sell their land to corporate buyers (NFU, 2010). Conversely, the profit margins of seed companies and agricultural input providers have continued to see unprecedented rates of growth (Howard, 2009). The income disparity between input companies, and the farmers that they are serving, speaks to broader dynamic of income inequality in the food system, and remains one of the most detrimental socioeconomic fallouts of corporate concentration.

2.5 SOCIO-ECOLOGICAL IMPACTS OF THE SEED REGIME

2.5.1 Vitiation of Informal Seed Networks

Seed collection and distribution has been the cornerstone of building resilient agricultural networks and communities for centuries (Borowiak, 2004) – it is only very recently that this practice has been challenged and changed. For seed companies engaged in private breeding and proprietary seed distribution, the long-standing practices of seed-saving and seed exchanges threaten firm profitability (Kuyek, 2007; Howard, 2009). Therefore, larger industry actors have attempted to overcome profitability

barriers through lobbying for the aforementioned regulatory mechanisms, but also through leveraging the scientific innovations of hybridized varieties (Kloppenburg & Kenney, 1984; Howard, 2009).

It is very time-consuming and extremely unpredictable for farmers to save true-to-type seeds from hybrid crops. Moreover, since germplasm of patented parent lines are only available to the private breeders, farmers are unable to replicate the breeding process of those hybrid varieties. Reaping the benefits of hybrid vigour through classical plant breeding has been a long-standing practice for farmers, and hybrid varieties are common in agro-ecological production as well (Dey, Organic Seed Survey for Ontario Farmers, 2012). However, centralizing the ownership and control of the propagation of hybrid varieties into the hands of private breeders, as opposed to sharing that knowledge and that task with farmers, is problematic for seed diversity and innovation (Kloppenburg & Kenney, 1984; Kuyek, 2007; Howard, 2009).

Additionally, if the denigration of informal seed networks contributes to the advancement of industrialized agriculture, then the patterns of destabilizing relationships in farming communities are also expected to continue. The increase of industrialized farming in rural communities has reduced rural populations, deteriorated community organizations, and diminished civic engagement in public decision-making (Lobao & Stofferahn, 2008). The shift from diversified informal farmer networks to centralized seed production through privatized breeding programs has also led to the loss of numerous ethno-culturally appropriate crops (Abaidoo, 2000; Jarvis et al, 2011). In Canada, this has happened in parallel with increased reliance on importing from foreign markets, as opposed to cultivating regionally-adapted culturally appropriate varieties. Although the importance of preserving seed varieties has rightfully warranted attention in economically impoverished countries, its values and benefits should not be understated in Canada:

> Growers in countries with dominantly industrial agri-food systems and developed commercial seed markets, like Canada, are not expected to continue saving seed; rather as participants in ‘modern agri-food systems’, they are expected to purchase their seeds each year as inputs (Phillips, 2008, p.6).

Many farmers resist this logic because they understand that propagating and harvesting good quality seed is a body of knowledge that might be lost if it is not maintained within regional communities.

2.5.2 Marginalization of Agro-Ecological Seed Varieties

Although sociocultural networks between farmers have been impaired under the third seed regime, the proliferation of commercial proprietary seeds are also, "increasingly bound to agricultural practices that promote unsustainable topsoil depletion, monocultures, contamination of ecosystems, and high fossil fuel and water consumption" (Howard, 2009, p. 1281). Although the risk of cross-pollination of vegetable crops with GM/GE crops is not a significant material concern at the moment, the increasing contamination of farmland by GM/GE crops could disadvantage farmers because of their inability to certify produce for sale in markets for organic produce (Belcher et al, 2005). Furthermore, the seed regime centralizes the ecological risk of food production in a small number of crop varieties (Lammerts van Bueren et al, 2010; Jarvis et al, 2011). Genetic uniformity in crop varieties renders current agricultural crop profiles more susceptible to pests and disease, less supportive of pollinator diversity, and less resilient to future changes in climatic conditions (Jarvis et al, 2011). Zimmerer (2010) further highlights the risks associated with 'genetic erosion', as it affects the degree of variation within different plant species, genera, and families. As evidenced by Jarvis et al (2011) earlier, there is a wealth of research that identifies the innumerable ecological benefits of maintaining a diversity of agro-ecological landraces.

It is important to note that seed suited for agro-ecological production is not a panacea to ecological problems; agronomic dilemmas (e.g. seed-borne diseases, pest resistance, low yields, etc.) inspired the development of biotechnology and agro-chemicals for practical reasons. However, these same agronomic issues are being addressed by agro-ecological growers through cultivation practices that are less ecologically damaging. These efforts could be further supported through both public and private breeding programs studying alternative seed treatments, agro-ecological pest and disease management, and rigorous field tests for seed quality. Many argue that if organic production is a priority for the state, then breeding programs need to be supported through both off-farm and on-farm research, multi-region variety trials that reflect the diversity of landscapes in agro-ecological production, and non-proprietary germplasm development (Macey 2005; Dillon & Hubbard, 2011). Instead, there is very little support for

organic breeding programs and the industry is concentrated with the proprietary commercial seed that symbolizes the problematic features of the third seed regime.

As a result, the efforts to build a diverse agro-ecological seed infrastructure for farming are structurally undermined by market and state dynamics. Ultimately, the third seed regime represents a microcosm of the impacts of the Green Revolution: although food production and agricultural development has increased, it has come at the cost of the socioeconomic equity of farmers and the capacity for food production to be ecologically restorative. Borowiak (2004) summarizes this entire dilemma for farmers appropriately:

> What do farmers want? Clearly different farmers want different things. But it seems reasonable to suggest that most want recognition of their contributions, fair rewards for their labor, the freedom to farm as they please, good seeds that produce good crops but that do not ruin their land or lead to lost autonomy, and supportive communities that exercise control over the food they consume (p. 527).

2.6 NEEDS OF AGRO-ECOLOGICAL VEGETABLE SEED GROWERS

So, what do farmers want? The conclusions drawn from the primary and secondary research from this project have been generally consistent with the academic literature, albeit with more complex dimensions and some variation. Most agro-ecological farmers understand the inherent importance of regionally-produced agro-ecological vegetable seed varieties, but farmers face a multitude of constraints to justify taking ownership of seed production. Jarvis et al's (2011) seed-saving heuristic is used here again to better contextualize these barriers, as they relate to the opinions and needs of agro-ecological growers in Canada.

Constraint 1: Regional agro-ecological seed diversity does not exist, or exists in insufficient quantities

Amongst all research participants, it was clear that there is not enough regionally grown agro-ecological vegetable seed being used in Canada, let alone Ontario. The main reason farmers provide for not purchasing agro-ecological seed for vegetable production is because producers cannot find appropriate seed for the specific varieties they either wanted or needed to grow:

> There is a lack of appropriate seed stock for growing organically. You can't just take the hybrid cucumber that was bred for 20 years, fed [nitrogen, phosphorus, and potassium

> fertilizer], sprayed to the dickens every season, and then just plant it organically and expect it to behave the same (OCO Executive Member, 2012).

One agro-ecological farmer voiced frustration at the lack of regionally-produced organic seed:

> We should have a small Canadian content rule. As of now, there is nothing. The only seed you get from Canada is corn, soy, wheat, and big cash crops. The vegetable seed saving is non-existent and food security is a joke without seed saving (Dey, Organic Seed Survey for Ontario Farmers, 2012).

Indeed, for seed-conservation CSOs and the small-scale seed growers across Canada, they exist because they genuinely believe in the need to build the capacity of agro-ecological landraces (Steiner, 2012; Brisebois, 2012; Wildfong, 2012).

However, it should also be noted that there are regional climatic difficulties to producing seed. As Lew-Smith (2012) notes, "[Some seeds] need a long season, they need it to be cool, and they need winters to be temperate – and that temperateness is something [other regions do not] really have". Since growing vegetable seed crops require longer and different seasons than growing those same crops for consumption, regions with longer summers and warmer winters have climatic advantages that enable them to grow greater quantities of seed more appropriately (Lessard et al, 2011). Most of the large seed producers supplying the Canadian market, source the majority of their seeds internationally because the costs are lower and climatic conditions are more favourable: "Popular vegetable varieties are often bred in Europe, and their seed production is better adapted to these conditions" (Lessard et al, 2011, p. 45).

Of the farmers surveyed in Ontario, while the survey respondents were either 'not satisfied' (44%) or 'somewhat satisfied' (18%) with the *amount* of regionally-produced seed offered by seed companies, they were mostly satisfied (88%) with the *number of varieties* being offered by seed companies (Dey, Organic Seed Survey for Ontario Farmers, 2012). While most of these seed companies provide internationally sourced untreated varieties of seed, as opposed to regionally grown certified organic seed, farmers find these conditions acceptable – if not ideal – in order to procure adequate quantities from a wide variety of seeds for their production.

In terms of what is being provided by Canadian growers, it is mostly "small-scale seed producers offering small quantities of various varieties with unequal quality" (Lessard et al, 2011, p. 45). If the

quantity of regional agro-ecological vegetable seed were to expand in Ontario, seed growers would most likely need to specialize their production practices to a smaller number of varieties that they can produce optimally. However, the shift in production would consequently reduce the diversity of regional varieties being produced, and "many seed growers may not be willing to take the path to this type of production if they value diversity and [would] refrain from expanding" (Lessard et al, 2011, p. 45).

Constraint 2: Regional agro-ecological seed diversity is inaccessible to farmers

That untreated commercial seed varieties are dominating the market makes it more difficult for growers interested in adhering to stricter regional agro-ecological practices to find suitable sources of seed – particularly for vegetable varieties (Macey, 2005). Lessard et al (2011) state that there is a clear market gap between the requirements of agro-ecological growers and the supply provided by seed retailers. However, most farmers surveyed responded that they are able to procure quality seed from private seed companies and do not place a high priority on the importance of seed origin during procurement (only 47% of farmers listed 'seed origin' as 'important' or 'very important'). One farmer notes that, "It's easy enough to purchase good seed from the private company. They are putting a lot of money into research and technology and can give me much more superior seed than a co-op or local farmer can" (Dey, Organic Seed Survey for Ontario Farmers, 2012).

Lessard et al (2011) notes that, "Most organic annual vegetable producers prefer to buy from large seed retailers instead of small organic seed producers … They prefer to buy from them even if there are small organic seed producers located closer to their farms" (p.16). This is not to say that farmers do not support the movement for regionally-adapted seed, but their priority is acquiring good quality seed to ensure that they can operate their farm. Therefore, although they might *understand* that regional agro-ecological vegetable seed is important, if it is not easy to procure or if it cannot ensure quality, farmers will not take on that risk and will not consider it a major factor in their purchasing behavior (Lessard et al, 2011; Slater, 2012; Wildfong, 2012; Dey, Organic Seed Survey for Ontario Farmers, 2012). Slater (2012), Coordinator of the National Farmers' Union in Ontario, encapsulates the position that many farmers take: "Personally, I don't have a lot of challenges with sourcing seed and getting the varieties that I want…but

lots of vegetable farmers would like to source more Ontario-grown vegetable seed *if they could*" (emphasis added).

Constraint 3: Farmers do not value and use regionally-adapted agro-ecological seeds

As the research indicates, cultivating farmer interest, awareness, and skill on regional seed production is a paramount concern. Nearly all growers surveyed expressed that finding time, building sufficient knowledge, managing crop rotations, integrating isolation distances for seed crops, and growing out enough of the crop to ensure trueness to type, are all significant challenges to seed-saving and production (Dey, Organic Seed Survey for Ontario Farmers, 2012). However, the importance of regionally-adapted seed varieties is not a vision that is shared by all advocates of the sector yet. Telford (2012), a Business Development Specialist at the Manitoba Agriculture, Food & Rural Initiatives (MAFRI), questions whether the benefits derived from regional varieties are enough to warrant growers to purchase regionally produced seed. Telford comments that, when most of the organic vegetable seed in the world is coming from Europe, farmers are right to wonder whether the benefits from producing regional varieties outweigh the costs. Accordingly, one of the primary reasons as to why farmers have yet to take more ownership over seed production is whether the investment of knowledge and time can be economically justified (Dey, Organic Seed Survey for Ontario Farmers, 2012).

Constraint 4: Farmers do not benefit from the maintenance of regional agro-ecological seed diversity

It is understood that given the labour-intensive character of agro-ecological farming, the direct and indirect costs to produce agro-ecological vegetable seed are extremely prohibitive, especially considering the difficulty that it takes to bring this form of seed production to competitive economies of scale. However, it is this tension that is one of the core issues for building the capacity for farmers to take ownership of seed production – why is it uneconomical to produce regionally-adapted agro-ecological vegetable seed in Canada? Climatic restrictions and knowledge barriers should be understood as two paramount obstacles; however, seed-saving for several particular crops is not impossible and it is important on an ecological level to discover which crops can produce seed that is well-adapted to Canadian conditions (Macey, 2005; Wildfong, 2012).

As such, one of the main reasons that building this capacity is difficult is because competing against larger seed companies that can keep their costs low creates a significant barrier to entry:

> The commercialization of the seed market means the prices are really low…just like with any other agricultural crop, we have this artificially low price on the input. So to do it crafted by hand, and compete with the same seed price is going to be a challenge, it precludes there being a market for it, unless it's something you're really good at (OCO Executive Member, 2012).

While some of the documented research may indicate that the importance of building regional agro-ecological vegetable seed capacity is not an immediate priority for farmers, it should not undermine the potential benefits it can bring. Not to undercut the challenges that farmers face when saving seed, or to discount their current procurement preferences, but just because it is uneconomical at the present time, does not mean that it is an initiative not worth pursuing. Wildfong (2012), Executive Director of Seeds of Diversity in Canada, explains why regionally-focused seed capacity is necessary:

> I think [regional varieties] makes sense…if we're going to have Canadian seed companies and Canadian produced seeds…it makes sense that we should have varieties that have been field tested over and in the places where they are going to be sold and grown.

Stellar Seeds, a small-scale organic seed company in British Columbia, is constantly running up against economic challenges due to financial constraints of seed production; however, Steiner (2012) founder of Stellar Seeds, continues the operation because of the belief in the necessity of the task: "we [do] it because we [know] it [needs] to be done" (Steiner, 2012). Amongst all interviewees and survey respondents, the general consensus was that *if* high quality regionally-adapted organic seed was available in Ontario, farmers would most certainly support it (Dey, Organic Seed Survey for Ontario Farmers, 2012; Dey, Organic Seed Survey for Ontario Seed Companies, 2012; Brisebois, 2012; Slater, 2012; Wildfong, 2012). As a result, there is a need for further investigation into what approach is economical, and which approach can yield the greatest benefits for both farmers and seed growers[8].

[8] The research presented later in this paper attempts to provide some of that information, and reconcile the apparent contradictions between the literature and the opinions and actions of farmers.

2.7 ROBUST SEED SYSTEMS

de Boef et al (2010) propose the idea of *robust seed systems* as a framework to build effective systems of seed procurement and distribution for farmers:

> Robust systems are able to respond to changes in environment, society, and economy; they are dynamic rather than static. Such systems are flexible, open, and in flux, but at the same time stable in providing expected social, economic, ecological and biological services (p. 510).

Accordingly, *robust seed systems* should exhibit (1) the maintenance and advancement of regionally-based agricultural biodiversity, (2) the institutional dynamism to respond to socio-economic changes and the ecological flexibility to adhere to agro-ecosystems, (3) community-based organization of seed related activities, (4) farmer autonomy and self-reliance, (5) the capacity to engage in market mechanisms and the focus to provide seed-related services to that market, and (6) the ability to create synergies across formal and informal seed systems, larger market actors, and government policy makers (de Boef et al, 2010). Although de Boef et al (2010) formulated these principles for the needs of economically disadvantaged countries, where the maintenance of agrobiodiversity is more clearly linked with food security and economic well-being than in Canada, these tenets can still provide a suitable framework for a robust seed system in Canada because the elements are generally consistent with the ideals of AAFNs.

As noted in *Figure 1*, non-profit organizations like Seeds of Diversity, the Seed and Plant Sanctuary for Canada, and USC Canada, are developing different strategies to preserve agro-ecological landraces, but they face severe economic challenges in scaling up their strategies. Similarly, small-scale seed companies like The Cottage Gardener, Hawthorn Farm, Urban Harvest, etc., are household names to small-scale growers and gardeners in Ontario (Dey, Organic Seed Survey for Ontario Farmers, 2012). While these firms are slowly building the capacity to serve larger markets, it is still beyond their organizational capacity to provide *bulk quantities* for the production needs of agro-ecological vegetable growers in Ontario. As mentioned earlier, if these companies choose to do so, they may have to scale up their production, limiting their ability to practice agro-ecological methods and compromising the diversity of their operations (Howard, 2009; Lessard et al, 2011).

As a result, most agro-ecological farmers are still purchasing bulk quantities of their seed from international organizations like William Dam Seeds, Johnny's Selected Seeds, and High Mowing Organic Seeds. There is no Canadian-based – let alone, Ontario-based – seed organization that is operated by regional growers *and* is providing bulk quantities of regionally adapted agro-ecological vegetable seed varieties. Therefore, consistent with the market trends and analyses listed earlier in this paper, and given that government support for undertaking this responsibility is unlikely, the challenge for growers is to develop initiatives that meet the criteria of robust seed systems. The next section explores how and why social enterprises are organizational forms that might be able to achieve the ideals of a *robust seed system* in Canada.

SECTION 3: CO-OPERATIVES AS SOCIAL ENTERPRISES IN THE SOCIAL ECONOMY

3.1 SOCIAL ENTERPRISES: BUSINESS MODELS FOR AAFNS[9]

To critique the oligopolistic tendencies of for-profit enterprises that occupy a particular industry is not a new endeavour. The aforementioned analysis of the third seed regime mirrors Marx's concepts of *concentration* and *centralization*[10], and it is also indicative of unchecked capital accumulation and profit maximization by critical social and economic theorists (Agger, 1993; Harvey, 2005). However, in an effort to not re-state what has been written by others about capitalist enterprises, it might be more useful to ask what kind of organizations can best facilitate the ideals of AAFNs and robust seed systems in an economy that is at odds with them? To answer this question, it is important to elucidate how conventional for-profit enterprises are *not* well-suited to achieve these goals, and how social enterprises – particularly co-operatives – might be more adept at doing so.

As with the concept of the social economy, the term 'social enterprise' has been inconsistently applied (Dees & Backman, 1994; Dart, 2004). Nonetheless, social enterprises may be differentiated from conventional for-profit institutions[11] and traditional NPOs through two main dimensions: (1) purpose and (2) means. First, contrary to conventional for-profit enterprises, social enterprises prioritize social objectives over economic profits: "The possible generation of a surplus may…be an outcome of providing services or a way to improve them, but not the main motivation behind the activity" (Borzaga & Defourny, 2001, p.6). When profits are generated, they are re-invested in the operation rather than distributed to shareholders and private owners, so that they, "support social causes rather than…increase the wealth of investors, managers and owners" (Masseti, 2008, p. 4). Second, contrary to NPOs, the means by which social enterprises generate these societal benefits is through market mechanisms (i.e.

[9] The content for Section 3.1 has been adapted from an unpublished paper co-written with another classmate that was submitted as coursework for ENVS 6115: Ecological Economics (Campbell & Dey, 2011).

[10] Marx describes *concentration* as individual capitalists engaging in the process of capitalist accumulation and slowly acquiring the means of production and capital for themselves. *Centralization* is accelerated capital accumulation, where larger capitalists through the acquisition of smaller capitalists (as capital), further centralize the means of production, and effectively reduce competition in the market (Agger, 1993).

[11] For the purposes of this paper, the terms "c*onventional for-profit enterprise/business/organization/institution"* will be used interchangeably to refer to all forms of for-profit organizations that are not classified as social enterprises.

selling products/services), rather than donations or grants from public or private sources (Alter, 2007). Thus, social enterprises must produce market-generated revenue in order to optimally achieve their mission, and accordingly demonstrate a higher level of self-sufficiency than traditional NPOs (Madill et al., 2010).

Building on this idea, Borzaga et al (2008) have created a working definition of social enterprises based on three economic indicators and three social indicators, reflecting both the enterprise-oriented and socially-focused dimensions of the business model. Most indicators derive directly from the definition explored above, while others elaborate more specifically on organizational structure. Social enterprises, as defined for the purposes of this paper, will exhibit the following characteristics:

Economic:
1) Ensure a continuous provision of goods and/or services (enterprise activity)
2) Maintain a strong degree of organizational autonomy
3) Trend towards paid work (as opposed to volunteerism)

Social:
1) Provide an explicit aim to benefit the community or a specific group of people
2) Maintain a governance structure not based on capital ownership
3) Exclude profit-maximizing tendencies

(adapted from Borzaga et al, 2008, p. 31-32)

Using these six criteria, the social enterprise model appears to be well-suited to facilitating the ideals of AAFNs by (1) limiting profit maximization and growth imperatives, (2) strategizing to pursue social mandates and scaling social impact, (3) maintaining democratic governance structures, and (4) building organizational capacity to adapt to ecological complexity. When applied to organizations that are in the food system, each of these characteristics can encourage tendencies that (1) reduce the pressure for farmers to expand the scale of their production and (2) ensure that the socio-ecological missions of these organizations are not compromised by solely pursuing economically-motivated goals. In doing so, these types of organizations can better support the efforts of AAFNs, and more strongly adhere to the principles of robust seed systems. Although different models of social enterprises exist, co-operatives – with several notable limitations – best exhibit these tendencies. This section will expound upon (1) the characteristics

of social enterprises that are conducive to achieving the ideals of AAFNs, and (2) the capabilities and limitations of co-operatives to be a social enterprise that can support a robust seed system.

3.1.1 Profit Limitations and Purposeful Growth

The prevailing perspective on conventional for-profit enterprises is that their primary responsibility is to create profit for their shareholders – or more broadly speaking, generate financial returns for their creditors (van Griethuysen, 2010). Porritt (2003) summarizes the limitations that this context poses for practitioners in any conventional for-profit enterprise for achieving socio-ecological improvements:

> Demonstrating a convincing business case for improving social, environmental and ethical practice has therefore become a precondition: either prove that whatever it is that you want to do (beyond compliance with legal standards) will be in the interests of shareholders, or just don't do it (p. 4).

A group of scholars have described this dynamic as the *credit relation* (Steiger, 2006; Steppacher, 2008; van Griethuysen, 2010). van Griethuysen (2010) posits that the credit relation imposes the following requirements on the receiver of capital: solvency, profitability, and time pressure (p. 591). Essentially, any debtor is required to refund any capital loan in monetary terms (solvency), with interest rates favourable to the creditor (profitability), in a period of time defined by the creditor (time pressure) (Steppacher, 2008; van Griethuysen, 2010).

To varying degrees, all enterprises that are financed through debt and/or equity are subject to this form of rationality from their creditors, and this rationale ultimately prioritizes economic value over all other considerations (van Griethuysen, 2010). The rationale inherently rewards profit-maximizing behaviour and perpetual growth, because these characteristics ensure the most favourable monetary returns for creditors – firms that exhibit these characteristics are better positioned to attract more credit. This imperative pressures the organization to intensify their current market position, to develop new products, to pursue new markets, or to diversify their operations (Kotler et al, 2006), not necessarily for the purposes of improved social welfare, but to meet increasing returns for creditors. The contemporary economic assumption holds that in doing so, organizations are generating optimal returns and efficiently allocating resources, which ultimately, ensures improved socioeconomic well-being. It is this assumption

that is challenged by social enterprises, because meeting the economic needs of creditors does not necessarily ensure optimal socioeconomic or socio-ecological welfare.

Profit Limitations:

Although social enterprises are financed through a multitude of different ways and may still be subject to some of the demands of the credit relation, these institutions maintain the flexibility to develop internal structures that can mitigate these economic pressures or adopt legal arrangements that can alleviate excessive profitability demands. For instance, social enterprises may very well choose to scale up production and intensify their market position to increase creditor return, but these firms are *not required* to do so in order to remain viable institutions. For instance, for NPOs that maintain enterprise activities, all surpluses must legally be redistributed into better fulfilling the mission of the NPO; by law, none of the members of a NPO can receive any pecuniary gain (Canada Corporations Act, R.S.C. 1970, c. 32, s. 153). In the case of for-profit co-operatives, co-operatives maintain legal specifications on how to distribute, and use, surpluses generated by its enterprise activities. Surpluses are re-distributed to members as patronage returns, but the primary responsibility of the co-operative is re-distribute the surpluses in the best interests of its members (which may or may not be patronage returns). Moreover, for interest payments and dividends owed to other creditors, the co-operative must have a maximum return percentage fixed in its articles of incorporation (Canada Co-operatives Act, S.C. 1998, c. 1, s. 15).

For-profit co-operatives raise initial capital by issuing ownership shares to the *members* of the co-operative, ensuring that the primary creditors are those that the co-operative intends to serve. However, shares are not required to fluctuate in price and value, because it is not expected that shareholders seek to profit from changes in the value of the firm. Rather, it is expected the co-operative develops its business, improves services for its members, provides reserves for interest or dividend payouts, improves community welfare, supports parallel co-operative development, and generates patronage returns for its members (Canada Co-operatives Act, S.C. 1998, c. 1, s. 7). While shares that are issued to non-members require some form of monetary return, these shareholders are not given any voting power in the organization, so as not to skew the strategic direction of the co-operative. Each of these features of co-

operatives ensures that these enterprises do not simply become investment vehicles for profit-generation, but remain institutions that exist to serve a social mission for a given community of members.

Purposeful Growth:

In order to achieve greater efficiencies of scale, gain more market share, and/or better provide products/services, conventional for-profit businesses will generally grow their organizations with the underlying motive that greater profitability can be achieved. This is not to say that businesses do not have to consider multiple criteria when choosing to expand the scale of their operations or that growth of the operation is solely driven by profit – indeed, businesses should grow if there is a genuine need for the services that they can provide. However, the deciding factor for this growth is generally the profitability of the organization, not the *social value or impact* that an expansion in services can provide. As a result, whether through internal growth, acquisitions, mergers, franchising, licensing, or partnerships, businesses are required to ensure that a profit is generated through expansion (Kramer, 2005).

For social enterprises, the purpose is to contribute to a common good, and they do not need to retain ownership over the expansion of their firm in order to secure profits: "no one owns efforts that help society" (Kramer, 2005). While social enterprises must also consider many factors when strategizing for growth, they must ultimately decide on how to *scale social impact*, instead of economic profits. Scaling impact is understood as, "the process of increasing the impact [that] a social-purpose organization produces to better match the magnitude of the social need or problem it seeks to address" (CASE, 2006, p. 2). In some cases, strategies for scaling the impact of a social enterprise are no different than that of a for-profit (i.e. physical expansion of the organization, improvement of the products/services being provided, or enhanced productivity of resource use). In other cases, scaling social impact may include building the capacity of other organizations to replicate the enterprise's social services, or ideally, changing the political, cultural, or economic environment in order to reduce the need/problem (CASE., 2006). While scaling the social impact of a social enterprise may lead to market penetration, market development or market diversification, it does not require it. Given that social enterprises are attempting to facilitate a change in the systems that create and maintain socio-ecological problems, social enterprises

may become smaller as they catalyze societal transformation (Alvord et al, 2004, p.2). Contrarily, conventional for-profit businesses would be – more often than not – disadvantaged if they strategized away from profitability and growth.

Food Regime Context:

Examples of these tendencies can be seen by the shifting of agribusinesses into active players in the financial industry – or what some call the *financialization of agriculture* (McMichael, 2009; Burch & Lawrence, 2009). For instance, Cargill formally maintained a market position in the seed industry; in 1998, Cargill sold its international seed division to Monsanto, and its North American seed division to AgrEvo (later acquired by Bayer) (Howard, 2009)[12]. Following the sale of these operations, Cargill had the available capital to develop new opportunities for profit-making through hedge-funds, investments, and private equity trading (Burch & Lawrence, 2009). These financial activities are related to regulating the price of agricultural inputs through the movement of capital, and are understood to be much more profitable than seed breeding (Howard, 2009). The resulting impact of a leveraged role of Cargill in the financial sector enables the organization to be more of a price-maker on the commodity prices of all food inputs. While some argue that their role in this sector has negatively impacted farmer incomes and food security through contributing to increased food input prices (Burch & Lawrence, 2009; McMichael, 2009), the more problematic dynamic is that Cargill has concentrated much of the market power of commodity inputs solely in their hands, with less market power in the hands of the farmers that they claim to serve.

In spite of the adverse impacts this type of activity may have, these sorts of actions are rewarded in the conventional for-profit model as astute methods of vertical/horizontal integration. Social enterprises do not face the kinds of profitability or growth pressures that could entice them to engage in this kind of decision making which, in the case of Cargill, is ultimately disadvantaging farmers. Therefore, until legal contexts are created for for-profit businesses to mitigate these behaviours, or until organizations are

[12] Incidentally, after the sale of its seed divisions, Cargill and Monsanto began a $50 million grain processing joint venture called Rennessen, which allowed Cargill to purchase Monsanto's transgenic seeds, through the grain collection and processing aspects of the firm's food and animal feed production operations (Howard, 2009)

internally motivated to create strategies that optimize scenarios for purposeful growth, conventional for-profit businesses are positioned to continuously meet demands of profit maximization and growth over socio-ecological objectives. Conversely, social enterprises are structured to (1) moderate the profit-maximizing pressures of their creditors and (2) manage the purposeful growth of their organization to scale social impact.

3.1.2 Social Mandates, Social Capital, and Social Accountability

Within the dominant economic rationale of the credit relation, considerations of a social nature are de-emphasized, not because they are incompatible, but because they can only be considered by economic agents to the extent that they are aligned with the requirements of the creditor (van Griethuysen, 2010). While revenue generation remains central to the financial viability of a social enterprise, its business model is designed around meeting socially-driven goals, over economic profitability. Social enterprises prioritize socio-ecological improvements through (1) the establishment of explicit social mandates (2) the building of social capital, and (3) the measurement of the social impacts of their activities.

Social Mandates:

With conventional for-profit businesses bound by the demands of the credit relation, traditional NPOs are often liable to the donors on which they depend (Eikenberry & Kluver, 2004). On the other hand, social enterprises face fewer of these pressures, and instead frame their liability towards the stakeholder interests of the mission they intend to serve. Thus, while social enterprises may benefit from public subsidies, "[they] are not managed, directly or indirectly, by these public authorities or by other organizations (federations, for-profit private firms, etc.)" (Borzaga et al, 2008, p. 31). In this sense, the stakeholders of the social enterprise are the members of the wider community whose needs are being targeted by the activities of the business. As a result, "business success and social impact are interdependent" (Alter, 2007, p. 18), and the income generated by a social enterprise is constantly directed towards the fulfillment of its *social mandate*.

Social Capital:

Beyond carrying explicit social or ecological goals, social enterprises can be building blocks for enhancing the social capital of a region. Social capital is generally understood as, "features of social life-networks, norms, and trust, that enable participants to act together more effectively to pursue shared objectives" (Putnam, 1995, p. 664-665). The types of actions undertaken by social enterprises, as well as some of the organizational principles upon which they are founded, allow them to both generate social capital and mobilize social capital as a resource (Laville & Nyssens, 2001). In particular, social enterprises are able to foster social cohesion by encouraging the development of new networks and social bonds, and by acting as visible examples of the effectiveness of collective action in achieving community goals (Sabatini, 2006). In turn, many social enterprises depend to a large degree on the creation of strong relationships with, and among, the community; thus, the fostering of social capital becomes an integral part of their success.

Social Accountability:

Since social enterprises pursue multiple interconnected goals rather than only profitability, they often face the challenge of being accountable and "proving their worth" (Doherty & Thompson, 2006, p. 415). For conventional for-profit enterprises, financial statistics and other quantitative measures are the main indicators for performance; social enterprises must often communicate less tangible social impacts (Doherty & Thompson, 2006). Given the diversity of institutions within the social economy, and the wide range of societal impacts they seek to create, several different methodologies designed to measure social value creation have emerged. Bouchard (2010) explains that organizations in the social economy are evaluated on dimensions of organizational performance (e.g. financial, quality, efficiency, etc.), social utility (i.e. measurements of their socio-ecological goals), and institutional change (i.e. capacity to influence broad-based policy change or social reform).

Food Regime Context:

In examining the 'corporate social responsibility' or 'sustainability' literature of any major agribusiness, several claims could be made that many of these firms are fulfilling social missions and

actively building social capital through investments in rural development, community engagement, and ecological stewardship. However, many of the efforts of these organizations are not necessarily *integrated* into their operations, and are often categorized as their 'social' or 'corporate' responsibilities. As Kurucz et al (2008) note, "By asserting that corporations must attend to 'social responsibilities' in addition to 'business responsibilities', we admit that the two are distinct and separable" (p. 98). When efforts to improve social welfare *are* integrated into the business operations of agribusinesses (e.g. less ecologically harmful agro-chemicals, resource-conserving seed varieties, prioritizing resource-poor communities for job creation, etc.), the debate turns to whether these kinds of efforts are truly attempting to facilitate socio-ecological betterment, or whether they are merely making the agri-industrial paradigm more marketable to critics.

As such, Lobao & Stofferahn (2008) conducted a detailed study on the impacts of industrialized farming on rural communities in North America, and found ample evidence that they have contributed to creating greater income inequality, higher unemployment rates, declines in small-scale family farms, increased instances of social disruption, decreased civic participation, fewer or poorer community services, and a general depletion of ecosystem services. While many agribusinesses will attempt to mitigate these impacts through the aforementioned socio-ecological investments, these are ancillary actions of the organization – they are used to remedy the problems that have been caused through the pursuit of their original profit-generating activities. For social enterprises, there is no division between the strategic operations of the enterprise and the role that the organization plays in its society. The roles are integrated, and the *purpose* of a social enterprise *is* to create social betterment *through* its enterprise activities, not through supplementary charitable or remedial initiatives.

3.1.3 Democratic Governance

In discussions surrounding broad-based socio-ecological reform there is an important concern forming around the potential for 'eco-authoritarianism': an authoritarian approach to ecological regulation (Kallis & Martinez-Alier, 2010). This possibility is particularly ominous given that the complexity of determining biophysical limits tends to privilege scientific experts and that many policy restrictions are

undesirable to a number of players. Recognizing these risks, some have emphasized the need for fundamental institutional change to ensure that the process through which social and ecological decision-making takes place is democratic and participatory (Schnieder et al, 2010; Kallis & Martinez-Alier, 2010). Proponents of socio-ecological reform stress that "democracy should not be suspended under any circumstance, even for the sake of perceived environmental problems of survival" (Kallis & Martinez-Alier, 2010, p. 1571).

Such a view asserts the need for both political democracy and economic democracy: "[a] system of checks and balances on economic power and the right of citizens to actively participate in the economy regardless of economic/social status, gender, etc." (Johanisova, 2010, p. 1). Similarly, Dahlberg (2001) emphasizes the crucial importance of democratizing food systems by building democratic governance at each level of decision-making in food policy, as well as within the institutions that carry power in the food system. Johanisova (2010) remarks that, because of their distinct organisational structure based on democratic governance, the development of social enterprises can act as powerful tools to help create these democratic conditions. This is most effectively illustrated by their (1) non-capital share based decision-making structures, and their (2) integration of multiple stakeholders in broad-based participatory governance.

Non-Capital Share Based Decision-Making:

In contrast to the shareholder primacy model of conventional businesses, which allocates decision-making power based on levels on shareholder investment, a distinct feature of the social enterprise is a participatory governance model on a non-capital share basis. For instance, within a co-operative structure, the model requires that each member maintains equal voting power under the 'one-member, one-vote' principle. Those social enterprises that are not cooperatively organized, similarly strive to ensure that representation in the decision-making process is provided equally to governing members, regardless of their relative investment in the business (Borzaga et al, 2008).

Participatory Governance:

A clear governance structure is particularly important for social enterprises in order to mitigate any tensions arising from potentially competing goals. An effective governance structure acts as a critical tool in matching the business' incentive structure with its objectives (Bacchiega & Borzaga, 2001). Many social enterprises distinguish themselves by including multiple categories of stakeholders into their governance structure (Borzaga & Mittone, 1997). Social enterprises tend to be initiatives based, "less on a common identity than on a shared belief that certain issues cannot be resolved through existing institutions" (Laville & Nyssens, 2001, p. 318). This is in direct contrast to conventional businesses in which the interests of shareholders supersede those of all other stakeholders: "No senior executive is allowed to forget for long that, however much the company may value the full spectrum of its stakeholders, Stakeholder No. 1 is always the shareholder" (Porritt, 2003, p. 6).

Food Regime Context:

The concentration of decision-making power in the hands of a small number of market and state actors is an issue that is at the core of food regime theory: "It is not about food per se, but about the *relations* within which food is produced" (McMichael, 2009, p. 281, emphasis added). As stated earlier, these relations are characterized by agribusinesses that intensify their lobbying position via the state, as they strengthen their economic standing in the market. Several critics contend that the voice that has been marginalized the most in this transition of power is that of the farmer:

> Agricultural commodity chains are an undemocratic, elite-controlled, and network based mechanism that large agribusiness firms use to accumulate capital, and show that by exerting power through these chains, agribusiness firms are able to restrict the environmental and non-environmental choices available to farmers and consumers (Downey & Strife, 2010, p. 163).

Dahlberg (2001) advocates that if democratic values are to be maximized in society, they need to be reflected in the institutions that make-up that society.

Accordingly, if the shareholder primacy model is the dominant model that typifies the institutions that operate in the food system, the opportunity to include meaningful input from other stakeholders will undoubtedly be disregarded. The structure of decision-making and ownership are critical determinants of

any enterprise's outcomes because those who hold decision-making power are able to ultimately determine the aim of the enterprise (Laville & Nyssens, 2001). Hence, just as an organisational structure based on shareholder primacy supports a business towards short-term profit generation, the multi-stakeholder and non-capital share based structure of social enterprises creates the conditions for the prioritization of a social mission. This distinct governance structure represents a model for an institutional shift towards a more participative approach to enterprise management, and reflects the ideals of democracy in AAFNs.

3.1.4 Biophysical Limits

Inherent to the characteristics of AAFNs is a food system that respects the ecology of the earth and adheres to the biophysical limits of the planet. In the field of ecological economics, the economy is understood as an *open system* that conducts activities that continuously deplete material/energy stocks, resulting in entropic waste in a *closed system* (the earth) which has a finite amount of energy and a limited capacity to absorb the waste (Georgescu-Roegen, 1975; Lawn, 2001; Victor, 2008; Pelletier, 2010). Continuing to understand and operate the economy as such is indisputably problematic for the long-term sustainability of human life on the planet. Although several tools and metrics have been developed that attempt to measure ecological impacts (e.g. Ecological Footprint, Global Reporting Initiative, etc.), no generally accepted method to measure the full costs of economic activities in accurate ecological terms currently exists.

In the absence of established metrics, enterprise organizations need to develop internal strategies to value biophysical limits and ecological welfare. Conventional for-profit enterprises have created internal systems that monitor and minimize waste production, energy use, pollution emissions, and other environmental impacts; but without legal enforcement or restrictions, ecologically restorative actions can only be implemented to the extent that they do not negatively impact profitability. Contrarily, by demonstrating the characteristics of (1) resource perpetuation and (2) complex adaptive systems, social enterprises are more appropriately suited to undertake economic activity that adheres to biophysical limits.

Resource Perpetuation:

Parrish (2009) states that due to their profit-maximizing behaviour, conventional businesses operate with the underlying logic of using resources to generate maximum financial returns in the shortest time possible. Conversely, because their aim is to meet socially underserved needs, social enterprises seek to provide their benefit for as long as possible (or as long as needed); as a result, it is in their interest to maintain or enhance the quality of the resources they use for the longest time possible, in order to continue to provide their services (Parrish, 2009, p.517). While it is also in the best interests of businesses to sustain resources to ensure long-term financial sustainability, the inherent demands of short-term profit maximization run counter to this ethic (Porritt, 2003).

Berkes and Davidson-Hunt (2007), further elaborate the concept as it relates to social enterprises:

> [Social enterprises] do not create markets for resources, but find ways of identifying existing global markets and engaging them. Often their interest in conserving resources is not as an abstract conservationist ideal, but in recognition that their survival is linked to the survival of their local environment (p. 212).

As a result, since the purpose of social enterprises is linked to the principle of resource perpetuation, "maintaining the quality of specific, identified natural resources indefinitely becomes a legitimate objective of the enterprise" (Parrish, 2009, p. 517). Although the idea of resource perpetuation is more applicable for social enterprises that have explicit ecological objectives, it remains valid for all social enterprises. Social enterprises seek primarily to provide a social benefit on a continuous basis; therefore, it is in their interests to ensure that the resources that support their activities are sustained. Contrarily, conventional for-profit enterprises that seek to integrate ecological considerations into their practices may achieve profitability in the long-term, but the temporal pressure exerted by creditors would ensure that short-term profitability goals must also be achieved, inevitably compromising those efforts (Porritt, 2003; van Griethuysen, 2010).

Complex Adaptive Systems:

Several theorists contend that conventional for-profit structures are not built to respond to changes in a global context that is characterized by economic instability, social inequity, and ecological degradation (Valente, 2010). The rigidity of the profit maxim restricts these firms from effectively

integrating socio-ecological considerations into their organizational designs and processes. Recognizing these tensions, groups of management theorists have proposed that, businesses, in order to better adapt to prominent socio-ecological issues, need to re-conceptualize themselves as complex adaptive systems (Stacey, 1996; Senge, 1996; Colbert et al, 2007; Valente, 2010). Complex adaptive systems are generally understood as systems characterized by networks of interacting relationships that continuously engage in a dynamic environment (Colbert et al, 2007; Valente, 2010).

As complex adaptive systems, businesses are dynamic sets of relationships and interactions that are working towards achieving a multitude of political, economic, and social goals. This perspective requires seeing organizations as an evolutionary set of interrelationships which embrace dialogue, pursue multiple goals, eradicate artificially instituted borders, seek opportunities for positive reinforcement, disseminate information freely, build capacities for indigenous innovation, and encourage reflective practice (Colbert et al, 2007). The central concept behind this mode of thought is that businesses are not *strictly economic agents*, but actors that engage in a variety of domains with diverse organizational interests. Goerner et al (2009) comment that there are economic benefits in embracing this form of complexity: "Durable economic vitality requires exchange networks that exhibit the same balance of ecological systems" (p. 81).

Colbert et al (2007) have developed a set of organizational heuristics, based on Kelly's (1995) 'living systems principles', to show how CAS tenets can be applied to businesses. The key organizational design principles are as follows: (1) build broad-based organizational identity and capability, (2) democratize the workplace, (3) create organizational networks based on common values, (4) encourage learning capacity and innovation, (5) embrace a culture of experimentation and dialogue, (6) encourage reflective practice, and (7) pursue multiple goals through incorporating multiple stakeholder perspectives (Colbert et al, 2007). While these characteristics do not have direct correlations to achieving ecological sustainability, they are consistent with the criteria identified earlier for social enterprises and they represent a set of principles that organizations can – and should – follow, if they are seeking to build the capacity required to appropriately respond to the complexity of prevailing ecological issues.

Food Regime Context:

The harmful ecological effects of the agri-industrial food system have been well-documented (please see Appendix 9 for a list of externalized costs for conventional agriculture), but it should be noted that all large agribusiness firms maintain ecological commitments that seek to reduce their ecological impact. However, similar to the peripheral nature of the 'social responsibility' of these actors, these ecological commitments are on the fringes of their operations. Or, if they are integrated into their operations, they are focused on strategies that work to make conventional agriculture less harmful, instead of investing in alternative methods of farming.

It has been well-established that the practices of agro-ecological farming sustain land, water, air quality, and biodiversity, better than the current system of industrial agriculture (MacRae et al, 2004; Altieri, 2009; Gomiero et al, 2011). Additionally, small farms are better suited to support agro-ecological farming practices (Altieri, 2009; Howard, 2009). Therefore, social enterprises that create market opportunities for differentially-scaled, regionally-based, agro-ecological farmers, are building the ecological integrity of their respective regions to better sustain food production. Moreover, since these social enterprises are created to increase the proliferation of regional and agro-ecological food for their communities, it is in their interests to sustain the land to produce this food for as long as possible.

If the organizations that concentrated the food industry prioritized the provision of food for as long as possible, then there might be a more conscious effort to re-orient their business models to provide services for a regionally-diversified agro-ecological food system. Instead, these firms adhere to the practices that are consistent with the agri-industrial paradigm as it is better suited to achieve short-term financial profitability. They do not fully embrace their role as complex social actors, but instead remain inflexible as economic agents. For social enterprises that adopt the mission of AAFNs, they would find it essential to the purpose of their organization to incorporate ecological considerations as they seek to prolong their social benefit. Additionally, by demonstrating the characteristics of complex adaptive systems, social enterprises represent a type of enterprise institution that is able to undertake and sustain

economic activity that, consistent with the demands of AAFNs, continuously adapts to its environment and respects its biophysical limits.

3.2 CO-OPERATIVES AS SOCIAL ENTERPRISES

In the aforementioned analysis, several examples have been provided on how co-operatives exhibit tendencies that enable them to be more adept at achieving the socio-ecological goals of AAFNs. In sum, co-operatives (1) maintain legal limitations in their articles of incorporation that enable them to limit their profit distribution, (2) are legally bound to provide a social and economic service in the interest of their members, (3) enable participatory democratic governance of their operations through providing all members of their co-operative equal voting power, and (4) due to the fact that social mandates are integral to co-operatives, they are better suited to achieve ecological goals by exhibiting the characteristics of resource perpetuation and of complex adaptive systems.

However, the most unique characteristic of a co-operative from other forms of social enterprise is its ability to balance the 'double nature' of being a social and a market actor (Levi, 2006). Enterprises with social purposes that are not incorporated as part of a NPO, or a co-operative, are still legally mandated to serve the needs of shareholders. On the other hand, a NPO with an enterprise component cannot reap the benefits of a surplus generated through market engagement to the same degree a co-operative is able to because of their affiliation with a NPO. Co-operatives, however, must engage in an enterprise activity in the market to sustain their own operations and services, but they are not tempted by the imperatives of excessive profit stimulation nor are they wholly unable to distribute surpluses to members and shareholders. Indeed, there is a great deal of promise – when looking both historically and in the present economic landscape – in the co-operative model to be a practical alternative to the both the conventional for-profit enterprise and the traditional NPO.

It is essential to note that the co-operative movement is not new nor is it dormant; co-operatives have historically served as a form of enterprise that, "defend[s] the consumers' or producers' rights and deploy[s] economic counter-measures to create the opportunities thereto" (Develtere, 1993, p. 185). While co-operatives have taken on different formats to address issues of membership, investment, market

engagement, and organizational behaviour, they have generally been inextricably linked to the efforts of social movements in sectors where the market and the state are insufficiently providing services (Develtere, 1993; MacPherson, 2011). However, McMurtry (2009) contends that the relative dearth of discussion of co-operatives as economically viable and socially progressive institutions is unfortunate, particularly when considering the growing prevalence of contemporary socioeconomic and socio-ecological concerns. McMurtry (2009) notes that, "arguably the most developed global ethical economic alternative within capitalism," has been marginalized, "…when this alternative is most relevant to debate" (p. 55).

3.2.1 Co-operatives in Canadian Agriculture

In Canada, co-operatives have historically emerged in periods of social, economic, and political transition (MacPherson, 2011). Approximately four of every ten Canadians are members of at least one co-operative, while more than 9000 co-operatives employ over 155,000 people and serve approximately 14 million members (Co-operatives Secretariat, 2011). MacPherson (2011) notes that, the perspectives of agricultural co-operatives in Canada emerged to resist or adapt to, "the advent of industrialism, rapid urbanization, and extensive rural change" (p. 45). Agricultural co-operatives demonstrated "recognition of environmental limits of the land and a concern over the consequences of bad agricultural practices" (MacPherson, 2011, p. 42). On a practical level, co-operatives in agriculture have historically been suitable due to their ability to ensure farmers remain in control of the operations of the co-operative and their ability to pool resources to generate economies of scale in production, distribution, marketing, procurement, and employment.

Moreover, since co-operatives do not face the same pressures for unfettered growth as conventional for-profits, they are less likely to exert those influences on their members. In the case of agricultural co-operatives, they are less likely to pressure growers to expand or change the scale of their production. McMurtry (2009) contends that, "rather than 'getting bigger' or becoming 'multinational', [co-operatives] must organize in such a way as to facilitate growth of their form at the level of a movement" (p. 74). As a result, while co-operatives can certainly increase the membership in order to

adopt greater profitability and market share, they can also help other co-operatives in their own industry develop *in their respective communities* without compromising their organizational mandate or undermining their own economic success. Indeed, the vision of a network of regionally connected local food co-operatives is one that has been shared and proposed by agro-ecological farmers and food advocates alike (Christianson et al, 2010; Steiner, 2012; Brisebois, 2012; Wildfong, 2012).

It is encouraging then, that the United Nations has recognized 2012 as the *International Year of Co-operatives*, to raise the public awareness of the value and presence of co-operatives across the world. Recent research has found that 227 co-operatives are involved in the production, marketing, retail, processing, and distribution of the 2,300 local food initiatives across Canada (Christianson et al, 2010). In Ontario, there are currently 24 established food co-operatives focusing on the promotion of local and organic food, and there are 7 local-organic food co-operatives either in development or beginning their operations in Ontario (ONFC, 2012). These co-operatives are all locally-owned, and represent distinct initiatives from communities that are willing to establish alternatives to the conventional food system through agro-ecological production and positive rural-urban connections (please refer to Appendix 10 for a list of existing and emerging food co-operatives in Ontario). Moreover, the Ontario Natural Food Co-operative has recently implemented a project to help assist and further develop local organic food co-operatives across Ontario (ONFC, 2012). As a result, there is an opportunity in Ontario for co-operatives to continue to develop in order to advance the goals of AAFNs.

3.3 LIMITATIONS OF CO-OPERATIVES AS SOCIAL ENTERPRISES

Admittedly, social enterprises and co-operatives are not panaceas to the issues of the food system, and many of the limitations of their organizational models should be identified. There are three main criticisms of co-operatives, and each focuses on different dimensions. These critiques relate to: (1) organizational design, (2) economic efficiency and undercapitalization, and (3) social economy.

Organizational Design:

For traditional co-operative structures, once the co-operative reaches a certain scale of production, the management cannot be feasibly executed by the member-owners; as a result, the co-

operative must hire external managers to actually direct and run the business operations. In these scenarios, co-operatives face what is commonly understood as the *principal-agent* problem (Nilsson, Organisational principles, 2001). This occurs because there is a potential risk that the managers (the agent), exploit the interests of the members (the principal). Since the members of the co-operative benefit primarily from the correction of market failures, and not increased value in their ownership shares, the members do not have recourse in the market to sell their ownership share and financially benefit from that sale, if they do not want to be part of the co-operative. Accordingly, members need to make sure that directors continuously act in the interests of the co-operative's objectives, which forces members to incur 'transaction costs' (e.g. extra effort spent on monitoring, hedging risks in the event managers act fraudulently, etc.) to ensure that management is acting appropriately (Nilsson, Organisational principles, 2001; Novkovic, 2008).

Unlike conventional for-profits where the ultimate indicator of managerial accountability is increasing the share value of the firm, co-operatives have complex socio-economic objectives that need to be met. Davis (2001) contends that managers need to be as aligned and as committed to the broader social purpose as the members. Moreover, maintaining competent managers to achieve complex social goals is made worse by the difficulties and inefficiencies that arise from maintaining democratic governance. As a result, the unique competitive space that co-operatives create for themselves to address market failures and social issues is often lost when management does not internalize social objectives or give the democratic process its proper due:

> Left in the hands of managers who see themselves as retailers, marketers, financiers, bankers, and business men and women, etc., the democratic process seems a hindrance and the social purpose an anachronism. It is hardly surprising co-operatives lose their way and fail as they try to compete on the same terms as their investor-led rivals instead of differentiating themselves and competing on their own terms (Davis, 2001, p. 32).

Economic Efficiency and Undercapitalization:

Most co-operatives offer open membership to their organization; as a result, co-operatives often attract members that are not fully committed to the organizational mission, but are simply looking to benefit from the advantages that a co-operative can offer (Nilsson, Organisational principles, 2001).

Moreover, since the ownership shares do not appreciate in value, members have no financial incentive to invest. As a result, some members often become 'free-riders', benefiting from the co-operative without contributing in kind. The free-rider problem makes it more difficult to raise capital, reducing initial capital investment, making lenders more cautions, and increasing the borrowing costs for capital (Nilsson, Organisational principles, 2001)

The free-rider problem is not the only issue that encourages underinvestment, other critics outline the *horizon problem* and the *portfolio problem* as investment issues for co-operatives ((Nilsson, Organisational principles, 2001; Novkovic, 2008). For the horizon problem, given that members of a co-operative do not benefit from increases in value on either their shares or any assets of the co-operative, members are less likely to be invested in long-term planning decisions. Even if the investments are potentially profitable in the long-term, they have a high likelihood of not being conducted, because the benefits are distributed according to what is best for the co-operative and not the financial interests of investors. For the portfolio problem, the co-operative may have difficulties making investment decisions with unallocated capital because of the diverse risk preferences of their members. As a result, an average investment is made based on member preferences, resulting in a sub-optimal allocation of investment returns.

Many of these characteristics clearly hinder capital growth, and thereby seriously impact the economic efficiency of the firm. Since co-operatives also have options to sustain profit limitations, co-operatives are not attractive to creditors solely seeking economic returns (van Griethuysen, 2010). Accordingly, these firms relinquish the primary benefit that comes with conventional for-profit businesses: long-term financial sustainability through ease of access to capital. These barriers to capital manifest themselves in manners no different than they would for conventional for-profit enterprises: resource limitations, organizational de-scaling, lower-quality products/services, and dissolution. Alter (2007) comments on how these limitations eventually inhibit the ability of social enterprises to progress beyond the start-up stage. Many social enterprises are compensated for this loss of capitalization, by being eligible for financial benefits that are not offered to conventional for-profits (e.g. donations, grants,

tax-exempt statuses, etc.) However, for-profit co-operatives do not receive these benefits, and must develop innovative methods to navigate around these financial constraints without compromising their social mission.

Critical Social Theory and the Social Economy:

In addition to organizational difficulties and issues of capitalization, co-operatives are also criticized by advocates of social change for their 'double nature' in the social economy (Levi, 2006; McMurtry, 2007). A crucial characteristic of co-operatives is to sub-ordinate the economic to the social; however, both elements must be maintained in order for it to truly be a co-operative:

> …an association devoid of an entrepreneurial content or an enterprise devoid of a specific non-economic priority would take us away from the idea of cooperation and toward either the benevolent, or the for-profit organization, respectively. (Levi & Davis, 2008, p. 2179).

This balancing act has drawn a number of criticisms, primarily that co-operatives are ineffective at accomplishing either objective.

For instance, Marx – whose view of capitalism is predominantly an issue of class and power, not one of production – has argued that the benefits of a capitalist system lie in the gains that can be reaped through efficient production (McMurtry, 2007). Marx argues that once the means of production have reached their most efficient apex, a social transformation needs to ensure an equitable and fair distribution of those gains. Marxist proponents have argued that co-operatives would be ineffective at achieving the same level of productivity as capitalist enterprises, and should therefore not be considered as viable market-based organizations. McMurtry (2007) summarizes the Marxist point of view on co-operatives:

> The capitalist form of production need not be challenged because of its productivity, according to the Marxists. Rather, its social and political manifestations are the aspects in need of a change in order to make society whole again. Co-operatives do neither effectively in this construction (p. 872).

Similar sentiments have been found with co-operatives being "too socially oriented" (Levi & Davis, 2008, p. 2182), where the prioritization of social objectives renders the economic activities insignificant. Others criticize co-operatives under the pretense that once they grow beyond a certain scale, external investors can enter the picture, compromising their social mission (Nilsson, Organisational

principles, 2001). Conversely, smaller co-operatives – despite the success they may have created in the community they are attempting to help – are considered inconsequential when situated in the larger socioeconomic context. Levi and Davis (2008) highlight the paradox that co-operatives face in terms of the scale of their organization and their impact: "On the one hand, large cooperatives are threatened by 'incongruent isomorphism' and, on the other, medium- and small-sized cooperatives…are practically 'innocuous' due to their economical marginality" (p. 2184). As a result, some argue that co-operatives face hardships at being both effective agents of producing economic advantages, and meaningful instruments of social change.

3.4 ALTERNATIVE EVALUATIONS OF CO-OPERATIVES

There are several degrees of merit to all of these criticisms, and they are all issues that co-operatives must be cognizant of in order to be successful. The criticisms that have the greatest degree of merit are those regarding the management challenges that face co-operatives. Regardless of how much trust is built within the members and management of a co-operative, the issues that arise with democratic governance are extremely complex. Therefore, there is a great deal of pressure for co-operatives to hire managers that not only internalize their social mission, but also demonstrate excellent management skills (Davis, 2001).

However, with respect to the obstacles co-operatives face at efficiently allocating costs and optimizing investment strategies, it is important to understand that co-operatives are not only economic alternatives *within* capitalism they are economic alternatives *to* capitalism:

> Co-operatives are about giving leverage in the market to individual consumers, small businesses, small farmers, and workers. They help people to be price makers rather than price takers. They give access to markets in realistic ways to people for whom capital-based investment gives no basis for influence and still less control of markets that effect the conditions of their labour, their consumption, their lifestyles, their businesses, and their communities (Davis, 2001, p. 33).

Therefore, evaluating co-operatives under the same metrics of free-market neoliberal fundamentalism is problematic: "it is their social movement nature that is destroyed by adopting a neo-classical frame" (McMurtry, 2009, p. 67). For instance, on the issues of inefficient cost allocation, Nilsson (Organisational principles, 2001) notes that, "if the members consider the co-operative valuable, they may be willing and

able to sacrifice some of the costs that arise due to the vaguely defined property rights" (p. 343). As a result, the transaction costs incurred through the principal-agent problem, or with issues of democratic governance, might not be seen as detrimental if they are being incurred to achieve the greater good of the co-operative.

With respect to the free-rider problem, the horizon problem, and the portfolio problem, they all arise when examined from the rationale of being an *investor* – not from the rationale of a member who is looking for an alternative to the socioeconomic marginalization they face in the dominant economy (Novkovic, 2008): "The co-op was constructed not for the sake of capital markets, but for ameliorating market failures for economic actors in their dealings with various product markets" (Nilsson, Organisational principles, 2001, p. 342). This rationale does not exclude the co-operative from being a financially astute and economically profitable organization, but it does introduce a different set of criteria by which to evaluate the co-operative's success. As McMurtry (2009) notes, co-operatives need to be evaluated from a *co-operative perspective*, not a capitalist perspective:

> [The capitalist perspective] does not explain the co-operative or social difference of these organizations, but rather co-operatives to corporations are equivocated at the level of economics, which is assumed to be primary to their functioning (p.60).

Therefore, while issues of efficient cost allocation and optimal investment are important, they should not be given the same level of credence, *if* the co-operative is achieving its social mission and addressing the market failures it seeks to solve (Nilsson, Farmer co-operatives, 2001).

With respect to the 'double nature' of the co-operative, co-operatives certainly have to make compromises on either the social or economic spectrum. However, the 'double nature' of a co-operative also invites its members to take on a twofold nature of a patron and an investor: "When members are highly involved both in their patron and investor role, the co-operative is effective in strengthening the members' market position" (Nilsson, Organizational principles, 2001, p. 348). Indeed, if co-operatives need to take on a different role to encourage more investment to avoid some of the aforementioned criticisms, they have the freedom to develop transferable equity shares, appreciable equity shares, defined

membership, legally binding delivery contracts, and minimum equity investments; however, they are not *required* to do so (Nilsson, Farmer co-operatives 2001).

Conventional for-profit businesses on the other hand, must provide increasing returns to their shareholders – any changes to that imperative is simply not allowed. Moreover, the other issues that arise with co-operatives can potentially be addressed through different management practices and a stronger emphasis on balancing the member/investor role. For conventional for-profits, no matter how financially astute and socially cognizant management might be they cannot change the socio-ecological constraints that exist due to the dynamics of the credit relation. The legal structures that exist for conventional for-profits reinforce the pressures of the credit relation, contorting the concept of profitability such that it becomes the end goal of all enterprise activities.

3.5 ALTERNATIVE FORMS OF CO-OPERATIVES

Many of the criticisms levied by neo-institutionalist scholars (e.g. free-rider problem, principal-agent problem, horizon problem, portfolio problem, etc.) do not consider that co-operatives have evolved from the traditional single-stakeholder model of open membership with no tradable shares or external partners. Instead, there is now a diversity of co-operative forms that attempt to overcome many of the past missteps or obstacles of traditional co-operatives. Multi-stakeholder co-operatives have gained popularity; rather than representing the sole interests of a group of workers, consumers, or producers, these co-operatives embrace the concept of community and "[extend] the scope of beneficiaries from the exclusive domain of members to that of the community where the members operate and, particularly to the most needy among them" (Borzaga, 1995, cited in Levi, 2006, p. 156). Nilsson (Farmer co-operatives, 2001) identifies three main organizational frames that can categorize the various types of co-operatives used in agricultural domains: (1) traditional co-operatives, (2) external-investor co-operatives, and (3) member-investor co-operatives. Each maintains different conditions of ownership, investment, membership, to address some of the problems of co-operative management and undercapitalization.

Traditional Co-operatives:

The traditional co-operative model is the status quo for co-operatives globally. These firms have voluntary and open membership, democratic member control, and economic contributions are equitably distributed and democratically controlled. Generally, these types of agricultural co-operatives are successful in large markets, or in markets regulated by governmental agricultural policy, where farmers use the co-operative to defend their interests (Nilsson, Farmer co-operatives, 2001). Essentially, the co-operative emerges in these markets to ensure higher prices are provided to the farmer than the market can currently offer.

Using Porter's (2008) categorization of competitive strategies, Nilsson (Farmer co-operatives, 2001) argues that co-operatives that focus on cost leadership strategies in these areas, by taking advantage of their economies of scale, can be economically successful. However, these types of co-operative forms are also most privy to the neo-institutionalist problems identified earlier. Nilsson (Farmer co-operatives, 2001) comments that if these co-operatives maintain low investments, low value-added operations, and specialize solely in building economies of scale for their products, the business activities and investments will remain stable over time and the free-riding, horizon, and portfolio problems, may be limited. In other words, if the co-operative stays within its purpose of ameliorating its market failures, and does not attempt to grow outside of this domain, the challenges that come from greater investment expectations are mitigated.

External-Investor Co-operatives:

External-investor co-operatives raise financing by offering more preference shares to encourage more equity financing through external investment. In doing so, co-operatives attempt to address issues of undercapitalization by generating greater degrees of equity and becoming more favourable to creditors. In these co-operatives, there is still a strong co-operative society of members that maintain a social purpose, but a stronger financial imperative is introduced with the adoption of more economically-oriented investors. Nilsson (Farmer co-operatives, 2001) argues that these types of co-operatives are well-suited to pursue diversified business strategies because a large amount of capital can be generated, and investors

might be constantly looking for growth opportunities. However, these cooperatives risk compromising the social-purpose as the co-operative ideology may be suppressed in order to adhere to the preferences of investors.

Member-Investor Co-operatives:

Member-investor co-operatives capitalize on the 'double nature' of the co-operative by ensuring that members have the opportunity to embrace their role as patrons and as investors. These co-operatives can have tradable, negotiable, and appreciable shares, and the membership is restricted to individuals that can produce for the co-operative. *New generation co-operatives* (NGCs) have emerged as the most common type of member-investor co-operative, where members are given *delivery rights*. Delivery rights ensure that each member purchases the right to deliver a certain amount of product to the co-operative each year, and the co-operative is obligated to accept delivery of that product. Delivery rights are usually proportional to the level of investment of the member, ensuring that members can be involved to varying degrees depending on their production capacity and capital availability.

By merging the role of the member and the investor, members are interested in the social purpose of the co-operative, but they are also committed to ensuring that their investments are protected and rewarded. Nilsson (Farmer co-operatives, 2001) argues that NGCs are generally used for creating *economies of scope* through vertical integration – this is why these co-operatives are generally used for production and processing operations for farm products. Nilsson (Farmer co-operatives, 2001) also contends that these co-operatives are better suited for highly processed unique products that serve a niche in a specific market. These co-operatives sidestep many of the neo-institutionalist problems due to the integration of the membership and investor roles, but still introduce higher levels of risk and 'mission drift' (i.e. deviating away from its social purpose) due to the prominent investor role of the member in the co-operative.

3.6 CONCLUSION: CO-OPERATIVES AS SOCIAL ENTERPRISES FOR AAFNS

Ultimately, in the context of achieving contemporary socio-ecological reform, conventional for-profit businesses are, at their worst, vehicles for perpetual profit generation, and at their best, providers of

goods and services attempting to develop 'win-win solutions' that usually result in further economic growth, increased entropic degradation, and widened social inequality (van Griethuysen, 2010). Thus, as they currently stand, conventional for-profit businesses are also not well-suited to facilitate the goals of AAFNs. Social enterprises, can, like conventional for-profits, provide goods and services to the public; however, contrary to conventional for-profits, they sustain limits on profit maximizing behavior and demands for perpetual growth, build social mandates and social capital, incorporate democratic and participatory governance structures, and internalize the principles of resource perpetuation and complex adaptive systems.

In the absence of a political and economic system that appropriately values social welfare or ecosystem services, co-operatives have emerged as social enterprises that might best facilitate the goals of AAFNs. In the context of building *robust seed systems* in AAFNs, co-operatives are social enterprises that maintain strong market orientations, are mandated to serve community needs, and can sustain institutional flexibility due their social mandate. Most co-operative models can be autonomous and self-reliant, and as an actor in the social economy, they have the capacity to create synergies between the formal and informal sector through advocacy and promotion of their work. Moreover, if the social purpose of their members is to sustain agrobiodiversity through providing regionally-based agro-ecological vegetable seed, then they are mandated to serve that purpose. The following section synthesizes the arguments put forth so far, and evaluates the capability of an agro-ecological vegetable seed production co-operative in comparison with other strategies that achieve the ideals of a robust seed system.

SECTION 4: COMPARISON OF STRATEGIES FOR AGRO-ECOLOGICAL SEED PROCESSING

By using the robust seed systems framework (de Boef et al, 2010), and the social enterprise criteria (Borzaga et al, 2008), a set of indicators can be applied to assess how different regional seed conservation strategies can not only meet the needs of robust seed systems, but also how well they adhere to the types of social enterprise models needed to advance AAFNs. Four different approaches have been evaluated, and each initiative represents a different form of some of the strategies categorized by de Boef et al (2010) earlier in *Figure 1*: Seeds of Diversity's *Seed Library* (community gene/seed bank), Stellar Seeds (small-scale seed enterprise), High Mowing Organic Seeds (High Mowing) (commercial-scale seed production), and Family Farmers' Seed Co-operative (FFSC) (community-based seed enterprise).

4.1 ROBUST SEED SYSTEMS EVALUATION

FIGURE 2: ROBUST SEED SYSTEMS EVALUATION

COMPANY/CRITERIA	SEED LIBRARY	STELLAR SEEDS	HIGH MOWING	FFSC
Agrobiodiversity	Strong	Strong	Strong	Strong
Dynamism	Strong	Moderate	Strong	Strong
Community	Moderate	Strong	Moderate/Strong	Strong
Farmer Autonomy	Moderate/Strong	Moderate/Strong	Moderate	Strong
Market Orientation	Minimal	Strong	Strong	Strong
Synergies	Strong	Strong	Moderate	Strong

4.1.1 Seeds of Diversity: Community Gene/Seed Bank

Seeds of Diversity (SoD) is an independent charitable NPO dedicated "to promot[ing] the conservation and use of heritage and endangered food plants, to preserv[ing] knowledge of traditional seed saving and agricultural practices, and to encourag[ing] people to actively engage in protecting the diverse gene pool of plants that sustain human civilization" (Seeds of Diversity, 2011). The organization has over 1,400 volunteer members who preserve, and grow out, traditional, heritage, and heirloom varieties of seed across Canada. SoD maintains all pertinent information of these seeds in their heritage plants database that documents over 19,000 cultivars of Canadian seeds. SoD's *Seed Library* lends out Canadian landraces to growers for a small processing fee, who then grow out those varieties and return a portion of those seeds back to SoD to lend out the following year. The purpose of the *Seed Library* is not

only to increase the quantity of these varieties, but to provide a large enough sample of appropriate varieties to growers who wish to bulk them out to commercial and retail levels (Wildfong, 2012).

Since the purpose of SoD is to maintain Canadian landraces, preserving agrobiodiversity is principal to their operations and initiatives. Through their *Seed Library* initiative, SoD has been able to maintain the circulation and propagation of over 2,900 varieties of vegetables, fruits, grains, and flowers across Canada (Seeds of Diversity, 2011). The decentralized responsibility of seed-saving across its membership base also enables SoD to be flexible as an institution since they are diversifying the risk of growing quality seed over a large network of growers. Moreover, SoD is not restricted by any other objective other than their mission to preserve seed diversity in Canada; as a result, if they find that their activities are not effectively achieving their goal, they are free to re-orient their operations to better re-align their strategies with their mission, without impunity from creditors or other stakeholders.

SoD's *Seed Library* is building an informal network of growers that can share knowledge of their seed-saving activities and network through their educational events. Since the network spans Canada, it might be difficult to build strong community bonds, but for the purposes of their endeavour it might not be essential to do so. With respect to grower autonomy and self-reliance, SoD gives their growers the freedom to grow out varieties in manners that are consistent with the best growing practices of those crops, and may request that certain information about the seed is documented and shared throughout the process (Wildfong, 2012). While many of the strategic decisions regarding the *Seed Library* are ultimately made by the executive staff at SoD, Wildfong acknowledges that there is constant collaboration and networking with member-growers and other interested stakeholders to move the *Seed Library* forward.

The one area in which SoD's *Seed Library* does not reflect an element of a robust seed system is in its market orientation. Indeed, since the costs and time to grow out, test, trial, and bulk up such a large number of varieties are incredibly high, Wildfong (2012) contends that the Seed Library must operate as a non-profit: "It's the only way for [all traditional, heritage, and heirloom] varieties to be identified, and to become available at the commercial level". However, as is the case for many NPOs, they face the

subsequent challenges of appropriately scaling up their mission because they are reliant on public or private donor funding for their operations.

That being said, SoD has been able to create some synergies across the private sector, the public sector, and citizens, as evidenced through their relationships with farmers, seed companies, and Agriculture Canada (Wildfong, 2012). For instance, by deliberately excluding the distribution of varieties that are commercially available through their *Seed Library*, SoD is not leveraging its subsidized position in the marketplace to disadvantage growers who choose to sell those varieties: "We are not competing with seed companies, and we don't want to. [The Seed Library] is a way of getting varieties out that are not commercially available…if they are commercially available, we don't give it out at all" (Wildfong, 2012). In conjunction with co-operating with seed companies, SoD collaborates with *Plant Gene Resources Canada*, the federal seed bank of Canada, by ensuring that all varieties that are saved through the *Seed Library* are subsequently backed up in the seed bank (Seeds of Diversity, 2011; Wildfong, 2012). Moreover, Wildfong is reflexive on the role of conservation, and is adamant on making these varieties more accessible by creating relationships with the growers that would like to use them: "Why are we [conserving seed varieties] if there's no one who can use it?"

4.1.2 Stellar Seeds: Small-Scale Seed Enterprise

Stellar Seeds is a small-scale seed enterprise in British Columbia that provides certified organic, open-pollinated, heirloom seeds. Seeds are grown both on the main family farm that owns the enterprise, and with a network of 7 other small-scale growers in the region. Stellar Seeds sells seeds primarily in small packets, but offers a select number of vegetable seeds in bulk quantities for market gardeners. The organization can be best classified as a small-scale farmer-based seed enterprise that is slowly transitioning into increasing its capacity to provide bulk quantities of organic seed.

Sustaining agrobiodiversity is central to Stellar Seeds' operating ethic. The organization ensures that all of their contracted growers have integrated on-farm diversity into their operations, and encourages their consumers to save all of the seeds that are sold through their company to increase the diversity of landraces in British Columbia. From re-introducing an heirloom variety of onion (Rosa di Milano), to

attempting breed a regionally-adapted thick-skinned pink cherry tomato, Stellar Seeds has demonstrated a strong commitment in their community to provide a diversity of agro-ecological landraces (Steiner, 2012).

The founder of Stellar Seeds understands that the political and economic context surrounding seed production has become much more complex, and farmers are more and more vulnerable to the dynamics of global seed markets (Steiner, 2012). Due the organization's focus on continuing the provision of regionally-adapted organic vegetable seed, the organization seems well-equipped to adapt to pending ecological changes. However, as a small-scale seed enterprise, Stellar Seeds deals with economic pressures with less flexibility. Steiner finds it difficult to scale up seed production due to limited farm capacity, encounters marketing challenges due to a small advertising budget, and finds it challenging to fairly compensate growers while still providing customers with affordable seed.

While Stellar Seeds initially began as the idea of their founder, they have slowly grown over the past 5 years to build a community network with 7 other small-scale family seed growers in the region. The organization emphasizes the importance of networking with small family farms, as they believe it builds community resilience and a greater capacity for knowledge sharing on seed production (Stellar Seeds, 2012). The organization also holds a variety of different workshops and training sessions to teach aspiring farmers in the community to learn about organic vegetable seed growing and farming. In terms of farmer autonomy, farmers are required to grow within certified organic principles and sustain agrobiodiversity on their farms. Like many other small-scale seed enterprises, while the strategic decisions are made internally by the main grower-farmer, Stellar Seeds relies on the input and expertise of their contracted farmers (Steiner, 2012). Stellar Seeds also provides educational resources for seed growers and allocates staff time to provide expertise and assistance, but Steiner has noted sustaining control over this process is challenging due to labour constraints.

As a for-profit organization, Stellar Seeds depends solely on market-based revenues, and as a result, is still subject to the terms of the credit relation. Despite these profitability pressures, the reason Steiner (2012) provides for increasing production, or scaling up, is rooted not in increasing sales, but in

responding to the concern that regional seed security needs to increase – "economic viability is an afterthought". In terms of creating synergies across different sectors, Stellar Seeds provides a large number of educational resources on seed-saving to encourage the proliferation of more organic seed-saving practices and is part of a network of other seed growers in the region called *B.C. Seeds* to support regional agro-ecological seed production (Steiner, 2012).

4.1.3 High Mowing Organic Seeds: Commercial-Scale Seed Production

High Mowing Organic Seeds (High Mowing) is a provider of high quality, open-pollinated and hybrid, certified organic seed varieties in Vermont. High Mowing provides gardeners and commercial growers with over 800 varieties of seeds on their own 40-acre farm, as well as through a network of contracted growers. High Mowing is well-known for their high quality seed and their capacity to provide 100% certified organic seed, to growers across North America.

Through constantly growing out, testing on, and experimenting with, over 800 diverse, open-pollinated and hybrid varieties, High Mowing is able to achieve strong degrees of regional agrobiodiversity. Although High Mowing sources some of their seed stock internationally from Europe, they are transitioning to growing many of their seeds are grown in the region of Vermont, and with their contracted farms in New York, Idaho, Washington, Oregon, and California. While they are still subject to the restrictions of a for-profit enterprise in terms of generating a return for private shareholders, they are a mission-driven organization which allows them to adapt their organization to better suit their objectives and principles. More pointedly, High Mowing came into existence, and sustains its competitive advantage *because* of their social purpose to produce and provide high quality *certified organic* seed (Lew-Smith, 2012).

High Mowing adopts the philosophy that providing quality organic seed is a crucial part of how healthy communities can be built (High Mowing, 2011). Through seed and produce donation programs and seed-saving workshops provided for the community, High Mowing is attempting to build social capital within their regional community. While these initiatives are not central to High Mowing's

enterprise operations, High Mowing leverages its core competences (i.e. knowledge and practice of regional seed production) to provide these social services.

As a commercial enterprise that exports some of its products and is reputable for a high quality standard, High Mowing must set certain growing standards for both their on-site and off-site growing operations. While farmer autonomy may be limited in this respect, High Mowing strives to adopt a collaborative approach with all of their contracted growers in terms of growing capacity and compensation. Lew-Smith (2012) discusses the relationship High Mowing maintains with their growers:

> I treat it as a collaboration, I don't want them to grow things that aren't going to do well for them…I don't want them to lose money on things…I want them to be growing it at a price and a size that work[s] for them…and [then] we both make money, and we continue to work together, and that works for all us.

High Mowing also conducts various types of advocacy work and educational programs to promote the growth of the organic seed sector. Through prioritizing the advancement of diverse seed production and organic seed breeding (High Mowing, 2012; Lew-Smith, 2012), they can leverage their position as an economically successful organic seed enterprise to build potential synergies across the sector.

4.1.4 Family Farmers' Seed Co-operative: Community-based Seed Enterprise

The Family Farmers' Seed Co-operative (FFSC) is a farmer-owned producer co-operative formed by agro-ecological vegetable seed growers across the United States. The co-operative specializes in producing high quality, certified organic, open-pollinated, public domain vegetable seeds in bulk quantities for small- to medium-sized farming operations, seed companies, and community garden organizations. The FFSC maintains a broader mission to "fundamentally change [the] food system from one that relies on distant, industrialized, monocultural farm operations to a system that derives its food from ecologically-based, diverse, local and regional farms and gardens" (FFSC, 2011).

The FFSC focuses not only on preserving agro-ecological landraces, but also on improving those varieties through a process of continuous varietal selection. The organization collaborates with the Organic Seed Alliance (OSA) for ongoing breeding research on organic varieties (FFSC Member-Farmer, 2012; Colley, 2012). The FFSC also strongly adheres to the ethic of regional adaptation, as growers ensure that they are continuously selecting seed from the best performing plants in their own regions.

Currently, they are able to provide 60 different varieties of vegetables to growers, seed companies, and other purchasers interested in acquiring bulk quantities.

As a co-operative, the FFSC maintains a great deal of flexibility as the risks of ownership, liabilities, production, and decision-making are spread out across the 13 farmer-members of the co-operative. A member-farmer of the FFSC, notes that ongoing dialogue and collaborative decision-making has enabled the organization to be proactive to address coming issues and to be astute when responding to challenges: "Having many minds…look at an issue…and come to some sort of consensus on how we can face the issue and deal with it in some sort of solution-based way…really makes a huge difference" (FFSC Member-Farmer, 2012).

Although the farmer-members of the FFSC are dispersed across different areas in the United States, the organization promotes the values of differentially-scaled family farms that are connected through the common goal growing seed to achieve food system reform. As a co-operative they practice democratic governance, knowledge sharing, and ongoing dialogue about their immediate production goals and their broader institutional objectives. Indeed, the FFSC began as a multi-year process of dialogue with seed growers about how they could collectively "give each other a leg up" (FFSC Member-Farmer, 2012). As a co-operative, the governance structure ensures that members are able to freely voice, and act on, their concerns, indicating a healthy degree of farmer autonomy. Farmers are responsible for growing certified organic seed, but there is collaboration among farmers to establish other quality standards. Similar to the other organizations, much of the responsibility and trust for high seed quality falls on the expertise of the grower and the knowledge they have of their region.

By selling bulk seed quantities with multiple buyers, the FFSC maintains a strong market orientation, as they attempt to be fully self-sufficient. Although initial capital and subsequent capital investments have been given through organizations such as the OSA (Dillon & Hubbard, 2011; Colley, 2012), the FFSC expects to sustain themselves as a co-operatively owned business through market-based revenues. Moreover, the co-operative has a broader mission to change the food system through constant collaboration and building relationships:

> It's good to know people who are out there that have connections with your universities – or wherever it is that [seed research is] being done – as well as individuals who have been doing it themselves on their farms…connecting those two…it creates a synergy (FFSC Member-Farmer, 2012).

Indeed, the FFSC Member-Farmer notes that creating synergies between, and collaborating among, various actors is paramount to ensuring institutional success more so than individual growers might seek to achieve on their own:

> There are some amazing folks…who are doing their own thing and doing it well and being successful at it, and I give them a lot of credit…but when we can come together and work through our differences and collectively lift up the system that we see needing to be lifted…there's just more benefits.

4.2 SOCIAL ENTERPRISE EVALUATION

FIGURE 3: SOCIAL ENTERPRISE EVALUATION

COMPANY/CRITERIA	SEEDS OF DIVERSITY	STELLAR SEEDS	HIGH MOWING	FFSC
Economic				
Enterprise Activity	Minimal	Strong	Strong	Strong
Organizational Autonomy	Moderate	Strong	Strong	Strong
Paid Work	Minimal/Moderate	Strong	Strong	Strong
Social				
Community Benefit	Strong	Strong	Strong	Strong
Non-Capital Governance	Strong	Minimal	Minimal	Strong
Profit-Maximizing Limitations	Strong	Minimal	Minimal	Strong

In terms of each of these organizations' suitability as social enterprises, the FFSC is the organization that meets all six criteria sufficiently. All organizations generate explicit community benefits through preserving agro-ecological vegetable seed varieties and providing different forms of education to preserve those varieties, as part of the *strategic operations* of their companies. Each group also offers a mixture of paid work and volunteer work to conduct their services (although as an NPO, SoD requires a greater degree of volunteer work than the other organizations). With respect to organizational autonomy, each organization is mission-driven to preserve and provide agro-ecological vegetable seed – it is this central mission that should ultimately guide all of their strategies and operations. However, other than the FFSC, each group may be subject to the influence of donors or private creditors that fund their activities, limiting some of their organizational autonomy to varying degrees.

The main differences between the organizations arise primarily in their degree of enterprise activity, their structures of governance, and their limitations on profit-maximization. With the exception of SoD, each organization must be successful in using market-based mechanisms to sustain their operations. Conversely, while SoD certainly faces financial challenges, they have the support of their charitable donors that are not expecting any degree of economic return. In terms of their profitability goals, SoD and the FFSC have legislated profit limitations in their articles of incorporation, whereas Stellar Seeds and High Mowing have no such limits. With respect to their governance structures, SoD and the FFSC are legislated not to be governed based on share capital, which is not the case for Stellar Seeds and High Mowing. Additionally, while each organization has prioritized a collaborative and participatory approach in their practices (Wildfong, 2012; Steiner, 2012; Lew-Smith, 2012), only the FFSC as a co-operative is legislated in their approach to make collective, democratic, and participatory decisions.

Based on the analyses conducted, it is clear that each of these organizations is well-positioned to provide their community benefit of preserving regional seed diversity, and will most likely *not* be compromising their mission for the purposes of profit generation. However, *as a model of social enterprise*, the FFSC adheres most closely to the ideal, by limiting tendencies of mission drift through profit limitations and providing greater opportunities for collaboration through non-capital based governance, while still engaging in enterprise activity to sustain their operations. As a result, the model used by the FFSC is the closest organizational form that can serve as a social enterprise to facilitate not only robust seed systems, but also AAFNs.

4.3 SYNTHESIS OF RESEARCH OF AGRO-ECOLOGICAL SEED PRODUCTION AND CO-OPERATIVES

The Efficiency-Substitution-Redesign (ESR) Framework devised by Hill and MacRae (1995) helps to contextualize the types of activities that advance change towards a food system consistent with the ideals of AAFNs. Efficiency-stage activities consist of modifications to existing structures in the food system that will most likely achieve limited, but potentially significant changes. Substitution-level strategies involve implementing initiatives that work within the existing system, but replace more problematic processes with methods that are less harmful or benign. Redesign-level strategies seek to

challenge the dynamics of the existing system, through proposing new methods and procedures that positively change the manner in which activities will be conducted in the future. Large agribusinesses releasing conventional seed that require less chemical inputs, or use less water, could be considered efficiency-level strategies. Similarly, the proliferation of untreated seed for organic production into the market by different commercial seed companies could be considered as a substitution-level strategy. However, neither of these strategies could be said to redesign the components of the food system into areas that could effectively facilitate robust seed systems and/or AAFNs.

SoD's *Seed Library*, High Mowing, Stellar Seeds, and the FFSC, can all be seen as initiatives and organizations that fit appropriately into the redesign model. These actors are all improving the availability of agro-ecological seed, increasing competition in the organic seed industry, and promoting the knowledge of agro-ecological seed propagation, within their membership (Wildfong, 2012), customer (Steiner, 2012; Lew-Smith, 2012), or community (FFSC Member-Farmer, 2012), base. Moreover, they are all capable of facilitating significant degrees of positive change at a societal level *if* their efforts can be scaled up or replicated. However, the FFSC's model might fit most closely to a redesign strategy, because of its capacity to not only *replace* the current models of seed production and distribution, but to *redesign* the nature of how that seed is produced and distributed. Through a co-operative seed production model, growers have full democratic ownership of their production and distribution conditions and there are legal limitations that temper the tendency to maximize economic goals over socio-ecological ones. In doing so, the growers are taking steps towards reclaiming the structures of power in seed production, and signalling a broader shift in the power dynamics of the seed regime.

In the context of the *oligopolistic agri-industrial food system* dictated increasingly by the ideologies of the corporate food regime, Seeds of Diversity, Stellar Seeds, High Mowing, and similar models of these organizations are more vulnerable to the economic pressures that may compromise their socio-ecological missions, and subsequently their capability to transition towards building AAFNs. For instance, despite the incredible gains SoD has been able to achieve, their operations are structurally limited due to their reliance on public funding and their inability to fully engage in market-based activities

to sustain their organization. As for-profit commercial models, both High Mowing and Stellar Seeds have a strong customer base and a long-standing reputation among agro-ecological farmers and gardeners due to their ability to provide high quality organic seed (Dey, Organic Seed Survey for Ontario Farmers, 2012; Steiner, 2012; Lew-Smith, 2012), but both these organizations endure the limitations discussed in Section 3.1.

It needs to be noted that many farmers have wondered why a model like High Mowing has not been established in Canada (Brisebois, 2012; Dey, Organic Seed Survey for Ontario Farmers, 2012). Indeed, the formation of an institution that provides what High Mowing is able to offer would be a welcome addition to the Canadian seed industry – but it does not necessarily have to come in the form of a commercial-scale for-profit seed enterprise. To clarify, aside from more favourable climactic conditions in their growing areas, much of the success of High Mowing has been dependent on the leadership of its owner, and the organizational culture that has since been cultivated. While replicating that kind of success could certainly be done based on the kind of leadership and ingenuity demonstrated by agro-ecological growers in Canada, in the context of the for-profit limitations listed earlier, there would be a greater chance for mission drift. Due to its visionary leadership the circumstances for High Mowing to deviate from its social mission are highly unlikely; however, there is no legal or institutional provision that exists in its *organizational form* that would prevent mission drift in similarly structured enterprises.

The FFSC on the other hand, is legislated to serve the socioeconomic purposes of its member-growers, while still sustaining themselves through market-based revenues. Even if some of the members of the co-operative lean towards more profit-oriented interests, changes to the mission of the co-operative must be done democratically and the co-operative must still make provisions for the services for *all* of its members (not just the members with the most amount of market power). While mission drift is still possible, it is less likely to occur due to the legal and institutional provisions internal to the co-operative. Therefore, based on the criteria of the robust seed systems framework and the criteria of a social enterprise, a co-operative seed production model can be an appropriate institutional arrangement that can increase the availability of bulk agro-ecological vegetable seed, and more broadly, begin to redesign areas

of the seed regime to transition towards regionally-based AAFNs. The following section outlines a preliminary business plan for a regionally-based agro-ecological vegetable seed co-operative in the GGH region.

SECTION 5: CO-OPERATIVE BUSINESS PLAN FOR AGRO-ECOLOGICAL SEED PROCESSING

5.1 MARKET ASSESSMENT: EXISTING AND EMERGING AGRO-ECOLOGICAL GROWERS

5.1.1 Market Size

Globally, the organic food sector is the fastest growing food product category with Canada accounting for 3% of the global organic food market. The number of certified organic food sales in Canada are estimated at over $1.3 billion, and Ontario holds over 1/3 of national organic food sales (Macey, 2007). The majority of unprocessed local-organic goods are sold through alternative distribution outlets (e.g. farmers' markets, CSAs, etc.), while the majority of non-local and processed organic goods are distributed through mainstream grocery markets, natural food stores, and other retail venues. End-consumer demand for organic food has grown by 15% to 20% per year in Ontario, and is expected to steadily increase (Christianson et al, 2010). MacRae et al (2006) note that supply has not been able to keep pace with demand; as a result, there is an economic opportunity for Ontario farmers to reclaim the rapidly growing organic market with regionally-produced agro-ecological food.

In line with increasing consumer demand for organic produce, farmers are slowly transitioning into adopting agro-ecological practices. The most recent agricultural census indicates that there were 774 certified organic and/or transitional farms in Ontario in 2011, up from 716 farms in 2006 (growth rate of 1.6% per year over 5 years) (Statistics Canada, 2012). Of those farms, 225 growers are selling fruits and vegetables which make up 20.8% of the agro-ecological vegetable farmers in Canada (Statistics Canada, 2012). In the Greater Golden Horseshoe (GGH) region, there are approximately 135 agro-ecological farmers (60% of agro-ecological vegetable farmers in Ontario) (Statistics Canada, 2012).

While farming has been increasing marginally in the organic sector, the number of total vegetable growing operations in Ontario have reduced in total by 9.8% from 3909 farms in 2006, to 3527 farms in 2011 (Statistics Canada, 2012). The decline in vegetable growing operations speaks to the aforementioned dilemmas of farm income in the conventional farming sector. However, the emergence of regionally-based farmer-oriented education and training programs in Ontario (e.g. Collaborative Regional Alliance for Farmer Training [CRAFT], FarmStart, Stewards of Irreplaceable Land [SOIL], World Wide

Opportunities on Organic Farms [WWOOF], etc.), indicates that there is a small constituency of new farmers getting involved in practicing organic or other forms of agro-ecological production.

The market value of organic vegetables produced *and* sold in Ontario or Canada is not well-documented. However, according to the OVCRT study, the estimated market value of organic vegetable *seed* in Canada is approximately $21,299,000 million per year (Lessard et al, 2011, p. 37). If all agro-ecological producers in Canada were to use certified organic seed (as opposed to untreated seed or other substitutes), the market is expected to be approximately $32,765,000 per year (Lessard et al, 2011, p. 37), with a residual untapped market of $11,466,000 (an increase of 53.8%). When applying these estimates to Ontario, the current market value of organic vegetable seed would be $4,430,192[13] and the projected market value could be $6,819,727, leaving an untapped market of $2,389,535. Therefore, using the aforementioned estimates, the current market for organic vegetable seed in the GGH region is $2,658,115, and the potential market could be $4,088,181, leaving an untapped market of $1,430,066.

In the surveys conducted for this paper, approximately 72% of growers surveyed would support a regionally-based seed co-operative (Dey, Organic Seed Survey for Ontario Farmers, 2012). Similarly, the OVCRT study indicated that 71% of growers across Canada would either support a seed co-operative, or consider the co-operative as an option to build organic seed supply (Lessard et al, 2011). Assuming that 72% of farmers in the GGH (97 farmers) would purchase bulk quantities of seed from a regional co-operative, it can be estimated that the current and potential market values are $1,913,843 and $2,943,490, respectively. If the growth rate for the number of agro-ecological vegetable farmers continues at 1.6% per annum, the market for organic seed can be expected to expand slowly with the increase of more agro-ecological vegetable growers demanding greater quantities of seed.

FIGURE 4: MARKET VALUE OF AGRO-ECOLOGICAL VEGETABLE SEED

	CURRENT MARKET VALUE	PROJECTED MARKET VALUE	RESIDUAL MARKET
Canada	$21,299,000	$32,765,000	$11,466,000
Ontario	$4,430,192	$6,819,727	$2,389,535
Greater Golden Horseshoe	$2,658,115	$4,088,181	$1,430,066
Seed Co-operative Market	$1,913,843	$2,943,490	$1,029,647

[13] Assuming 20.8% of Canadian organic vegetable production occurring in Ontario (Statistics Canada, 2012),

5.1.2 Market Preferences and Buying Behaviour

The majority of research participants surveyed and interviewed for this project agreed to support a regionally-based co-operative *if* it were to produce high quality agro-ecological vegetable seed. Growers noted that the increase of regionally-produced seed, the availability of bulk quantities from a regional vendor, the potential for better community feedback loops, and the potential decrease in seed costs, are among many of the reasons to support a regional seed co-operative (Dey, Organic Seed Survey for Ontario Farmers, 2012). The greatest concerns expressed among growers have been regarding quality control and certification standards. Only a small minority of growers and seed companies feel that a co-operative would not be necessary (please refer to Appendix 11 for a full categorization of survey responses).

In terms of procurement preferences, agro-ecological farmers currently purchase the majority of their seeds from large-scale non-regional seed growers that offer both organic and untreated seed (Lessard et al, 2011). From the surveys conducted, the top three seed companies are international suppliers: William Dam Seeds, High Mowing Organic Seeds, and Johnny's Selected Seeds (Dey, Organic Seed Survey for Ontario Farmers, 2012). Smaller amounts of unique varieties are purchased from regionally-based small-scale organic producers (e.g. Cottage Gardener, Hawthorn Farm, Urban Harvest, etc.), but bulk quantities are rarely procured from these growers (Lessard et al, 2011; Dey, Organic Seed Survey for Ontario Farmers, 2012). Of the 14 farmers that saved their own seed, the use of that seed accounted on average for about 30% of their seed use on their farms. Of the 4 farmers that exchanged seed between regional farmers, the use of exchanged seed accounted for 4.75% of their seed use on their farms. Therefore, although some farmers use a moderate amount of saved seed in their operations, most farmers prefer to rely on the larger seed suppliers due to their quality standards and variety availability (Dey, Organic Seed Survey for Ontario Farmers, 2012; Lessard et al, 2011).

Based on the data collected, the small-scale agro-ecological vegetable grower demonstrates *complex buying behaviour*, where they are highly involved in their purchase because of the risk associated with poor quality seed (Kotler et al, 2006). Virtually all growers place priority on specific high-quality

varieties that have good flavour and strong yield potential. According to the surveys conducted, other characteristics in order of preference include, days to maturity, disease/pest resistance capability, storability, value, origin/location of seed, and uniqueness of variety (Dey, Organic Seed Survey for Ontario Farmers, 2012). Farmers are able to identify these characteristics through information in seed catalogues, past experiences, and information shared through farmer networks (Lessard et al, 2011). In general, if the variety is of a high quality, and has been recommended by other growers, farmers will be relatively price insensitive, and will commit to these purchases based on value-orientations[14] (Lessard et al, 2011; Dey, Organic Seed Survey for Ontario Farmers, 2012; Brisebois, 2012; Wildfong, 2012). The importance attributed to seed quality cannot be understated – indeed, it is this characteristic that differentiates the buying behaviour from market-garden farmers from hobbyist-gardeners:

> There's a natural resistance to experimentation on the part of farmers that you don't get with gardeners…There [are] two distinct seed markets: one highly experimental, with varieties that [are] interesting and different from the mainstream…and then there [is] the one for farmers who are much more risk-averse, not interested in trying out something different, wanting to be sure that it was going to work, because [they] can't really take a risk (Wildfong, 2012).

5.1.3 Competitive Analysis

There are two main categories of suppliers that can contextualize the competitive space for the organic seed market: (1) bulk vegetable seed producers and (2) small-scale speciality organic producers (please refer to Appendix 12 for an overview of competitor profiles). Bulk vegetable seed suppliers purchase from international breeders or seed growers, and only a small proportion of their seed comes from Canadian seed growers. These companies will normally carry seed from both conventional and organic product lines, and provide a variety of sizes from small-packet to bulk quantities. These seed growers need to use high-quality seed with reliable germination rates and a constant supply. As such, these companies will contract the most appropriate growers from all over the world to meet the needs of both large-scale vegetable growers, while simultaneously being able to cater to small-scale gardeners

[14] Due to the low response rate from non-agro-ecological growers, appropriate conclusions could not be devised for those farmers. While it is expected that they would still give high priority to quality characteristics, it is not clear whether they would be willing to pay a premium for regionally produced organic seed, and as such, might exhibit greater price sensitivity. However, it is expected that as farmers transition to agro-ecological production, they might place greater importance on regional agro-ecological vegetable seed.

(Lessard et al, 2011). Small-scale organic vegetable seed growers are generally able to regionally source their seeds, and provide small quantities of a wide number of varieties. Both groups of companies will use similar distribution outlets by providing seed through online catalogues, but the small-scale seed companies will also attempt to use regional channels, such as their own retail stores, specialty retail markets, and community seed-exchanges (e.g. Seedy Saturdays/Sundays).

In order to appropriately fill the market niche, the co-operative's position would remain unique: there are no seed companies in Ontario that are able to offer *both* regionally-adapted *and* agro-ecological vegetable seed in *bulk quantities*. It is clear that the market that needs to be exploited for any seed enterprise is differentially-scaled agro-ecological vegetable farmers, as opposed to hobbyist gardeners: "If we're going to have people growing more Ontario seed, then we're going to have to get the quantities and the varieties that are suitable for market gardens" (Slater, 2012). Given that the co-operative is part of a broader initiative to support agro-ecological seed production as a whole, it would be problematic if the efforts of small-scale seed growers were undermined. Therefore it would be in the co-operative's interests to leverage the respective capabilities of those actors to help everyone "get a leg up" (FFSC Member-Farmer, 2012).

In order to ensure that small-scale seed growers are not disadvantaged, the co-operative could pursue two options: (1) provide bulk quantities of successful varieties that are both commercially available and unavailable *with* the small-scale seed companies and other regional farmers or (2) provide bulk quantities of select varieties that are commercially *unavailable*, with or without the small-scale seed companies, so as not to compete directly with them. For the former option, further research would need to be conducted to understand which specific varieties can be brought to scale both in terms of regional capability, supplier capacity, and grower demand. For the latter option, the infrastructure is being built with Seeds of Diversity's *Seed Library*, and research is being conducted as to which varieties can be commercialized (Wildfong, 2012). Wildfong suggests that focusing on bulking up lesser-known, but still successful, varieties would be most appropriate market niche to exploit:

> If there's a common variety that you can buy from the big Canadian seed companies, then I'm not really sure why/how it fits economically for a small-scale seed producer

> to try to multiply that variety and sell it locally or to domestic seed retailers, when the same retailers can just buy those seeds that are mass produced by somebody else in a much larger operation.

Wildfong elaborates further on the economic reality of agro-ecological vegetable seed production: "I think it has to be a variety that is not available from those big wholesalers, because there's not really anyway you can compete with them…so the obvious market niche is Canadian grown, Canadian varieties".

5.2 BUSINESS MODEL AND VALUE PROPOSITION

Based on the market assessment conducted, the value proposition that the co-operative can offer to farmers is to provide *regionally-produced agro-ecological vegetable seed for growers in bulk quantities*. Essentially, the co-operative would establish a network of member-growers in the GGH region to grow out select varieties of agro-ecological landraces, and then purchase different lots of the select varieties from the different member-growers. The co-operative would offer processing services for seed procured from the grower at various levels of the post-harvest process, depending on the state that the grower sends the seed. The more processing that the grower does themselves, the greater price they would receive for the seed from the co-operative. The co-operative would distribute the bulk quantities of these seeds to member-growers and non-member growers, and store the remaining inventory for future sales and production. Any surpluses generated by the co-operative would either be reinvested to improve its services or distributed as patronage returns to growers according to the quantity of seed that they have grown and sold.

Based on the earlier analysis of different co-operative models, the business model for the seed co-operative in Ontario can be formulated as a *new generation co-operative* (NGC) maximizing the role of the *member-investor* (Nilsson, Farmer co-operatives, 2001). The *delivery rights* inherent in a NGC enable growers of different scales of production to join the co-operative, without pressuring individual growers to increase the scale of their own production. Therefore, the co-operative would open membership only to those individuals who can produce a specific quantity of select varieties of agro-ecological vegetable seed. These members can then purchase delivery rights that are proportionate to their production capacity

and the level of investment they can provide to the co-operative for share capital. Members can purchase more delivery rights (if available) each year if they would like to increase their contribution to the co-operative, but they would not be required to do so.

In order to build a robust seed system in the GGH region, and help facilitate the creation of AAFNs across Canada, the co-operative needs to meet short-term financial goals that will help enable long-term social-utility and institutional objectives in the future (Bouchard, 2010) (please see Appendix 13 and 14 for a summary of goals, objectives, and core activities). It is also essential that as the co-operative grows and achieves greater economies of scale, it focuses on scaling the *impact* of the co-operative, but not necessarily the *organization* (Kramer, 2005). More pointedly, it is essential that the co-operative does not exclude smaller farmers as the organization grows. The structure of delivery rights based on the units that can be delivered by the smallest grower ensures that this is possible (see Section 5.4 for more details). Moreover, the success of the co-operative should encourage other regions to create similar systems that can provide food to build a collection of regionally-based agro-ecological food economies, which will hopefully signal to both the market, and the state, the importance of robust seed systems and AAFNs. The remaining sections will explain in the further detail the operational functions of the co-operative.

5.3 OPERATIONS

5.3.1 Production Overview

Other than the conceptual advantages co-operatives pose as both facilitators of robust seed systems and as social enterprises, the structure of a co-operative has been one that intuitively suits the unique demands of seed production (Steiner, 2012; Wildfong, 2012; Brisebois, 2012). For seeds to be true-to-type year-to-year, crops need to be isolated from other plants of the same species, to prevent unwanted cross-pollination through either wind- or insect-pollination. Isolation distances are based on the average amount of distance the pollen of a particular plant can travel (either carried by wind or by insects) (Apple et al, 2005). As a result, it is difficult (but not impossible) for one farmer to grow out the diverse number of crops for a vegetable market garden while keeping those varieties genetically pure. Farmers

need to allocate more land for growing crops to account for isolation distances, or implement barriers (e.g. greenhouses, natural barriers, etc.) to prevent the unwanted transfer of pollen. However, if each farm grew out a select number of varieties from a selection of crops, these restrictions would be less cumbersome for each farmer.

For the seed co-operative, one farmer could grow out three varieties of tomato, four varieties of lettuce, two varieties of bean, two varieties of squash, and so on. Similarly, another farmer would do the same for the selected varieties if they meet the appropriate isolation distances, and a network of growers could be established to grow set quantities of the selected seed varieties. The co-operative would then focus on aggregating the same seed varieties from these different lots, and then processing the vegetable seed that can be grown optimally in those climates. The number of varieties and the quantity of those varieties would be expected to increase as the production capacity of the region increases.

While farmers would be welcome to grow a large number of varieties of different crops on their fields, it might be more feasible to focus on a select number and bulk up the quantities of those varieties (Wildfong, 2012). Moreover, since many of these farmers are expected to be market gardeners themselves, they may be limited in terms of both time and space. When starting a seed enterprise with multiple growers, Colley (2012), Executive Director of the OSA, states that it is, "often best to give new growers several smaller lots…so the grower can see what works in their climate and system, [and] then increase quantities as they gain experience and past successes".

Admittedly, it is challenging enough for market gardeners to profitably sustain a diverse vegetable garden; adding a seed growing operation to that task only adds another degree of difficulty. Lew-Smith (2012) cautions that, "it works best just to grow seed, rather than grow seed part of a diversified operation". Brisebois (2012), a member farmer at Tourne-Sol Co-operative Farm in Quebec, offers an alternative point of view on the challenges of being a market gardener with a seed operation: "The vegetable component of the farm is what has permitted [our] seed business to grow without ever being in a hurry…we can do the seed on the side, [and] as it grows, it can generate more revenue". As Tourne-Sol has grown, Brisebois notes that, "there's more of an economic imperative in our crop

selection and allocation of space". Moreover, maintaining the vegetable garden allows Brisebois to grow out different varieties and test those varieties with their consumers. Therefore, market gardeners can generate additional revenues from their seed crops by harvesting a portion of those crops earlier to sell as produce. That being said, the greatest challenges that market gardeners will encounter with the addition of a seed growing operation are labour and knowledge. The co-operative needs to be mindful of these challenges, and would provide the appropriate resources and staff to support market gardeners.

5.3.2 Production Process

The production process for the seed co-operative follows varied processing techniques for different vegetable seeds. There are several resources available for seed growers that outline seed processing in more detail and for instructive purposes (see Colley et al, 2010; Steiner, 2008). This section will provide a summary of the general process and elaborate on the types of considerations the co-operative needs to take into account (please see Appendix 15 for an overview of the full seed production process and the types of equipment needed).

Isolation and Crop Planning:

The first step in the seed production process that the co-operative needs to co-ordinate is the organization of not only which crop varieties will be profitable and can be grown optimally, but also the co-ordination of isolation distances for each crop. In doing so, instead of each individual farmer researching which crops are being grown in neighbouring areas that risk cross-pollination, the co-operative can assume that responsibility and gather the information from the region.

Seed Procurement:

The co-operative can give priority to (1) purchasing high quality varieties from SoD's *Seed Library* that are not being commercially produced and (2) purchasing regionally-grown high quality varieties from small-scale seed companies that are seeking to scale up the production of those cultivars. While the original seed stock of some of these varieties may be from areas outside the GGH region, these varieties should have had a history of being successfully grown and adapted in the region.

Cultivation and Planting:

In accordance with the isolation distances and mutually agreed upon crop planning requirements, growers for the co-operative will devote a portion of their land to cultivate and plant seeds. Growers will assume responsibility for the proper cultivation and planting of seeds; however, the co-operative may advise on the location, timing of planting, and soil fertility requirements, for certain varieties.

Flowering and Pollination:

The most crucial step to monitor during the production of a seed crop is the pollination stage. Some crops, such as, tomatoes might need assistance through vibrating the flowers to ensure pollination; others, such as cucurbits, may need to be hand-pollinated if there are a shortage of insect pollinators in the area. Protocols for specific crops can be established between the grower and the co-operative to ensure certain control measures are followed to maximize pollination. Other conditions to monitor include temperature, humidity, and wind, all of which affect the fertility, viability, and movement of pollen. Beehives can also be purchased or flower beds can also be planted by the co-operative for farmers to encourage greater pollination rates.

Disease Management, Weed Pressure, Selection and Rogueing:

Similar to the pollination process, establishing protocols for disease and weed management, as well as selection and rogueing standards, are essential to maintaining high quality seed. Weed pressure should be managed by the grower both to ensure that the seed crop matures properly, but also to prevent any weeds from flowering early and risking cross-pollination with similar crop species. Disease management is more difficult to monitor, but can be facilitated by mandating certain preventative measures for growers to practice for each crop. If seed crops exhibit characteristics of certain diseases, the co-operative can attempt to address the disease through different post-harvest treatments (please see Appendix 15). Lastly, establishing criteria for rogueing and selection are critical. Rogueing criteria refer to the removal of plants that exhibit ‘off-type’ characteristics or undesirable traits; selection criteria refer to implementing practices that will improve the quality of the seed crop. Due to the greater quantities of seed that could be sold through the co-operative, Brisebois (2012) notes that it might be more enticing for

farmers to support stronger quality control and seed testing: "If I could sell 20 or 30 pounds of arugula, it's more [of an] incentive to me to go and have that lot tested, either at the lab the co-op is working with, or at an independent lab, rather than if I was growing one pound".

Seed Harvesting and Processing:

Once the grower harvests the seed crops using harvesting criteria provided by the co-operative, the grower threshes the seeds (i.e. removing the seed from the plant material) if it is a dry seeded crop, or harvests the fruit if it is a wet seeded crop. Once the seed is harvested, it can be transported to the seed co-operative and the seed separation, cleaning, treating, testing, and packaging of the seeds can be handled by the co-operative. However, the co-operative can give the grower the autonomy to take ownership up to any stage of the process as well, and then send the seed to the co-operative for any remaining quality control protocols. Accordingly, the seed co-operative will process the seeds from whatever stage the grower delivers them. However, conducting germination, purity, and disease tests during the post-harvest process is something that co-operative can take ownership of, and do more efficiently than individual growers.

5.3.3 Facilities Management and Planning

Co-Packing Relationships:

Generating enough capital to develop a production facility is generally understood as the largest barrier for most processing businesses in the food industry; accordingly, the costs to purchase and maintain an investment facility is simply too prohibitive for small scale seed producers. Co-packing (sharing production with existing operators) can be considered as a good option to begin production until demand is proven and a critical mass of production is reached, to ensure an adequate return on investment in a new production facility or production line (OMAFRA, 2008). Accordingly, the co-operative can engage in co-packing arrangements with a select number of certified organic processors in the industry (please see Appendix 16 for an overview of potential co-packers). In the event that successful co-packing arrangements cannot be established (or when the production capacity of the region has exceeded co-

packing capacity), investment would need to be undertaken in either developing a new facility or renovating an orphaned facility.

Transportation and Inventory Management Strategy:

One of the primary economic benefits of building regionally-based food networks is the decrease in transportation costs, since products will be distributed over relatively shorter distances than interregional or international chains. However, with rising fuel costs, efficient distribution chains connecting farmers will need to be established to minimize the delivery costs of vegetable and seed transport. With respect to inventory management, the delivery rights inherent in the structure of the co-operative will help to manage inventory more appropriately, as product delivery obligations would be decided at the beginning of the growing season for each producer.

Due the perishable nature of the products before processing, and the need to process the goods within a specific period of time, the majority of the inventory costs will be realized through holding finished processed goods (i.e. seeds), as opposed to raw materials and work-in-process goods (i.e. unprocessed fruit). Moreover, Wildfong (2012) notes that the abundance of surplus seed that gets produced can sustain its quality if it is stored correctly, storage in freezers present an affordable opportunity for growers to store seed over long periods of time:

> What I don't hear people talking about is what to do with extra seed… seeds last for a lot longer than most people think…and if it's been stored well and it still germinates well then that's fine…so what's missing in the small-scale system is a -20 degree freezer to store the extra seed.

Wildfong furthers his point to reiterate the economies of scale that a co-operative can achieve with respect to inventory storage:

> It's much more economical to put a huge amount of seed in the freezer for 8 years than it is to grow it brand new every year…so that's one of the economic flaws in the small-scale system right now. If you had a seed co-op, you could do that.

Producing surplus amounts of seed is also encouraged because of the risks of crop failure and poor seed germination (Davis, 2012). Co-packing and shared storage in facilities can dramatically help reduce storage costs for seeds. The co-operative can also pursue opportunities to provide excess seed inventory to other regions, seed banks, and breeding organizations for research.

5.4 FINANCE

5.4.1 Revenue and Expense Projections

Given that the data on organic vegetable production in Ontario is not well-documented, it is difficult to present accurate demand projections for the seed co-operative. However, preliminary financial scenarios have been developed based off of organic seed yields of 25 common organic vegetables grown by market gardeners in the GGH area (Parsons, 2005; Steiner, 2008; COG PWW Chapter, 2011; Statistics Canada, 2012). By estimating the amounts of organic vegetables grown in the GGH region[15], and by using data on average organic bulk seed prices[16], a series of financial simulations have been conducted to identify the most economically viable seed crops to grow in the GGH region based on a series of economic and ecological constraints.

Figure 5 shows the total gross sales, total amount of acreage and row feet needed, and the gross sales per row foot, in low, medium, or high, processing scenarios for the co-operative. The different scenarios are based on different projections of how much vegetable acreage per crop is expected to be produced each season by agro-ecological vegetable farmers in the region (please see Appendix 17 and 18 for a full list of financial assumptions and projections). Thériault & Brisebois (2010) recommend that choosing a target gross sales figure per acre enables farmers to derive a gross sales target per row foot, thereby allowing more financially astute crop planning. For the co-operative, $25,000 gross sale per acre has been chosen as the target, which results in $0.57 gross sales per row foot. Therefore, regardless of which seed crop farmers would choose to produce, each crop has shown to generate more than $0.57 in gross sales per row foot per crop. Assuming that 55% of the farmers in the GGH region (74 farmers) that save seed could potentially produce for the co-operative, farmers would need to allocate anywhere from 4.72 to 8.45 acres of land collectively among themselves for seed production. Given the current estimates of land-use for agro-ecological vegetable acreage (see Appendix 17, Section 17.2), and the projected

[15] Derived from Agriculture Census (2011) (please see Appendix)
[16] Derived from bulk organic seed prices from the seed catalogues of High Mowing Organic Seeds, Johnny's Selected Seeds and William Dam Seeds (please see Appendix).

gross sales per row foot formulated (Figure 5), seed production is well within both the physical and economic constraints of farmer capacity in the GGH region.

FIGURE 5: REVENUE AND LAND-USE PROJECTIONS

	LOW (10 ACRES/CROP)	MEDIUM (15 ACRES/CROP)	HIGH (20 ACRES/CROP)
Target Gross Sales per Row Foot	$0.57	$0.57	$0.57
Total Gross Sales	$476,777.81	$715,175.79	$961,812.90
Amount of Total Acreage Required	4.72	4.89	8.45
Amount of Total Row Feet Required	205,485	212,085	367,941
Average Gross Sales per Row Foot	$2.32	$3.36	$2.61

Operating costs for seed enterprises vary based on costs of production, co-packing relationships, labour costs, and other operating expenses; therefore, it is difficult to develop meaningful profit/loss scenarios for the co-operative. However, initial estimates for costs of goods sold (COGS), major capital expenditures, labour costs, and operating expenses have been calculated[17] (please see Appendix 18, Sections 18.7 and 18.8). *Figure 6* shows abridged income statements for the co-operative using initial COGS and operating expense estimates. Based on the data presented, and under ideal scenarios of seed yield and farmer participation (both as producers and consumers), the demand of agro-ecological vegetables in the GGH region will most likely be able to profitably support a seed co-operative.

FIGURE 6: SUMMARIZED INCOME STATEMENTS

	LOW (10 ACRES/CROP)	MEDIUM (15 ACRES/CROP)	HIGH (20 ACRES/CROP)
Total Gross Sales	$476,777.81	$715,175.79	$961,812.90
Total Cost of Goods Sold	($120,617.67)	($303,851.48)	($83,423.80)
Gross Profit	$356,160.14	$411,324.31	$878,389.10
Operating Expenses	($207,299)	($207,299)	($207,299)
Total Operating Income[18]	$148,861.14	$204,025.31	$671,090.10

5.4.2 Sources of Financing

Preferred Shares with Delivery Rights:

Preferred shares with delivery rights would be the shares distributed to the seed growers of the co-operative. These membership shares would provide farmers with the right to vote, and delivery rights.

[17] While the expenses documented are not accurate, they are generally consistent with the expenses of a commercial-scale seed enterprise like High Mowing (Davis, 2012).
[18] The gross profit figures are moderately inflated because of the high ending inventory figures due to the surplus amount of seed. However, a high ending inventory is common in large-scale seed enterprises to take into account crop failures for future years of production (Davis, 2012).

Each preference share gives the right of the member to deliver *one unit* of product to the co-operative for processing, and ensures that the co-operative purchases that unit for processing. Each minimum unit of product delivery will be based on what the smallest grower can produce and on the minimum population size required for seed production.

To maintain genetic diversity, genetic resiliency, and to avoid inbreeding depression, there is a minimum number of plants that need to be grown out in one field for each crop. Accordingly, the quantity of seeds that is produced from that population size, can serve as the minimum production unit for the co-operative. Therefore, in order for a farmer to own a membership share of the co-operative, the minimum that the farmer needs to produce is the number of plants required for the genetic maintenance of the seed. As a result, there will be a different number of units available to produce for each type of crop depending on how much of that crop is in demand (e.g. different number of delivery units for beans than for tomatoes). The amount of land required to maintain the minimum population is marginal, therefore the co-operative ensures that even the smallest agro-ecological producers are being served under this arrangement, *and* that the genetic diversity of the seed crops are also maintained.

The price of each delivery right share is typically determined by dividing the total amount of equity capital the co-operative requires to finance the business, by the processing capacity of the co-operative's facilities (Gamble, 2002). Given that the processing volumes are different for each crop, the delivery right price for the co-operative has been formulated by multiplying the equity required for the co-operative by the percentage of total volume of units for each crop, and then dividing it by the number of units produced through the co-operative. *Figure 7* provides the different share prices for each scenario. Essentially, farmers that choose to be part of the co-operative will purchase the number of delivery rights in accordance with the number of units that they believe that they can produce for any crop they choose.

For example, if a farmer purchases 50 shares from the co-operative, the farmer has purchased 50 delivery rights, and is obligated to grow out 50 units of seed (of any combination of crops) for the co-op. In turn, the co-operative is obligated to purchase those 50 units of seed from the farmer at whatever price best reflects the degree of processing that the farmer has incurred. The co-operative would then sell those

50 units of seed to agro-ecological growers in the region. Similar to traditional co-operative structures, patronage returns would be distributed to members according to the level of product delivered and sold to the NGC, and remaining surplus profits would be reinvested to improving the services of the co-operative.

FIGURE 7: EQUITY, DELIVERY RIGHTS, AND MEMBERSHIP SHARES

	LOW (10 ACRES/CROP)	MEDIUM (15 ACRES/CROP)	HIGH (20 ACRES/CROP)
Initial Equity Required	$907,740	$907,740	$907,740
Delivery Right Price	$4.24	$7.38	$7.45
Total # of Membership Shares (Equal to Total Number of Minimum Units)	121,860	123,076	214,126

Preferred Shares without Delivery Rights and Other Sources:

Preferred shares without delivery rights will be offered to interested individuals to allow investment from non-producers. However, these individuals will not be able to vote in the matters of the co-operative unless specified/allowed by the primary members of the co-operative. Dividends will be distributed to all preference shareholders without delivery rights with limits on the payout at the discretion of the members (Canada Co-operatives Act, S.C. 1998, c. 1). The co-operative can also seek out social finance intermediaries as holders of preference shares without delivery rights. Social finance is commonly understood as investment in social enterprises that have specific socio-ecological goals, and whose purpose is to generate socio-ecological welfare, as well as nominal returns to investors (Task Force, 2010). Consistent with those forms of social enterprises without profit limitations, social finance intermediaries must still adhere to the terms of the credit relation, but seek to support market-based activities to generate a social/ecological good. Other sources of financing can be sought through government grant and financing programs for agricultural endeavours (please see Appendix 19).

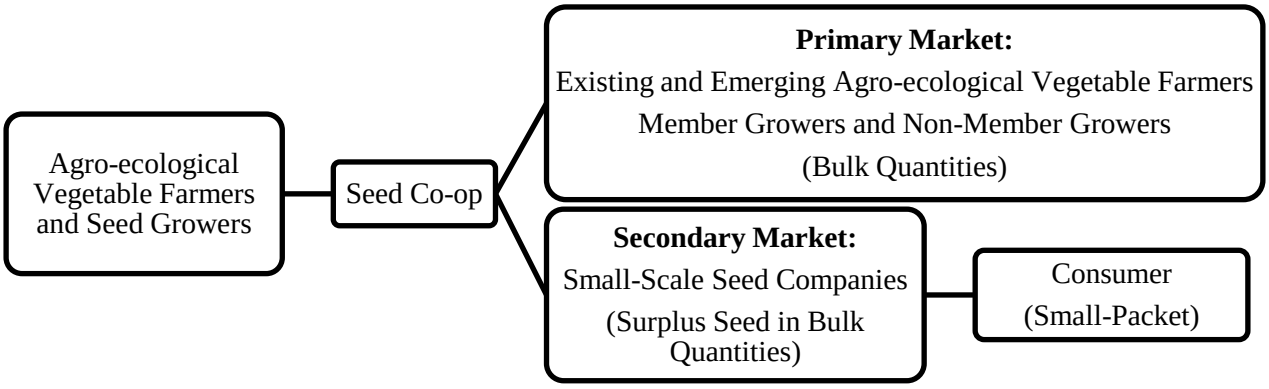
5.5 MARKETING STRATEGY

5.5.1 Distribution Scenarios

The co-operative can employ a multi-channel direct distribution strategy by distributing the seeds back to the growers, selling seeds directly to non-member growers, and selling seeds to seed companies

(see *Figure 8*). The primary purchasers will be agro-ecological vegetable farmers in the GGH region. Bulk seed would be provided through online catalogues, and any surplus seed can either be stored for future use, or sold to small-scale seed companies. Although the majority of the buyers from the co-operative, will be the producer-members themselves, it is expected that growers will purchase seeds that they have not grown. For example, the member-farmer that grows their own tomato seed will process the seed through the co-operative and re-acquire the quantities they need at the processing cost of the co-operative. However, that same grower would also be able to purchase bulk quantities of other vegetable seeds from the co-operative that they have not produced. Additionally, while minimum production units have been derived for member-farmers, these units will *not* be the minimum quantities that farmers would need to purchase as consumers. Instead, different volumes would be determined for each crop (either by number of seeds or by weight) that corresponds with the amount of seed suitable for the average bulk production for that crop. The co-operative will not however, sell any seed in small-packets so as not to disrupt or interfere with the efforts of small-scale regional seed enterprises.

FIGURE 8: DISTRIBUTION CHAIN



5.5.2 Pricing Model

For the member-growers, appropriate quantities of the seeds they have grown can be distributed back to the member-growers at the processing cost for the co-operative (or at a discounted cost for the

member-grower)[19]. For non-member growers or small-scale seed enterprises interested in acquiring seed, volume discounts can be orchestrated. As mentioned earlier in the initial market research conducted, while agro-ecological farmers are not wholly insensitive to price, they are not opposed to paying a price premium for seed that is of a genuinely high quality (Dey, Organic Seed Survey for Ontario Farmers, 2012; Lessard et al, 2011). Moreover, Steiner (2012) discusses the reality that contract growers face with larger seed companies, where these large seed companies might genuinely want to purchase from local growers, but will have to pay significantly lower prices because of the need to maintain profit margins: "If that's the seed procurement model [you want to implement], you won't be able to support local markets". As a result, there are broader purposes to using a price premium for the co-operative's products: (1) to ensure that farmers obtain a larger percentage of the dollar and are appropriately compensated for their efforts, and (2) to entice conventional farmers to recognize the economic benefits of agro-ecological production.

5.5.3 Promotional Strategy

The primary promotional activities for the co-operative could come from the maintenance of a website that would be focused on two dimensions: (1) direct product promotion and (2) seed education for growers. Both direct product promotion and education can occur through knowledge sharing between farmers, AAFN advocacy conferences, and through strategic alliances with Seeds of Diversity, USC Canada, the COG, the OCO, and other CSOs and associations. The co-operative would also need to adopt the branding strategies of national organic seed certification schemes to promote that their seeds are certified organic.

5.5.4 Growth Strategy

Until greater scale is reached with agro-ecological production, the products from the co-operative will primarily be in the introduction and growth stage of the *product life cycle* (please refer to Appendix 20 for *Porters' 5 Force Analysis* and Appendix 21 for the co-operative's *Marketing Strategy for Growth*)

[19] While an optimal price per gram/seed has been developed for the co-op (see Appendix 18, Sections 18.3-18.6), the units in which the co-op will sell its seed has not; therefore, estimates on price per unit, volume discounts, etc. have not been formulated.

(Kotler et al, 2006; Porter, 2008). During this stage, the target market remains farmers that value bulk quantities of regionally-adapted seed (innovators and early adopters). However, as more farmers begin to transition towards agro-ecological practices, these farmers might exhibit *habitual buying behaviour* (low purchasing involvement and brand indifference) and will most likely simply purchase seeds based on price and availability (Kotler et al, 2006).

While the cost of seed production could decrease as greater economies of scale are achieved, the goods would still need to be sold at a relative price premium to ensure appropriate value to the growers. Therefore, a shift in broader societal values towards the ecological value of regionally-adapted seed is necessary, to compensate for the price sensitivity that is typical of farmers with more habitual buying behaviour. During the maturation phase of the co-operative's products, the co-operative will need to re-strategize on two of its broader social objectives: (1) how to provide the co-operative's products to farmers of all income-classes and (2) how to collaborate with similar emerging agro-ecological food co-operatives from other regions.

FIGURE 9: SUMMARY OF MARKET TRANSITION

BUYER	TYPE OF SEED PURCHASED	QUANTITIES PURCHASED	CURRENT SUPPLIER	PROPOSED SUPPLIER
Existing and Emerging Agro-ecological Vegetable Farmers	Untreated	Bulk and Small-Packet	Non-regional conventional vegetable seed producers	Seed co-operative provides bulk quantities of agro-ecological vegetable seed that were otherwise being purchased as conventional, untreated, and/or outside of the region.
	Organic	Bulk and Small-Packet	Non-regional organic vegetable seed producers	
Conventional Vegetable Farmers	Conventional	Bulk	Regional and non-regional conventional vegetable seed producers	
Regional Small-Scale Organic Seed Enterprises	Organic	Bulk and Small-Packet	Saved seed or non-regional organic vegetable seed producers	

5.6 ORGANIZATIONAL DESIGN

5.6.1 Organizational Culture

It is essential that each member of the co-operative comprehensively understands the complexities of AAFNs to avoid the aforementioned issues attributed to co-operatives during its

formative stages, and as the co-operative experiences growth. Ongoing dialogue with producer-members, staff, community members, and other stakeholders, must be conducted to incorporate the economic, social, and ecological considerations inherent to AAFNs. The co-operative should develop an organizational culture of learning and connectivity to ensure an ongoing discourse of the organization's goals, and strategies on how to achieve those goals (Kurucz et al, 2008). Although it is important for all employees to develop a sound understanding of agro-ecological food systems, and their broader roles in AAFNs, it is equally important to create a space for debate to further discuss the different perspectives of these systems (Bouchard, 2010; Ebrahim & Rangin, 2010). A co-operative business structure helps to facilitate this type of culture by distributing power equally throughout members of the organization, but the co-operative must also ensure that all non-members (production staff) are involved as well.

5.6.2 Membership Structure and Board of Directors

The membership of the co-operative will be restricted to regional growers that can commit to delivery rights for seed production, to ensure that the seed growers have the primary voice in the organization. It is expected that these producers will make the most optimal decisions with respect to what is appropriate for their seed production needs, and for the rural development of their communities. Similar to traditional co-operatives, the governing body of the Board of Directors will be elected by the members of the co-operative, to oversee broader policies and strategic direction.

5.6.3 Management and Staff

There is an emerging class of post-secondary graduates from a variety of disciplines with interests in agro-ecology, agricultural science, community development, social enterprises, and other complex socio-ecological issues, who are expected to provide the labour and leadership for local-organic food co-operatives (Christianson et al, 2010) (for a full list of management and stuff functions please see Appendix 22). For all employees, the co-operative could employ a strategy that will focus on holistically training workers on two dimensions: (1) management functions, (2) technical agro-ecological vegetable seed processing, and (3) plant breeding and agricultural research. Similar to internships programs across organic farms in Ontario, the co-operative may present opportunities for education placements, trade

apprenticeships, and other training programs for students looking for seasonal employment/practical placements (please refer to Appendix 23 for human resources programs and services offered for by OMAFRA).

5.7 INCUBATION OPPORTUNITIES AND FURTHER RESEARCH

The business model proposed here is an overview of the main components of how the seed co-operative could be established in its ideal form as a for-profit co-operative. However, recognizing limitations in terms of available capital, farmer labour, farmer participation, and seed yield variability, the projections are admittedly optimistic. The more likely scenario is that seed yields, farmer participation, and farmer demand is significantly lower, and it is unlikely that the co-operative will be able to establish itself as a for-profit co-operative immediately. As a result, the following section briefly outlines how the co-operative can be incubated and the future research that would need to be conducted.

- Connect with the Eastern Canada Organic Seed Growers Network (ECOSGN)
    - ECOSGN is a group of experienced seed growers working under Seeds of Diversity that is helping farmers and seed growers to produce more high quality seed through technical assistance, education, marketing collaboration, advocacy, and shared facilities.
    - Relationships should be established with ECOSGN to engage with the seed growers that would most likely be part of the co-operative.
    - Members that are part of ECOSGN can also identify varieties that are being commercially sold to gardeners but could be scaled up through the co-operative, as potential varieties to sell.

- Conduct a full-scale feasibility study
    - Partnerships should be made with seed-conservation organizations or other research institutions to conduct a full feasibility study in the GGH region to more accurately construct the financial scenarios for the co-operative.

- Incubate the co-operative as a non-profit co-operative with Seeds of Diversity
    - Seeds of Diversity has actively expressed support for incubating a seed co-operative for several years in order to bulk up the capacity of specific seed varieties.
    - Once the co-operative has a sufficient network of growers and surplus quantities of quality seed available, the co-operative can incorporate into the for-profit co-operative model.
    - Seeds of Diversity maintains a database that collects information on all Canadian landraces grown across Canada by their members. The database can serve as an initial resource to identify varieties that demonstrate good quality, but are not being commercially sold, as another set of potential varieties to be sold through the co-operative.

SECTION 6: CONCLUSION

The research presented in this report has demonstrated the importance of preserving regionally-adapted agro-ecological seed varieties, and has provided an overview of the efforts being taken by actors in the social economy of North America who are making these varieties more accessible. However, due to the impacts of corporate consolidation in the seed industry and regulatory co-option by these same corporate actors, the efforts of informal seed-saving networks, seed conservation CSOs, and small-scale seed enterprises, are severely constrained.

The implementation of a vegetable seed co-operative might be the type of organization that can most effectively scale up the production of regionally produced agro-ecological vegetable seeds, without pressuring individual farmers to compromise their growing practices or without drifting towards more economically-driven goals. The financial projections formulated for this research have indicated that a seed co-operative could be very successful under ideal conditions of seed yield and farmer engagement. By connecting with more farmers in the GGH region, partnering with Seeds of Diversity, ECOSGN, and other seed conservation agents, and conducting more detailed feasibility studies, a regionally-based seed co-operative seems viable to implement in the near future.

That being said, the largest determinant for success of the seed co-operative ultimately depends on the level of farmer commitment to this undertaking and the ability to attract adequate financial resources to support such an ambitious initiative. While there is no shortage of enthusiasm and effort by the existing and emerging constituency of agro-ecological farmers, the capacity for devoting labour, time, and money are severely limited. In part, these constraints exist due to the sheer reality of farming; however, they also exist due to the fact that these farmers are involved in the unrelenting struggle against market dynamics and state policies that are ultimately at odds with the goals of AAFNs.

Accordingly, an OCO Executive Member (2012), comments on another possible reality of a seed co-operative in Ontario:

> I am not optimistic that there is a market-based model that we will be able to find here that is going to work. If it's market-based it will be because people are sponsoring it…and calling it a commercial thing, but it will be subsidized by people or

> government…it is not going to happen without subsidization in Canada (OCO Executive Member, 2012).

In truth, until an appropriate method is developed to accurately account for socio-ecological costs and benefits (Lawn, 2001; Victor, 2008), ecologically-focused social enterprises, such as the seed co-operative, must rely on societal value shifts to fully drive financial success. Moreover, until efforts are taken by the state to curtail the oligopolistic tendencies of dominant market actors, the likelihood of economic success for the co-operative is constrained.

It is appropriate then, that Seeds of Diversity has been proposed as an institution that can incubate the co-operative as a non-profit until capacity is built for the region and the organization. Yet the need for subsidization from the public purse speaks to a broader paradox that exists in the social economy: social enterprises, like co-operatives, are taking responsibility for market and state failures, but these endeavours are often money-losing or largely uneconomical ventures (Levi, 2006; Scharf et al, 2010; McMurtry, 2010). Given this reality, some argue that seed-saving and seed production should not be another endeavour taken on by overburdened farmers, but that it needs to be the responsibility of the state: "Philosophically, [seeds] are a public good and the livelihood for this absolutely ought to be 100% created through the public purse…Why can't we ask for that? It should not be off the table as one of the building models" (OCO Executive Member, 2012).

To return to Borowiak's (2004, p. 527) comment on what farmers want (see p. 36) – why is it unreasonable to expect these efforts from the government? Whether this form of state support is through subsidization, publicly-owned seed enterprises, agro-ecological seed research and breeding, more favourable government policies, or any combination of those options, is a discussion that requires considerable attention. However, the profit-maximizing businesses that dominate the agricultural sector and similarly single-minded political actors that make agricultural policies have shown that they are either unwilling or incapable to support these kinds of initiatives. As a result, co-operatives and other social enterprises in the social economy must provide these services through their market-based initiatives.

Yet, while the social economy is the space in which AAFN advocates must currently operate, the purpose of this engagement should not be forgotten:

> The defining feature of the social economy is the ability to realize its normative claims in both the practical actions of meeting life-needs and in articulating these needs beyond the confines of particular organizations, as a movement for ethical economic practice (McMurtry, 2010, p. 29).

At the core of this *movement for ethical economic practice* is a vocalization of what these life-needs are, and how they are being underserved. Therefore, the co-operative social enterprise model proposed in this paper should be not only be understood as an alternative market model for seed production, but as a form of democratic engagement that signals to state actors the actual *life-needs* of a group that has been marginalized in the current socioeconomic system. In doing so, it is hoped that these types of organizations can convince the state and the general public to take further efforts to significantly re-construct agricultural policies that will encourage, if not directly facilitate, the transition towards building robust seed systems and regionally-populated AAFNs across the country.

APPENDIX

APPENDIX 1: DEFINITION OF SMALL-SCALE AGRO-ECOLOGICAL FARMERS

Classifications of farm sizes vary from the type of commodity produced, the yield produced for that region, and the sales generated for the farm – therefore, there is no exact definition of a 'small farm'. In the broader context of agro-ecological farming, the average certified organic farm in Ontario is approximately 161 acres, compared to 232 acres for conventional farms (OMAFRA, 2010). It is generally understood that agro-ecological farming uses significantly less land per farm, and is more suitable to smaller farming operations than larger ones (Parsons, 2005). While detailed data is unavailable and cannot be extrapolated on the average sizes of organic fruit and vegetable operations, 80% of organic farms in Ontario were 15 acres or less (Parsons, 2005). As a result, while an exact categorization for 'small' cannot be used, it can be assumed for the purposes of this report, all organic fruit and vegetable growers use smaller amounts of acreage (15 acres or less) than conventional operations, and can be classified as small agro-ecological fruit and vegetable farmers.

APPENDIX 2: GREATER GOLDEN HORSESHOE AREA COUNTIES

COUNTIES	TOTAL VEGETABLE ACREAGE	NUMBER OF VEGETABLE FARMS	NUMBER OF ORGANIC VEGETABLE FARMS	% OF FARMS ORGANIC
Southern Regions				
Hamilton	3443	102	8	7.84%
Niagara	1617	153	16	10.46%
Haldimand-Norfolk	16919	241	12	4.98%
Brant	4256	51	1	1.96%
Oxford	5918	105	4	3.81%
Middlesex	12668	149	5	3.36%
Western Regions				
Peel	484	49	2	4.08%
Dufferin	555	28	1	3.57%
Wellington	903	107	10	9.35%
Halton	689	44	2	4.55%
Waterloo	1254	106	14	13.21%
Perth	645	61	11	18.03%
Huron	2841	88	5	5.68%
Bruce	534	76	6	7.89%
Grey	323	93	10	10.75%
Simcoe	6460	176	12	6.82%
Central Ontario				
Peterborough	390	53	1	1.89%
Durham	1782	93	10	10.75%
York	10867	149	5	3.36%
Toronto	0	0	0	N/A
TOTAL	72548	1924	135	7.02%

(derived from Statistics Canada, 2012)

APPENDIX 3: SURVEY QUESTIONNAIRE

The following two surveys were distributed electronically to farmers and seed companies across the GGH region.

3.1: Organic Seed Survey for Ontario Farmers

All questions pertaining to seed saving refers to seed from fruit/vegetable production, not seed from grain production.

Context:

1. Do you farm according to principles consistent with certified organic or other methods of ecologically-oriented farming (e.g. integrated pest management, permaculture, biodynamics, etc.)?

    - Yes (Please specify, if possible)
    - No

2. Are you a certified organic farmer?

    - Yes
    - No

3. What is the total land area that you use for fruit/vegetable production? Please select an appropriate measurement unit for your scale of production.

    - Square Feet
    - Hectares
    - Acres

Saving Seed:

4. Do you save your own fruit/vegetable seed at your farm? If "no", please skip to Question 13.

    - Yes
    - No

5. Please indicate which fruit/vegetable crop seeds you save and how many varieties of each:

Crop	Variety

6. Please provide a list of the equipment you use for seed saving:

    - Pollination (e.g. bags/covers/tapes; etc.)
    - Harvesting (e.g. small combines; etc.)
    - Cleaning (e.g. seed blowers/fans; seed screens; sieves; graders; etc.)
    - Quality Control (e.g. microscopes; moisture testers; etc.)
    - Counting/Packing (e.g. scales; seed counters; seed packeters; etc.)
    - Storage (e.g. containers; glass jars; refrigerator/freezer; etc.)

7. What are the main challenges you face when saving seed:

Selling Seed:

8. Do you sell the fruit/vegetable seed saved at your farm?

   - Yes
   - No

9. What is your farm's annual revenue? How much revenue do you generate from seed production?

   - Annual Revenue:
   - Revenue from Seed Sales:

10. Of the seeds that you save and sell, please list the top five fruit/vegetable cultivars that are the most profitable:

11. Please select the range of quantities in which you sell seed:
    - 25-50 seeds/packet
    - 50-100 seeds/packet
    - 100-250 seeds/packet
    - 250-500 seeds/packet
    - 500-1000 seeds/packet
    - 1000 + seeds/packet

12. What are the main challenges you face when selling seed:

Purchasing Seed:

13. Please provide the approximate percentages of where the seeds for fruit/vegetable crops grown at your farm come from. If you purchase from seed companies, please name the suppliers and percentages if possible:

    - Personal Farms/Nurseries: %
    - Other Local Farmers: %
    - Company 1: %
    - Company 2: %
    - Company 3: %
    - Other: %

14. Please indicate the importance you place on the following characteristics of fruit/vegetable seeds when you are purchasing seed.

	Very Important	Important	Somewhat Important	Not Important
Price/Value				
Yield Potential				
Pest Resistance Capability				
Nutritional Quality				
Storability				

Flavour				
Days to Maturity				
Traditional/Heirloom/Heritage Variety				
Origin/Location of Seed				

15. Please provide any other characteristics that you look for when purchasing seed that were omitted in the previous question.

16. What are your annual operating costs? How much do you spend on seeds on a yearly basis?

    - Operating Costs:
    - Seed Expenses:

17. How satisfied are you with the *variety* of fruit and vegetable seed that is available for your farm's production needs from *local growers*?

    - Not satisfied
    - Somewhat satisfied
    - Satisfied
    - Very Satisfied

18. How satisfied are you with the *amount* of locally/regionally produced seed being offered from *local growers*?

    - Not satisfied
    - Somewhat satisfied
    - Satisfied
    - Very Satisfied

19. How satisfied are you with the *variety* of fruit and vegetable seed that is available for your farm's production needs from *seed companies*?

    - Not satisfied
    - Somewhat satisfied
    - Satisfied
    - Very Satisfied

20. How satisfied are you with the *amount* of locally/regionally produced seed being offered from *seed companies*?

    - Not satisfied
    - Somewhat satisfied
    - Satisfied
    - Very Satisfied

State of Seed in Ontario:

21. What changes in the seed industry would make it easier for you as a farmer or seed grower to save and sell more seed?

22. Family Farmers Seed Co-op is a co-operative in Sante Fe, New Mexico. It pools production from seed farmers in surrounding states to supply high quality, organic, open-pollinated, public domain seeds. Would it be helpful for yourself and other farmers if a co-operative were to pool seed production from growers in Ontario and sell those seeds to farmers and other buyers? Why or why not?

3.2: Organic Seed Survey for Ontario Seed Companies

Context:

1. Do you produce fruit and vegetable seed consistent with certified organic or other methods of ecologically-oriented seed production (e.g. integrated pest management, permaculture, biodynamics, etc.)? All questions refer to seeds for fruit/vegetable production, not grain or other field crop production.

    - Yes (Please specify, if possible)
    - No

2. Are you a certified organic seed producer?

    - Yes (Please name your certification company, if possible)
    - No

3. Please provide the approximate percentages of where the seeds of fruit/vegetable crops sold through your company come from. If you purchase from seed companies, please name the suppliers and percentages if possible.

    - Our own farms/nurseries: %
    - Contracts/relationships with local farmers: %
    - Company 1: %
    - Company 2: %
    - Company 3: %
    - Other: %

Saving Seed:

4. What is the total land area that you use for fruit/vegetable seed production? Please select an appropriate measurement unit for your scale of production. If you do not save seed, please skip to Question 9.

    - Square Feet
    - Hectares
    - Acres
    - Other

5. What are the main challenges you face saving seed?

6. Please provide a list of the equipment you use for seed saving:

    - Pollination (e.g. bags/covers/tapes; etc.)

- Harvesting (e.g. small combines; etc.)
- Cleaning (e.g. seed blowers/fans; seed screens; sieves; graders; etc.)
- Quality Control (e.g. microscopes; moisture testers; etc.)
- Counting/Packing (e.g. scales; seed counters; seed packeters; etc.)
- Storage (e.g. containers; glass jars; refrigerator/freezer; etc.)

7. Have you patented any of the seeds that you have discovered or cultivated?

8. Of the seeds that you save and sell, please list the top five fruit/vegetable seeds that are the most profitable?

Selling Seed:

9. What percentage of the fruit/vegetable seed sold through your company is:

    - Certified organic:
    - Non-certified organic:
    - Non-organic:

10. Please rank in order of preference the characteristics of fruit/vegetable seeds that your buyers say are most important when you are selling seed.

- Price/Value
- Yield Potential
- Pest Resistance Capability
- Nutritional Quality
- Storability
- Flavour
- Days to Maturity
- Traditional/Heirloom/Heritage Variety
- Origin/Location of Seed

11. Please provide any other characteristics that your buyers look for when purchasing seed that were not identified in the previous question.

12. What are the main challenges you face in when selling seed?

13. Please select the range of sales units with which you sell seeds.

    - 25-50 seeds/packet
    - 50-100 seeds/packet
    - 100-250 seeds/packet
    - 250-500 seeds/packet
    - 500-1000 seeds/packet
    - 1000 + seeds/packet

Seed Industry in Ontario:

14. How satisfied are you with the variety of fruit and vegetable seed that the seed industry is providing for Ontario growers?

- Not satisfied
- Somewhat satisfied
- Satisfied
- Very Satisfied

15. How satisfied are you with the quantity of regionally-sourced fruit and vegetable seeds that the seed industry is providing for Ontario growers?

    - Not satisfied
    - Somewhat satisfied
    - Satisfied
    - Very Satisfied

16. What changes in the seed industry would make it easier for you to save and sell more seed?

17. Family Farmers Seed Co-op is a co-operative in Sante Fe, New Mexico. It pools production from seed farmers in surrounding states to supply high quality, organic, open-pollinated, public domain seeds. Do you think there is an opportunity for a co-operative to pool seed production from growers in Ontario and sell those seeds to farmers and other buyers? Why or why not?

APPENDIX 4: RESEARCH PARTICIPANTS (INTERVIEWS)

NAME	ORGANIZATION	POSITION
Ann Slater	National Farmers' Union in Ontario	Co-ordinator
Anonymous	Seed and Plant Sanctuary	Executive Member
Anonymous	Organic Council of Ontario	Executive Member
Anonymous	Family Farmers' Seed Co-operative	Member-Farmer
Anonymous	Ontario Seed Growers' Association	Executive Member
Bob Wildfong	Seeds of Diversity	Executive Director
Daniel Brisebois	Tourne-Sol Co-operative Farm Easter Canadian Organic Seed Growers Network	Member-Farmer President
Jodi Lew-Smith	High Mowing Organic Seeds	Director of Research and Production
Ken Stoner	Canadian Seed Institute	CSI Western Representative
Laura Telford	Manitoba Agriculture, Food & Rural Initiatives Organic Value Chain Roundtable	Business Development Specialist Representative
Meredith Davis	High Mowing Organic Seeds	General Manager
Micaela Colley	Organic Seed Alliance	Executive Director
Patrick Steiner	Stellar Seeds	President & Owner

APPENDIX 5: INTERVIEW TEMPLATE

Variations of these questions have been asked to all research participants, according to their position and role in the seed industry.

1. What are the main challenges vegetable seed growers and seed companies face?

2. Do you see farmers trending towards saving more fruit/vegetable seed and taking control of their seed production and distribution needs?

3. From your experience, are there enough heirloom seed varieties being grown and provided in Ontario to suit both existing and emerging ecological growers in Ontario?

4. Can you discuss how seed companies generally co-ordinate production, varietal selection, and quality control, with multiple growers?

5. Can you discuss some of the dynamics that seed growers have encountered when making decisions in regards to increasing scale of production? Why do some vegetable seed growers choose to expand or not expand production/markets?

6. Would you be able to discuss some of quality control techniques that seed growers use for assessing seed quality?

7. What kinds of equipment are do most vegetable seed companies use for seed harvesting, cleaning, processing, packing etc.?

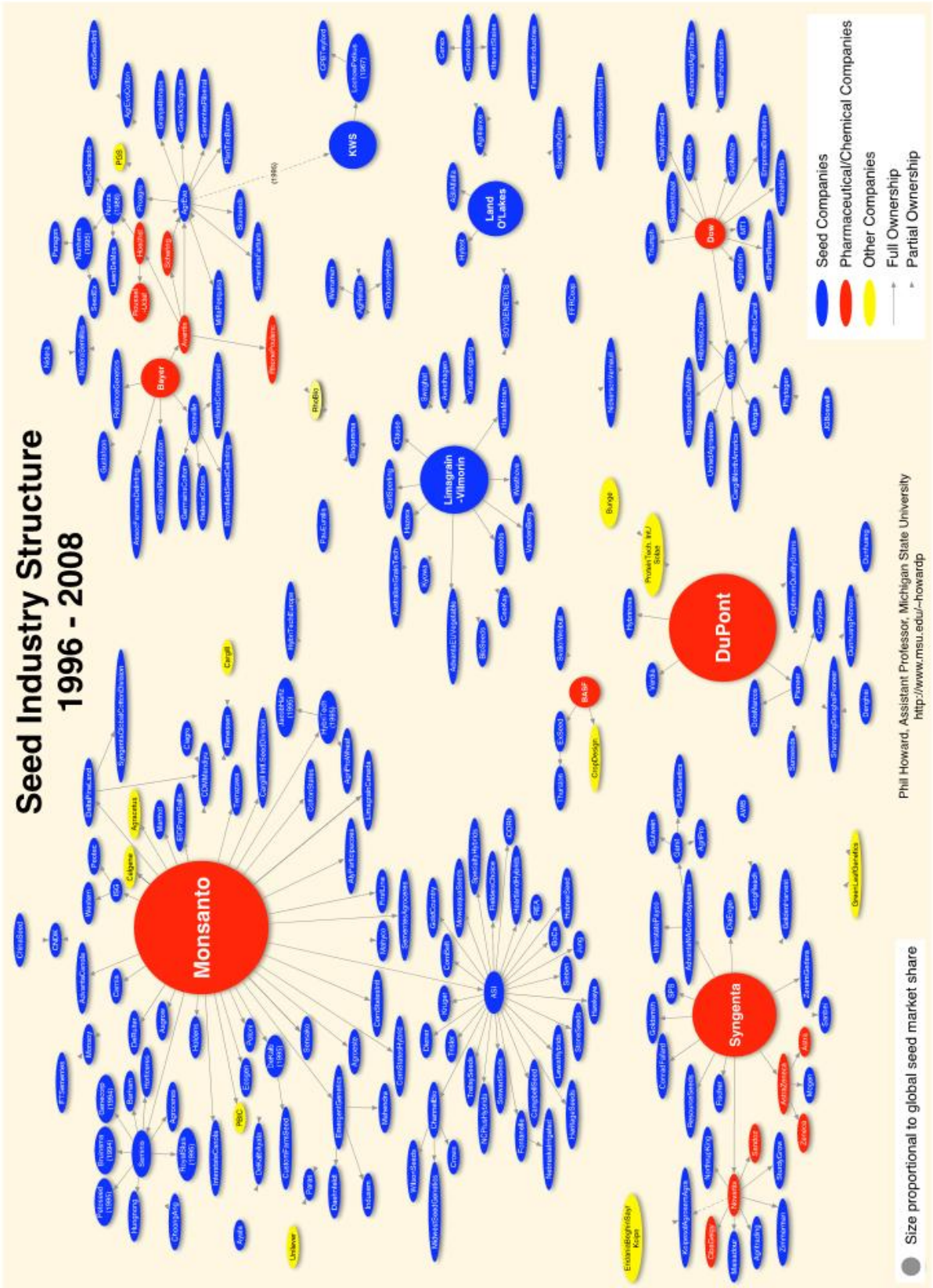
8. Where are the greatest inefficiencies in the seed production process? How do you feel you can remedy them?

9. Do seed companies have the capacity to devote time to other aspects of the organic seed industry (e.g.: breeding, research, education, lobbying, etc.)? Can you elaborate on some of those activities?

10. Have fruit and vegetable growers that save seed been affected by national and international seed legislation? How so?

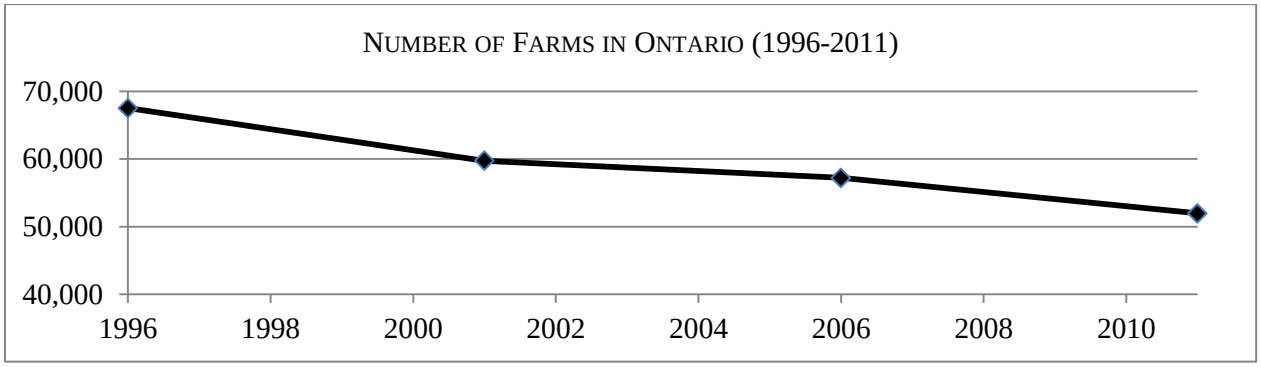
11. Family Farmers Seed Co-op is a co-operative in Sante Fe, New Mexico. It pools production from seed farmers in surrounding states to supply high quality, organic, open-pollinated, public domain seeds. What do you see to be the advantages and disadvantages to this model?

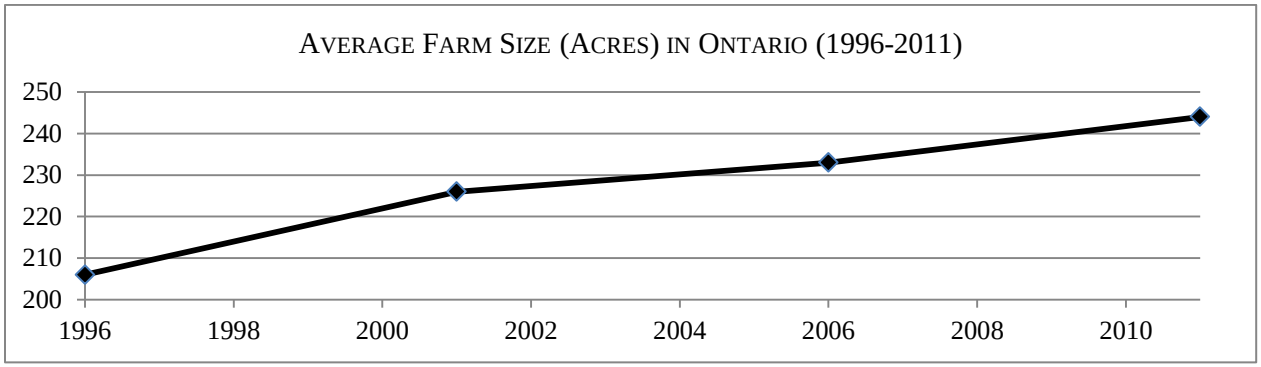
APPENDIX 6: VISUALIZATION OF CONSOLIDATION IN THE SEED INDUSTRY

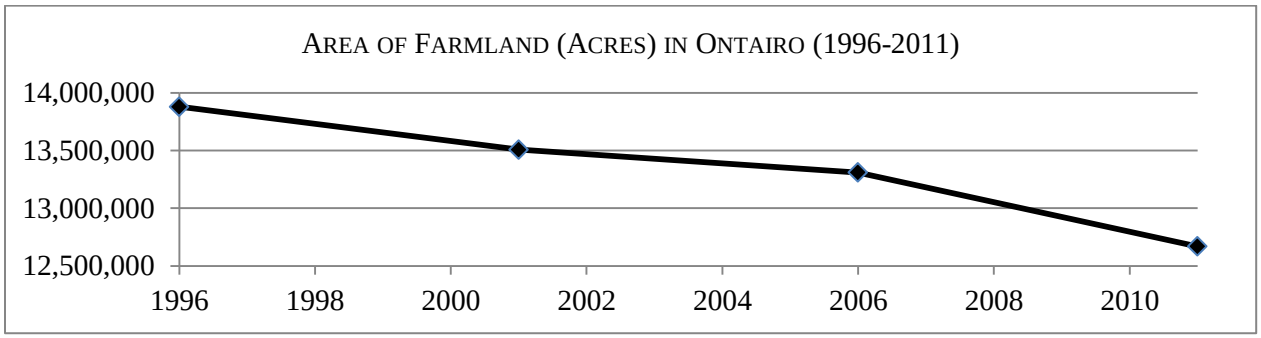


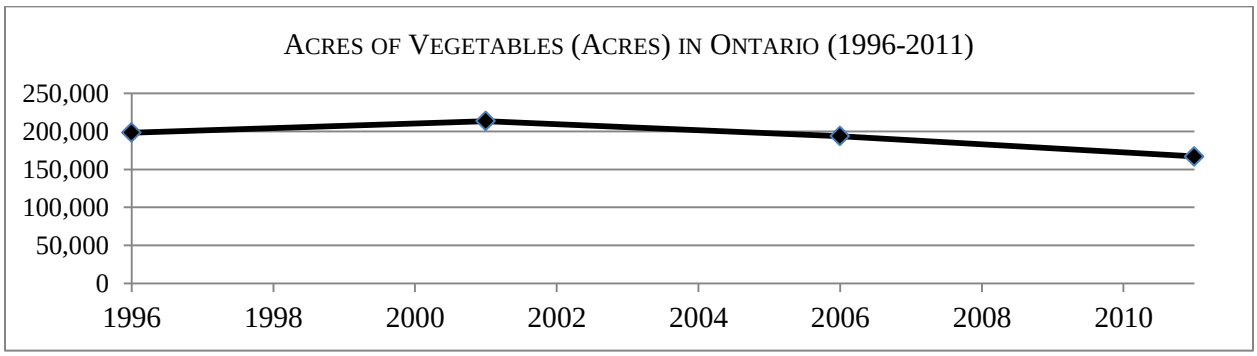
(Howard, 2009, Figure 2, p. 1273)

APPENDIX 7: DECLINING NUMBER OF FARMS AND INCREASING FARM SIZE IN ONTARIO



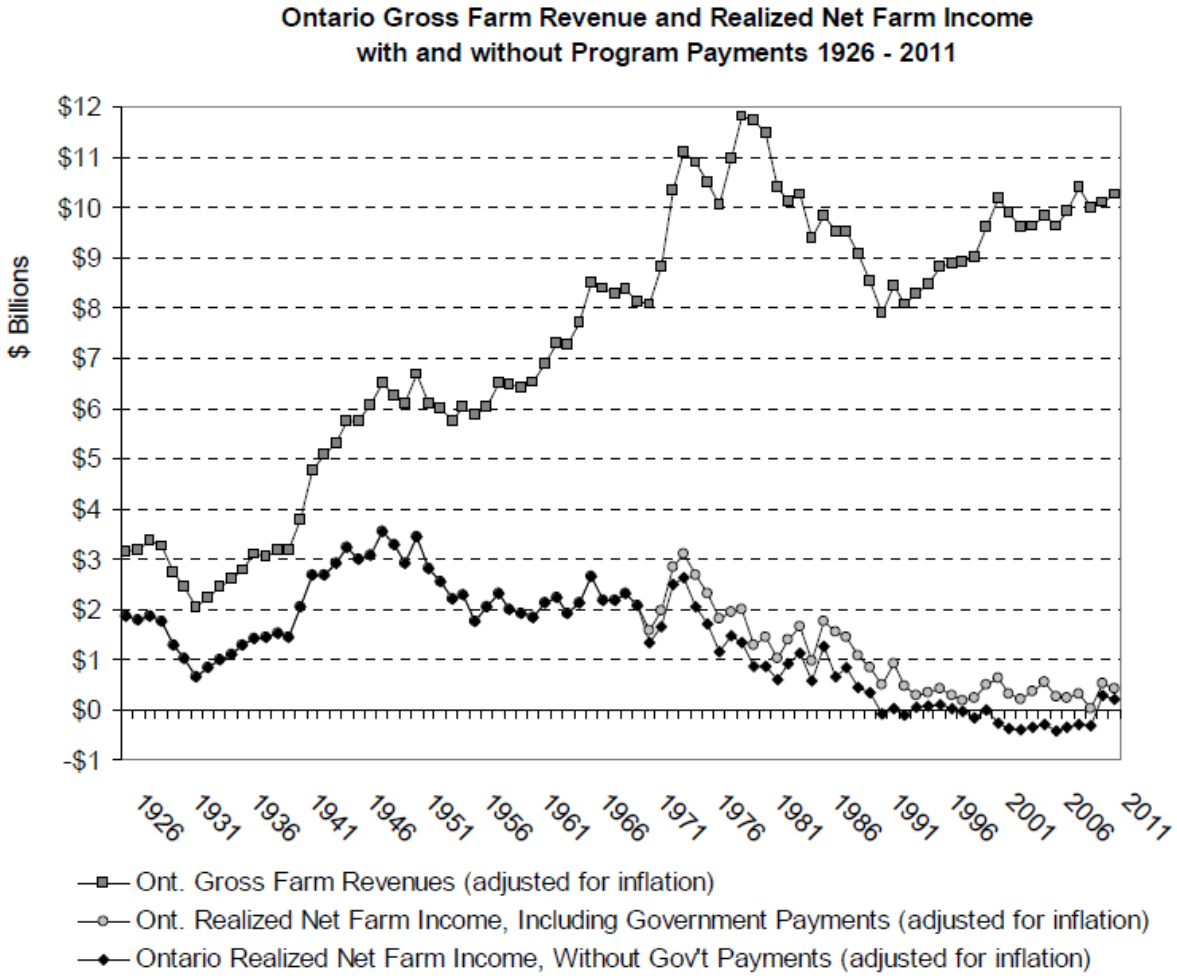






(derived from Statistics Canada, 2012)

APPENDIX 8: FARMER INCOME IN ONTARIO



(NFU, 2011, p. 8)

APPENDIX 9: EXTERNALITIES OF CONVENTIONAL AGRICULTURE

ENVIRONMENTAL COST	COST PER HECTARE FOR CONVENTIONAL FARMING (CDN$/HA)	ORGANIC COST AVOIDANCE PER HECTARE IN ONTARIO (CDN$/HA)
Damage to Water Sources		
Treatment of microbial pathogens	$0.83	$0.41
Treatment for nitrate	$1.32	$0.53
Treatment for pesticides	$0.78	$0.78
Damage to Soil Resources	$15.68	$6.27
Damage to Air Resources		
GHG emissions from crops	$1.98	$0.99
GHG emissions from livestock	$1.17	$0.47
Damage to Wildlife and Biodiversity		
Honey and pollinator losses	$2.87	$2.58
Loss of beneficial predators	$4.66	$4.12
Fish kills from pesticides	$0.15	$0.14
Fish kills from manure	$0.08	$0.07
Bird kills from pesticides	$0.24	$0.24
Damage to Human Health: Pathogens	$2.91	$0
Damage to Human Health: Pesticides	$7.06	$5.65
Summary	**$39.73**	**$22.25**

(adapted from MacRae et al, 2006, Table 1, p. 8)

APPENDIX 10: EMERGENCE OF LOCAL ORGANIC FOOD CO-OPERATIVES IN ONTARIO

ESTABLISHED LOCAL-ORGANIC FOOD CO-OPERATIVES		
CO-OPERATIVE	LOCATION	TYPE OF CO-OP
Agri-Cultural Renewal Co-operative Inc.	Elmwood	Worker
By The Bushel Community Food Co-op	Peterborough	Multi-Stakeholder
Co-operative Agricole de Windsor	Windsor	Producer
Eastern Ontario Local Food Co-op	Martintown	Producer; Consumer
Eat Local Sudbury Co-operative Inc.	Sudbury	Multi-Stakeholder
Fitzroy Beef Farmers Co-operative Inc.	Fitzroy Harbour	Producer
Harvest Noon Café	Toronto	Consumer (Students)
Karma Food Co-operative Inc.	Toronto	Consumer
La Siembra Co-operative Inc.	Ottawa	Worker
London Co-op Store	London	Direct Charge
Niagara Local Food Co-operative Inc.	Niagara Falls	Producer; Consumer
Ontario Natural Food Co-op	Mississauga	2nd Tier
Organic Meadow Farmers Co-op	Guelph	Producer
Ottawa Valley Food Co-operative	Pembroke	Producer
Quinte Organic Farmers Co-operative Inc.	Picton	Producer
Seasoned Spoon Café	Peterborough	Consumer (Students)
Sexsmith Farm Co-op	Fort Erie	Producer
Sumac Community Worker Co-op – Planet Bean	Guelph	Worker
The Big Carrot	Toronto	Worker
The Mustard Seed Co-op	Hamilton	TBD
True North Community Co-operative	Thunder Bay	Multi-Stakeholder
Village Co-op	Kingston	Producer
West End Food Co-operative Inc.	Toronto	Multi-Stakeholder
Your Local Market Co-operative Inc.	Stratford	Worker

EMERGING LOCAL-ORGANIC FOOD CO-OPERATIVES		
CO-OPERATIVE	LOCATION	TYPE OF CO-OP
123 Farm! Worker Co-operative	Mount Hope	Worker
Guelph Local Food Hub	Guelph	TBD
Heart's Content Organic Farm	Brantford	Producer
Lunik Café at Glendon	Toronto	Consumer (Students)
On the Move Organics	London	TBD
Our Community Food Store	St. Catharines	TBD
St. Jamestown Community Café	Toronto	Multi-stakeholder

(adapted from Christianson et al, 2010, Appendix 2 & 3, p. 95-96 and ONFC, 2012)

APPENDIX 11: SURVEY RESPONSES ON SEED CO-OPERATIVES

Below are the survey responses to the following survey question that was distributed to farmers and seed companies in the GGH area (Dey, Organic Seed Survey for Ontario Farmers, 2012; Dey, Organic Seed Survey for Ontario Seed Companies, 2012).

"Family Farmers Seed Co-op is a co-operative in Sante Fe, New Mexico. It pools production from seed farmers in surrounding states to supply high quality, organic, open-pollinated, public domain seeds. Would it be helpful for yourself and other farmers/seed companies if a co-operative were to pool seed production from growers in Ontario and sell those seeds to farmers and other buyers? Why or why not?"

SUPPORTIVE
Yes. I like the idea of developing 'regionality' - seeds/plants that are unique to this part of the world, that would thrive in ON climate.
Yes, I may be interested if I found out more:)
Yes absolutely. Due diligence should have to be proven with documentation as well as purity and germination tests. This will help create local and bio-regionally appropriate seeds!
Yes, that's a great idea. The only concern I would have is quality. Would there be someone making sure that the seeds were disease free, had high germination rates, were true to type, etc.? Not having hybrids is also an issue; if that's what the co-op would be, that's fine; it would just reduce the amount of seed I would be buying from the co-op. Don't get me wrong, I love the idea of co-operatives, and I know this research is looking at developing this type of system in Ontario, but, personally, I'd be happy if somebody started a company like High Mowing in Ontario.
Yes - I would perhaps grow just a few things for seed and maybe sell to such a coop, but more importantly I could source seed from it - as long as the purity of varieties and quality of the seed meets rigorous standards.
Assuring quality and germination rates is our greatest concern with inexperienced seed savers. A co-op would have to demonstrate it's performance before we would use as a portion of our production. If believable germination rates would be provided, then we may be more aggressive in adoption
Yes! It would help seed costs decrease; help local seeds to be used (potentially more viable).
Concern about seed quality possibly, but this is already happening on a small scale in my area.
Yes, if they offered the varieties we need.
I would love to buy this seed, but I doubt I would produce very much (for the reasons listed above).
Yes
Why=pool seed cleaning equipment Why not= overload the market
Yes, since each of the small commercial seed growers are only able to produce small quantities of any given variety, it is not too applicable to commercial vegetable growers needs.
Yes. I like to source locally wherever possible. We have the capacity to save seed, and so of course I'd love to see it happen on a larger scale.
On the surface it would sound good.
Yes.
I personally like this idea of sharing seeds. The closest thing that we have to this that I am aware of, in Canada, is Seeds of Diversity. We have a Seedy Saturday seed exchange at our local library (Kincardine, On) each Spring where people bring in extra seed packages or some seeds saved from their gardens.
Yes. It would allow for more one-stop shopping. It's hard to get the quantities needed for growing on a commercial scale from local seed companies/farms. For the larger amounts of seeds, I reluctantly had to order from American companies (the farm either didn't have the amount I needed or charge far too much for the same amount coming from an American company.)
Yes
Yes! I would love to support such a venture, my money to other local farmers. Easier to give them

feedback on desired varietys [sic], varieties available that suit our climate, lower shipping costs.
We (ECOSGN) are working on it. Not just for Ontario, Quebec and Maritimes. Ideal for the bigger quantities for market gardeners who need bigger quantities
It's worth considering only if the seed is not mixed & documentation accompanies it OR if mixed, that all batches of seed are proofed by the co-op before mixing.
It would be helpful for farmers to pool their seed growing and share them amongst themselves or even sell some bulk. I don't know if there is a need for someone else to start selling seed by the packet but maybe there is. The gap, as I see it, is with the availability of high quality, organic bulk seed.

UNDECIDED
While I support the local seed movement and think that public seed is important, I also find hybrids critical to my production success. Such an organization could help in a small way, but I think what we need is someone local to start a private seed company providing high quality organic seed both local OPs and imported hybrids and providing seed in commercial grower quantities.
Yes and no. It depends on how it is organized and what it's [sic] directive are. Is it started by local farmers and developed over time or started by a third party and brought to farmers?
I would have concerns about cross contamination from "un-certified" growers. Also major concern that it would be "taken over" by the organic faction and be impracticable for conventional farmers/growers.
Not sure, there are a lot of small companies already out there, just hard to find. Maybe an organic/biodynamic catalog which includes everybody would be the most convenience for me.
I don't know. I'm not sure the fact that they are a co-operative has any bearing on the quality of the seed. I am just as happy to support my local seed company, Hawthorn, so I would need more information in order to decide. In case you don't know about Seeds of Transition, this is a local initiative in Grey County bringing together farmers and community members to relocalize our seed supply. You may want to learn more about them.
Yes and no. I like the idea but I also like cultivating those relationships directly with my customers.
Don't know

NOT SUPPORTIVE
No. Fruit production is mostly done with vegetative plants - not seeds - and as such, is highly specialized
No. Private companies are doing a good job and a co-op would be too hectic
I am too busy to think about this.
No. I think there are several independent seed producers that are already successful and are serving the market.

APPENDIX 12: COMPETITOR PROFILES

COMPANY	REGIONALLY GROWN IN GGH AREA	ORGANIC	BULK
Urban Harvest	Yes	Yes	No
Terra Edibles	Yes	Yes	No
Hawthorn Farm	Yes	Yes	No
Ontario Seed Company	Yes	Yes	No
Greta's Organic Seeds	Yes	Yes	No
The Cottage Gardener	Yes	Yes	No
Stokes Seeds	Yes	Untreated	Yes
High Mowing Organic Seeds	No	Yes	Yes
Johnny's Selected Seeds	No	Yes	Yes
West Coast Seeds	No	Yes	Yes
Veseys	No	Yes	Yes
Seedway	No	Yes	Yes
William Dam Seeds	No	Untreated	Yes
Rupp Seeds Inc.	No	No	Yes
Prospective Seed Co-operative	**Yes**	**Yes**	**Yes**

APPENDIX 13: GOALS AND OBJECTIVES OF CO-OPERATIVE

ORGANIZATIONAL (SHORT-TERM)
Increase the availability of regionally-grown bulk agro-ecological vegetable seed
Create greater market opportunities for differentially-scaled agro-ecological vegetable seed growers
SOCIAL UTILITY/INSTITUTIONAL (LONG-TERM)
Establish economies of scale for agro-ecological vegetable seed
Support the growing market demand of regionally produced agro-ecological vegetables
Encourage similar farming regions in Ontario, and across Canada to develop similar institutions that support regionally-based agro-ecological food economies
Entice conventional vegetable growers to transition towards agro-ecological farming practices by demonstrating the benefits of a regional agro-ecological seed co-operative

APPENDIX 14: CORE ACTIVITIES OF CO-OPERATIVE

PRIMARY CORE ACTIVITIES: AGRO-ECOLOGICAL SEED PRODUCTION AND PROCESSING	
Production	Pooled production of select varieties of agro-ecological vegetable seed in the GGH region
Processing	Providing cleaning, quality testing, and packaging services for seeds
Distribution	Distributing seed varieties to growers and to seed companies
Storage	Providing storage facilities for surplus seed varieties for long-term bulk seed production

SECONDARY CORE ACTIVITIES: AGRO-ECOLOGICAL CAPACITY BUILDING	
Breeding, Research, and Education	Collaborating with institutions to provide market research, breeding research, variety trials, and technical research on agro-ecological vegetable seed production

APPENDIX 15: SEED PRODUCTION AND PROCESSING PROCESS

STAGE OF PRODUCTION	DESCRIPTION	POTENTIAL INVESTMENTS/EQUIPMENT	OTHER CONSIDERATIONS
Crop Planning	Mapping of main crops to identify isolation distances and cross pollination requirements	Geographic information systems (GIS) software	Identification of cross-pollination risks from GM/GE-fields may also be required
Cultivation & Planting	Cultivating, seeding, and transplanting crops	Leverage existing equipment farmers would normally use for crop cultivation	Advise/provide specifications for how and when to seed and transplant particular crops
Pollination	Fertilization and pollination of crops	Bee hives may be necessary to facilitate pollination	Careful monitoring needs to occur to ensure some plants do not bolt prematurely
Harvesting	Rogueing, selecting, and harvesting appropriate optimal seed crops	Predominantly low-tech (i.e. paper bags, sieves, etc.) and hand harvesting methods Combines, threshers, and wet seed processors may be necessary for large seed lots	
Transportation	Transporting produce to processing facility/facilities	Transportation vehicles	
Dry-Seed Cleaning	Separating harvested seeds from other plant material based on weight, size, or shape of seed	Various seed cleaning screens Seed clippers/cleaners (automated size and shape separation) Gravity tables (weight and shape separation)	
Wet-Seed Cleaning	Removing, drying, and fermenting seeds from vegetables	Predominantly low-tech (e.g. buckets, seed screens, etc.) and hand processing methods Wet vegetable seed processing unit	

APPENDIX 15: SEED PRODUCTION AND PROCESSING PROCESS (CONTINUED)

STAGE OF PRODUCTION	DESCRIPTION	POTENTIAL INVESTMENTS/EQUIPMENT	OTHER CONSIDERATIONS
Treatment	Treatment of seed to eradicate pathogens, optimize handling/planting, and improve germination	Hot-water treatment equipment	Other tests include Bleach disinfection and applying plant extracts and oils Priming & pelleting services from other companies might also be sought (priming seeds to improve germination diseases and pelleting to enable uniform seeding)
Testing	Tests for genetic purity (trueness to type), physical purity (presence of weeds or other seeds), viability (germination), vigor, and seedborne diseases	Generally conducted through field trials and simple laboratory tests (e.g. using germination paper for germination tests)	Inspection and certification can be conducted by external organic certification agencies
Packaging &Labelling	Counting and packaging seeds for sale	Seed counter and packer Labelling and printing equipment	
Storage	Storing seeds in appropriate refrigeration/freezing facilities after processing	Industrial-size walk-in freezer	

(derived from Colley et al, 2010)

APPENDIX 16: POTENTIAL CO-PACKING ARRANGEMENTS

The following organizations are certified organic seed processors in Ontario that could serve as potential co-packers for the seed co-operative. These processors have been provided by a request to OMAFRA regarding co-packing arrangements for certified organic vegetable production.

COMPANY	LOCATION	CERTIFICATION	SCOPE
Seeds of Diversity	Various	Unknown	Capacity to store seeds in freezers set up at different seed library locations
Homestead Organics Ltd.	Berwick, Ontario	Certified Organic	Capacity to process seeds in a shared processing facility for organic products

(OMAFRA Representative, 2012)

APPENDIX 17: FINANCIAL ASSUMPTIONS

17.1 Revenue Targets

DATA	VALUE	ASSUMPTIONS AND JUSTIFICATIONS
Target Gross Sales per Acre	$25,000/per Acre	As a crop planning technique, farmers often establish a given amount of gross sales they expect per acre, to develop a sales target either per crop bed, bed foot, or row foot. A well-diversified agro-ecological vegetable market garden should expect gross sales of approximately $25,000 per acre (Thériault & Brisebois, 2012).
Square Feet per Acre	43561 sq. ft.	
Standard Row Width (Feet)	1 ft.	For the purposes of standardizing calculations, each row is 1 foot wide.
Target Gross Sales per Row Foot	$0.57	(Gross Sales/Acre * Row Width)/Square Feet per Acre Therefore, each producer-member of the co-operative should be earning $0.57 gross sales/row foot, regardless of the crop(s) chosen by that farmer.

17.2 Demand Assumptions

DATA	VALUE	ASSUMPTIONS AND JUSTIFICATIONS
Number of Agro-ecological Vegetable Farms in Ontario	225	(Statistics Canada, 2012)
Number of Agro-ecological Vegetable Farms in Golden Horseshoe Ontario	135	(Statistics Canada, 2012)
Potential Customer-Farmers in the GGH Region	97	Assuming that the farms that expressed interest in the seed co-operative (72%) would be willing to be a purchase seeds from the co-operative (Dey, Organic Seed Survey for Ontario Farmers, 2012)
Approximate Agro-ecological Vegetable Acreage in Ontario	1204	Amount of organic vegetable acreage in active production (Macey, 2007)
Approximate Agro-ecological Vegetable Acreage in GGH Region	722.4	% of Agro-ecological Vegetable Farmers in the GGH area in Ontario (60%) * Amount of Organic Vegetable Acreage in Ontario
Average Amount of Vegetable Acreage Used per Farmer	5.35	Approximate Agro-ecological Vegetable Acreage in GGH / Number of Agro-ecological Vegetable Growers in the GGH 5.35 acres is generally consistent with anecdotal research on the amount of acreage in active production for small-scale organic vegetable gardens
Average Number of Crops for an Agro-ecological Vegetable Farm	25	Based on anecdotal research and participant observation most agro-ecological market gardens in the GGH region generally provide around 25 different vegetable crops. Only crops with available organic seed yields have been used in the projections (Steiner, 2008).

Average Amount of Land per Crop per Farmer	0.21	Average Amount of Organic Vegetable Acreage / Average Number of Crops for an Organic Market Garden
Total Amount of Land per Crop in the GGH Region	17.34	Average Amount of Land per Crop per Farmer * Potential Customer Farmers Therefore, this assumption holds that each crop will take up approximately 17.34 acres when aggregating all of the production of that crop in the GGH region. Using this figure as an approximate benchmark, the different low, medium, and high, scenarios for the co-operative will include projections of 10, 15, and 20 acres of production per crop in the region.

17.3 Production Capacity

DATA	VALUE	ASSUMPTIONS AND JUSTIFICATIONS
% of Farms that Save Seed	55%	(Dey, Organic Seed Survey for Ontario Farmers, 2012)
Farms Available for Co-op (Potential Member Farmers)	74	% of Farmers Save Seed in GGH Region * # of Agro-ecological Vegetable Farms in Golden Horseshoe Ontario Assuming that the farms that save seed (55%) would be willing to be producer-members of the co-operative (Dey, Organic Seed Survey for Ontario Farmers, 2012)

17.4 Seed Yields per Crop

DATA	ASSUMPTIONS AND JUSTIFICATIONS
Minimum Germination Rate under Canada Seeds Act	Minimum germination rates for each crop according to industry standards (Steiner, 2008)
Seed Viability	Viability of seed if stored properly in number of years (Wildfong, 2008)
Average Amount of Seed Required per Vegetable per Acre without Accounting for Germination	Estimated number of seeds required per vegetable per acre derived from High Mowing's Organic Seed Catalogue (High Mowing, 2012) and Johnny's Selected Seeds' Seed Catalogue (Johnny's Selected Seeds, 2012)
Average Amount of Seed Required per Vegetable per Acre Accounting for Germination	Average Amount of Seed Required per Vegetable per Acre without Accounting for Germination / Germination Rate
Average Amount of Seed Required per Vegetable per Row Foot	Estimated number of seeds required per vegetable per acre / 43561
Estimated Yield of Seed (in Grams) per Row Foot	Derived from organic seed yields documented by Steiner (2008)
Seeds/Gram	Approximate number of seeds per gram according to industry standards (CFIA, 2011)
Estimated Yield of Seed per Row Foot	Estimated Yield of Seed (Grams) per Row Foot * Seeds/Gram

17.5 Minimum Unit of Production per Crop

CATEGORY	ASSUMPTIONS AND JUSTIFICATIONS
Minimum Population for Genetic Maintenance	Minimum number of plants required for genetic maintenance and variation (OSA, 2010)
Number of Plants Needed per Row Foot	Approximated number of plants needed for one row foot for genetic maintenance and variation derived from Steiner (2008)
Minimum # of Row Feet Needed for Genetic Maintenance	Minimum Population/Number of Plants Needed per Row Foot
Minimum Quantity of Seed Production per Farmer	Estimated Yield of Seed per Row Foot * Minimum # of Row Feet Needed

17.6 Market Price per Crop

DATA	ASSUMPTIONS AND JUSTIFICATIONS
Market Price per Gram	Derived from High Mowing's Organic Seed Catalogue (High Mowing, 2012)
Market Price per Seed	Market Price per Gram / Seeds per Gram
Market Price per Unit	Market Price per Seed * Minimum Quantity of Seed Production per Farmer

17.7 Demand Assumptions per Crop

DATA	ASSUMPTIONS AND JUSTIFICATIONS
Estimated Amount of Vegetables Grown (Acres) in GGH Area	Total Amount of Land per Crop in the GGH Region
Estimated Amount of Seed Required to Meet Demand without accounting for Germination	Average Amount of Seed Required per Acre (Seeds) * Estimated Amount of Vegetables Grown (Acreage) in GGH Area
Estimated Amount of Seed Required to Meet Demand accounting for Germination	Estimated Amount of Seed Required to Meet Demand without Accounting for Germination / Minimum Germination Rate per Crop
Estimated Amount of Seed Required to Meet Demand	Estimated Amount of Seed Required to Meet Demand accounting for Germination / Seeds per Gram
Estimated Amount of Row Feet Required to Meet Demand	Estimated Amount of Seed Required (Grams)/Estimated Yield of Seed (Grams) per Row Foot
Estimated Amount of Units Required to Meet Demand	Estimated Amount of Seed Required to Meet Demand accounting for Germination / Minimum Quantity of Seed Production per Farmer

APPENDIX 18: FINANCIAL PROJECTIONS

A goal-seeking program in Microsoft Excel called Solver has been used to optimize the total sales of the co-operative to achieve the required gross sales per row foot to meet the demands of agro-ecological vegetable seed used in Ontario. The following optimization function was used:

Total Sales per Crop
*= ∑Optimal Price per Seed * Estimated Number of Seeds Required to Meet Demand.*

The market price per gram and the amount of row feet required were the main variables that would need to be decided, given a series of constraints. Appendices 18.1 and 18.2 outline the variables and their respective constraints. Appendices 18.3 to 18.6 present the baseline revenue projections for the co-operative. Appendices 18.7-18.10 outline preliminary expenses, and approximate profit projections.

Volumes and quantities in which bulk seed are sold varies per crop, and it is not yet clear in what volumes each crop will be sold through the co-operative and what kind of volume discounts will be applied. Therefore, total sales have been derived by multiplying the price per seed per crop by the total number of seeds expected to be sold.

While expenses and preliminary income statements have been developed, they serve as estimates for the co-operative and are not meant to be accurate representations, nor are the presentation of the numbers intended to follow any contemporary accounting standard.

18.1 Decision Variables

VARIABLE (PER CROP)	**FORMULA & EXPLANATION**
*Optimal Price per Gram**	*25% below Market Price per Gram <= Optimal Price per Gram <= 25% above Market Price per Gram*
Optimal Price per Seed	Optimal Price per Gram / Seeds per Gram
Optimal Price per Unit	Optimal Price per Seed * Minimum Quantity of Seed Production per Farmer
*Actual Number of Row Feet Needed**	*Must be greater than Minimum # of Row Feet Needed for Genetic Maintenance*
Actual Number of Seeds Required to Purchase to Meet Demand	Actual Number of Row Feet Needed / Number of Plants Needed per Row Foot
Cost of Beginning Inventory	Actual Number of Seeds Required to Purchase to Meet Demand * Market Price per Seed
Total Sales	Market Price per Seed * Estimated Amount of Seeds Required to Meet Demand
Sales per Row Foot	Total Sales per Crop / Actual Number of Row Feet Needed
Number of Grams Harvested	Actual Number of Row Feet Needed * Estimated Amount of Seed Yield (Grams) per Row Foot
Number of Seeds Harvested	Number of Grams Harvested * Seeds/Gram
Number of Units Produced	Number of Seeds Harvested / Minimum Quantity of Seed Production per Farmer
Farmer Compensation for Seed Production	Assuming farmers process 40% of the seed crop, the co-operative purchases units from the farmer at 40% of the optimal price per unit. (40%*Optimal Price per Unit)*Number of Units Produced
Surplus Seed	Number of Seeds Harvested - Estimated Amount of Seeds Required
Cost of Ending Inventory	Surplus Seed per Crop * Market Price per Seed

Years of Surplus	Surplus Seed / Estimated Amount of Seed Required (in Seeds)
% of Crop Sales	Total Sales per Crop / Sum of Total Sales
% of Crop Volume (Seeds)	Actual Amount of Seeds Harvested per Crop / Total Amount of Seeds Harvested
% of Crop Volume (Units)	Actual Amount of Units Produced per Crop / Total Amount of Units Produced
Delivery Right Price (based on Units of Seed)	Total Equity Cost * [%Crop Volume (Units) / Number of Units Harvested per Crop (Seeds)]
# of Membership Shares (Delivery Rights)	Total Units Produced (Each unit is equal to 1 delivery right)

*Main variables determined by Excel simulation

18.2 Constraints

The following constraints needed to be fulfilled for the linear programming model:

VARIABLE	CONSTRAINT		RATIONALE FOR CONSTRAINT
Actual Market Price/Gram	<=	25% above Average Market Price/Gram	To set an upper limit for the co-operative's pricing, the co-operative's seed prices has not been allowed to be higher than 25% above High Mowing's prices for bulk quantities.
	>=	25% below Average Market Price/Gram	To set a lower limit for the co-operative's pricing, the co-operative's seed prices has not been allowed to be lower than 25% below High Mowing's prices for bulk quantities.
Amount of Row Feet Needed per Crop	>=	Minimum Amount of Row Feet Needed for Genetic Maintenance	The total amount of row feet used per crop needs to be greater than the minimum amount of row feed needed for genetic maintenance.
Sales per Row Foot	>=	Target Sales per Row Foot	Sales per row foot for each crop must be greater than or equal to the target sales per gross foot.
Actual Number of Seeds Harvested	>=	Estimated Number of Seeds Required to Meet Demand	The actual amount of seed the co-operative uses must be greater than or equal to the minimum amount of seed required for vegetable production in the region.
Years of Surplus	<=	Seed Viability	The number of years that the co-operative maintains a surplus amount of seed that they cannot sell in that year, must be less than the viability of the seed.

18.3 Baseline Estimates and Constants

The information provided in this chart remained constant regardless of the different scenarios.

SEED CROP	GERM. RATE	SEED VIABILITY	MIN. POP.	EST. AMT. OF SEEDS REQUIRED PER ACRE	EST. AMT. OF SEEDS REQUIRED PER ROW FT.	EST. YIELD OF SEED IN GRAMS PER ROW FT.	SEEDS PER GRAM	SEED YIELDS PER ROW FT.	MIN. # OF SEEDS FROM MIN. POP.	AVERAGE MARKET PRICE PER GRAM
Arugula	80%	3	80	312,500	7.2	10.37	500	5,184	57,810	$0.05
*Basil**	80%	5	80	37,500	0.9	3.02	702	2,123	197,277	$0.08
Bean, Bush	85%	4	15	147,059	3.4	34.02	4	136	605	$0.02
*Beets***	75%	4	80	420,000	9.6	13.83	55	761	6,311	$0.04
Broccoli	80%	5	80	62,500	1.4	22.68	315	7,144	398,347	$5.80
*Brussels Sprouts***	80%	5	80	43,750	1.0	4.69	315	1,476	117,573	$14.65
*Carrot***	60%	3	200	1,200,000	27.5	7.50	825	6,187	44,921	$0.11
Cress	80%	3	80	312,500	7.2	11.49	425	4,884	54,462	$0.15
Cucumber	80%	10	15	53,125	1.2	11.63	40	465	5,722	$0.33
Eggplant	80%	7	15	32,500	0.7	4.54	230	1,043	20,975	$1.16
*Kale***	80%	5	80	140,000	3.2	3.86	315	1,215	30,232	$9.45
*Kohlrabi***	80%	5	80	545,000	12.5	1.81	315	572	3,655	$9.23
*Leek***	65%	2	80	161,538	3.7	4.00	395	1,580	34,085	$2.17
Lettuce	70%	3	15	248,571	5.7	5.83	1036	6,042	15,882	$0.29
Mustard Greens	80%	5	20	312,500	7.2	17.00	625	10,625	29,621	$0.08
*Onion***	75%	2	200	770,000	17.7	4.86	340	1,652	18,696	$1.53
Peas	85%	3	15	635,294	14.6	30.24	3	91	93	$0.03
Peppers	65%	3	15	40,000	0.9	2.41	165	398	6,503	$0.36
Pumpkin	65%	6	15	15,385	0.4	5.13	5	26	1,089	$0.15
Radishes	80%	4	80	1,250,000	28.7	8.54	75	640	1,786	$0.10
Spinach	65%	6	80	446,154	10.2	24.49	100	2,449	19,132	$0.11
Squash	80%	6	15	18,750	0.4	6.33	14	89	3,088	$0.14
*Swiss Chard***	75%	4	80	386,667	8.9	22.68	940	21,319	192,142	$0.18
Tomato	75%	4	15	34,667	0.8	3.56	405	1,440	27,151	$1.48
*Turnip***	80%	5	80	1,207,500	27.7	15.00	535	8,025	23,160	$0.04

*Eliminated from final revenue projections because these crops did not meet the feasibility constraints.
**Biennial seed crops that are assumed to be grown out and selected the previous year to grow seed in the current year of projections

18.4 Co-operative Revenue Projections (High – 20 Acres per Crop)

SEED CROP	EST. AMT. OF SEED IN DEMAND	EST. AMT. OF SEED TO BE PURCHASED	BEGINNING INVENTORY	OPTIMAL PRICE PER SEED	ACTUAL #OF ROW FT. NEEDED	TOTAL SALES PER CROP	SALES PER ROW FOOT
Arugula	6,250,000	9,220	$0.98	$0.0001	1,285	$826.72	$0.64
Bean, Bush	2,941,176	77,143	$352.89	$0.0057	22,851	$16,818.07	$0.74
Beets	8,400,000	123,813	$90.32	$0.0009	12,841	$7,659.93	$0.60
Broccoli	1,250,000	711	$13.09	$0.0230	496	$28,750.00	$57.98
Brussels Sprouts	875,000	670	$31.17	$0.0581	667	$50,859.38	$76.21
Carrot	24,000,000	117,981	$15.29	$0.0002	4,283	$3,888.09	$0.91
Cress	6,250,000	9,460	$3.34	$0.0004	1,319	$2,755.73	$2.09
Cucumber	1,062,500	2,970	$24.39	$0.0103	2,435	$10,906.67	$4.48
Eggplant	625,000	1,819	$9.21	$0.0063	2,535	$3,953.88	$1.56
Kale	2,800,000	11,619	$348.58	$0.0375	3,615	$105,000.00	$29.04
Kohlrabi	10,900,000	388,407	$11,380.33	$0.0366	31,045	$399,212.50	$12.86
Leek	3,230,769	14,787	$81.33	$0.0069	3,987	$22,211.54	$5.57
Lettuce	4,971,429	5,281	$1.48	$0.0004	926	$1,742.91	$1.88
Mustard Greens	6,250,000	7,056	$0.90	$0.0002	984	$992.06	$1.01
Onion	15,400,000	168,919	$760.14	$0.0056	9,556	$86,625.00	$9.06
Peas	12,705,882	2,691,034	$23,928.21	$0.0111	184,519	$141,223.16	$0.77
Peppers	769,231	1,901	$4.19	$0.0028	2,153	$2,119.79	$0.98
Pumpkin	307,692	5,844	$180.37	$0.0386	16,547	$11,870.85	$0.72
Radishes	25,000,000	1,378,399	$1,758.45	$0.0016	48,036	$39,866.26	$0.83
Spinach	8,923,077	66,946	$76.75	$0.0014	6,536	$12,786.60	$1.96
Squash	375,000	2,483	$25.46	$0.0128	5,770	$4,805.31	$0.83
Swiss Chard	7,733,333	12,074	$2.37	$0.0002	1,360	$1,899.85	$1.40
Tomato	666,667	555	$2.03	$0.0046	725	$3,048.32	$4.20
Turnip	24,150,000	96,132	$6.34	$0.0001	3,468	$1,990.31	$0.57
Total		**5,195,225**	**$39,097.59**		**367,941**	**$961,812.90**	

18.4 Co-operative Revenue Projections (High – 20 Acres per Crop) (Continued)

SEED CROP	NUMBER OF SEEDS HARVESTED	NUMBER OF UNITS PRODUCED	PAYMENTS TO FARMERS	SURPLUS SEED	YEARS OF SURPLUS	ENDING INVENTORY	% OF CROP SALES	% OF CROP VOLUME (UNITS)	DELIVERY RIGHT PRICE
Arugula	6,662,434	115	$352.51	1,662,434	0	$219.90	0.09%	0.05%	$4.24
Bean, Bush	3,109,536	5,143	$7,112.31	609,536	0	$3,485.41	1.75%	2.40%	$4.24
Beets	9,766,741	1,548	$3,562.50	3,466,741	1	$3,161.31	0.80%	0.72%	$4.24
Broccoli	3,542,774	9	$32,593.52	2,542,774	3	$58,483.80	2.99%	0.00%	$4.24
Brussels Sprouts	985,013	8	$22,901.54	285,013	0	$16,566.36	5.29%	0.00%	$4.24
Carrot	26,499,368	590	$1,717.20	12,099,368	1	$1,960.14	0.40%	0.28%	$4.24
Cress	6,440,292	118	$1,135.85	1,440,292	0	$635.05	0.29%	0.06%	$4.24
Cucumber	1,133,053	198	$4,652.36	283,053	0	$2,905.56	1.13%	0.09%	$4.24
Eggplant	2,645,228	121	$6,693.70	2,145,228	4	$13,571.14	0.41%	0.06%	$4.24
Kale	4,390,961	145	$65,864.41	2,150,961	1	$80,661.03	10.92%	0.07%	$4.24
Kohlrabi	17,743,215	4,855	$259,938.10	9,023,215	1	$330,475.26	41.51%	2.27%	$4.24
Leek	6,300,000	185	$17,325.00	4,200,000	2	$28,875.00	2.31%	0.09%	$4.24
Lettuce	5,591,948	352	$784.18	2,111,948	1	$740.42	0.18%	0.16%	$4.24
Mustard Greens	10,449,655	353	$663.47	5,449,655	1	$865.02	0.10%	0.16%	$4.24
Onion	15,790,366	845	$35,528.32	4,240,366	0	$23,852.06	9.01%	0.39%	$4.24
Peas	16,739,605	179,402	$74,422.85	5,939,605	1	$66,017.43	14.68%	83.78%	$4.24
Peppers	857,256	127	$944.95	357,256	1	$984.50	0.22%	0.06%	$4.24
Pumpkin	424,431	390	$6,549.87	224,431	1	$8,658.62	1.23%	0.18%	$4.24
Radishes	30,766,082	17,230	$19,624.46	10,766,082	1	$17,168.14	4.14%	8.05%	$4.24
Spinach	16,010,373	837	$9,177.02	10,210,373	2	$14,631.27	1.33%	0.39%	$4.24
Squash	511,282	166	$2,620.66	211,282	1	$2,707.40	0.50%	0.08%	$4.24
Swiss Chard	29,000,000	151	$2,849.78	23,200,000	4	$5,699.56	0.20%	0.07%	$4.24
Tomato	1,044,767	37	$1,910.87	544,767	1	$2,490.93	0.32%	0.02%	$4.24
Turnip	27,830,025	1,202	$917.44	8,510,025	0	$701.35	0.21%	0.56%	$4.24
Total	**244,234,404**	**214,126**	**$579,842.86**	**111,674,404**		**$685,516.65**			

18.5 Co-operative Revenue Projections (Medium – 15 Acres per Crop)

SEED CROP	EST. AMT. OF SEED IN DEMAND	EST. AMT. OF SEED TO BE PURCHASED	BEGINNING INVENTORY	OPTIMAL PRICE PER SEED	ACTUAL #OF ROW FT. NEEDED	TOTAL SALES PER CROP	SALES PER ROW FOOT
Arugula	4,687,500	6,487	$0.69	$0.0001	904	$620.04	$0.69
Bean, Bush	2,205,882	54,724	$250.34	$0.0057	16,210	$12,613.55	$0.78
Beets	6,300,000	79,865	$58.26	$0.0009	8,283	$5,744.95	$0.69
Broccoli	937,500	188	$3.46	$0.0203	131	$18,994.25	$144.75
Brussels Sprouts	656,250	447	$20.76	$0.0522	445	$34,255.24	$77.05
Carrot	18,000,000	80,140	$10.39	$0.0002	2,909	$2,916.07	$1.00
Cress	4,687,500	6,886	$2.43	$0.0004	960	$2,066.80	$2.15
Cucumber	796,875	2,089	$17.15	$0.0103	1,713	$8,180.00	$4.78
Eggplant	487,500	776	$3.93	$0.0063	1,040	$3,084.02	$2.97
Kale	2,100,000	5,557	$166.71	$0.0375	1,729	$78,750.00	$45.55
Kohlrabi	8,175,000	178,955	$5,243.37	$0.0366	14,304	$299,409.38	$20.93
Leek	2,423,077	5,687	$31.28	$0.0069	1,534	$16,658.65	$10.86
Lettuce	3,728,571	3,521	$0.99	$0.0004	617	$1,307.18	$2.12
Mustard Greens	4,687,500	3,165	$0.40	$0.0002	441	$744.05	$1.69
Onion	11,550,000	123,558	$556.01	$0.0056	6,990	$64,968.75	$9.29
Peas	9,529,412	1,531,934	$13,621.69	$0.0111	105,042	$105,917.37	$1.01
Peppers	600,000	1,628	$3.59	$0.0028	1,772	$1,653.44	$0.93
Pumpkin	230,769	3,178	$98.07	$0.0386	8,997	$8,903.13	$0.99
Radishes	18,750,000	840,048	$1,071.67	$0.0016	29,275	$29,899.69	$1.02
Spinach	6,692,308	27,983	$32.08	$0.0014	2,732	$9,589.95	$3.51
Squash	281,250	1,366	$14.00	$0.0128	3,174	$3,603.98	$1.14
Swiss Chard	5,800,000	2,415	$0.47	$0.0002	272	$1,424.89	$5.24
Tomato	520,000	1,077	$3.94	$0.0046	1,354	$2,377.69	$1.76
Turnip	18,112,500	62,565	$4.13	$0.0001	2,257	$1,492.73	$0.66
Total	**131,939,394**	**3,024,237**	**$21,215.81**		**213,085**	**$715,175.79**	

18.5 Co-operative Revenue Projections (Medium – 15 Acres per Crop) (Continued)

SEED CROP	NUMBER OF SEEDS HARVESTED	NUMBER OF UNITS PRODUCED	PAYMENTS TO FARMERS	SURPLUS SEED	YEARS OF SURPLUS	ENDING INVENTORY	% OF CROP SALES	% OF CROP VOLUME (UNITS)	DELIVERY RIGHT PRICE
Arugula	4,687,500	81	$248.02	937,500	0	$124.01	0.09%	0.07%	$7.38
Bean, Bush	2,205,882	3,648	$5,045.42	330,882	0	$1,892.03	1.76%	2.96%	$7.38
Beets	6,300,000	998	$2,297.98	1,575,000	0	$1,436.24	0.80%	0.81%	$7.38
Broccoli	937,500	2	$7,597.70	187,500	0	$3,798.85	2.66%	0.00%	$7.38
Brussels Sprouts	656,250	6	$13,702.10	131,250	0	$6,851.05	4.79%	0.00%	$7.38
Carrot	18,000,000	401	$1,166.43	7,200,000	1	$1,166.43	0.41%	0.33%	$7.38
Cress	4,687,500	86	$826.72	937,500	0	$413.36	0.29%	0.07%	$7.38
Cucumber	796,875	139	$3,272.00	159,375	0	$1,636.00	1.14%	0.11%	$7.38
Eggplant	1,084,940	52	$2,745.42	694,940	2	$4,396.33	0.43%	0.04%	$7.38
Kale	2,100,000	69	$31,500.00	420,000	0	$15,750.00	11.01%	0.06%	$7.38
Kohlrabi	8,175,000	2,237	$119,763.75	1,635,000	0	$59,881.88	41.87%	1.82%	$7.38
Leek	2,423,077	71	$6,663.46	848,077	1	$5,830.53	2.33%	0.06%	$7.38
Lettuce	3,728,571	235	$522.87	1,118,571	0	$392.15	0.18%	0.19%	$7.38
Mustard Greens	4,687,500	158	$297.62	937,500	0	$148.81	0.10%	0.13%	$7.38
Onion	11,550,000	618	$25,987.50	2,887,500	0	$16,242.19	9.08%	0.50%	$7.38
Peas	9,529,412	102,129	$42,366.95	1,429,412	0	$15,887.61	14.81%	82.98%	$7.38
Peppers	705,609	109	$777.79	315,609	1	$869.73	0.23%	0.09%	$7.38
Pumpkin	230,769	212	$3,561.25	80,769	1	$3,116.10	1.24%	0.17%	$7.38
Radishes	18,750,000	10,501	$11,959.88	3,750,000	0	$5,979.94	4.18%	8.53%	$7.38
Spinach	6,692,308	350	$3,835.98	2,342,308	1	$3,356.48	1.34%	0.28%	$7.38
Squash	281,250	91	$1,441.59	56,250	0	$720.80	0.50%	0.07%	$7.38
Swiss Chard	5,800,000	30	$569.96	1,450,000	0	$356.22	0.20%	0.02%	$7.38
Tomato	1,950,000	72	$3,566.53	1,560,000	4	$7,133.06	0.33%	0.06%	$7.38
Turnip	18,112,500	782	$597.09	3,622,500	0	$298.55	0.21%	0.64%	$7.38
Total	**134,072,443**	**123,076**	**$290,313.99**	**34,607,443**		**$157,678.32**			

18.6 Co-operative Revenue Projections (Low – 10 Acres per Crop)

SEED CROP	EST. AMT. OF SEED IN DEMAND	EST. AMT. OF SEED TO BE PURCHASED	BEGINNING INVENTORY	OPTIMAL PRICE PER SEED	ACTUAL #OF ROW FT. NEEDED	TOTAL SALES PER CROP	SALES PER ROW FOOT
Arugula	3,125,000	4,325	$0.46	$0.0001	603	$413.36	$0.69
Bean, Bush	1,470,588	47,073	$215.34	$0.0057	13,944	$8,409.03	$0.60
Beets	4,200,000	53,243	$38.84	$0.0009	5,522	$3,829.97	$0.69
Broccoli	625,000	188	$3.46	$0.0203	131	$12,658.78	$96.47
Brussels Sprouts	437,500	447	$20.76	$0.0522	445	$22,834.82	$51.36
Carrot	12,000,000	80,140	$10.39	$0.0002	2,909	$1,944.04	$0.67
Cress	3,125,000	6,886	$2.43	$0.0004	960	$1,377.87	$1.44
Cucumber	531,250	2,089	$17.15	$0.0103	1,713	$5,453.34	$3.18
Eggplant	325,000	532	$2.69	$0.0063	713	$2,056.02	$2.88
Kale	1,400,000	5,557	$166.71	$0.0375	1,729	$52,500.00	$30.36
Kohlrabi	5,450,000	178,955	$5,243.37	$0.0366	14,304	$199,606.25	$13.96
Leek	1,615,385	5,687	$31.28	$0.0069	1,534	$11,105.77	$7.24
Lettuce	2,485,714	3,521	$0.99	$0.0004	617	$871.45	$1.41
Mustard Greens	3,125,000	3,165	$0.40	$0.0002	441	$496.03	$1.12
Onion	7,700,000	123,558	$556.01	$0.0056	6,990	$43,312.50	$6.20
Peas	6,352,941	1,531,934	$13,621.69	$0.0111	105,042	$70,611.58	$0.67
Peppers	400,000	948	$2.09	$0.0028	1,032	$1,102.29	$1.07
Pumpkin	153,846	3,178	$98.07	$0.0386	8,997	$5,935.42	$0.66
Radishes	12,500,000	840,048	$1,071.67	$0.0016	29,275	$19,933.13	$0.68
Spinach	4,461,538	27,983	$32.08	$0.0014	2,732	$6,393.30	$2.34
Squash	187,500	1,366	$14.00	$0.0128	3,174	$2,402.65	$0.76
Swiss Chard	3,866,667	2,415	$0.47	$0.0002	272	$949.93	$3.49
Tomato	346,667	718	$2.63	$0.0046	902	$1,585.12	$1.76
Turnip	12,075,000	41,710	$2.75	$0.0001	1,505	$995.15	$0.66
Total	**87,959,596**	**2,965,664**	**$21,155.74**			**$476,777.81**	

18.6 Co-operative Revenue Projections (Low – 10 Acres per Crop) (Continued)

SEED CROP	NUMBER OF SEEDS HARVESTED	NUMBER OF UNITS PRODUCED	PAYMENTS TO FARMERS	SURPLUS SEED	YEARS OF SURPLUS	ENDING INVENTORY	% OF CROP SALES	% OF CROP VOLUME (UNITS)	DELIVERY RIGHT PRICE
Arugula	3,125,000	54	$165.34	625,000	0	$82.67	0.09%	0.04%	$7.45
Bean, Bush	1,897,463	3,138	$4,339.99	647,463	1	$3,702.29	1.76%	2.58%	$7.45
Beets	4,200,000	666	$1,531.99	1,050,000	0	$957.49	0.80%	0.55%	$7.45
Broccoli	937,500	2	$7,595.27	437,500	1	$8,861.15	2.66%	0.00%	$7.45
Brussels Sprouts	656,250	6	$13,700.89	306,250	1	$15,984.37	4.79%	0.00%	$7.45
Carrot	18,000,000	401	$1,166.43	10,800,000	1	$1,749.64	0.41%	0.33%	$7.45
Cress	4,687,500	86	$826.72	2,187,500	1	$964.51	0.29%	0.07%	$7.45
Cucumber	796,875	139	$3,272.00	371,875	1	$3,817.33	1.14%	0.11%	$7.45
Eggplant	743,982	35	$1,882.63	483,982	2	$3,061.77	0.43%	0.03%	$7.45
Kale	2,100,000	69	$31,500.00	980,000	1	$36,750.00	11.01%	0.06%	$7.45
Kohlrabi	8,175,000	2,237	$119,763.75	3,815,000	1	$139,724.38	41.87%	1.84%	$7.45
Leek	2,423,077	71	$6,663.46	1,373,077	1	$9,439.90	2.33%	0.06%	$7.45
Lettuce	3,728,571	235	$522.87	1,988,571	1	$697.16	0.18%	0.19%	$7.45
Mustard Greens	4,687,500	158	$297.62	2,187,500	1	$347.22	0.10%	0.13%	$7.45
Onion	11,550,000	618	$25,987.50	5,775,000	1	$32,484.38	9.08%	0.51%	$7.45
Peas	9,529,412	102,129	$42,366.95	4,129,412	1	$45,897.53	14.81%	83.81%	$7.45
Peppers	410,829	63	$452.85	150,829	1	$415.64	0.23%	0.05%	$7.45
Pumpkin	230,769	212	$3,561.25	130,769	1	$5,045.11	1.24%	0.17%	$7.45
Radishes	18,750,000	10,501	$11,959.88	8,750,000	1	$13,953.19	4.18%	8.62%	$7.45
Spinach	6,692,308	350	$3,835.98	3,792,308	1	$5,434.30	1.34%	0.29%	$7.45
Squash	281,250	91	$1,441.59	131,250	1	$1,681.86	0.50%	0.07%	$7.45
Swiss Chard	5,800,000	30	$569.96	2,900,000	1	$712.44	0.20%	0.02%	$7.45
Tomato	1,300,000	48	$2,377.69	1,040,000	4	$4,755.37	0.33%	0.04%	$7.45
Turnip	12,075,000	521	$398.06	2,415,000	0	$199.03	0.21%	0.43%	$7.45
Total	**122,778,286**	**121,860**	**$286,180.67**	**56,468,286**		**$336,718.74**			

18.7 Cost of Goods Sold Calculations

COST OF GOODS SOLD	Low	Medium	High
Beginning Inventory (Seed Purchases)	$21,155.74	$21,215.81	$39,097.59
Labour (Production Staff)	$150,000.00	$150,000.00	$150,000.00
Payments to Farmers	$286,180.67	$290,313.99	$579,842.86
Ending Inventory	($336,718.74)	($157,678.32)	($685,516.65)
Total Cost of Goods Sold	**$120,617.67**	**$303,851.48**	**$83,423.80**

18.8 Operating Expenses

LABOUR	COST PER YEAR	DETAILS
Management Personnel (3)	$150,000	$50,000 per year
Production Personnel (5)	$150,000	4 regular staff at $35,000 per year 1 intern at $10,000 per year
Total Cost	**$300,000**	

MAJOR CAPITAL EXPENDITURES	COST	USEFUL LIFE	DEPRECIATION	DETAILS
Co-Packing Fee	$500,000	25	$20,000	OMAFRA, 2008
Clipper Prelude with Adjustable Screens	$17,575	15	$1,171.67	Hoffman Manufacturing
Westrup Gravity Separator	$25,000	15	$1,666.67	Seedburo Equipment Company
Spiral Separator	$1,665	15	$111.00	Seedburo Equipment Company
Contador Seed Counter	$9,000	15	$600.00	Hoffman Manufacturing
Millet Wet Vegetable Seed Processor	$2,500	10	$250.00	A.G.E. Manufacturing Inc.
Walk-in Freezer	$10,000	20	$500	N/A
Delivery Vehicle	$10,000	10	$1000	N/A
Total Cost	**$575,740**		**$25,299**	

(derived from Colley et al, 2012)

UNIQUE OPERATING EXPENSES	COST PER YEAR	DETAILS
Advertising Costs	$2,500	Conference Fees: ECOSGN Conference Guelph Organic Conference Organic Connections Marketing Collateral
Certification Fee	$1,500	Canadian Seed Institute Organic Certification Fee
Seed Supplies	$2,000	Germination Paper, Bags, Labels, etc.
Total Cost	**$6000**	

GENERAL OPERATING EXPENSES	COST PER YEAR	DETAILS
Office Supplies	$2,000	
Office Rent and Utilities	$18,000	$1500/month
Communications (Telephone, Internet)	$3,600	$300/month
Vehicle Expenses	$2,400	$200/month
Total Cost	**$26,000**	

TOTAL OPERATING EXPENSES	COST PER YEAR
Capital Expenditures	$25,299
*Labour (Management Staff)**	$150,000
Unique Operating Expenses	$6,000
General Operating Expenses	$26,000
Total	**$207,299**

*Production staff accounted for in Cost of Goods Sold

TOTAL EQUITY REQUIRED	COST PER YEAR
Total Capital Expenditures	$575,740
Total Operating Expenses (excluding Depreciation)	$332,000
Total Cost	**$907,740**

18.9 Delivery Rights

	LOW	MEDIUM	HIGH
Initial Equity Required	$907,740	$907,740	$907,740
Delivery Right Price	$4.24	$7.38	$7.45
Total # of Membership Shares (Equal to Total Number of Minimum Units)	121,860	123,076	214,126

18.10 Summarized Income Statements

	LOW	MEDIUM	HIGH
Total Gross Sales	$476,777.81	$715,175.79	$961,812.90
Total Cost of Goods Sold	($120,617.67)	($303,851.48)	($83,423.80)
Gross Profit	$356,160.14	$411,324.31	$878,389.10
Operating Expenses	($207,299)	($207,299)	($207,299)
Total Operating Income	**$148,861.14**	**$204,025.31**	**$671,090.10**

APPENDIX 19: GOVERNMENT GRANTS/SUPPORTS

The following provincial funding programs can be utilized by the co-operative directly for the capital of their business, or to reduce the financial burden of participating farmers engaged in the co-operative.

PROGRAM OR SERVICE NAME	DESCRIPTION	ELIGIBLE AMOUNTS
GROWING FORWARD BUSINESS DEVELOPMENT PROGRAMS		
Advanced Business Planning	Funding offered on a cost-share basis for business planning services for farmers.	Up to 50% cost-sharing to a maximum of $20,000
Business Plan Implementation	Funding offered on a cost-share for business one-time non-capital implementation costs	Up to 50% cost-sharing to a maximum of $3,000
ENVIRONMENT AND CLIMATE CHANGE ASSISTANCE PROGRAMS		
Canada-Ontario Farm Stewardship Program (COFSP)	Voluntary cost-share program to encourage producers to improvement management of agricultural properties on environmental dimensions	Up to 30% to 50% of cost-sharing
LOAN, BUSINESS RISK AND FINANCIAL ASSISTANCE		
The Canadian Agricultural Loans Act	Loan guarantee program that provides loans to farmers and agricultural co-operatives	Maximum Loan for Co-operatives: $3 million Interest Rate: Prime + 1% Repayment Term: 10-15 years
FUNDING PROGRAMS TO BUILD PROGRAMS TO BUILD BUSINESS OPPORTUNITIES		
Ontario Market Investment Fund	Funding offered to agricultural initiatives that promote local produce in Ontario	Up to 50% cost-sharing to a maximum of $100,000
Premier's Award for Agri-Food Innovation Excellence	Awards to recognize innovation in the farming sector in the province	Awards from $5,000 to $100,000

(Stevenson, 2010)

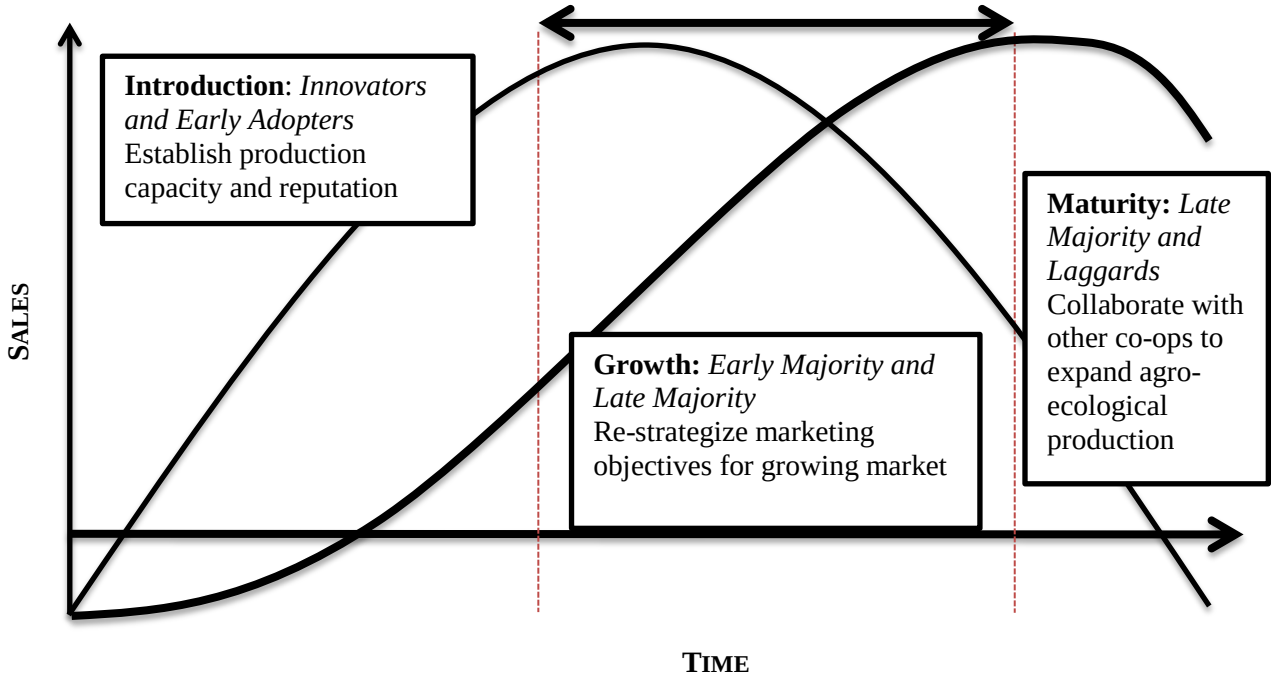
APPENDIX 20: PORTER'S FIVE FORCES ANALYSIS OF SEED CO-OPERATIVE'S STRATEGY

In the niche market that the co-operative would be operating in, the conditions for success are moderately favourable, but very risky. Using Porter's 5 Forces as an analytical frame to assess the industry, the industry has a low-moderate bargaining power of suppliers and buyers, because agro-ecological growers require much fewer inputs for production, and the target market is generally understood to be price insensitive. Moreover, the co-operative will have a market niche in being able to provide regionally-adapted agro-ecological vegetable seed, with no competitors offering the same product. However, the success of the co-operative relies on the value-orientations of growers – if growers do not place importance on the regional character of the seed produced, the co-operative will not be able to maintain its market position. Additionally, if the conventional seed producers in Canada choose to adopt agro-ecological principles and consequently capture greater efficiencies of scale, the producers begin to co-opt the practices of the industry and compete on price. Beyond the niche target market of the co-operative, the conditions are unfavourable, as buyers are price sensitive, there is heavy concentration and competition in the industry, and substitute products are easily available, and farmers would not be exhibiting a complex buying behaviour based on value-orientations (Kotler et al, 2006; Porter, 2008).

	NICHE TARGET MARKET	EXPANDING TARGET MARKET
Threat of New Entrants	MODERATE	MODERATE-HIGH
	- Expansion and co-option of the organic/untreated vegetable seed industry is relatively high, but building both autonomy, capacity, and reputation among regional agro-ecological growers may mitigate some of that threat	- Costs can be easily undercut by large scale seed producers through greater efficiencies in capital investments to offer untreated seed
Bargaining Power of Suppliers	LOW-MODERATE	MODERATE
	- Given that the majority of seeds being grown will be provided by the members of the co-operative or Seeds of Diversity Seeds the bargaining power of suppliers remain in the hands of the co-operative	- Suppliers of more mechanized seed processing equipment to support expansion may exercise bargaining power
Bargaining Power of Buyers	LOW-MODERATE	HIGH
	- Farmers are relatively price insensitive with respect to quality	- Until value shift occurs across all farmers, farmers will be price sensitive to seeds as inputs
Substitutes	LOW	HIGH
	- Seeds that are regionally-adapted *and* agro-ecological are not available in Ontario	- Many conventional substitutes exist in the market; difficult to attract consumers because of price premium that do not value local/agro-ecological dimensions
Competitive Rivalry	MODERATE	HIGH
	- Uniquely positioned in the market as the only provider of regional bulk agro-ecological vegetable seed, but would still compete with non-regional organic seed growers	- Until value shift occurs across all farmers, the co-operative will not be able to compete with larger seed producers on price

APPENDIX 21: MARKETING STRATEGY FOR GROWTH

The following diagram serves to help conceptualize how the seed co-operative will strategize through different stages of the *product life cycle* and manage different types of consumers through the *diffusion of innovation curve* for its products (Kotler et al, 2006).



APPENDIX 22: MANAGEMENT AND STAFF

ROLES	PRIMARY RESPONSIBILITIES
Members	All producer-members of the co-operative are responsible for growing the seed for the co-operative
Board of Directors	Policy-making body elected by members of the co-operative, overseeing the strategic direction of the co-operative
Management Functions (3)	
Strategic Planning	Principal liaison between producer-members and processing staff Ensures co-ordination of membership goals and operational aspects of the co-operative Strategizes on how to acquire different sources of share capital and funding Collaboratively strategizes on sales, marketing, operations, finance, and human resources decisions Develops relationships with CSOs to co-ordinate breeding, research, and education efforts
Marketing & Sales	Co-ordinating promotional materials for members of the co-operative, distributors, and website Co-ordinating relationships with small-scale seed growers and certification agencies Managing relationships with partnering institutions to promote agro-ecological education for farmers, consumers, and distributors
Operations & Logistics	Organizing logistics of pooling production and transporting to distribution channels Manages co-packing relationships and strategizes on future facilities management plans Provides direction on regulatory requirements and innovations on seed processing Develops inventory management strategy
Finance & Administration	Manages distribution and acquisition of share capital Develops and maintains appropriate financial documents for co-operative
Recruitment & Retention	Co-ordinates hiring, training, and retention programs for all employees
Staff Functions (5)	
Production Manager	Supervision of overall production process and quality control standards of cultivation, pollinating, rogueing, selection, pest management, and harvesting
Postharvest Staff	Supervision and execution of postharvest handling duties including separation, cleaning, treating, testing, and packaging and labelling, of seeds

APPENDIX 23: OMAFRA HUMAN RESOURCES PROGRAMS

OMAFRA HUMAN RESOURCES, EMPLOYMENT, AND EDUCATION PROGRAMS	
Advanced Agricultural Leadership Program	19-month executive personal and leadership development program for individuals looking to take leadership positions in agricultural sectors and rural development initiatives
Ontario Agri-Food Education (OAFE)	Program offered by OMAFRA that promotes agri-food educational opportunities and professional development services
Ontario Ministry of Training, Colleges, and Universities Apprenticeship Programs	Programs can be offered by the OMTCU for horticultural technician programs
Rural Summer Jobs Service – Employers	Provides wage subsidies for rural and agri-food businesses that employ students for the summer

(Stevenson, 2010)

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