OPPORTUNITIES AND CONSTRAINTS TO SEED SOVEREIGNTY FOR ORGANIC VEGETABLE FARMERS IN BRITISH COLUMBIA

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Abstract

Seed is a primary element in a changing agricultural landscape and has seen a steady shift over the past 100 years from common good to private commodity. This shift has jeopardized long-held farmer traditions of saving, reusing, and selling seed and has catalyzed a response, framed as seed sovereignty, which challenges the corporate enclosure of seed while asserting farmers' *rights* to save, sow, share, and breed seed, as well as participate in shaping seed policy.

British Columbia (BC) has a history of vegetable seed production dating back to the early 1900s and offers a unique case study due to its high number of organic vegetable farms and locally focused seed companies. I used a mixed-methods approach including archival research, interviews, and an online survey to better understand ways in which BC organic vegetable farmers and seed growers experience seed sovereignty and identify constraints that limit their seed sovereignty and seed security.

From 1915 to 1958, BC saw the rise and decline of a vegetable seed sector due to the influence WWI and WWII on seed imports from Europe. This history offers lessons for modern day seed production and a proactive approach to seed security. Currently, BC seed companies, independent seed growers, and vegetable farmers experience seed ***sovereignty*** in their rights to save, sow, share, and breed seed, as well as participate in shaping seed policy. However, BC vegetable seed production does not meet the needs of BC organic farmers who require larger quantities of high-quality seed. BC organic farmers' dependence on imported seed, gives them a low degree of seed ***security***, which they have mitigated by utilizing multiple sources of seed from local and international suppliers – reducing their vulnerability seed import disruptions.

BC organic vegetable farmers and seed growers are constrained in their ability to meet provincial seed needs due to space, infrastructure, knowledge limitations, and a lack of data on the economic viability of seed production. However, well-established infrastructure among BC's seed growers indicates the potential for scaling up seed production to better meet the needs of local farmer and protect the capacity for seed security in British Columbia.

Lay Summary

Seed is an important input for organic vegetable farms and the increasing privatization of seed has raised concerns about the loss of farmer traditions of saving and sowing farm-grown seed. These concerns have prompted a global movement, framed as seed sovereignty – the right to save, sow, share, and breed seed, as well as participate in shaping seed policy – which aims to counter the growing privatization of seed and assert farmers' seed rights.

British Columbia (BC) is home to over 7000 acres of organic and ecological vegetable production, requiring $7.8 million of imported seed each year. BC's history of vegetable seed production dates back to the early 1900s, with 28 small-scale vegetable seed companies currently operating.

BC's seed companies, seed growers, and farmers experience a high degree of seed *sovereignty* in saving, sowing, and sharing seed, but farmers experience low levels of seed *security* due to their dependence on imported seeds.

Preface

Chapter 2 is drawn primarily from archived documents in which I did all the research, documentation, and analysis.

For Chapter 3, I designed interview questions and interview formats with support from Dr. Hannah Wittman and Dr. Alexandra Lyon and I conducted, transcribed, and coded all interviews for analysis. I designed the BC Vegetable Farm Management (BCVFM) survey in collaboration with Susanna Klassen, PhD candidate, UBC Institute for Resources, Environment and Sustainability. I was responsible for coordinating, conducting, and analyzing the results from a focus group at the 2017 BC Seed Gathering with support from Torin Boyle and Jesse Howardson who took notes and supported group facilitation.

Interviews and the focus group in Chapter 3 received human subjects ethics approval from the UBC Behavioral Research Ethics Board (BREB) Certificate #H15-03287: 'Canada Seed Trials + Seed Sovereignty'. The BCVFM survey received human subjects ethics approval from the UBC BREB Certificate # H19-02615: 'Canada Organics'. I worked with Keeley Nixon of the BC Eco Seed Co-op to identify BC's currently active vegetable seed companies.

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List of Abbreviations

CFIA	Canadian Food Inspection Agency
COG	Canadian Organic Growers
DUS	Distinct, Uniform, Stable
EFAO	Ecological Farmers Association of Ontario
FSC	Food Secure Canada
IP	Intellectual Property
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
NAFSA	Native American Food Sovereignty Alliance
NFU	National Farmers Union (Canada)
NFB	National Film Board of Canada
OSA	Organic Seed Alliance (United States)
OSSI	Open-Source Seed Initiative (United States)
PVPA	Plant Variety Protection Act (Unites States)
SODC	Seeds of Diversity Canada
UNDROP	United Nations Declaration on the Rights of Peasants and Others Working in Rural Areas
UPOV	International Convention for the Protection of New Varieties of Plants
USDA	United States Department of Agriculture

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I acknowledge that this research takes place in the region which is now called British Columbia, Canada but is comprised of unceded territories stewarded by First Nations people for millennia. In particular, my writing takes place on the ancestral and unceded homelands of the hən̓q̓əmin̓əm̓ and Sḵwx̱wú7mesh speaking peoples, now known as Burnaby.

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And thanks to the friends and family whose question, “Are you still working on your thesis?” will be forever etched in my brain.

Dedication

For Terran,

Experience is knowledge

And we are all still learning

1 Thesis introduction

1.1 The modern state of agriculture and seed

Over the past 150 years, agriculture across the world has shifted from a mostly regional-based activity on smallholder farms to a highly industrialized global industry. This shift has resulted in agricultural resources coming under increasingly concentrated corporate ownership. Such concentrated ownership in the food system is a product of the neoliberal economic paradigm which asserts,

> that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets, and free trade. (Harvey, 2005, p. 2)

Monbiot (2016) counters that neoliberalism is geared towards favouring corporate interests and the ideologies suggested by the neoliberal approach, which Patel and McMichael (2016) assert is "maintained through active hegemony" (p. 31), representing an erosion of democracy in global and regional food systems.

Seed is a significant element in the modern agricultural landscape and has seen a steady shift over the past 100 years from common good, which farmers could freely save, sow, share, and breed, to an increasingly private commodity under corporate control and restricted terms of use (Howard, 2015). The shift towards a more corporate seed system has been enabled by biological (Crabb, 1947) and intellectual property protection mechanisms (Winston, 2008) and has prompted concern over the erosion of farmers' rights around using seed – a concern which is

now expressed in social movements advocating for *seed sovereignty* (La Via Campesina, 2013; Kloppenburg, 2014; Montenegro de Wit, 2017).

1.2 An introduction to seed sovereignty

Prior to the introduction of hybrid corn seed in the early 1920s, the sole method seed companies had to protect their seed from reproduction and resowing by farmers was through maintaining high-quality stockseed (Navazio, 2012). High-quality stockseed was, and still is, grown under strict conditions to ensure trueness-to-type and such conditions are not easily replicated on commercial farms. But replication was still possible and widely practiced (Navazio, 2012), limiting the profit potential for seed companies (Kloppenburg, 2005).

In 1961, the first plant variety protection (PVP) regulations came into effect. The *International Convention for the Protection of New Varieties of Plants* gave breeders exclusive rights to market new and novel varieties for a 20-year period (UPOV, 1961). In the years to follow, seed patenting and seed licensing contracts strengthened breeders' rights to protect seed from reproduction on farms as well as limiting the use of patented seeds for breeding purposes (Winston, 2008). These evolving seed protection mechanisms amounted to an increasing *enclosure* of seed – the shift of a resource from being commonly held to being privately owned (Montenegro de Wit, 2017). Such enclosure has favoured corporate interests over the interests of farmers and facilitated the privatization of seed through increased restrictions for on-farm use and breeding (Wattnem, 2016).

The seed sovereignty movement arose as a response to the increasing privatization and concentrated corporate ownership of seed genetic resources across the globe (La Via Campesina,

2013; Howard, 2015). Seed sovereignty is strongly coupled with principles of food sovereignty which asserts "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems" (Nyeleni, 2007, p.1). Food sovereignty itself was a direct response to the growing neoliberal influence on global food systems and its destructive impact on ecosystems and communities around the world (Wiebe, 2017).

La Via Campesina (2013), a global network of grassroots organizations that works to mobilize and advocate for peasant[1] and family-farmer rights, positions seed sovereignty within the greater context of food sovereignty – with seeds playing an important role in regionally adapted and culturally relevant food systems. Navdanya, a grassroots organization based in India, advocates for farmers' *seed freedom*, or their to right to save, breed, exchange, and sell seeds in an effort to preserve cultural and biological diversity (Shiva et al., 2012). Groups like La Via Campesina and Navdanya advocate for a more democratic food system, where farmers and citizens have a central voice in shaping the food system. These groups view farmers and global citizens as more than just producers and consumers, but rather as participants and decision makers with personal and community-based economic, environmental, and cultural stakes in the food system (Wittman et al., 2010).

[1] For the purposes of this paper, I will use the definition of ***peasant*** as stated in the *UN Declaration on the Rights of Peasants and Other People Working in Rural Areas*: any person who engages or who seeks to engage alone, or in association with others or as a community, in small-scale agricultural production for subsistence and/or for the market, and who relies significantly, though not necessarily exclusively, on family or household labour and other non-monetized ways of organizing labour, and who has a special dependency on and attachment to the land.

Kloppenburg (2008; 2010; 2014) has built on the work of La Via Campesina and Navdanya to explore seed sovereignty in the North American context extensively, framing seed sovereignty as farmers' rights to save, sow, share, and breed seed as well as participate in developing seed policy. This definition will frame how the term seed sovereignty is used in this paper and will be expanded on in Chapter 3.

Seed sovereignty movements are present in both developing and developed countries and are unique to local climates, politics, and historical context (Peschard & Randeira, 2020). Hendrickson and James (2005) have shown how concentrated ownership of seed genetic resources in the United States limits farmer agency, or freedom of choice, in their seed purchasing options and compels them toward seed purchasing decisions that may be contrary to their ethics. Lammerts van Bueren et al. (2018) incorporate issues of plant breeding into the conversation on seed sovereignty, through plant breeding for organic systems and participatory plant breeding in Europe, where farmers work with breeders throughout the breeding process to develop new varieties. Such breeding efforts can empower farmers dispossessed from their sovereignty due to modern seed protection mechanisms (Golay & Bessa, 2019). The US-based Open-Source Seed Initiative (OSSI), an organization made up of plant breeders and seed growers, aims to find a balance between seed as a commodity, farmers' rights to save and sell seed, and access to seed as breeding materials for new varieties (OSSI, 2016; Luby et al., 2015).

Complementary to the concept of seed sovereignty is seed *security*, which refers to reliable access to sufficient quantities of appropriate seed (FAO, 2018). The distinction between the two terms is important as seed security addresses *access* to seed but does not adequately address who

determines that access and under what conditions. In discussing security as it relates to food, Wittman et al. (2010) assert,

> This definition invites an interpretation towards food related policies that emphasizes maximizing food production and enhancing food access opportunities, without particular attention to how, where and by whom food is produced. (p. 3)

Scholars (Wattnem, 2016; Montenegro de Wit, 2017; Lyon et al., 2021) and community groups (Shiva et al., 2012; La Via Campesina 2013) frame seed sovereignty as an important precursor to seed security and food security, which requires the participation of farmer and citizen stakeholders. Farmer and citizen participation in shaping seed and food systems is crucial for ensuring their needs are being met in a just and equitable way (Wittman et al., 2010).

Seed security for farmers also means economic security. Farmers cannot grow crops if they do not have seeds. In Canada, vegetable farmers faced the prospect of seed shortages in 1915 due to the onset of World War I and again in 1939 with the onset of World War II. Global supply chain disruptions and seed panic buying (Slaughter, 2020; Timmins, 2020) from 2019 to 2021, due to the COVID-19 pandemic, show the risk of unexpected seed shortages is still a genuine concern. With these instances in mind, we look at organic vegetable farmers in BC as a regional case study for better understanding the dynamics of seed sovereignty and the impact on seed security.

1.3 Research context: local organic vegetable production in BC

Organic agriculture has been growing extensively over the past two decades across the globe. Between 1999 and 2019 global land in organic production increased more than six-fold from 11 million hectares to 71.5 million hectares while the number of global organic producers increased

more than ten-fold from 200,000 to 2.8 million. The global market value of organic agriculture is $117 billion US (IFOAM, 2019).

British Columbia has seen a similar trend in increasing organic production and is home to over 7000 acres of certified organic and ecological[2] vegetable production. BC has Canada's second highest farm gate sales for certified organic vegetables at $9.6 million[3] on 5.6% of Canada's land in organic vegetable production (Statistics Canada, 2020). BC is also home to 28 small-scale seed companies which sell their seed to gardeners throughout the province, many of which are engaged in seed research and community seed projects.

Accompanying the growth of organic agriculture in North America is an increase in consumer support for local food. Consumer motivation towards local food systems is driven by perceptions of a growing disconnect from food due to the increasing globalization of the food system (Wittman & Klassen, 2017). A 2012 US survey showed that consumer motivations for sourcing local foods included supporting local economies and a lack of trust of big box stores (Rushing & Ruehle, 2013), while a 2016 USDA report identified local meat and local produce as the top two food trends in 2015 (Tropp, 2016). In BC, the provincial government was well-attuned to consumer desire for local food and relaunched the government-funded BuyBC program in 2018 to support local food production. The BuyBC program provided $6 million in funding, over three years, and a logo licensing program[4] to BC businesses wanting to promote their food locally

[2] Organic, but not certified.
[3] 14.8% of Canada's $64.7 million in farm gate value of organic vegetable
[4] BC's Investment Agriculture Foundation currently manages the BuyBC Partnership Program which has provincial government funding through 2023 (Investment Agriculture Foundation, 2021).

(Lehn, 2018). Vasi et al. (2015) see growing consumer support for local food movements as a "moralized market" where consumers are not simply acting out of self-interest, but rather are making food purchases in line with their social and environmental values – and farmers are eager to meet that demand.

1.4 Research question

In response to the growth of global movements in support of seed sovereignty as a precursor to seed security, along with increasing farmer and consumer interest in local and organic food in North America, this thesis asks: In what ways do BC organic vegetable farmers and seed growers experience seed sovereignty? What are the constraints that limit the seed sovereignty of BC organic vegetable farmers and seed growers? And what are the opportunities to mitigate the impact of constraints to seed sovereignty for BC farmers and seed growers?

Answering these questions can help us better understand how seed secure farmers are in British Columbia and how they might adapt in the face of seed shortages or changes in the seed system which render it incapable of adequately serving their needs.

1.5 Positionality

I am approaching this research first and foremost as a vegetable farmer, vegetable seed grower, and community organizer who has worked extensively with other vegetable seed growers in southern British Columbia over the past 20 years. As a seed grower, it is impossible to not be aware of the economic, political, and cultural complexity that revolves around seed. Consequently, all the seed-related work I have done has been in support of locally focused,

community-centered seed systems to counter the effects of an increasingly corporate-driven seed system which favours the private ownership of seed. I am particularly interested in how seed issues affect farmers on the ground. I am also interested in complementarity between local and global seed systems that can accommodate the needs of growers of all types and scales, a reality BC may be demonstrating already.

It is difficult to talk about agricultural seed without acknowledging its role in the colonial history of Canada. This thesis does not adequately address the powerful role the importation, reproduction, and distribution of seed played in dispossessing Indigenous peoples of their land (see Buttel & Bush, 1988; DePauw et al., 1995; Kuyek, 2007), but it does not shy away from it either. Although this research into seed sovereignty may not directly contribute to the ongoing process of reconciliation with Canada's Indigenous peoples, it may be able to contribute to the conversation in the many ways Indigenous people were directly affected by the governance of agricultural seed during the centuries-long dispossession of land they experienced. In doing so, it may shift the reverence we hold for some types of seed.

I used a mixed-methods, archival, qualitative, and quantitative approach to explore vegetable seed production in BC through the concept of seed sovereignty to better understand farmer and seed grower experiences of growing, purchasing, and stewarding seed in BC. In Chapter 2, which follows, I explore the history of vegetable seed production in BC from 1915 to 1958 and how it might inform efforts at modern day vegetable seed production. In Chapter 3, I introduce the modern context of seed and the results of my research focused on organic vegetable seed growing and use in BC.

2 Vegetable seed production in BC – 1915 to 1958

2.1 Introduction

In this chapter, I review historical BC government reports and newspapers, paying special attention to the Grand Forks area of southwest BC, to explore the rise and decline of the vegetable seed sector in BC from 1915 to 1958. This chapter aims to elucidate some of the historical foundations leading to the present state of vegetable seed production in BC. The chapter is framed by the following questions: What were the factors contributing to the rise and decline of commercial vegetable seed production in BC during this period? What lessons can we learn from this period to inform efforts towards seed sovereignty and seed security in modern day vegetable seed production in BC?

I start chapter 2 with a look at early settler agriculture and seed in Canada and then examine BC vegetable seed production from 1915 to 1958 in 4 distinct phases:

1. Factors leading to the potential need to grow vegetable seed in Canada in 1915
2. The growth of vegetable seed production in BC from 1915 to 1938
3. Rapid growth in vegetable seed production during WWII
4. Rapid decline in vegetable seed production after WWII

2.2 Methodology

This chapter was inspired by a 1994 article by Jim Glanville in *British Columbia Historical News*. In the 20 years I have been working with vegetable seed in British Columbia, I often heard stories of the history of vegetable seed production in the Grand Forks area. The Glanville article

was the only article I could find with any details about this history, and it prompted me to dig deeper. I researched the history of vegetable seed production in BC from 1915 through 1958 as presented primarily through references in archived BC newspapers and BC Department of Agriculture annual reports. I accessed these documents through the UBC Library electronic archives and the newspaper-archive website, newspapers.com. I focused specifically on newspapers for the Grand Forks area, which was a major seed production area during the research period, but also searched issues of BC newspapers for Kelowna, Cranbrook, Enderby, Creston, and Victoria to identify relevant content. I also searched a dozen archived Canadian seed catalogues from the Toronto Public Library dating from 1855 to 1950.

I searched archived issues of BC newspapers for Kelowna, Cranbrook, Enderby, Creston, and Victoria using the term “vegetable seed” to identify relevant content. I searched three archived Grand Forks Newspapers using the terms “seed”, “vegetable seed”, and “root seed” to identify relevant content: The Grand Forks Miner (1896 to 1898), the Grand Forks Sun (1901 to 1930), and the Grand Forks Gazette (1944 onward). No relevant seed references appeared in the Grand Forks Miner.

The Grand Forks Sun is electronically archived at the UBC Library with dates from 1901 to 1930, with the first mention of vegetable seed in 1915. The Grand Forks Gazette is electronically archived at newspapers.com from 1944 onward and provided a wealth of insight into vegetable seed production in the Grand Forks region.

Using UBC Library's BC Sessional Papers collection, I searched all available British Columbia Department of Agriculture annual reports[5] using primarily the search terms "seed", "root-seed", "root seed", "vegetable-seed", "vegetable seed", and "vegetable[6]", from 1891 (first report) through 1965, with the first mention of vegetable seed production appearing in the report for 1916 and the last mention appearing in the report for 1958. I also did intermittent searches for other topics such as "seed control act", "seed-control area", "seeds act" and "Europe" for specific periods of time. Reports were not issued from 1897 to 1899, in 1901, and from 1903 to 1912. Only annual reports cited in the paper are listed in the reference list.

British Columbia Department of Agriculture annual reports were broken down into regions, sometimes differentiating the types of seed being grown in different regions and documenting the successes and challenges farmers were experiencing in each of these regions. Despite regular mention of vegetable seed production in Department of Agriculture annual reports and regional newspapers from 1915 to 1958, data on crop acres, crop values, and the number of farms growing seed were intermittent and inconsistent at best but are included as much as possible.

From each of the newspapers and Department of Agriculture annual reports above, I took a screen shot of articles or passages mentioning seed in a context relevant to this research[7] and recorded all mentions of vegetable seed, including topics such as: seed sales, seed yields, seed harvesting processes, seed harvesting equipment, seed-related events including training events

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[5] Annual reports for each year were issued in the *following* year. Thus, the annual report for 1918 was issued in 1919. The annual report issued in 1915 was for both 1913 and 1914.
[6] Search terms with and without the hyphen returned different results in BC Department of Agriculture annual reports and helped make the search process more precise.
[7] For example, I did not record *recipes* where the word seed was used or when the word was used as a verb in a non-agricultural contact (e.g., seeding ideas)

and field days, seed crop diseases – in field and in storage, and other seed-related topics. I then used this content to construct a chronological narrative describing the evolution of the BC vegetable seed sector from 1915 to 1958.

Currency adjustments to 2021 values were calculated using the online Bank of Canada Inflation Calculator (Bank of Canada, 2021).

2.3 Settler agriculture and early seed regimes in Canada

In the early 1900s, Canada was just three decades into its confederacy. Although the land had been stewarded by Indigenous peoples for thousands of years, settlement by England and France in the early 1600s started the East to West occupation of land that displaced native inhabitants with European settlers. Despite well-established Indigenous systems of farming, including seed selection in crops such as beans, corn, and squash in the eastern parts of the continent, European crops and cropping systems[8] came to dominate the landscape over the next three centuries (Dick & Taylor, 2015).

Wheat was an important crop for early settlers in Canada, though settlers struggled with growing European varieties that were not well adapted to Canadian conditions (Fedak, 2015). The introduction of a handful of Red Fife wheat in 1864, stolen from a shipment of Ukranian wheat in a Glasgow Port (Rempel, 2015),[9] greatly increased wheat yields and accelerated the colonial

[8] European cropping systems resulted, for example, in shifting Indigenous crops such as beans, corn, and squash, from being grown together as a polyculture to being growing individually as a monoculture.
[9] The original name for the variety known as Red Fife is Galician (Campbell, 2013). According to Rempel (2015): "One legend states that a load of wheat grown in Ukraine was on a ship in the Glasgow harbour. A friend of Farmer

development of land in Canada (Fedak, 2015). In the early 1900s, the crossing of the high-yielding Red Fife with the early-maturing Hard-Red Calcutta, a variety from India, resulted in a high-yielding, short-season variety subsequently named Marquis (Rempel, 2015) – facilitating colonial expansion west into the prairies (White, 1995).

The success of wheat crop development meant settlers now had a more stable food source and could maintain a reliable wheat seed supply[10] (Kuyek, 2007). Much of the wheat grown on family farms in Canada was shipped back to Britain to aid increasing industrialization and a growing population of wage labourers in what Friedmann and McMichael (1989) refer to as the first modern *food regime*. This "colonial-diasporic" food regime was greatly characterized by a new type of agriculture: the family farm producing wheat for an export market which became "the first price-setting world market in a basic food staple" (Friedmann, 2006, p.236). At the same time, Great Britain exported back to Canada the capital to expand railways to aid in continued colonial expansion westward[11]. In this regard, wheat seed in Canada was playing key roles in the maturing of Canada as an independent nation-state, the displacement of Indigenous populations already present in Canada, and the development of export-based agricultural markets (Friedmann, 2006; Magnan, 2012).

Fife dropped his hat into the red-coloured wheat, collecting a few seeds in the hatband, which he then shipped off to Farmer Fife. The wheat grew. The family cow managed to eat all the wheat heads except for one, which Mrs Fife salvaged. This was the beginning of Red Fife wheat in Canada" (Rempel, 2015, n.p.).

[10] It is important to note that grain crops are primarily annual, self-pollinating crops and the edible grain and seed are one and the same, making seed saving an easy and practical endeavour. Vegetable seed crops are often cross-pollinating, require a longer season than their food-producing siblings, and sometimes require two seasons to set seed – as is the case of many root crops (which were prominent at the time).

[11] The ceremonial "last spike" of the Canadian Pacific Railway was placed in Revelstoke, BC on November 7, 1885 (Francis, 2019).

Building on Friedmann and McMichael's food regimes, Kuyek (2007) identified two distinct *seed regimes* in the early history of Canada. The first regime was characterized by the development and maintenance of crops, especially wheat, for which decisions around seed were made primarily by local settler-farmers, "with state involvement limited to supporting efforts of settler communities to feed themselves" (Kuyek, 2007, p.32). During this time, there were no regulations on the use of seed, which sometimes resulted in poor-quality seed finding its way to the market and onto Canadian farms (Agriculture and Agri-Food Canada, 2013).

In the second seed regime, the maturing nation-state of Canada took greater interest in seed. Canada introduced the Seeds Act in 1923 to protect farmers from fraudulent seed claims by US seed suppliers (AAFC, 2013) while still allowing Canadian farmers to maintain control over growing and distributing seed (Kuyek, 2007). Canada developed breeding programs focused on improving crop yields and national seed policy shifted from colonial expansion to the development of export markets (Lyon et al., 2021). By the 1920's Canada was a world leader in the export of wheat (DePauw et al., 1995).

Wheat was an important crop for early Canadian settlers, but settler-farmers also grew vegetables for home use and local markets. Although farmers had success saving seed from some vegetable crops for on-farm use, there was little commercial vegetable seed production happening in Canada, making imported seeds important for commercial vegetable production (Malte & Macoun, 1915). In the early 1900s much of Canada's vegetable seed was imported from Europe which already had a long history of vegetable seed production. But the onset of WWI in 1914 put that seed supply in jeopardy. Along with a growing export market for wheat, Canada now had to consider vegetable seed production in its agricultural policies.

2.4 Factors leading to the potential need to grow vegetable seed in Canada

In 1913, the quantity of vegetable seed imported into Canada from Europe amounted to over 1.3 million pounds – primarily from France, Germany, and Holland (Malte & Macoun, 1915). In 1915, the threat of reduced vegetable seed imports from Europe due to the impacts of WWI prompted Canadian government officials to encourage farmers to grow more vegetable seed for the commercial market. The federal Department of Agriculture publication, *Growing Field Root, Vegetable and Flower Seeds in Canada* (Malte & Macoun, 1915) described the seriousness of the situation,

> The prospective scarcity of root and vegetable seeds for the year 1916 and for some time thereafter, on account of the probable disorganization of seed production operations by reason of the present great war, in those European countries whence such seeds have heretofore been imported by Canada and the United States, makes the production of root, vegetable, and flower seeds in Canada a matter of great importance. (p. 3)

Malte and Macoun (1915) suggested seed imports may still be possible from "friendly or neutral countries" (p. 5) but insisted the loss of European vegetable seed imports posed significant risk to Canadian agriculture and that "such a calamity would seriously affect almost every branch of agriculture and horticulture" (p. 5).

While European vegetable seed imports were important for Canadian farmers, there was some commercial seed production taking place in Canada in 1915 – with turnip seed being grown in Nova Scotia and sugar beet, carrot, and mangel[12] seed being grown in southern Ontario (Malte &

[12] Mangel is a giant mangled beet often used for animal fodder

Macoun, 1915). But Malte & Macoun (1915) describe commercial seed production overall as a "new line of work" (p. 3) that would be required to help meet both current and future seed needs, and suggested farmers should "try to establish a permanent seed growing industry which would make them independent of any other countries" (p. 6). The publication further suggested farmers should consider saving and using their own vegetable seed, as experiments had shown "as good or better results are obtained by using home grown seed than imported seed" (p. 6).

Despite concerns over high labour costs and the lack of seed growing experience among farmers, the prospects for successful seed production in regions across Canada appeared favourable, with suitable climatic and soil conditions being identified across the country, including in BC (Grand Forks Sun, July 2, 1915).

2.5 The steady growth of vegetable seed production in British Columbia

2.5.1 Establishing commercial vegetable seed production in British Columbia

The first colonial settlement was established in British Columbia in the late 1700s, but even by the early 1900s European agriculture in the region was still much less developed relative to other regions of Canada (Lawrence et al., 2020). The *First Report of the Department of Agriculture of the Province of British Columbia, 1891*, highlighted the potential for agriculture in the province,

> Enough information has been obtained to prove that the Province is not the "Sea of Mountains" it has been represented, and although it cannot be compared in extent as a grain growing country to the Great North West…it will…yet show that it is not to be

> ignored in the matter of agricultural productions, while its climatic excellence is too well known to need descanting upon. (British Columbia, 1892, p. 734)

The 1891 BC Department of Agriculture annual report gave no mention of vegetable seed production in BC. However, there was some vegetable seed production occurring in BC at the time, as evidenced by the 1888 seed catalogue offered by W.H. Steves, on Lulu Island in southern BC. The Steves seed catalogue offered both farm-grown and brokered[13] seed, stating, "those varieties, the seeds of which have not been saved on my own Seed Farm, have been procured from the most reliable sources" (Steves, 1888, p. 4) – but the scope and scale of this production is unclear.[14]

The Department of Agriculture annual report for **1916** appears to be the first mention of vegetable seed production in these annual reports to date, and foreshadows more than just the growth of the vegetable seed sector in BC,

> In addition to the regular fruit- and vegetable-growing industries, a certain amount of attention has been given to such industries as nut culture, holly growing, the cranberry industry, the cultivation of drug plants, and the development of vegetable-seed production. (BC, 1917, p. V 22).

Over the next 42 years, mentions of seed in these annual reports were regular and helped paint a picture of the trajectory of vegetable seed production in the province.

[13] Seed sourced from off-farm.
[14] The Steves farm is still in operation today and offering seed of some of the varieties present in the 1888 catalogue.

2.5.2 BC farmers take up the call increase vegetable seed production

The government plea to farmers across the country to grow vegetable seed to aid in wartime efforts reached the Grand Forks area of south-central BC via the July 2, 1915 issue of the *Grand Forks Sun*,[15]

> **Farmers and Gardeners Must Plan How to Supply for 1915**
>
> For three months after the outbreak of the war much anxiety was felt throughout North America as to supplies of field root and vegetable seeds that come principally from the warring countries of Europe. The field officers of the seed branch devoted much of this time to a study of the possibilities of creating a supply of Canadian grown seed for 1916 planting. It was advisable in the autumn to [s]elect [sic] and specially store any biennial roots to be transplanted this spring for seed production...Canadian farmers and gardeners should give this unstable situation their serious consideration. The soil and climatic conditions in different parts of Canada are equally favorable if not superior to those of Europe. The growing of these seeds in quantity for commerce has been limited in Canada by the higher price of labour and because few farmers have experience with biennial seed crops. (p. 6)

Vegetable seed production was encouraged throughout south-central BC over the next several years, with newspapers from Kelowna, Enderby, and Cranbrook publishing articles urging farmers to consider growing vegetable seed due to world shortages and high seed prices,

> During the past few months…a serious world seed shortage has developed and it is predicted that the shortage will be even more acute in 1919. The suitability of the climate

[15] The same article ran in the April 8, 1915 Montreal Gazette and the April 27, 1915 Winnipeg Free Press.

> of this province to the growing of seed has been recognized for some time but the prevailing high prices now paid for seed of all kinds are such as to make seed-growing a remunerative undertaking, even for the inexperienced. The wholesale seed houses have turned to British Columbia for a supply of seed for 1919 and 1920. (Kelowna Record, Feb. 28, 1918, p. 4)

South-central BC's hot dry summers, fertile soil, and abundant fresh water made the region ideal for vegetable seed production. When Dutch seed grower, W.A. van der Giessen, visited the region decades later, he praised Grand Forks as "the best area on the continent for growing seeds due to the weather and soil conditions" (Grand Forks Gazette, July 25, 1946, p. 1).

Grand Forks farmers took up the call and started experimenting with several vegetable seed crops (Glanville, 1994). The potential of building a local vegetable seed industry was particularly welcome in the former mining town of Grand Forks which was "on the way to being a ghost town after the smelter moved out, leaving its mountain of slag" (National Film Board, 1947, 8:09). Several local farmers, such as C.C. Heaven and C.A.S. Atwood, started growing seed crops and took a lead in encouraging and organizing local seed production (Glanville, 1994). Their names appeared frequently in Grand Forks newspapers in seed-related articles for the next 40 years.

By 1917, farmers in Grand Forks were growing seed crops of beet, bean, and squash with onion, carrot, mangel and lettuce seed added by 1919 (Glanville, 1994). The August 9, 1918 Grand Forks Sun reported that new seed threshing equipment was purchased for farmers in the Grand Forks area by the BC Seed Growers' Association and the March 21, 1919 issue of the Grand

Forks Sun reported that $50,000[16] of seed was grown in the Okanagan in 1918 with the accompanying note that "the government would give encouragement to this new industry, be promised" (p. 1). The March 28, 1919 Grand Forks Sun announced the formation of the Grand Forks Seed Growers' Association, indicating growing interest in seed production in the area.

BC Department of Agriculture annual reports and central-BC newspapers gave regular mention of the nascent vegetable seed sector during WWI. However, it remains unclear how significantly European seed imports were interrupted due to the war and to what degree BC farmers were able to make up any seed shortfalls during that time. No official crop or acreage values had yet appeared in BC Department of Agriculture annual reports or regional newspapers. What can be gleaned from sources at the time is that farmers in various regions were taking up vegetable seed production and BC Department of Agriculture annual reports, at the very least, were regularly reporting on vegetable seed growing activities across the province.

2.5.3 Continued growth of vegetable seed production in BC after WWI

BC Department of Agriculture annual reports from the early 1920s show continued interest in vegetable seed production in BC after the war. The 1925 annual report (BC, 1926) briefly reported on the sector and suggested that government assistance should be given to farmers for marketing their seed, while the 1927 annual report (BC, 1928) made specific mention of the important role farmers in central BC were playing in BC's vegetable seed production. The BC

[16] There is no record of these sales in BC Department of Agriculture annual reports.

Department of Agriculture annual report from 1936 (BC, 1937) references 1927 as having a vegetable seed crop value of $15,800.[17]

In the late 1920s and early 1930s, BC Department of Agriculture annual reports show continued growth in the vegetable seed sector with the 1929 annual report containing the first mention of the province's *area* in vegetable seed production,

> It is rather difficult to state definitely the present value of…vegetable-seed production in the Province [sic]. There has been a gradual increase in the acreage devoted to this work and the value of the product marketed. A conservative estimate would place the total acreage between 300 and 400 acres. (BC, 1930, p. I 22)

The 1930 BC Department of Agriculture annual report (BC, 1931) states that both federal and provincial governments are supporting seed growers by purchasing seed-cleaning machinery to be sent to a number of regions across the province for shared farmer use.[18] The BC Department of Agriculture annual report[19] for 1930 gives the first listing of vegetable seed production *quantities* in BC, showing the seed produced for 18 different crops at 197,000 lbs.

BC Department of Agriculture annual reports from the early 1930s continue to document the sector with intermittent crop figures, references to seed-cleaning equipment being sent to regions by the provincial government, and the need to prevent cross-pollination in crops as more acres of seed crops are planted. Seed production in the Grand Forks area was frequently mentioned in annual reports, highlighting the success farmers were having with vegetable seed production.

---

[17] $250,342 in 2021 dollars

[19] Only a portion of this report appears to have been scanned into electronic format and is thus greatly truncated.

The annual report for 1934 highlighted this success, which was leading to the need for pollination control for seed crops,

> The vegetable-seed industry is the bright spot in the agricultural industry of this district and is assuming greater importance each year. Approximately 25 acres of onion-seed bulbs were planted during the year…Growers are being urged to branch out into the production of carrot, radish, and other seeds, and to get away from too many onion varieties owing to the danger of cross-pollination. (BC, 1935, p. R 12)

With the presence of cross-pollinating seed crops increasing in BC, the government enacted the BC Seed-growers' Protection Act in 1935. The goal of the act was to "facilitate the growing of Pure Seed of Vegetable and Field Crops" (Government of British Columbia, 1935, p. 391), by establishing seed-control areas and "protecting the growing of seed within the seed-control area" (p. 393). The Grand Forks area established the first seed-control area under the Act in 1935 with Vernon and Okanagan Landing establishing seed-control areas in 1939. Other seed-control area may have been established, but none are mentioned in any subsequent BC Department of Agriculture annual report.

The BC Department of Agriculture annual report for 1936 gives the first record of vegetable seed crop values in BC at $62,315[20] for the 1935 growing season (BC, 1937). To put the value of the 1935 vegetable seed crop in perspective, the BC lettuce crop that year was worth $100,000; hothouse tomatoes were valued at $264,400; and wheat from the Peace River was valued at

[20] $1.23 million in 2021 dollars

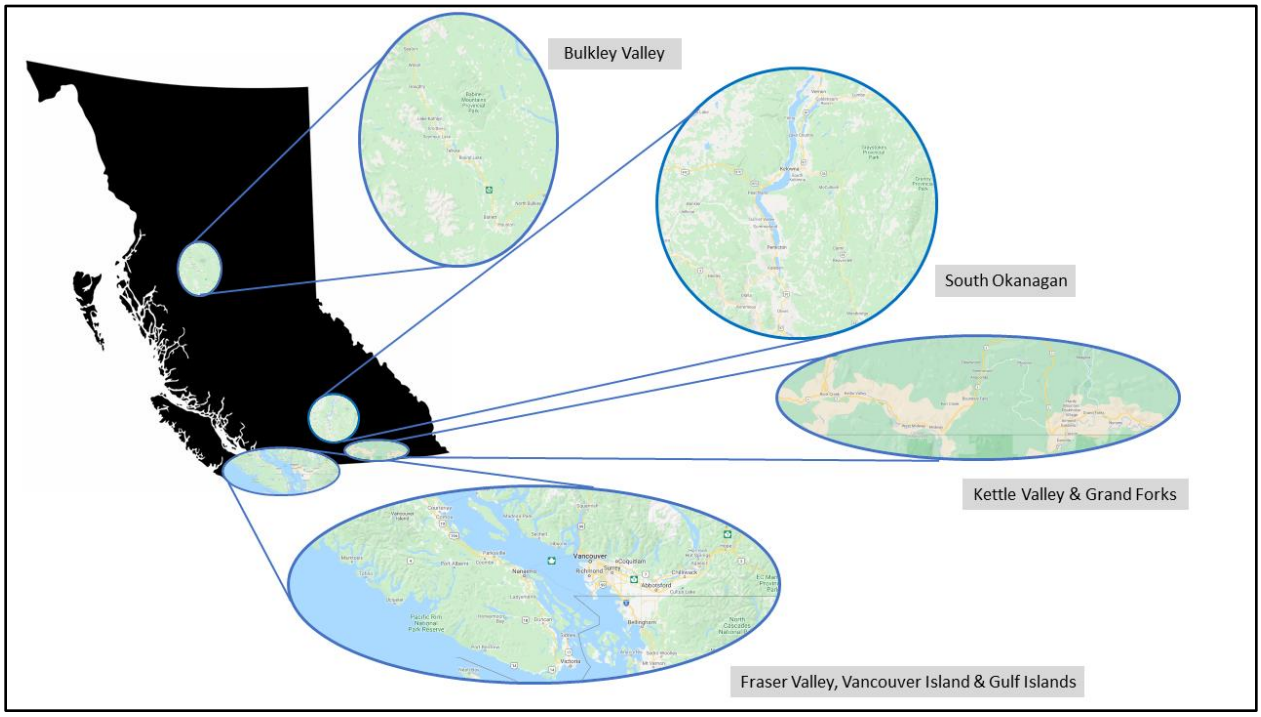
$445,000 (BC, 1936). The total value for agricultural products in BC for 1935 was $42.4 million (BC, 1937) with vegetable seed accounting for 0.15% of this value.

BC Department of Agriculture annual reports for 1937 and 1938 continue to report favourably on the state of vegetable seed production in the province and its promise for the future. The district agriculturist for Grand Forks reported in the 1937 annual report, "Your Agriculturist gives a considerable amount of time to the seed industry, as it is considered one of the most important in the Province" (BC, 1938, p. K 98).

From 1915 to 1938, the records show there was slow but steady growth in the vegetable seed sector in BC. Farmers across BC were having success growing over a dozen vegetable seed crops, with South-Central BC and the Lower Mainland receiving the most frequent mention in Department of Agriculture annual reports. Vegetable seed production also took place in the Bulkley Valley, and on Vancouver Island and the Gulf Islands, with farmers in each region growing the seed crops best suited to their climates. See map in figure 2-1.

After 23 years of vegetable seed production, seed growers were well organized and regularly attending seed production training events organized by the provincial government, the University of British Columbia and regional seed growers' associations across the province. The provincial and federal governments were supporting seed growers through shared equipment subsidies and the provincial government enacted the Seed-growers' Protection Act to help reduce the risk of cross-pollination of seed crops. The vegetable seed sector in BC was now well established, and this foundation put BC in a strong position to contribute to global vegetable seed shortages due to the onset of World War II in 1939.

Figure 2-1 Map of British Columbia highlighting major seed production regions[21]



2.6 Rapid growth in vegetable seed production during World War II

The onset of WWII in 1939 was the catalyst for substantial growth in BC's vegetable seed sector due to a reduction in seed production in Europe. The need to grow food in Europe displaced many seed crops (Edler, 1948), meaning European countries themselves would now need to import more seed and Canada would need to grow more of its own supply. The BC Department of Agriculture annual report for 1939 expressed concern over future vegetable seed supplies,

[21] Silhouette map from: https://cdn1.vectorstock.com/i/1000x1000/27/35/british-columbia-province-dark-silhouette-map-vector-32292735.jpg. Regional map sections from: www.google.com/maps

> In some lines it was found that stocks in hand or on order will be adequate for the 1940 and 1941 requirements, but there are definite indications of scarcity of seeds of carrots, beets, parsnips, turnips, cabbage, cauliflower, peas, lettuce, spinach, and several other biennial and annual crops; that is, shortages are indicated, providing present war conditions continue to exist for two years or longer. (BC, 1940, p. B 15)

The BC Department of Agriculture annual report for 1940 announced the appointment of a provincial vegetable-seed field inspector whose role was described as, "In addition to extension and inspection work a certain amount of his time is devoted to studying certain problems directly affecting the industry" (BC, 1941, p. H 35). Annual reports over the next decade included detailed province-wide seed production reports from the inspector and comments on the viability of the sector in the long-term, beyond the war-time boom. The need to produce seed for export to Britain[22] is also mentioned throughout the annual report for 1940 which listed the value of the 1939 BC vegetable seed crop at $72,130.[23]

BC Department of Agriculture annual reports over the next several years show substantial increases in vegetable seed crop values in BC. The 1940 seed crop value was $153,068;[24] the 1941 seed crop value was $456,266;[25] the 1942 seed crop value was $565,885;[26] and the 1943 seed crop value was $920,722[27] – more than 12 times the provincial seed crop value in 1939. The

[22] At the time, Canada's ties to Britain were still very strong and contributing to war efforts was framed as supporting the "Dominion", as the British Commonwealth was then called.
[23] $1.35 million in 2021 dollars
[24] $2.73 million in 2021 dollars
[25] $7.57 million in 2021 dollars
[26] $9.07 million in 2021 dollars
[27] $14.43 million in 2021 dollars

regional update from Grand Forks in the annual report for 1943 showed the region had vegetable seed crops growing on 908 acres, a six-fold increase from 1941 (BC, 1944).

In 1944 the Grand Forks Gazette appears again in the electronic archives and the frequency of seed-related articles demonstrated showed how important the vegetable seed industry had become to the region. The May 18, 1944 issue reported on challenges with the storage of carrot and onion roots and the June 29, 1944 issue of the highlighted the organization of a local field day to celebrate the success of local seed production,

> It is believed the occasion will be a very pleasant surprise to many, as it is not quite generally known to just what extent the valley has gone into seed and other agricultural developments...The field day is being sponsored jointly by the Board of Trade and the Seed Growers of the valley. (p. 1)

The field day would later be rebranded the Seed Blossom Carnival and become a popular annual event in Grand Forks.

July through September issues of the 1944 Grand Forks Gazette gave updates on the season's seed crop progress, including dealing with downy mildew in the onion seed crop, a report on the resounding success of the first annual field day held in July, and the tragic loss of George Haffner's thumb while threshing radish seed. November 1944 issues of the Grand Forks Gazette discussed shipments of seed to Vancouver and of the local school selling parsnip seed as a fundraiser. Many issues of the Gazette throughout 1944 and in subsequent years made mention of local farmers coming and going to seed production training events throughout BC. It is clear from newspaper articles how important seed production was to this former mining town.

By 1945, the value of BC's vegetable seed crop had grown 20-fold since 1939, with the Department of Agriculture annual report projecting a seed crop value of $1.3 million for the year. But 1945 also marked the last year of WWII, and that year's annual report hinted at the impact the end of the war would have on the continued viability of the vegetable seed sector, due primarily to the cancelling of all seed contracts for export to England,

> In vegetable-seed production the outlook does not look as hopeful as it did during war years. However, the seed-growers have firmly established their industry and are looking to the rest of Canada as a satisfactory and growing market for their product. (BC, 1946, p. V 26)

The BC Department of Agriculture annual report for 1945 contained the most comprehensive report for BC's seed sector to date, detailing the production of 3.4 million pounds of seed from 29 crops – representing 75% of Canadian vegetable seed production (BC, 1946). The summary of the Grand Forks area in the 1945 annual report demonstrated the importance of that region for BC seed production. The Grand Forks area was responsible for 91% of BC's carrot seed production; 75% of BC's parsnip seed production; 74% of BC's lettuce seed production; 59% of BC's onion seed production; and 43% of BC's radish seed production on 1033 acres spread over 158 farms in 1945 (BC, 1946).

After experiencing substantial growth over the previous six years, 1945 would be the highest reported value for vegetable seed sales in BC in history, even up to the present day. The sales estimate of $1.3 million reported in the 1945 annual report would be adjusted to $1.48[28] million

[28] $22.94 million in 2021 dollars

in the 1946 annual report (BC, 1947) and account for 1.43% of the total agricultural value for BC – up from 0.15% in 1935.

Despite referencing the seed sector in BC as "firmly established", the annual report for 1945 goes on to detail multiple concerns for the future of the sector due to growing competition from other countries, the rapid recovery of the European seed sector, a steep devaluing of European currencies, and seed import restrictions in Britain (BC, 1946). For the next three years, the seed sector in BC would experience a rapid decline.

2.7 Rapid decline in vegetable seed production after World War II

Although still seven months before the end of WWII, the February 15, 1945 issue of the Grand Forks Gazette offered some foreshadowing to the decline of the seed sector to come, with a plea to the region's farmers to grow crops for the local vegetable cannery,

> Cannery officials feel that the operation of a cannery is a definite boon to the farmers of the valley, particularly in the years to come when the seed business takes a dive from its war time boom, and that it should be given consideration by the growers now to ensure that it is here when they need it most. (p. 1)

This plea was followed up by at least two more from the cannery in March issues of the Grand Forks Gazette, including on March 22, 1945, stating, "with the liberated countries of Europe getting back into production in the next year seed prices will drop and it will be more profitable to grow cannery crops" (p. 1).

The 1946 BC Department of Agriculture annual report addressed the imminent decline in the vegetable seed sector in British Columbia, reporting on the canceling of some federal seed

production subsidies, the ongoing closure of British markets to seed imports, and of American seed firms dumping low-priced seed into Canada (BC, 1947). But the 1946 report also continues to convey optimism about an ongoing vegetable seed sector for BC and that, "it is confidently expected that seed production in this province will remain an important branch of the agricultural industry for years to come" (BC, 1947, p. W 12).

The 1947 BC Department of Agriculture annual report listed the 1946 crop value at just over $1 million[29] (BC, 1948), a 32% decline from 1945, and by 1948 the seed crop value had declined to $300,000[30] (BC, 1949) – nearly one-fifth of the provincial vegetable seed crop's peak value in 1945. Despite positive comments about maintaining the vegetable seed sector in the last three annual reports, declining annual seed crop values were showing the opposite to be true. In his 1947 seed report, provincial vegetable-seed field inspector, J.L. Webster, explained in detail the trajectory of the vegetable seed sector in BC due to the conditions of WWII,

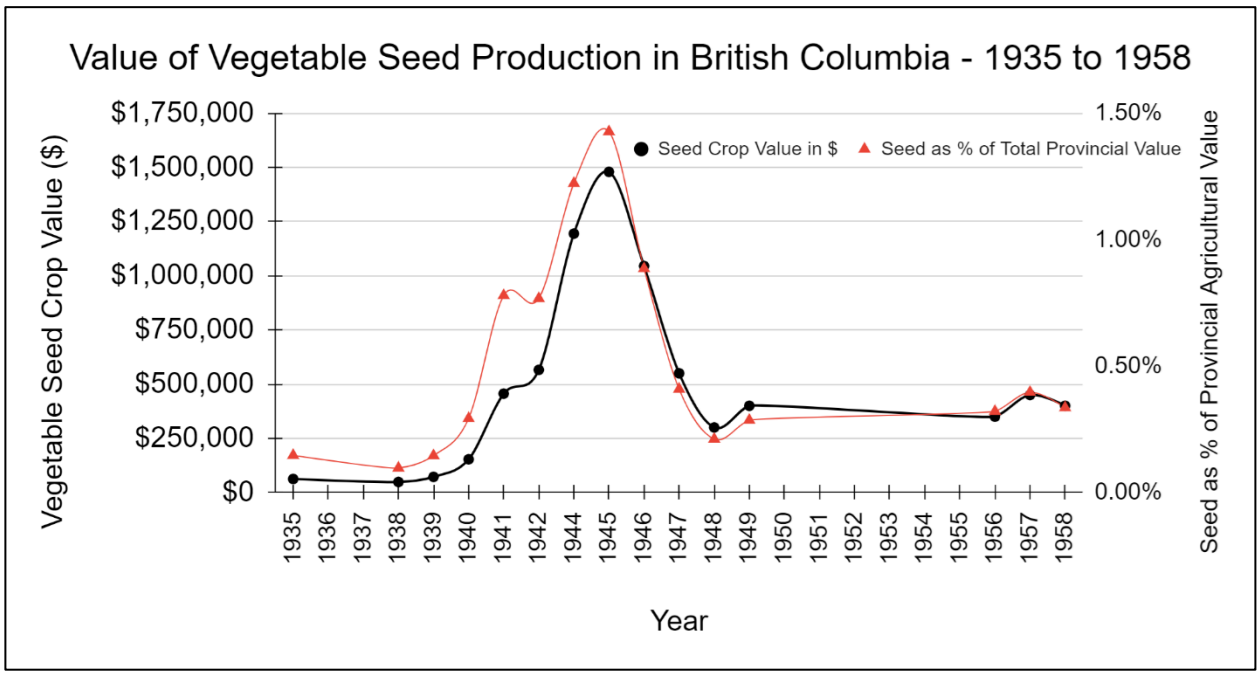
> During the war there had been a tremendous demand for seed at high prices from the United Kingdom and from all allied countries because of the cutting-off of normal supplies from Europe…Prices of seed rose to as high as three times that prevailing before the war, and [BC] farmer-growers were given contracts for large acreages at the very profitable prices…Toward the end of 1946…the United Kingdom refused to allow the importation of further Canadian seed because of her desire to conserve British dollars for the purchase of other more needed supplies…prices on most kinds of vegetable-seeds are…now much lower and almost back to their pre-war level. At the same time the cost of production has increased…and there is…little incentive for many farmers to continue

[29] $15.52 million in 2021 dollars.
[30] $3.59 million in 2021 dollars.

> producing…Many former seed-growers are dropping out and resuming the growing of other types of crops. (BC, 1948, p. R 67)

From 1949 through 1958, seed crop values are only presented intermittently in BC Department of Agriculture annual reports and are consistently in the $300,000 to $400,000 range – much higher than pre-war levels but apparently not enough to sustain the sector. 1955 was the last annual report with a sector summary by the vegetable-seed field inspector appointed in 1940 (BC, 1956), and the 1958 annual report is the last one in which vegetable seed production is mentioned (BC, 1959). Figure 2-2 shows the dollar value, and the percent of total provincial agricultural value, of BC's vegetable seed crop from 1935 to 1958.

Figure 2-2 Vegetable seed crop values in BC from 1935 to 1958



Grand Forks Gazette issues through the early 1950s continued to report positively on the sector, but 1956 marked the last year of the area's annual Seed Blossom Carnival and the end of an era of vegetable seed production in Grand Forks. Glanville (1994) in his historical piece on seed production in the Grand Forks area for BC Historical News noted, "the halcyon days of the forties were on the wane and by 1955 the lowly potato once again became the favorite crop of many of the former seed growers" (p. 17). Seed production is likely to have continued, at some scale, past 1958 in Grand Forks and in other regions across BC, but a lack of reporting makes it impossible to know what did occur and on what timeline. The now-redundant provincial Seedgrowers' Protection Act, enacted in 1935 to support the sector, was repealed by the BC provincial government in 2003 (BC Laws, 2011).

2.8 Lessons from the past

The growth and decline of vegetable seed production in BC from 1915 to 1958 offers lessons for modern efforts at seed production in BC. This review of historical newspaper and BC Department of Agriculture annual reports highlights five primary themes:

1. BC's climate was suitable for producing a wide range of vegetable seed crops; the warm, dry summers in many regions were ideal for maturing and drying down seed crops. Most seed crop issues reported were not from the field, but rather with problems in the winter storage of biennial bulbs and roots for planting the following season.
2. The growth of the vegetable seed sector in BC from 1915 to 1938 was fostered by infrastructure, training, and regulatory support from provincial and federal governments as well as provincial and national seed growers' associations. This support set a solid

foundation that supported farmers' ability to quickly meet increased demand at the onset of WWII, demonstrating the value of a proactive approach to supporting local agriculture systems. Had such sector development not taken place prior to WWII, the outcome may not have been so favourable.

3. Vegetable seed production took place at a small-scale. In 1941, there were 59 farms growing 150 acres of seed in the Grand Forks area – averaging 2.5 acres per farm. In 1943, 99 Grand Forks farms averaged 8.3 acres of seed production per farm; and in 1945, 158 Grand Forks farms averaged 6.5 acres of seed production per farm.
4. Farmers demonstrated the ability to pivot in and out of seed crop production. The supports mentioned above would have been important for quick farmer uptake of seed production. After a steep drop in the market price for vegetable seed after WWII, farmers were able to pivot to other crops, such as potatoes or crops for the Grand Forks cannery.
5. The seed sector has long been global in scope. The growth and decline of the sector in BC from 1915 to 1958 was largely determined by global market forces. The seed BC produced was important for supporting allied war efforts, but Europe was quick to reestablish the sector after the war.

Global instability from 1915 to 1945 resulted in compromised seed security for BC vegetable farmers, who relied on seed imports from Europe. After WWI prompted BC farmers to start growing vegetable seed in 1915, the vegetable seed sector in BC experienced slow but steady growth until 1938. During this time, farmers demonstrated that vegetable seed production was feasible in several regions and climates across BC. Training, marketing, and infrastructure supports helped farmers transition into seed production and created the foundation for a strong

sector. The onset of WWII resulted in rapid growth in the sector from 1939 to 1945, with farmers entering the market when seed prices were three times their pre-war value. Despite well-established supports for BC seed growers, the drop in vegetable seed's market value and a reduction in access to European markets after the war prompted farmers to abandon vegetable seed for other crops. After decades of development, market forces ultimately sealed the fate of the sector and BC Department of Agriculture annual reports' mention of vegetable seed production ended in 1958.

1990 would mark a resurgence of vegetable seed production in BC with the birth of Canada's first *Seedy Saturday* event. The time between 1958 and 1990 marked significant changes in the global state of seed, which helped set the tone for a new age of vegetable seed growing in BC. Supply chain disruptions from 2019 to 2021 were a reminder that seed supply chains are still vulnerable to disruption and BC farmers would benefit from being prepared to increase the local seed supply on short notice.

3 Constraints to Seed Sovereignty for Organic Vegetable Farmers in British Columbia

3.1 Introduction

The nature of seed as a commodity is unique in that seed is readily and easily reproducible by farmers. Traditionally, farmers would save a portion of each season's crop to serve as the following year's seed, resulting in crops that became better adapted to an individual farm's unique growing conditions (Navazio, 2012; La Via Campesina, 2013). It is only recently in agricultural history that seed has been primarily an off-farm input – supplied by regional, national, and international seed companies (Fitzgerald, 1993; Howard, 2015).

Changes in seed technology and legal protections applied to seed over the past 100 years have seen seed shift from being a common good to an increasingly private commodity. This process started with the appropriation of seed genetic resources by colonial powers, then continued with means of implied "ownership" over seed – first through biological means, then evolving to include legal protection through modern intellectual property mechanisms. These mechanisms of seed protection have enabled a concentration of seed ownership, resulting in increased control over seed by global seed companies and a loss of seed rights for farmers, amounting to an increasing enclosure of seed (Howard, 2015; Montenegro de Wit, 2017; Lyon et al., 2021).

Canada, as a country, has in many ways been defined by seed due its long history with wheat as both a colonial tool of land accumulation and as one of the world's first exporters of wheat as a commodity crop (Friedmann, 2006; Magnan, 2012). Canada also has a long, yet intermittent,

history with vegetable seed – with much of its past and present commercial vegetable seed production happening in British Columbia (BC). Both vegetable seed and grain seed have been affected by global changes in seed policy over the past 100 years, albeit in different ways.

This chapter first documents the key events and policies which have facilitated the increasing enclosure of seed on a global scale. It then focuses on the regional impact of global seed policy on vegetable seed and the implications on seed access for organic vegetable farmers in BC. I focus on the concept of seed sovereignty as a direct response to the enclosure of seed and on the constraints that compromise seed security for BC's organic vegetable farmers. I then explore the opportunities that may exist to mitigate the impacts of those constraints, and how the actions of organic vegetable farmers and seed growers in BC might contribute to global efforts towards seed sovereignty.

3.2 The changing state of seed – from common good to private commodity

3.2.1 The appropriation of seed genetic resources

Seed from cultures the world over has long been subject to appropriation by global colonial powers. Termed *biopiracy* (Mooney, 1993; 2000), the appropriation of seed genetic resources and traditional knowledge is as old as colonialism itself, with European explorers often returning home with plants and seeds of interest from their global explorations. In modern times, biopiracy extends beyond the simple collection of plants and seeds, with derivatives of the appropriated organisms frequently receiving intellectual property (IP) protections – offering economic protection for the appropriating party with little to no benefit returning to the region of origin (Oldham, 2006). Worldwide, the movement of genetic resources, and the resulting financial and

social benefits, has primarily flowed from the developing world to the developed world in support of a global neoliberal economic agenda. Fredricksson (2006) explains,

> The social system that spawned western law and the property regime it supports, has come to dominate the world through colonialism and subsequent neoliberal globalization. Viewed in such a historical context, bioprospecting can thus be seen as an enduring (neo)colonialist practice where a globalized property regime takes precedence over local property systems, just like the law upheld by the colonial state takes precedence over customary rights. (p. 13)

Developed and stewarded by food growers over hundreds of generations, appropriated seed makes up the foundation of many modern crops. Crabb (1947) describes the importance of this stewardship with corn,

> Had North and South American Indians neglected to plant, hoe, and harvest corn and at the same time discarded their reserve supplies of seed during any one of the thousands of years they preserved it, the maize as we know it would have disappeared from the earth, for there is not a single recorded instance of corn having ever survived in the wild. (p. 5)

Corn is a particularly important crop in the history of modern seed. An appropriated crop grown on appropriated land throughout North America, corn was the primary crop that marked the beginning of the privatization of seed.

International measures have been taken to address the imbalance in the flow of plant germplasm between nations, including the *Convention on Biological Diversity*, the *International Treaty on Plant Genetic Resources for Food and Agriculture* (ITPGRFA, 2009), which includes farmers'

rights to save and sell seed, and the *Nagoya Protocol on Access and Benefit Sharing*[31], the objective of which is "the fair and equitable sharing of the benefits arising from the utilization of genetic resources" (United Nations, 2011, p. 4). However, conflicts with international seed and trade regulations have weakened the effectiveness of such benefit-sharing efforts (Christinck & Tvedt, 2015; Kotschi & Horneburg, 2018; Golay & Bessa, 2019). Instead, germplasm often makes it way back into its country of origin in the commodified form of a new crop variety, coupled with intellectual property protections that often restrict further propagation of the seed for local use (Ewens, 2000).

3.2.2 Traditional farm-saved seed and the role of seed companies

Modern seed companies date back to at least the early 1600s (Formiga, 2010). The historic role of seed companies was not so much as a primary seed supplier to farms, but rather as a source of new, specialty, or hard-to-find varieties, that farmers could then continue to propagate on their own farms (Navazio, 2012). As Kloppenburg (2005) explains, the reproductive nature of seed made it difficult for seed companies to thrive, "the very reproducibility of seed made the farmer the commercial seed company's prime competitor and constrained private investment in plant improvement" (from preface). In this regard, seed was a common good – with no legal protections – that farmers could freely grow, save, sow, and share.

[31] Full title: "Nagoya protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization to the convention on biological diversity"

The one mechanism seed companies did have to protect their seed was through quality assurance and the maintenance of high-quality stockseed. Organic plant breeder, John Navazio, explains the importance of stockseed for a seed company's success,

> The term stockseed is a quality designation. Stockseed implies that the seed used by reputable commercial seed growers to produce a seed crop has in fact had more scrutiny and care in its development than the more common production seed that is sold to the farmer. The ability to maintain varietal integrity and trueness to type within any variety has become the hallmark of the seed companies that earn the respect of farmers and in turn earns their longtime loyalty as customers. (Navazio, 2012, p. 364)

The introduction of hybrid corn in 1921 changed the nature of the seed industry across the globe and started the path towards the enclosure of seed.

3.2.3 The hybridization of seed

The development of hybrid corn in the United States (US) in the late 1800s and early 1900s was a biological marvel. The vigour, uniformity, and pest resistance of hybrid corn resulted in rapid farmer adoption after years of stagnant yield growth in corn in the US (Crabb, 1947). But the nature of hybrid seed is that it cannot be saved by farmers and retain its desirable characteristics in subsequent generations, compelling farmers to purchase seed anew each year (Navazio, 2012).

Developed by public universities in the US and then brought to market by private companies, one of the original visions of hybrid seed by breeders was to support farmers producing their own hybrids (Crabb, 1947). But the economic opportunities to be realized through annual sales of corn seed to farmers were too enticing for US seed companies, new and old, to pass up,

> As soon as corn farmers accepted the fact they could neither select seed from their own fields nor profitably maintain the breeding plots necessary to producing their own hybrid seed corn, the way had been opened to building the new hybrid seed corn industry. (Crabb, 1947, p. 267)

Between 1940 and 1950, seed company revenues tripled in the United States and by 1965 more than 95% of corn acres in the US were planted to hybrids (Kloppenburg, 2005). The success of hybrid corn[32] prompted the development of hybrids in other crops allowing hybrid seed to become a major global industry worth $25.2 billion in 2016, and expected to reach $34.9 billion by 2026 (MarketsandMarkets, 2021).

Hybrid corn offered a biological means of protecting the economic interests of seed companies and the decades following its success saw an expansion from the biological protection of seed to legal protection mechanisms for seed.

3.2.4 International Convention for the Protection of New Varieties of Plants

In 1961 the *International Convention for the Protection of New Varieties of Plants* (UPOV Convention) came into effect – the first legal mechanism to provide intellectual property protection to seeds. The goal of the UPOV Convention was to protect the economic interests of plant breeders. Breeding new plant varieties is an expensive and time-consuming process and the UPOV Convention helped protect the investments made by plant breeders and plant breeding companies in creating new varieties. The original Convention allowed farmers to save and resow

[32] As a note, some hybrid corn seed was grown in Canada during the vegetable seed era of 1915 to 1958, but I found no record of it being grown in BC.

seeds from UPOV-protected varieties on their own farms and further allowed farmers and breeders to use UPOV-protected varieties for breeding new varieties.

While the goal of UPOV is to promote variety development and prevent the unauthorized marketing of protected varieties, amendments to the Convention in 1991 (UPOV 91) placed stronger, though optional for each Contracting Party to the Convention, restrictions on farm-saved seed with UPOV-protected status. Breeding from UPOV-protected varieties continued to be allowed in UPOV 91.

3.2.5 Plant patents

A more recent mechanism to protect crop varieties is through plant and utility patents. Plant patents are primarily issued in the United States and Europe and only apply to varieties marketed in those regions. Although the United States has allowed plant patents since 1930 for *asexually propagated* plants, it was not until 2001 that patents had been effectively applied to *seeds* directly (Hubbard, 2013).

Patents have stronger protection mechanisms than UPOV-protected varieties and can more easily prohibit the saving and reusing of seeds as well as prohibit the breeding of new varieties from patented varieties (Luby et al., 2015). Plant patents are not currently issued in Canada, but the allowing of patents on genes and gene sequences found in plants are allowed (Kuyek, 2007) – amounting to a de facto patent on plants, such as Canadian patent # CA 3062016 for Canola Variety 17GG1228L (Canadian Intellectual Property Office, 2019).

3.2.6 Seed licensing

With the increasing frequency of seed biotechnology in the late 1990s came another way to protect seed from farmer reuse: seed licensing, explained by Winston (2008),

> No longer is seed sold. Instead, seed is licensed and protected through an extensive private ordering system that does not rely on the Patent Act...Private ordering has allowed agricultural innovators to control the market, to affect seed prices, and to develop new varieties, without having to patent their seed. (p. 323)

Seed licensing is an effective means of protecting seed because at no time is the farmer who is licensing the use of the seed the actual owner of the seed. Some vegetable seeds come with a "bag-tag" licensing agreement on the package, stating that opening the package is an agreement to the conditions stated, including not saving the seed produced by the crop for further use (Winston 2008; Dillon, 2010; Luby & Goldman, 2016). Licensing is often coupled with patents to strengthen the protection on seed (see J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred International, 2001).

In summary, the appropriation of crop genetics has been coupled with biological and legal intellectual property (IP) protection mechanisms to protect the investments of modern seed companies while disregarding the investments made by farmers and their communities over hundreds of generations. These seed protection mechanisms have helped facilitate concentrated corporate ownership over seed genetic resources.

3.2.7 Concentrated ownership in the seed sector

The seed sector has long been global in scope and had characteristics of concentrated power in one form or another (e.g., economies of scale; maintenance of stockseed), but the 21st century has seen an unprecedented consolidation of ownership among global seed companies. Howard (2015) asserts as recently as the 1970s there were thousands of small-scale seed companies serving farmers, but now just four companies account for 67% of global seeds sales to the amount of $26.5 billion[33] (US) in annual revenue (Mooney, 2018). Such concentration is a concern as "when four or fewer firms [C4] control 40 percent or more of an industry's market, that sector loses characteristics of a competitive market." (Hendrickson & James, 2005, p. 271). According to the ETC Group (2013),

> Whenever four or fewer enterprises control 50% or more of sales in a given sector, a de facto cartel exists and competition suffers…In food and agriculture, the four-firm market share should never exceed 25% and a single firm's share should never rise above 10%. There should be no exclusive monopoly [on] intellectual property exercised over vital agricultural resources including plant and animal genetic resources. (p. 31)

The concentration of power in seed control globally has given seed companies significant control over seed prices (MacDonald, 2017; Elsheikh & Ayazi, 2018), varietal availability (Shiva et al., 2012) and terms of use on seed (Winston, 2008) which affects farmers' and plant breeders' access to breeding material (Luby et al., 2015; Shelton & Tracy, 2017); reduces farmers' access to crop varieties (Howard, 2015; Kloppenburg, 2014); and jeopardizes farmers' long-held

[33] Larger figures than this have been cited though such figures usually include the agrochemical sales of these companies as well.

practice of saving and replanting seed (Philips, 2016; National Farmers Union, 2018; Golay & Bessa, 2019). The reduction in available germplasm for planting and breeding also makes it more difficult for farmers to develop regionally appropriate varieties and concentrates much decision-making power of the collective food system into the hands of corporations. This is of particular concern to organic and peasant farmers who have seed requirements distinct from those of conventional growers (Steiner, 2008; Lammerts van Bueren et al., 2011; Hoagland et al., 2015) and may be more vulnerable than conventional growers to the changing global seed market. With many modern varieties being developed for high-input farming systems, low-input peasant and organic farming systems can have a hard time benefiting from these varieties while maintaining low-input farming practices (Murphy et al., 2004; Lammerts van Bueren et al., 2011).

Modern intellectual property mechanisms have allowed agricultural corporations to privatize and control seed genetic resources, perpetuating "the appropriation of that which is shared and its transformation into an exclusive, commodified form" (Kloppenburg, 2008, p. 11). This enclosure of seed has been a means of accumulation by dispossession by corporate seed companies (Wattnem, 2016) – separating farmers from seed, the primary means of production on a farm.

The enclosure of seed has sparked a power struggle over the control of seed between global seed companies and farmers around the world who, for hundreds of generations, have bred and stewarded the crops which form the foundation of modern agriculture – yet now have limited access to those genetic resources. Efforts in both developing and developed nations have mobilized to challenge the consolidation of seed genetic resources, and the international regulations that favour this concentration of power, through encouraging and employing principles of seed sovereignty. The struggle for seed sovereignty originated through the efforts of

peasant framers in less-developed countries and has been taken up in many different forms by farmers of all scales the world over (Peschard & Randeira, 2020).

3.3 Reclaiming farmer seed sovereignty

3.3.1 Food sovereignty and the roots of seed sovereignty

The global response to the increasing privatization of seed, often framed as *seed sovereignty*, grew greatly out of the food sovereignty movement, catalyzed by La Via Campesina – a global network of organizations which work to mobilize and empower peasant and family farmers, rural workers, and others to promote social justice and oppose the neoliberal agriculture system and its commodification of agricultural resources (La Via Campesina, n.d.). The founding of La Via Campesina and the development of the principles of food sovereignty were a direct response to the growing neoliberal influence on global food systems and its impact on ecosystems and communities around the world (Wiebe, 2017). A definition of food sovereignty was established at the 2007 Nyéléni forum in Sélingué, Mali,

> the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. (Nyeleni, 2007, p.1)

Particularly important in this definition is peoples' democratic right to define their own food system, including how and where food is grown (Food Secure Canada, 2011), shifting such decisions away from the exclusive realm of government and private businesses. In this regard,

the idea of food sovereignty was addressing a weakness in the then-common term "food security",

> The conventional term of "food security" was inadequate. This was about more than producing more food or distributing it more efficiently. We were grappling with fundamental questions of power and democracy: Who controls food producing resources such as land, water, seeds and genetics and for what purposes? Who gets to decide what is grown, how and where it is grown and for whom? We needed to have language that expressed the political dimensions of our struggle. Food Sovereignty is such a term. It provokes the necessary discourse about power, freedom, democracy, equality, justice, sustainability and culture. Food is taken out of the realm of being primarily a market commodity and re-embedded in the social, ecological, cultural and local contexts as a source of nutrition, livelihood, meaning and relationships. (Wiebe, 2017, p. 6)

Complementing the definition of food sovereignty are six *principles* of food sovereignty, to which Food Secure Canada (2011), in adopting these principles, added a seventh to recognize the importance of Indigenous food systems in Canada (p. 10),

1. Focuses on food for people
2. Values food providers
3. Localizes food systems
4. Puts control locally
5. Builds knowledge and skills
6. Works with nature
7. Recognizes that food is sacred

These principles recognize the peoples and the places of food and aim to re-establish food as a public good (FSC, 2011; Lammerts van Bueren et al., 2018). Seed is inseparable from food (Shiva et al., 2012; Peschard & Randeria, 2020) and the principles of food sovereignty, as well as consumer and farmer values around food, apply just as well to seeds.

Complementing the work of La Via Campesina is the work of Navdanya, based in India, which frames the fight against ongoing genetic appropriation and seed privatization as "Seed Freedom" or, "the...right of every farmer and food producer...to save, exchange, evolve, breed, sell seed" (Shiva et al., 2012, p. 324). Like La Via Campesina the work of Navdanya is driven by the need to counter the increasing privatization and corporatization of seed.

3.3.2 Seed sovereignty and seed security

Building on the food sovereignty work of La Via Campesina and the seed *freedom* work of Navdanya, Kloppenburg (2014), proposes "four principal and constitutive dimensions of seed sovereignty" (p. 10) which facilitate seed sovereignty while recognizing the importance of "geo-social positioning" (p. 15),

1. The right to save and replant seed
2. The right to share seed
3. The right to use seed to breed new varieties
4. The right to participate in shaping policies for seed

Kloppenburg's dimensions of seed sovereignty, framed as rights, help determine if the policy environment is conducive to facilitating seed sovereignty. However, achieving seed sovereignty also requires action on the part of farmers. Wenar (2015) asserts, "A rightholder may be permitted to perform or not perform some action, but this still does not mean that she is capable of performing the action that she is free to perform" (n.p.). Thus, one must be able, and choose, to exercise their rights, or exercise their *agency*, as a seed grower or potential seed grower, to contribute to efforts at achieving seed sovereignty.

In her study on food sovereignty in American Indian community gardening, Hoover (2017) emphasizes the importance of being able to feed yourself, as a community, to consider yourself food sovereign. In other words, even if all the rights exist, one cannot realize sovereignty without the required actions – or without exercising agency. There must be intentional action to achieve sovereignty - "a process, a method, and a goal" (Hoover, 2017, p. 62).

Fitzgerald (1993) saw the introduction of hybrid corn as an agent of deskilling due to farmers ceasing traditional seed saving practices and a loss of agency in how farmers acquire planting seed. Increasingly technical crop breeding techniques have further reduced farmer agency in seed choices in that farmers may have the agency to choose whatever seed they want from what is available, but they have no choice on what seed makes it to the market (Marshal et al., 2021).

The combination of rights and exercising agency to realize change form the basis for realizing seed sovereignty, which requires farmers' and citizens' democratic participation in shaping the seed system. Such efforts represent opposition to the increasing privatization of seed, but limitations imposed by seed policy or intellectual property protection can be dissuasive to taking action. Just the risk of facing patent claims from corporate seed companies has caused plant breeders in the United States to abandon breeding projects (Luby et al., 2015) and BC small-scale seed growers are regularly discussing the challenges of choosing which crop varieties to grow to avoid the risk of legal action. Thus, increased seed sovereignty may increase farmers' right to use seed and bring greater agency to their decision regarding the purchasing, growing, sharing, and breeding of seed, but this does not necessarily equate to seed self-sufficiency or an absolute right that applies to all seeds all the time. Increased seed sovereignty may still come with limitations around how farmers use and share seed.

3.3.3 The continuums of seed sovereignty and seed security

Given that farmer rights around seed may be different based on the political environment in which they farm, their financial means, and whether they want to save seed for their own use or save seed to sell, it is helpful to look at sovereignty as a continuum. In this way, instead of determining whether a farmer or a community or a nation is simply seed sovereign or not, we can explore the *ways* in which they are seed sovereign. Identifying the factors involved in supporting or constraining seed sovereignty can be useful for effectively building capacity around localized seed production.

A similar continuum exists for seed security in that there can be ways in a which a farm or community is seed secure and ways in which they are not. A farm which grows at least a portion of its own seed would be more secure in that seed should there be supply chain or other disruptions to off-farm seed sources, while having multiple seed suppliers to choose from would make a farm more seed secure than one that relied on a single supplier.

3.3.4 Framing seed sovereignty efforts in more developed nations

With this research taking place in Canada, understanding how seed sovereignty manifests in similar regions can help put the Canadian situation in context.

Europe

In Europe the requirements for marketing seed have become increasingly strict due to a "synergistic" relationship between the UPOV Convention and the EU "Common Catalogue" (Golay & Bessa, 2019). Crop varieties must be listed in the EU Common Catalogue to be eligible for marketing in Europe and must further meet UPOV standards for distinctness, uniformity and

stability (DUS) (Renaud & Lammerts van Bueren, 2016). However, such seed requirements often do not work for European peasant farmers, who can benefit from the regional adaptation and genetic diversity of more variable landraces (Golay & Bessa, 2019). The interplay between the common catalogue and the UPOV Convention makes it difficult for these farmers to market and purchase more diverse, "less-distinct" cultivars.

The tightening of restrictions on seed in Europe has prompted several movements in Europe, including efforts at participatory plant breeding where researchers work directly with farmers to breed new varieties based on regional farmer needs (Lammerts van Bueren et al., 2011). However, such varieties maybe difficult to register in Europe if they do not meet DUS requirements. (Lammerts van Bueren et al., 2011). Europe is also home to efforts at developing open-source seed licences, which allows for the free use of seed for breeding new varieties, as long as the same rights are applied to derivatives of such seed. The open-source model ensures the seed maintains its status as a common good and cannot be privatized or limit future breeding (Kotschi & Horneburg, 2018).

The European Union itself is a member of UPOV and many EU members countries are individual members of UPOV.

United States

Seed sovereignty movements in the United States are similar to those in Europe with efforts in both participatory research and open-source seed. In 2010, the United States Department of Agriculture (USDA) funded the *Northern Organic Vegetable Improvement Collaborative* (NOVIC) to identify existing varieties best suited for organic farms in Oregon, Washington,

Wisconsin and New York. The project is still active with the cooperation of Oregon State University, University of Wisconsin-Madison, Cornell University, Washington State University, Organic Seed Alliance, and the USDA along with 22 organic farms in 3 states (eOrganic, 2019). NOVIC inspired the launch of participatory variety trials in British Columbia in 2016, the *BC Seed Trials*, which led to the Canadian Organic Vegetable Improvement Project (CANOVI) which was launched in 2019.

The *Open Source Seed Initiative* (OSSI), made up of plant breeders and seed growers, "engages in education and outreach that promotes sharing rather than restricting access to plant germplasm" (OSSI, 2016, n.p.). OSSI's approach to seed acknowledges "the twin principles of farmers' right to save and replant seed and to open access to material for breeding purposes." (Kloppenburg, 2014, p.3), while also recognizing the importance of financial compensation for public and private plant breeders and how this may conflict with the seed sovereignty efforts of allies in less-developed nations,

> If OSSI has ambitions to contribute to a social movement rather than supporting a mere development methodology, it needs to understand how its approach is compatible with or diverges from the positions and perspectives of its projected movement allies. (Kloppenburg, 2014, p.9)

While OSSI recognizes the commodity nature of seed, the organization does not position seed *primarily* as a commodity. Kloppenburg (2014) asserts, "their goals are an adequate and legitimate return to their labor, not monopoly profit." (p. 17). However, such an approach to seed sovereignty could be at odds with efforts elsewhere where seed sovereignty asserts a move away from the commodification of seed (Peschard & Randeira, 2020).

The United States is home to over one hundred small-scale seed companies, many of which focus on rare, heirloom and regionally appropriate varieties, including the *Seed Savers Exchange* (SSE) which stewards over 20,000 varieties of open-pollinated seed (SSE, 2021). The Organic Seed Alliance (OSA) is a US non-profit that works with farmers and seed growers across the United States (and Canada) on participatory plant breeding, variety trials, research, and public seed advocacy projects.

The US is also home to numerous projects trying to revitalize Indigenous seed systems, such as the Indigenous Seedkeepers Network, Native American Food Sovereignty Alliance, and the Alliance of Native Seedkeepers – projects which extend into Canada as well. Such projects are complementary to seed sovereignty projects already mentioned but are a distinct movement (Lyon et al., 2021). Indigenous seed sovereignty initiatives include seed stewardship mentorships, the development and use of an Indigenous Seed Sovereignty Assessment Toolkit, and the rematriation of Indigenous seeds into Indigenous communities (Native American Food Sovereignty Alliance, 2020). The use of the term rematriation highlights the important role women play in stewarding Indigenous seeds and,

> Can also encompass the reclaiming of ancestral remains, spirituality, culture, knowledge, and resources. It simply means back to Mother Earth, a return to our origins, to life and cocreation, honoring the life-giving force of the Divine Feminine. (NAFSA, 2020, n.p.)

The United States is a signatory to the UPOV Convention, which is administered through the Plant Variety Protection Act (PVPA), and currently allows the farmers' exemption to save and reuse seed.

Canada

Canada has had a voice in the food sovereignty movement from its early days, with the *National Farmers Union* being a founding member of La Via Campesina. Seed has been an important topic for the NFU which has been a vocal opponent of Canada's adoption of UPOV '91 (NFU, 2018). The NFU has also been closely following Canada's current seed modernization process with concerns about changes to seed policy in Canada further favouring the interests of private companies over the interests of farmers, such as the introduction of trailing royalties on farm-saved seed, a reduction of older, royalty-free seeds on the market, and the vulnerability of maintaining the farmers' privilege in Canada's Plant Breeders Rights Act – the optional exemption to UPOV's Breeders Rights (NFU, 2018).

Canada is home to over 140 small-scale seed companies, most of which grow and market all their own seed and carry only rare and heirloom varieties. Many of these seed companies sell their seed at Seedy Saturdays and Seedy Sundays, one-day "seed fairs" which take place throughout the country, and most also have a web-based store to facilitate online sales. Canadian grassroots movements in support of seed sovereignty include the National Farmers Union (NFU), Food Secure Canada (FSC), the Bauta Family Initiative on Canadian Seed Security (Bauta Initiative), FarmFolk CityFolk (FFCF), and Seeds of Diversity Canada (SODC), which maintains a library housing over 2900 varieties of seed.

Seed research in Canada is generally focused on field crops, but the University of British Columbia (UBC) has been working with the Bauta Initiative since 2016 conducting participatory vegetable variety trials with farmers across the country. In 2019, UBC and the Bauta Initiative started the Canadian Organic Vegetable Improvement (CANOVI) – a participatory breeding

project focused on orange and red carrots optimized for organic systems. Many vegetable seed-related projects in Canada have been grassroots in nature, but Lyon et al. (2021) assert Canadian universities could play an important role in supporting and facilitating participatory research with seed, including "how seed systems work relates to broader issues of food sovereignty and community food justice in the context of the United States and Canada." (p. 9)

Other small-scale participatory breeding and trial projects can be found in Eastern Canada. The Ecological Farmers Association of Ontario (EFAO) is leading a pepper-breeding project to develop a blocky sweet pepper variety adapted to growing conditions in Southern Ontario (EFAO, 2019) and growers in Quebec are currently trialing varieties of African eggplant and winter spinach to identify suitable regional varieties and inform for future breeding (SeedChange, 2021).

Seed sovereignty efforts in more developed nations aim to recognize seed for its commodity, genetic, and cultural values and are trying to address the tension between "an adequate and legitimate [financial] return" (Kloppenburg, 2014, p. 17) and the importance of the ecological and socio-cultural aspects of seed. The perspective on seed as a commodity may vary between international allies in the struggle for seed sovereignty and may not always fully align, but there is much agreement on the need for greater seed *democracy* – in the form of farmer and citizen participation in shaping the seed system. Acknowledging and addressing differences in perspective on seed sovereignty is an important factor in this research taking place in British Columbia, where a majority of the seed grown, sold, and used originates from elsewhere.

3.3.5 Seed policy in Canada

Seeds act and seeds regulations

All seed grown and marketed in Canada is regulated under the *Seeds Act* and the corresponding *Seeds Regulations*. However, vegetable seeds are exempt from many conditions from the Seeds Act (Minister of Justice, 2019) and thus do not require the time- and cost-intensive registration process that field crops require to make it to market.

Plant breeders' rights act and UPOV

Canada signed onto UPOV in 1991 and administers its commitment to UPOV through the *Plant Breeders Rights Act.* Canada currently accommodates the optional provision in the UPOV Convention allowing farmers to save and replant seed from UPOV-protected varieties, denoted as "farmers' privilege". Despite the exception, the 1991 amendments to UPOV have been controversial in Canada for encroaching on farmers' rights to save seed. Boehm (2019) asserts the UPOV '91 amendments are placing restrictions on seed which can be seen to favour private interests over farmer interests and may lead to further reducing farmer ability to save seed.

Plant breeders must apply for variety protection in each UPOV-member country individually and, currently, *very few* vegetable varieties have UPOV protection in Canada. This absence of UPOV-protected varieties in Canada gives Canadian small-scale seed growers and seed companies the opportunity to grow and market more modern varieties in Canada. However, these varieties can be protected by their breeders very quickly and force local variants off the market; protection of a variety under UPOV in Canada starts *at the time of application* and remains until the application is declined or the breeder ceases to register an approved variety. Breeders must

renew variety protection *annually* or choose to "surrender" protection, which could occur if a variety does not meet market expectations and the breeder no longer wants to maintain the fees and administrative tasks associated with maintaining protected status (Anthony Parker[34], personal communication, November 26, 2020). Once surrendered, a variety is essentially in the public domain and the seed can be grown and marketed freely by any party.

Seed modernization in Canada

Canada is currently undergoing a comprehensive review of its *Seeds Regulations*, framed as *seed regulatory modernization*, by the Canadian Food Inspection Agency (CFIA), with the goal to "reduce overlap and redundancy; increase responsiveness to industry changes; address gaps, weaknesses and inconsistencies; and provide clarity and flexibility to affected regulated parties" (CFIA, 2021a, PARA 1). The review is a multi-year process, meant to involve stakeholders throughout Canada's seed system.

3.4 Research question

Considering global movements encouraging principles of food sovereignty and seed sovereignty along with increasing consumer interest in local and organic food in North America to address the social and ecological impacts of modern industrial agriculture, this chapter seeks to better understand the regional impact of global seed policy and seed privatization and its implications on the seed sovereignty of BC organic vegetable farmers, by asking:

[34] Commissioner, Plant Breeders' Rights Office, Canadian Food Inspection Agency

- In what ways do BC organic vegetable farmers and seed growers experience seed sovereignty?
- What are the constraints that limit the seed sovereignty of BC organic vegetable farmers?
- What are the opportunities that may exist to mitigate the impacts of those constraints?
- How does the state of seed sovereignty in BC affect the state of seed security in BC?
- How do the actions of organic vegetable farmers and seed growers in BC contribute to both the local and the global struggle for seed sovereignty?

Answering these questions can help us better understand how seed secure farmers are in British Columbia and how they might adapt in the face of seed shortages or changes in the seed system which render it incapable of adequately serving the needs of organic vegetable farmers in BC. Such insights may be useful when exploring barriers to seed sovereignty elsewhere in the world.

I use a constrained choice framework to identify the constraints that limit the seed sovereignty of vegetable seed growers and vegetable farmers as framed by Kloppenburg's (2014) "dimensions" of seed sovereignty coupled with the need for citizens and farmers to take action to have a voice in shaping regional and global seed systems (Shiva et al., 2012).

3.5 Theoretical framework

This research draws on constrained choice theory to identify the structural constraints faced by BC organic vegetable seed growers and vegetable farmers in growing, buying, selling, and using local seed, drawing on Kloppenburg's "dimensions of seed sovereignty" for understanding structural constraints to on-farm seed production as they relate to policy. I further explore on-farm conditions and farmer agency, or choice, as constraining factors to farmer engagement in seed production. I then consider the overall contributions of policy, structural constraints, and

on-farm conditions and how they affect farmer engagement in seed production and seed sovereignty in British Columbia.

3.5.1 Constrained choice

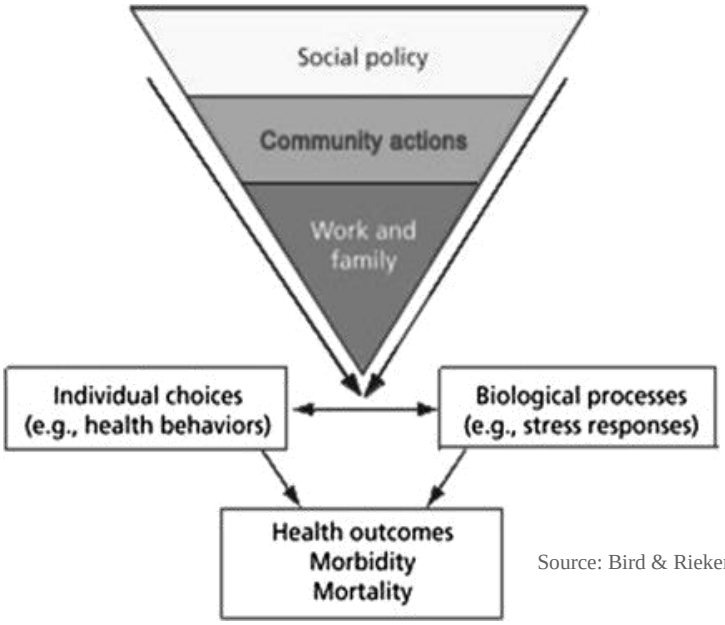
The concept of constrained choice is used in various disciplines as a tool for identifying and better understanding the factors which create structural constraints to individual decision making. Structural constraints are those created through social structures and can vary by country, region, class, gender, and other factors. Individuals have choice, or agency, in making decisions, but various political, economic, and socio-cultural factors interact to create limits on what choices individuals can actually make from available or desired options (Bird & Rieker, 2008; Abel & Frohlich, 2012). Such constraints are not universal and "are laden with differences in power and thus empower individuals and classes differentially" (Abel & Frohlich, 2012, p. 237).

In agricultural studies, the constrained choice model has been used to look at the constraints farmers face in farm management decision making such as adopting farming practices to adapt to climate change (Stuart & Schewe, 2016); adopting environmentally sound land management practices (Stuart, 2009); and accessing and navigating agricultural markets (Hendrickson & James, 2005; 2016). Hendrickson and James (2005) assert that the constraints farmers face often result in compromising their social and environmental values to achieve economic goals or to conform to standardized production requirements.

Bird and Rieker (2008) have done extensive work on constrained choice theory in their work on gender-based health decisions and have developed a useful model to draw from. Figure 3-1 illustrates their model which asserts that the ability of individual men and women to make

positive health-related choices (i.e., exercise their agency) are constrained by social policy, community actions, and work and family (Bird & Rieker, 2008). These constraints exert pressure on individuals' decision-making ability and the subsequent health outcomes.

Figure 3-1 Bird & Rieker model of constrained choice

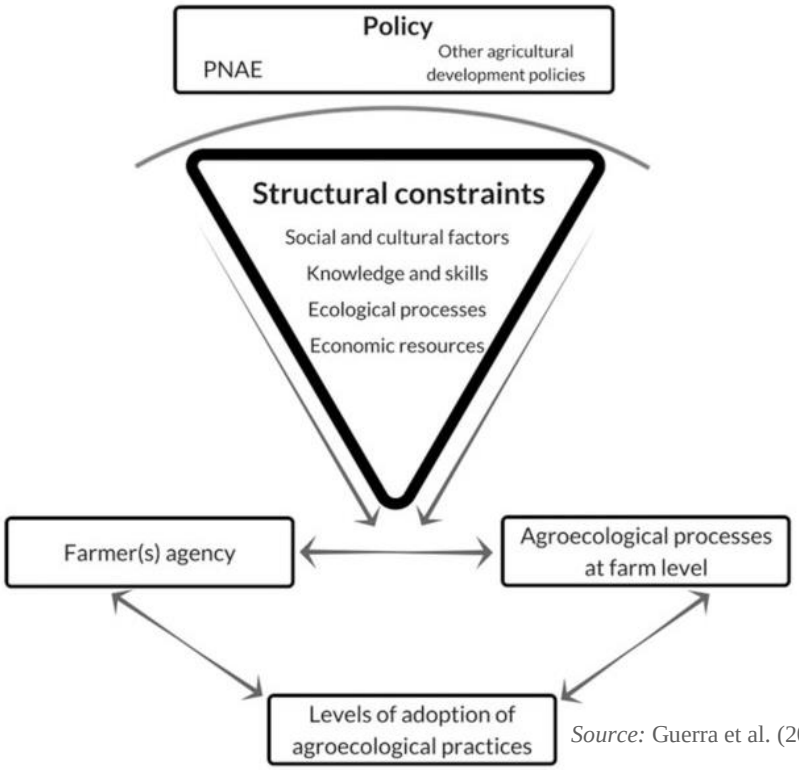


Source: Bird & Rieker, 2008

Guerra et al. (2017) adapted the Bird and Rieker model in their research on family farms in Brazil and their ability to adopt agroecological farming practices within a specific policy environment. Guerra et al. (2017) showed that the ability of family farms to adopt agroecological practices in Brazil was constrained at the highest level by a policy environment, combined with the structural constraints of social and cultural norms such as socially acceptable field aesthetics and farming practices, knowledge and skills relating to agroecological methods, understanding local ecological processes, and the farm's economic resources.

Guerra et al. (2017) highlighted the importance of policy and its interaction with structural constraints and farm-level processes in affecting farmer decision making and adapted the Bird and Rieker model accordingly (see Figure 3-2).

Figure 3-2 Guerra et al.'s (2017) model of constrained choice



Source: Guerra et al. (2017)

Policy and structural constraints are primarily external, but farmers also experience internal or on-farm constraints (Makuvaro et al., 2017). Some on-farm constraints can be a result of policy and structural constraints (e.g., water use; organic waste management), while others can be due to conditions inherent to the farm. Farm-level constraints which may affect seed crop production include regional climate; soil type; proximity to neighbouring farms; and farm size.

James and Hendrickson (2005), in their research on the constraints industrial agriculture models place on farmer decision-making, suggest two ways in which constraints affect outcomes,

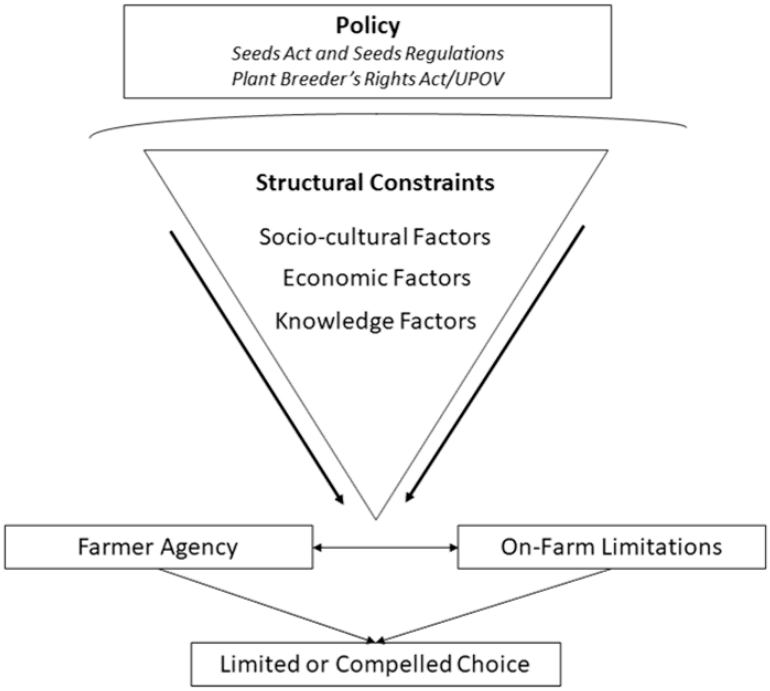
1. “Limit or inhibit...the decisions of farmers by restricting choice options or the types of decisions they can make.
2. Compel or oblige...the choices of farmers by forcing them into the kinds of decisions that they otherwise would not have chosen for ethical or other reasons.” (p. 283)

Hendrickson and James (2005) further suggest, “constraints placed on the choices of farmers could result in an erosion of farmer ethics.” (p. 285), leading to undesired, but accepted, environmental and social consequences. Stuart and Schewe (2016) suggest structural constraints also inhibit the development of *new* ethics – such as those around adopting climate change mitigation strategies in agriculture.

3.5.2 Constrained choice model for on-farm seed production

Drawing from the works above, I build on the constrained choice model by placing seed production within a regionally implemented, international policy framework (UPOV) which favours the corporate protection of seed and interacts with socio-cultural, economic, and knowledge constraints, along with constraints due to on-farm limitations, which leads to limited or compelled farmer choice when it comes to seed-related decisions (see Figure 3-3).

Figure 3-3 Constrained choice model for seed production



3.6 Methodology

This research used a mixed-methods approach to gain insight into the extent to which BC's vegetable seed system exhibits elements of seed sovereignty and seed security. Primary methods included in-person and online interviews; a focus group with organic seed growers and farmers; a comprehensive seed production and farming practices survey – *The BC Vegetable Farm Management Survey (BCVFM)*; and three short seed company research projects.

During the research period from 2017 to 2020, which included a one-year leave of absence from September 2018 to August 2019, I also attended multiple seed-production field days, seed conferences, and other seed-related events and spent much of this time working directly with seed growers as the Seed Security Program Manager with FarmFolk CityFolk (FFCF), a BC-

based charitable non-profit which delivers programming for the Bauta Family Initiative on Canadian Seed Security in BC. I was also able to draw on BC organic vegetable seed survey data from 2007 and 2014 and data from the BC Seed Trials – a participatory variety trial research project between UBC, FFCF, and vegetable farmers throughout southern BC. See Table 3-1 from an overview of research methods.

Between interviews, the focus group, and the BCVFM survey I formally engaged with 220 research participants. Several meetings, gatherings, and conferences[35] gave me further opportunity to speak informally with dozens of seed growers, researchers, seed company representatives, and plant breeders. Estimated formal participant count for this research is 275.

[35] These include the 2017 BC Seed Gathering in Richmond, BC; the 2019 Organic Seed Alliance (OSA) Conference in Corvallis, Oregon; student organic seed symposiums (SOSS): 2019 in Wisconsin and 2018 in California. USDSA carrot breeding field work: 2019 and 2020 in El Centro, California.

Table 3-1 Summary of research methods and participants

Method	Target Audience	Number	Overview
In-person and online interviews	Vegetable **seed growers** in BC who operated (or previously operated) a seed company, were members of the BC Eco Seed Co-op, or grew seed for on-farm use	14	1- to 1½-hour, primarily in-person, interviews with seed growers in 2017 and 2018 including a base set of questions and specific questions for each grower dependent on responses and their unique circumstances. Interviews were transcribed then coded inductively and deductively in NVivo.
Focus Group	Active vegetable **seed growers and users** in BC	21	2-½ hour focus group at the 2017 BC Seed Gathering exploring topics of seed system resilience, strengths and weaknesses of seed growing in BC, and scaling up seed production in BC. Results were transcribed then coded inductively in NVivo.
BC Vegetable Farm Management Survey	Active vegetable **seed growers and users** in BC	168	Comprehensive survey looking at seed purchasing and growing practices as well as other farm practices. Distributed online from Dec. 2019 to June 2020.
Online interviews	Online survey **farmer respondents who "did not grow seed"**	12	15- to 20-minute survey follow-up interviews in 2020 to better understand why farmers do not grow seed and what drives/inhibits their local seed buying practices; questions varied depending on survey responses. Interviews were transcribed then coded inductively and deductively in NVivo.
Other Interviews	**Others** working with seed or food in a relevant capacity to this research	5	Interview content varied greatly per participant. Interviews were transcribed then coded inductively and deductively in NVivo. 2018-2020.
BC Seed Company Values Analysis	BC **seed companies**	17	Identified terms used on seed company websites in 2017 relating to seed company values and coded in NVivo using inductive and deductive approaches.
Seedy Saturday Inventory	BC **Seedy Saturday & Seedy Sunday** events	56	Used Seeds of Diversity Canada Seedy Saturday directory, various media sources, and basic math to determine and document first and subsequent dates of BC Seedy Saturday events from 1990 to 2019.
Seed Crop Diversity	BC **seed companies**	11	Identified and documented varieties of select self- and cross-pollinating crops (three of each) offered by BC seed companies in 2017 to demonstrate the different frequency in which they are offered.

3.6.1 BC vegetable and seed farmer survey

The *BC Vegetable Farm Management Survey* (BCVFM) aimed to extend previous organic seed-focused surveys in BC (Wells, 2007; Goodall, 2014), gather demographic data about organic vegetable farmers and seed growers, understand farmers' perception of their "seed sovereignty", and assess the validity of insights gained through interviews and anecdotal evidence. The survey was a collaboration between me and PhD candidate, Susanna Klassen, which asked a wide range of seed, farm technology and farm management related questions.

The BCVFM survey was released in November 2019 with a target audience of vegetable farmers in British Columbia, both organic and conventional, at all scales. The 76 survey questions generally took respondents between 20 and 45 minutes to complete. A $50 gift card was offered for completing the survey. The survey was distributed through multiple channels across BC including industry association listservs, farmer mailing lists, social media, and direct to farmers. Information requested from survey participants was for the 2018 growing season.

The survey received 168 responses, 68[36] of which were from certified organic vegetable farmers and 65 of which were from "organic", but not certified vegetable farmers which are here referred to as "ecological" farmers[37]. According to the Organic BC[38] website, there were 194 certified organic farms that list vegetables as one of their certified organic products as of July 15, 2020.

[36] Includes one respondent in transition to organic.
[37] In BC, farmers cannot use the word organic to promote their products unless they are *certified* organic.
[38] Formerly the Certified Organic Associations of British Columbia (COABC)

The 67 survey respondents who identified as certified organic represent approximately 34.5% of farms that grow organic vegetables in BC.

3.7 Results and discussion

3.7.1 Current organic vegetable seed production in BC

BC is currently home to at least 28 small-scale organic vegetable seed companies[39] which sell primarily packet sizes of rare and heirloom vegetable, herb, and flower seeds to home gardeners. BC seed companies are generally "all-in-one" companies, growing and marketing most of their own seed, with some companies contracting out the growing of some varieties to other farmers in BC. BC organic farmers are also growing seed for on-farm use with all the certified organic farmer survey respondents asked about growing their own seed (n=39) producing at least some of their own seed for on-farm use.

An important marketing and sales channel for BC seed companies is a circuit of independently organized "Seedy Saturday" and "Seedy Sunday" events – one-day seed fairs held in communities throughout the province each year over weekends in late winter and early spring at which BC seed companies offer their unique collections of seeds to BC gardeners.

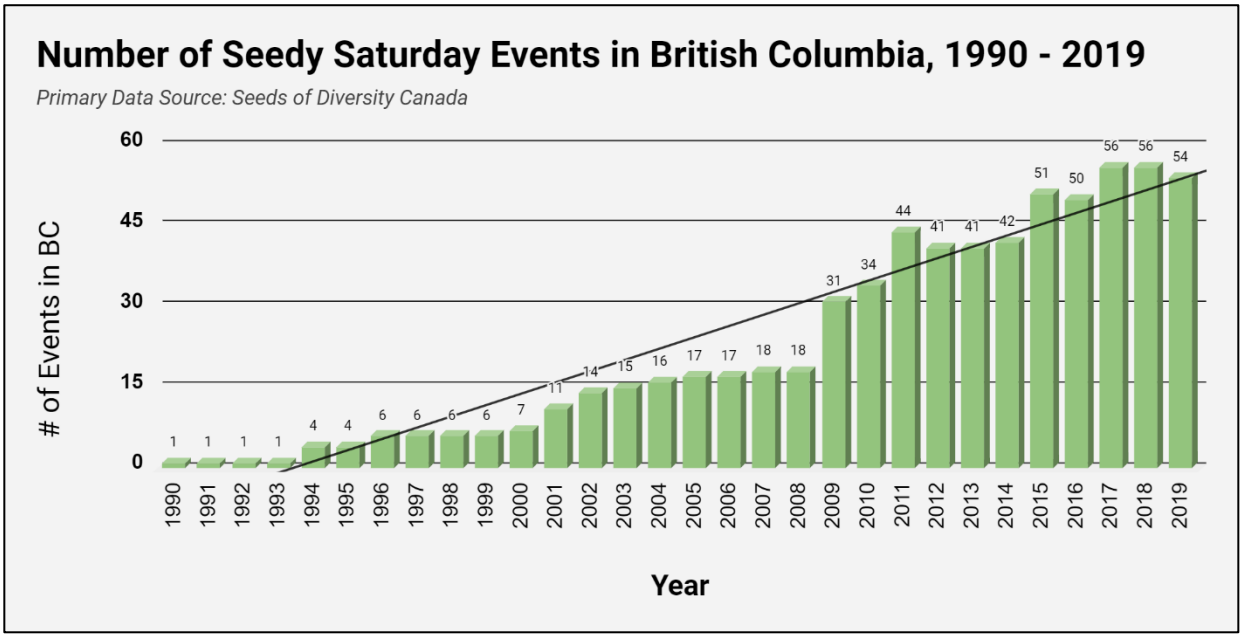
Conceptualized in 1989 by Sharon Rempel, in part as a response to increasingly strict seed regulations and corporate control of seed, Seedy Saturdays and Seedy Sundays launched as a

[39] This refers to BC seed companies that grow all or most of their own seed and do not include seed companies which are primarily "retailers", buying bulk seed and repacking it for retail sale to the public, which includes West Coast Seeds

single event in Vancouver in 1990 (Rempel, n.d.) and now take place in close to 60 communities in BC and over 150 communities across Canada (see Figure 3-4). In the BCVFM survey, Seedy Saturdays and Sundays ranked as seed growers' *most important* sales and marketing channel.

BC seed companies also market their seeds online which makes their seeds available worldwide, though not all BC seed companies ship outside of Canada. Some seed companies market their seeds through retail display racks in garden centres and other stores while some also sell seed at the farmers markets where they sell their produce.

Figure 3-4 Seedy Saturdays and Sundays in BC, 1990 to 2019



The success of Seedy Saturdays and Sundays along with seed companies' online sales suggest BC seed companies are doing well to serve BC *gardeners* with seed. But none of the certified organic farmers surveyed chose Seedy Saturdays as their top choice for sourcing seeds, with only

10% ranking Seedy Saturdays as their second top choice and another 10% ranking them as their third top choice as a seed source – often to source new varieties they might grow on their farms.

Despite BC's history of successful commercial vegetable seed production, there is no large-scale commercial vegetable seed production currently happening in the province. The 2014 formation of the BC Eco Seed Co-op, a collective of 22 organic and ecological seed growers, is making an effort to scale up production to better serve farm-scale customers with bulk quantities of seed. However, only 7.8% of the Co-op's sales in 2021 were in bulk quantities.[40]

Marketing and selling seed are important to BC seed companies, and so is peer-engagement and research. BC is home to the biennial *BC Seed Gathering* which brings together seed growers from across the province for workshops, farm tours, community strategizing, and social opportunities. BC organic farmers are also engaged in seed research through the Canadian Organic Vegetable Improvement (CANOVI) project which includes variety trials with several crops and a participatory carrot breeding project with orange and red varieties.

BC small-scale vegetable seed companies would be best characterized as part of the *informal* seed system in that they are not subject to the crop registration and variety uniformity requirements of the formal seed system and are mainly regionally based (Sperling & Cooper, 2003). However, while informal seed systems account for 80 to 90 percent of the seed used by small-scale farmers around the world (Sperling & Cooper, 2003; Food and Agriculture Organization, 1998), BC's seed companies service primarily garden-scale, non-commercial

[40] Bulk quantities here are defined as the quantity for each type of seed at which the Canadian government does not require the vendor to charge GST in Canada – thus making bulk volumes of seed GST exempt.

growers. Thus, BC vegetable farmers are almost wholly dependent on imported seed and are little able to take advantage of BC's informal seed system. 54% of certified organic farmer survey respondents stated they made an effort to source local seed, but just over 11% stated **21% or more** of their seed was BC grown.

3.7.2 Becoming a seed grower in BC

The increasing corporatization of seed was a catalyst for Sharon Rempel to start Seedy Saturdays, but BC seed growers found themselves drawn toward seed production for many different reasons. One Lower Mainland seed grower's interest in seed was sparked by the difficulty of finding a desired variety,

> I went to Seedy Saturday and bought purple tomatillos which I didn't know existed then…I loved them and the next Seedy Saturday in 2008 I went back and [the grower] said "I don't grow them anymore". Then I realized how sensitive it was – how precarious it was to always rely on someone to save the seeds for you. She said, "I think I have few left in a shoebox at home" and she actually found some and brought it to the farm for me and I promised myself I will always save them so I will always have purple tomatillos and that's what started my journey as a seed saver.

This seed grower in the West Kootenay took a longer path to seed growing,

> I picked up the book *Seed to Seed* by Suzanne Ashworth. And I thought – oh this looks interesting so I bought it and took that back to the farm with me and…it was kind of a revelation that book. It was sort of my first introduction to the thought of saving seeds. I used that book over the rest of that season to just fart around with seed saving...amateur and for fun. I got a…grant to help start up your own business, and that's where I got this idea to start a seed business. In all my years of apprenticing I kept hearing "There's not a lot of organic seeds", "We need more organic seeds". I did hear that multiple times over

> the years. I knew there was a niche there that could be filled or exploited as a business opportunity.

And this Vancouver Island seed grower had an informal start to seed saving,

> So that particular year, my first year, I had left some, umm – this is not how you're supposed to save seeds – I left some Scarlet Runners that were kind of ...the runts of the...the runts were left! And they had dried out on their trellis. And I picked them and sat in the sun on the grass and shelled them in September. On a beautiful day. And those are the most beautiful beans, as you know – purple and black, and scarlet – they're lovely. And I said to myself I want to do this for the rest of my life whether it makes money or not. And so I'm still doing it. That's how many years later?

The stories of how BC seed growers started growing seed vary considerably, but the awareness of the modern state of private seed ownership was present with all the seed growers I interviewed. Further, almost all the seed growers I interviewed did not come from a farming background and none of them had taken over a family farm – each being introduced to seed saving in adulthood.

3.7.3 Farmer constraints to <u>using</u> local seed

This research identified three main constraints faced by BC vegetable farmers regarding sourcing and buying local seed:

1. Lack of varietal availability
2. Insufficient quantities of seed available
3. Concern over seed quality

Lack of varietal availability

Only **1.5%** of certified organic vegetable farmer respondents to the BCVFM survey (n=68) agreed they could find the varieties they were looking for in locally grown seed. The lack of varietal availability and insufficient seed quantities in local seed for organic farmers were also identified in a 2006-2007 survey of organic vegetable farmers in BC by Wells (2007) which showed these were the two biggest factors for organic farmers not buying more local seed. BC seed companies sell primarily rare and heirloom varieties that have no IP protections and can be freely grown and marketed in Canada. Heirloom vegetables may be popular in local food movements, but they do not always meet the productivity or disease- and pest-resistance needs that can be realized with many modern varieties (Brouwer et al., 2016).

52% of certified organic farmer respondents in the BCVFM survey (n=68) ***agreed or strongly agreed*** that hybrid seed is important to the success of their operation. No BC seed companies currently grow hybrids. The growing of hybrids locally could present new opportunities for BC seed growers, but the "proprietary" nature of hybrid seed has not made it an attractive endeavour to BC seed growers. In one of my seed coordinator roles in 2018, I started exploring the prospect of producing some hybrids locally. I had come into contact with a horticulturist who had extensive experience growing hybrid vegetable seed in South America and Li et al. (2013) theorized the potential for participatory hybrid breeding – a method that could fit the ethic of the local seed grower community. The idea did not receive an enthusiastic response among seed growers I discussed it with, who strongly associated seed hybridization with seed protectionism. Further, hybrid breeding requires some specialized skills, suitable infrastructure, and access to parental breeding lines – all achievable with the right resources, but difficult to acquire.

Insufficient seed quantities

Just 9% of certified organic vegetable farmer respondents to the BCVFM survey (n=68) stated they could find the quantity of seed they were looking for in locally grown seed. With the exception of the BC Eco Seed Co-op, BC seed companies sell exclusively packet-size quantities of seed, targeting garden-scale growers. For one farmer on Cortes Island,

> I used to [buy local seed] when I was a gardener because we used to do the Seedy Saturdays and stuff like that. But for the volume I'm buying [as a farmer] it's cost-prohibitive; the price for the volume of peas that I would need is not economical.

Seed prices decline quickly with larger volume purchases, so buying local seed priced only as individual packets is not an economically feasible option for farmers.

Concerns over seed quality

Just 15% of certified organic farmer respondents to the BCVFM survey (n=67) agreed that locally grown vegetable seed was comparable or better in quality than other vegetable seed they purchase. Seed quality is an important issue for farmers who rely on high-quality seed to produce high-quality crops. In the words of one farmer on Vancouver Island,

> If you're starting a plant in February and you don't find out until June that it's a dog, well, you're in trouble, right. So, if you find somebody you can get a consistent good-quality product from – absolutely you are going to stick with them 100%. If we kept on buying seeds from Johnny's and they kept giving us poor quality seed, we would be looking, scrambling, to look elsewhere. But we continue to have success so there probably is a bit of trepidation [to change suppliers]. Maybe that could change if a seed supplier were to...if there was a local guy who said, "I know that my seeds are as good as

> Johnny's. You know, give them a [free] try – and if you don't like them, you're not out of pocket."

Very little can be gleaned from the genetic and performance quality of seed from its appearance. In this regard, the true quality of seed cannot be determined for weeks or even months after it is planted – at which point the impacts of poor-quality seed cannot be reversed. Farmers rely on seed to produce the crops which generate their income, and the hidden quality of seed represents a high level of risk for farmers. A farmer on Vancouver Island shared,

> I guess on my scale being pretty small sometimes it feels like I really need reliable seed and I have a bit of a hard time trusting some of the smaller seed companies, which I feel kind of bad saying, and it's because – and this is before I had my own farm and I was working on other Farms – I would have my *own* garden, and I did buy a lot more local seed from smaller seed companies, and would have it not come true to type or not grow really well…But now that it does matter a bit more, it maybe makes more impact on, you know, if I can pay my bills, I feel hesitant. At this point, the vast majority of my seed I get through High Mowing [Organic Seeds] and Johnny's [Selected Seeds]. And that was the part that, when I worked on other farms and there was a lot of seed from them that was used and they were great varieties and so I got to know them through that.

Farmers mitigate, but do not eliminate, the risk of poor-quality seeds by buying seed from trusted sources. Even though seed companies like Johnny's Selected Seeds and High Mowing Organic Seeds are not local, their reliability, customer service, and organic seed selection make them an easy choice for farmers looking for reliable organic seed.

In contrast to larger corporate seed companies, Johnny's and High Mowing are at a scale that gives them the capacity to supply a wide range of seed in bulk-scale quantities to farmers and still stay connected and engaged with their farmer customers. Both companies are diversified in

their operations and offer popular modern and heirloom varieties which they buy from larger seed companies or have farmers grow for them on a contract basis. Both companies also have in-house breeding programs and develop their own varieties with strict quality assurance protocols.

Key to the success of these two seed companies may be their origins as "one-man" operations and their ongoing engagement with farmers. Johnny's was founded by Rob Johnston in 1973 – operating from his parents' attic (Johnny's, 2019) and evolving into an employee-owned company offering over 1500 varieties of seeds (almost a third of which are certified organic) with revenue over $40,000,000 annually (Valigra, 2016). Johnny's values transparency in their seed and clearly labels whether the seeds they carry are heirloom, open-pollinated, hybrid, PVP protected, or patented. Rob can frequently be found at organic seed events along with sales staff and in-house breeders mingling with farmers.

High Mowing Organic Seeds was founded by Tom Stearns in 1996 and many of High Mowing's first 28 varieties were grown in his backyard (High Mowing Organic Seeds, 2021). High Mowing offers a range of heirloom, open-pollinated, and hybrid varieties and all of High Mowing's seeds are certified organic. High Mowing also does in-house breeding and has developed a steam-based method for organic seed sanitation and disease control (High Mowing, 2018). Tom's enthusiasm for seed is hard to miss at organic seed conferences.

Both Johnny's and High Mowing cater to small-scale organic vegetable farmers and use a combination of seed grown specially for them on contract by farmers and seed sourced from larger seed breeding companies, like Vitalis, the organic arm of Enza Zaden. The quality and diversity of the seed these companies provide make them a trusted and reliable seed source for BC's organic farmers, who can feel they are still holding to their values by purchasing seed from

smaller seed companies with appropriate seed options, transparency about their seed, and great customer service, even though they are not local. One organic vegetable grower from the BC interior shared,

> There's quite a few F1 [hybrid] varieties that we really, really like. Some of them are coming from Johnny's and…they're just so beautiful and so nice and so shiny and sparkly! You know! Sometimes…I'm not going to try this OP [open-pollinated], this BC-grown OP when I have a shiny sparkly new variety from Johnny's!

Companies like Johnny's and High Mowing could be seen as impediments to local seed production and seed sovereignty, but they can also be seen as complementary – giving farmers the choice to buy seeds that fit with their values. Representatives from these companies are regularly presenting their research at conferences and BC seed growers have been in attendance many times to receive that knowledge over the past 15 to 20 years. These companies grow and sell high-quality seed in a transparent manner from which BC vegetable farmers benefit. The relationships farmers build with these companies are important and are a complement to on-farm seed production.

The question of seed quality is important in the context of the *right* to grow and sell seed in that rights are almost always coupled with *responsibilities* (Waldron, 2010). In the growing of seed, whether for one's own farm or for sale off-farm, farmers and seed companies have a responsibility to maintain the genetic integrity of crop varieties (de Beer, 2007) and communicate the characteristics of those varieties accurately to consumers.[41] This accuracy is

[41] Quality assurance issues such as seed hygiene (being disease free) and germination rate are also an important but did not come up in farmer interviews.

important with known varieties and ensuring they grow out true-to-type (e.g., if you are marketing an orange tomato, it better produce an orange tomato) as well as with less "distinct" varieties or landraces which are typically more heterogenous – genetically and in appearance (Almekinders et al., 1994; Ceccarelli, 1996). This transparency allows farmers to make informed choices about the seed they grow and the ability to choose heterogeneous varieties that do not meet DUS standards.

3.7.4 Seed grower and farmer constraints to growing more seed

This research identified six main constraints faced by BC vegetable seed growers that inhibit their ability to grow more seed and increase BC's local seed supply,

1. Space is better used for vegetable production than seed production
2. Limited economic data on seed production
3. Lack of sufficient seed growing knowledge
4. Limited farmer capacity for adding seed to their cropping systems
5. Seed crop isolation requirements
6. Limited seed processing infrastructure

Space is better used for vegetable production than seed production

Sixty percent of certified organic survey respondents who currently *do not* grow seed (n=30) stated their space was better utilized for growing vegetables than for seed production. Vegetable farmers already have established markets for their produce in farmers markets, restaurants, farm stands, and community supported agriculture (CSA) subscription programs.

33% of respondents also stated they didn't have sufficient space to grow their own seed. Thus, adding seed production to their crop system might mean removing or reducing a marketable vegetable crop from their rotations. Though with sufficient space, seed production can be an option. According to one Vancouver Island farmer,

> We've actually gotten access to a lot more land and we're trying to figure out what to do with it and one of the possibilities that came up was actually growing seed. We have new opportunity with this land and we don't want to just grow 20 acres of veggies and scale up. I don't think we're very interested in that…So I guess we kind of see it as a diversification strategy.

Diversification of crops brings resilience to farming systems in the face of fluctuations in markets and weather, which can affect the marketability of a crop (Folke et al., 2002).

Limited economic data on seed production

Fifty-seven percent of certified organic farmers who currently *do not* grow seed (n=30) felt it was not economically viable to grow their own seed. There is currently limited information available on the economics of small-scale seed production. FarmFolk CityFolk has developed a template seed enterprise budget, but it has seen minimal use by BC seed growers.

The BCVFM survey did not receive sufficient seed revenue information to determine seed production's contribution to overall farm revenues, though several seed growers shared in interviews that growing their own seed has *saved them* a significant amount of money on seed purchases over the years.

Seed production training

Fifty-three percent of BCVFM survey respondents who currently *do not* grow seed (n=30) felt they did not have sufficient skill to grow their own seed while 38% of BCVFM survey respondents who currently *do* grow seed (n=37) felt the same. There are several opportunities for seed production training for BC farmers including a paid online course offered by Canadian Organic Growers focused specifically on organic vegetable seed and a free online course offered by the Organic Seed Alliance. Several of the non-seed-grower farmers I interviewed were aware of these training opportunities as well as more informal resources (e.g., YouTube) and several well-known seed production books.

Limited farmer capacity for adding seed to their cropping systems

Seed crops have distinct marketing, packaging, and storage needs unique from those of fresh vegetable crops. Some channels, such as farmers' markets, can be used to market both seed and fresh produce, but other channels – such as box delivery programs, restaurants, and wholesalers – are not as flexible. Several BC vegetable farmers I interviewed stated an interest in growing seed but had no desire to operate their own seed company on top of their farming operations. Operating a seed company means carrying many types of seed and a whole new level of operation, according to this Vancouver Island farmer,

> I'm really interested in seed production in general. It's like a lot of things in farming. It's easy to see your business mushroom out a little bit in a way that can get pretty unsustainable pretty fast…so maybe once we reach a place where we envision being – not the end place – but you know what I mean, what we're working towards at this point, then we would consider expanding into vegetable seed operations.

And this long-time seed grower in the Fraser Valley has a similar experience, which is what drew them to the BC Eco Seed Co-op as a means of marketing their seed,

> Part of the reason we haven't sold seed yet – we get to this time of year and the farming season takes off and suddenly it's May and we're going to markets – and I haven't designed seed packets or packaged seeds or made a seed rack – all the logistics of selling seed are different than the logistics of selling veg. It just makes it such an easy avenue – just join the Eco Seed Co-op!

Follow-up interviews with survey respondents that *did not grow* seed identified limitations in their available time as a factor that constrained their ability to grow seed.

Seed crop isolation requirements

Seed crops need an adequate amount of isolation from flowering plants within the same species which could cross-pollinate and render the seed crop unmarketable. Cross-pollinating risks may come from one's own farm or a neighbouring farm and from both cultivated crops and wild plants. Self-pollinating crops can be grown commercially with isolation distances as close as 30 to 50 meters, but cross-pollinating crops may need isolation distances of one to two kilometres if there are no physical barriers (Navazio, 2012).

On small-scale diversified farms, isolation distances can be very difficult to maintain depending on the food and seed crops being. Difficulty with seed crop isolation was identified as a constraint in the BCVFM survey for 32% of certified organic farmer seed growers (n=37). Some BC seed companies, such as Salt Spring Seeds, have overcome this issue by contracting out seed growing to other local farms. This has allowed them to offer a wider range of varieties then they may otherwise be able to do and create a peer network of local seed growers.

Limited seed processing infrastructure

While harvest and post-harvest processing of seed on a small-scale can be achieved manually and with simple, easy-to-source equipment, even medium-scale seed production requires more advanced equipment to make the processing of seed feasible in an efficient manner. Seed also requires post-harvest space for drying which can be limited on small farms. For one Vancouver Island farmer,

> The property that I farm at does not have good facilities for drying and curing things so, you know, even just doing some onions and garlic and squash and stuff and smaller amounts it's kind of a challenge for me.

After feedback from seed growers over several years, FarmFolk CityFolk acquired funding to purchase a selection of small-scale seed cleaning equipment in 2019 for use by BC seed growers. The equipment is housed in a cargo trailer to make it easily transportable – based on a mobile seed cleaner design from the Organic Farm School in Washington State. FarmFolk CityFolk added three more mobile seed cleaning units in Summer of 2021, with financial support from the BC Ministry of Agriculture, Food and Fisheries. These additional units will be placed at locations around the province for easier regional access for seed growers – building a province-wide network of seed processing infrastructure.

3.8 The state of seed sovereignty for organic vegetable farmers in BC

Seed growers in Canada have a strong recognition of their right to save and sell or resow vegetable seed in Canada based on Kloppenburg's four dimension of seed sovereignty. From the BCVFM Survey,

1. 94.7% of seed growers agreed they have the right to save and replant vegetable seed
2. 81.7% agreed they could sell vegetable seed
3. 71.1% agreed they could use seed to breed new vegetable varieties
4. 84% agreed they have the right to participate in shaping seed policy in Canada.

However, just 10% of seed growers agreed they have the information they need to participate in shaping seed policy in Canada. This is of concern considering the CFIA's seed modernization process has been underway for several years and the CFIA (2021a) aims to "consult a broad range of stakeholders" (PARA 6). Without the opportunity to engage in activities to shape seed policy, the *right* to do so offers little hope that farmer voices will have an influence on seed policy if the *means* to do so are not present.

With the exemptions for vegetable seed provided in the *Seeds Act*, the "Farmer's privilege" in the *Plant Breeders' Rights Act* allowing the UPOV Convention's exemption for farm-saved seed from UPOV-protected varieties, and very few UPOV-protected vegetable varieties being registered in Canada, there is presently very little active policy in Canada which constrains farmers' ability to grow, sow, share, or sell vegetable seed in Canada. However, the NFU (2014) has long been concerned with maintaining Farmers' privilege in the Plant Breeders' Rights Act and their right to grow and save seed,

> The UPOV Convention says it should only be permitted "within reasonable limits and subject to the safeguarding of the legitimate interests of the breeder." This is a far cry from "entrenching" the right of farmers to save seed. (p. 1)

Farmers lacking the information they need to participate in shaping seed policy in Canada is thus a constraint to farmer seed sovereignty in its impact on farmers *maintaining* their current rights.

3.8.1 Seed sovereignty for BC organic vegetable seed companies

In the context of supplying gardeners with varieties of rare and heirloom seeds, BC vegetable seed companies experience a relatively high degree of sovereignty and are using that status to pursue their economic independence as small business owners. Their seed crops may be smaller in volume, but also represent crops that have become adapted to BC conditions and would be strong candidates for improvement or creating new varieties through exerted breeding efforts. However, future policy changes, such as the introduction of a common catalogue as is used in Europe, could change the situation quickly – though there is no sign of such change in Canada's current seed modernization process.

3.8.2 Seed sovereignty and seed security for BC organic vegetable farmers

Despite a policy environment which places minimal constraints on the production and sale of vegetable seeds in BC and Canada, and farmers exercising their agency to grow and sell seed, BC organic vegetable farmers experience a relatively low degree of seed sovereignty. BC farmers grow only a small portion of the seeds they sow on their own farms and BC seed companies do not carry the varieties farmer are looking for in the quantities they need. The lack of local seed to meet their needs limits BC farmers' ability to buy local seeds and makes BC farmers almost wholly dependent on imported seed for their operations.

BC organic farmers have found reliable and trusted seed suppliers in companies like Johnny's and High Mowing, but the reliance on imported seed makes BC farmers vulnerable to supply chain disruptions, strained trade relations, or other factors which may limit the import of seed. Despite the US and Canada having good relations, trade disputes do occur, and future disputes

could affect seed imports. Further, trade relations beyond just the US and Canada also need to be considered as US seed companies typically source seed from all over the world. BC organic farmers do have access to several Canadian seed suppliers as well, but these also companies also rely on imported seed for their supply.

Relying on seed imports represents a missed opportunity for BC farmers to develop varieties better adapted to BC conditions. Growing seed crops with local farms in mind allows farmers to participate in selecting the traits most important for addressing local conditions (Almekinders et al., 1994). In BC, this could mean strengthening already existing relationships between seed researchers at UBC and organic farmers as well as using varieties that have already been grown by BC seed companies for decades.

Farmers ready access to seed gives the impression of seed security, but we only need to refer to our historical look at seed in Chapter 2 to realize how quickly farmer seed security can be disrupted. When the onset of WWII reduced seed imports from Europe, BC and Canadian farmers were able to quickly increase local seed production to meet domestic and export needs. But in that case, BC had spent the previous 24 years building up a seed sector that was prepared to meet those demands. It is difficult to say whether BC farmers could have met that demand without having built such a strong foundation first. It is equally difficult to say whether the current seed system could meet such a challenge. There are multiple parallels between the two periods including government and institutional support for seed production, the building up of seed processing infrastructure, and training opportunities for seed growers. Such conditions could find BC well prepared if seed imports were to be disrupted again.

Despite BC seed companies not meeting the needs of BC organic vegetable farmers, leaving vegetable farmers vulnerable to disruptions on seed imports, the province may be in a good position to maintain seed security for vegetable farmers. Existing efforts which have built a local seed system that serves BC gardeners may be able to quickly adapt and scale up to better serve farmers. BC farmers have proven in the past they can scale up quickly and with modern technology and resources are in a position to do so again.

3.8.3 BC seed sovereignty in the global context

BC organic vegetable farmers' seed procurement practices are contrary to global trends, where small-scale farmers rely primarily on informal seed systems (Sperling & Cooper, 2003; Food and Agriculture Organization, 1998). Thus, BC vegetable farmers are very dependent on the formal seed system for their seeds.

BC's small-scale seed companies, focused on growing and selling small quantities of seed to home gardeners, with multiple sales and marketing channels, may offer a valuable model to other regions – in both developed and developing countries – for increasing local seed use. BC seed growers have a high level of awareness of their seed rights and take advantage of national seed regulations which place very few restrictions on selling vegetable seed to successfully identify, cultivate, and market open-pollinated crop varieties which have no intellectual property or biological protections. An increase in farmer and seed grower awareness of applicable seed regulations and the IP status of desirable open-pollinated crops in their respective region may be valuable in increasing local seed production.

3.9 Opportunities towards realizing seed sovereignty in BC

In the current global policy environment, which favours seed protectionism and privatization, achieving seed sovereignty must be done with intention. In this regard, it would require efforts in communication and cooperation between seed growers, farmers, researchers, community groups, and others. Such intentions amount to a commoning of seed,

> People, in community, must devise the protocols and practices intrinsic to producing, marketing and distributing resources as a collective subject. Where commons are being re-established (when they have been eroded or lost), communities must actively recruit participants, build their resources, and work to inculcate norms of cooperation, sharing and non-proprietary values. In this way, commoning helps us appreciate that commons do not just exist; they must be produced and reproduced, negotiated and renegotiated, learned about and labored over. (Montenegro de Wit, 2017, p. 2)

I propose there are six opportunities worth exploring for increasing seed sovereignty for organic vegetable farmers in BC, which can also bring economic opportunities to BC farmers.

3.9.1 Farmer participation in seed policy

Survey respondents felt they had the right to participant in seed policy in Canada, yet only 10% felt they had the information they needed to participate. With Canada presently undergoing a review of its seed regulations, the time is ripe for farmer participation in Canadian seed policy. There does not appear to be any major regulatory changes regarding vegetable seed being proposed, but ensuring their voice is at the table may benefit vegetable farmers in the long run. Corporate seed companies are making their voice heard in Canada's seed modernization process through cooperation between Seeds Canada (CFIA, 2021b), a seed industry advocacy group

formed in 2021, and CropLife Canada (CropLife Canada, 2020), an advocacy group which represents global seed and agrochemical companies such as Bayer/Monsanto, Syngenta, and BASF – which spent a combined $18.1 million globally on policy lobbying in 2017 (Elsheikh & Ayazi, 2018).

3.9.2 Seed growers collaborating with farmers

This research identified the lack of appropriate varieties and insufficient quantities of seed as two primary reasons why organic vegetable farmers did not buy local seed. Directly working with farmers would help seed growers determine the varieties and quantities of seed required to meet farmer needs. Collaboration could also result in farmers participating in the seed production process or incorporating seed production into their farm system with support from a seed grower mentor. FarmFolk CityFolk is currently working with local farms for growing biennial root seed crops, such as carrots and beets. The farm grows the crop in the first year and helps select roots which the seed grower grows to seed on their farm in the second year. I am currently growing a beet seed crop selected from a farm in Chilliwack earlier this year. A portion of the seed will go back to the farmer while the rest will go to the BC Eco Seed Co-op.

3.9.3 Support the Seedy Saturday network to better include farmers

British Columbia communities have established an effective and popular seed distribution system over the past 30 years through a network of over 55 Seedy Saturdays and Seedy Sundays throughout the province. These events target gardeners with smaller quantities of seed, but they could also be used to engage farmers in buying larger quantities of seed. Continuing to support these events also continues to support gardeners in their efforts to buy BC-grown seed.

BC's Seedy Saturdays and Sundays could also benefit from increased cooperation between events and between events and seed growers. Currently, each event is organized independently by local community groups. A more coordinated effort could support a bigger-picture agenda to increase BC seed sovereignty and seed security.

3.9.4 Participation in university research

BC organic vegetable farmers have been participating in provincial and national seed research projects since at least 2014. Canada's modern crop development efforts have focused almost solely on field crops, but participatory vegetable variety trial research and breeding projects between UBC, the Bauta Initiative, and other universities and non-profit organizations in Canada, present an opportunity for increasing organic vegetable crop development. Further, such research can engage with Indigenous seed growers in BC in efforts to support Indigenous food systems (Lyon et al., 2021) such as current Indigenous-led efforts in the Peace River area to identify varieties that may be well adapted to growing in the Peace River region of northern BC and further be adapted in the face of climate change (Campbell, 2021).

3.9.5 Growing self-pollinating crops

BC seed companies currently grow a much greater quantity of self-pollinated vegetable varieties than cross-pollinated vegetable varieties. Self-pollinated crops are more suitable than cross-pollinated crops for conditions that make isolation from related flowering crops difficult – a constraint to seed production identified by farmers. With a wide range of self-pollinating varieties currently being grown in BC, seed growers may be able to increase production to better supply local farms, assuming they can provide the varieties farmers want. Some self-pollinating

crops like lettuce do not have hybrid varieties on the market to compete with open-pollinated varieties, while crops like tomatoes offer a wide range of heirloom varieties which tend to be popular at local markets.

3.9.6 Maintaining relationships with seed companies

Farmers will benefit from maintaining relationships with seed suppliers around the globe for both exporting their seed and importing seed from elsewhere. A greater amount of seed sovereignty due to an increase in local seed production may bring a greater amount of seed independence to BC farmers, but a seed system which favours locally grown seed, but also allows for importing seed is more flexible and more resilient than a seed system that aims to be wholly independent. US-based seed companies, such as *Johnny's Selected Seeds* and *High Mowing Organic Seeds*, have been crucial for the success of BC's vegetable farmers and can continue to be so. Canadian seed companies such as West Coast Seeds or William Dam have not been as engaged with seed growers but may represent future opportunities for collaboration.

3.10 Conclusion

In both periods of vegetable seed production in British Columbia, from 1915 to 1958 and from 1990 to the present, economics and global events played a significant role in farmer choices to grow seed. In the 1915 to 1958 period, the high value of seed due to seed shortages caused by WWI and WWII prompted farmers into commercial seed production and a drop in seed value after WWII saw farmers abandon seed production for other crops. In current times, the creation of Seedy Saturdays as a response to the increasing corporatization of seed helped BC become home to 28 small-scale seed companies. However, despite the number of seed companies in BC,

farmers are still required to import the bulk of their seeds despite efforts to source local seed. Although the presence of dozens of small-scale seed companies in BC suggests seed production is economically viable, there is not sufficient data to validate this. Being coupled with vegetable production and having a lack of seed crop-specific data means BC seed companies could be operating at a loss – though this loss, on paper, may not account for expenses saved on seed as well as improved growth from locally adapted crops. Further, insufficient space and a lack of economic data are contributing factors in keeping farmers from growing more of their own seed.

Both periods of seed production in BC had a favourable policy environment for seed production, with vegetable seeds being mostly exempted from the Seeds Act since 1937. The early-century period had the Seed-growers' Protection Act to reduce cross-pollination of seed crops in areas of concentrated commercial seed production, though no such regulation currently exists in BC.

Kloppenburg's dimensions of seed sovereignty provided a valuable framework for this research, but only address the policy aspect of the dimensions of seed sovereignty. Despite a favourable policy environment, BC farmers have a low degree of seed sovereignty due to a lack of local supply and limited engagement in shaping seed policy. As Hoover (2017) asserts in terms of food sovereignty, there must be intentional action to achieve sovereignty. Without the goal of seed sovereignty, BC vegetable farmers will continue to be dependent on imported seed and at risk of seed insecurity. With seed sovereignty movements being a direct response to modern industrial agriculture, BC farmers and seed growers need to set a strong intention towards seed sovereignty in order to bring it to fruition. Such efforts may seem political in nature but increasing the local seed supply can also provide economic, ecological, and social benefits while increasing the resilience of BCs food system.

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