

THE BAUTA FAMILY INITIATIVE ON
CANADIAN SEED SECURITY
PILOT YEAR ENVIRONMENTAL SCAN



ACKNOWLEDGEMENTS

This report was made possible thanks to the generous support of Mrs. Gretchen Bauta, member of the Weston family. Through her vision and championing of a secure and thriving Canadian seed system, The Bauta Family Initiative on Canadian Seed Security was established in 2012.

The program seeks to expand the production and conservation of ecologically-grown, regionally-adapted, biodiverse seed in Canada. It is delivered by USC Canada, in partnership with Seeds of Diversity Canada, and through the generous support of The W. Garfield Weston Foundation.

In 2012, its pilot year, our team conducted field visits, held advisory meetings, launched online surveys, and interviewed farmers, farmer associations, researchers, government officials, organic industry partners, and non-governmental organizations. We thank the nearly 1000 people who shared their time and their perspectives to contribute to this report.



Seeds of Diversity

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INTRODUCTION

This document is a summary of the findings of the pilot year of The Bauta Family Initiative on Canadian Seed Security (BFICSS). It is intended to provide a high-level scan of the key challenges and opportunities related to expanding the production, conservation, and distribution of ecologically-grown, regionally-adapted, biodiverse seed in Canada.

In 2013, The BFICSS will make the transition from research to implementation. From February 1, 2013 to January 31, 2017, the program will provide training, applied research, market development initiatives, and financial support to expand production and improve public access to high quality, ecological seed. It will be delivered in partnership with regional and national organizations, with an aim to ensure activities are regionally relevant and contribute to the long-term sustainability of seed security work across the country.

The Bauta Family Initiative on Canadian Seed Security will continually adapt over its 4-year term. We encourage dialogue and feedback on the findings presented here, and will use this information to guide the goals, strategies, and objectives of the program.

DEFINING ECOLOGICAL FARMING AND ECOLOGICAL SEED

Organic farming refers to farming practices certified by an eligible certification body in accordance with Canada's *Organic Products Regulations*. As defined by the regulations, principles of organic farming include, but are not limited to: minimizing soil degradation and erosion; maintaining and enhancing long-term soil fertility; optimizing biological productivity and diversity; managing weeds, pests, and diseases without the use of synthetic pesticides; encouraging beneficial insects and balanced predator-prey relationships; improving livestock health; and decreasing pollution.

Many growers farm according to these principles, but also integrate other ecologically restorative practices. Some are not certified organic, but still adhere to agro-ecological farming practices. Accordingly, *ecological farming* refers to certified organic agriculture, but also other farming practices that are organic, but not certified. It also includes farming systems that adhere to similar agro-ecological principles, such as biodynamics and permaculture. The term extends beyond production techniques to include principles of sustaining human health, social equity, and well-being for future generations. Acknowledging some of the current challenges regarding organic certification, and in order to support a broad range of farming operations, The BFICSS focuses on seed grown using ecological farming practices.

PILOT YEAR FINDINGS: AN OVERVIEW

- ***Sustaining and improving a diversity of seeds in active circulation is important for the resilience of Canada's farming sector.*** Climate change has arrived in farmers' fields, bringing with it increasingly complex environmental pressures. This shifting context, combined with resource depletion and biodiversity loss, makes it necessary to preserve a diversity of seed varieties to build the genetic base necessary for farm and agro-ecosystem resilience.
- ***Ecologically-grown seed is more suitable for ecological farming operations than conventionally bred cultivars.*** Developing varieties under the conditions, and in the regions where the crops will be grown, will develop and strengthen ecological farming by providing producers access to high quality seeds suitable for their production systems and environments.
- ***The market for ecological seed is highly fragmented.*** In this small market, supply-demand interactions change drastically depending on crop, scale of production, and needs of the buyer. Collaboration among growers and diverse members of the seed value chain is needed for this market to develop.
- ***There is a need to develop increased trust in regionally-produced seed.*** Quality assurance programs – in particular, for vegetable seed – are needed to help build trust of ecological producers, who represent a strong potential market for the bulk provision of regionally-produced ecological seed.
- ***The ecological seed market cannot develop significantly without selection and breeding programs.*** Although some producers may find success through small-scale independent breeding and trialing, it will be difficult to scale up ecological seed without established programs to identify and develop varieties well-adapted to the diverse agronomic conditions across the country.
- ***Producers need support with approaches and strategies to grow and expand high quality ecological seed.*** There is a wealth of knowledge that needs to be exchanged between, and among, growers, researchers, industry partners, and public and non-profit agencies.
- ***Canada's regulations pertaining to seed need to be more supportive of ecological seed development.*** The regulations governing seed in Canada are designed to advance the production and distribution of seeds suitable for large-scale, high-input, conventional farming operations. Developing the ecological seed sector – field crops in particular – will require careful monitoring of regulatory frameworks.

MARKET OVERVIEW

The organic food sector is the fastest growing food product category in the world. Canada accounts for approximately \$2.9 billion of the global market, making it the 4th largest market for organic food in the world.¹ End-consumer demand for organic food has grown consistently since the introduction of the federal organic standard in 2009.² However, Canadian producers have not been able to maintain pace with this growing demand. In 2011, there were 3713 certified organic farms, up from 3555 in 2006, but growth across the country has not been consistent and some provinces have seen significant attrition.³ Nevertheless, with the emergence of farmer training programs that promote organic production and increased public awareness of local, ecological food, it is expected that as the market for organic and ecological food increases, a growing constituency of producers will seek, and be able, to meet that demand.^{4,5}

It follows that as ecological food production in Canada increases, there should be a commensurate growth in the supply of ecological seed adapted to Canadian growing conditions. Many breeders and farmers attest that seed varieties developed and selected under ecological conditions are better able to adapt to marginal and diverse agro-ecosystems, develop greater soil fertility and health, attract pollinators, build natural resilience to pests and diseases, respond to environmental stresses, and adapt to climatic variability.^{6,7,8} A growing body of academic research also supports the claim that seeds cultivated under ecological conditions are more appropriate for differentially-scaled ecological farming operations than cultivars bred for high-input, large-scale farming operations.^{9,10,11,12,13}

Canada's *Organic Products Regulations* require organic farmers to use organic seed when it is available, but they are permitted to use untreated conventional seedⁱ if the desired variety cannot be obtained as organic seed.¹⁴ Farmers use this exemption often, because untreated conventional seed is more widely available in the quantities and varieties they need. Without demand from buyers, seed producers lack the incentive to invest in the labour and certification costs to grow organic and/or ecological seed.¹⁵ This pattern is understood as one of the major obstacles to the development of the ecological seed market. For this reason, and others we explore in this report, the supply of seed suitable for ecological production in Canada is very limited.

A recent study by the Organic Value Chain Roundtable (OVCRT) estimates that the current market for organic seed in Canada is approximately \$41 million. They further suggest that if all ecological producers in Canada were to use organic seed (instead of untreated conventional seed), the market would be approximately \$67 million.¹⁵ This data presents a clear and compelling economic opportunity to expand the production and sale of ecological seed in Canada.

ⁱ Untreated conventional seed is seed grown out in conventional farming conditions, but once harvested, it is not treated with any substances that are prohibited under the *Organic Products Regulations*.

Categorizing Seed Markets in Canada

Broadly speaking, we can define two main markets for field cropⁱⁱ and vegetable seed in Canada: the *formal seed market* and the *informal seed market*.

The Formal Market

In the formal seed market, field crop and vegetable seed is purchased from seed producers, re-sellers and/or pedigreed seed suppliers. Virtually all field crop seed is subject to the variety registration and pedigreed seed certification processes under Canada's *Seeds Act* and *Seeds Regulations*.ⁱⁱⁱ These seeds are required to meet quality standards set by field crop commissions and may need to contain identity-preserved (IP) traits that meet specific demands of millers and processors.¹⁶ The majority of vegetable seeds are exempt from this regulatory framework. In the formal market for vegetable seed, regional seed re-sellers who procure seed from international growers (e.g. William Dam Seeds) and international seed companies (e.g. High Mowing Organic Seeds) dominate the market. Small-scale regional seed companies obtain their seed from these sources, as do many small-scale vegetable farmers.^{15, 16}

Buyers in the formal seed market are looking for varieties delivered on time, in the quantities they need, and most importantly, at a quality they can trust. The importance of seed quality for ecological vegetable producers cannot be overstated. The OVCRT study reports: "most organic annual vegetable producers prefer to buy from large seed retailers instead of small organic seed producers [...] even if there are small organic seed producers located closer to their farms".¹⁵ Trust in seed quality differentiates the risk-averse buying behaviour of commercial farmers from the more experimental purchasing habits of hobbyist-gardeners. Farmers experiment with a few new varieties each year to test comparative performance or explore a potential niche market; but they hesitate to trial ecologically-grown, regionally-produced varieties on significant scales.¹⁶

The Informal Market

In the informal market, seed is exchanged at various scales and between different types of farming operations. This market also includes the practice of saving seed to re-sow or sell to other growers. For instance, an ecological field crop grower may sell uncertified green manure seed to vegetable producers or unregistered heritage wheat seed to small-scale grain producers. Backyard vegetable hobbyist-gardeners may exchange seed with small-scale seed companies, heritage/heirloom seed banks, or at community seed events such as Seedy Saturdays/Sundays. Seed sold in this market is not subject to the commercial pressures of the formal seed market, and is often sold or exchanged without adhering to any proprietary restrictions.

Much of the vegetable seed sold in this market comes from small-scale regional ecological seed companies. The market is primarily hobbyist-gardeners that do not require large quantities of seed, and are often willing to experiment with heritage/heirlooms, new, or unproven varieties.^{15,16,17} For this reason, these growers are crucial to the conservation and enhancement of plant genetic diversity.

ⁱⁱ *Field crops* refer to grasses, cereals, oilseeds, and pulses, used for food, forages, and/or green manure production.

ⁱⁱⁱ Visit the following link for an overview of the *Seeds Regulations* – in particular, the distinction between the variety registration and the pedigreed seed certification process: <http://bit.ly/seed-regulations>

This categorization allows us to identify dual needs related to the production and spread of ecologically-grown, regionally-adapted^{iv} seed in Canada:

1. The need to dramatically reduce reliance on seed producers from outside Canada through increased availability of Canadian seed grown by regional seed companies;
2. The need for a substantive increase in the volume of regionally grown, quality seed from ecological seed producers.

Seed Procurement Considerations

Field Crop Production

For medium to large-scale ecological field crop producers, yield and price received for the crop are critical considerations when selecting seed. In general, there is a need for varieties that have a competitive advantage against weeds, resistance to pests and diseases, and good processing qualities. Agronomic and market demands make it difficult for these growers to experiment with unproven ecologically-grown varieties. For instance, field crop seed producers that provide seed to markets that require specific traits must conform to specifications of the primary processors or end-users of the crop. In these scenarios, trait predictability and reliability are crucial and producers will most likely buy pedigreed seed with assured varietal purity, uniformity and trait consistency.

The limited investment in seed adapted to ecological growing conditions means that untreated conventional seed is generally the only option available for ecological producers. When pedigreed organic/ecological seed is available, it is often too expensive or available in limited quantities for a very restricted number of crops. While field crop growers often save their own seed, this seed cannot be sold through the formal commercial system by variety name, due to regulatory constraints and bury concerns about germination rates, genetic purity, varietal integrity, and weed seed contamination.^v When field crop producers seek new genetics or specific traits, they turn to pedigreed seed suppliers and/or seed companies in the formal seed market.^{15, 16}

Vegetable Production

Commercial ecological vegetable producers prioritize high quality varieties that have strong yield potential, good flavour, and disease/pest resistance. Other desirable characteristics include days to maturity, storability, market value, and heritage/heirloom value. In general, if the variety is high quality and has been recommended by other growers, farmers are willing to pay a higher price for ecologically-grown seed. There are a number of producers of regional, ecologically-grown seed with the potential and motivation to satisfy these farmers. At this point, however, they face a disadvantage in economies of scale, and tend to grow quantities suitable for the demands of hobbyist-gardeners, but not larger scale ecological vegetable producers.^{15,16,17} This limitation, and other challenges related to expanding ecological seed production, is explored in the following section.

^{iv} Seed that has been selected for multiple plant generations in a particular region and is well-adapted to grow as both a food and seed crop in that region, or in regions that have similar agronomic and ecological conditions.

^v Saved field crop seed is illegal to sell by variety name if it has not gone through the pedigreed seed certification process; therefore, this seed would need to be sold as “common” seed.

EXPANDING ECOLOGICAL SEED PRODUCTION IN CANADA – THE CHALLENGES

Regulatory Challenges

Organic Products Regulations

Under Canada's *Organic Products Regulations*, organic farmers are required to use organic seed when it is available.¹⁴ Opinions vary on the benefits of mandating use of organic seed in organic production.¹⁶ On the one hand is the strong belief that stricter enforcement would stimulate an increase in the supply of organic seed. On the other, a concern that stricter application of organic standards would narrow the range of varieties available to producers for a significant period of time, since the organic seed industry is underdeveloped.^{15,16,17,18} Since organic seed is generally sold at a premium, the requirement to purchase organic seed might also discourage farmers from transitioning into, or remaining in, certified organic production.¹⁵ Adding to this debate are tensions about the ecological integrity of organic production standards and the costs-versus-benefits of certification.¹⁵ Some ecological seed producers have abandoned organic certification in favour of direct marketing to consumers who trust that their production methods are organic.¹⁶

Seeds Regulations

The main regulations governing seed production in Canada are the *Seeds Act* and the *Plant Breeders Rights Act*. The *Seeds Act* governs the *variety registration process* and the quality standards used by the Canadian Food Inspection Agency (CFIA), Canadian Seed Growers' Association (CSGA), and third party registered seed establishments (RSEs) for *pedigreed seed certification* (see below). These regulations were implemented to protect farmers, reward plant breeders, and safeguard other food industry value chain actors. While some believe they are critical to ensure seed quality in the food system, other stakeholders report that the regulations primarily serve large-scale conventional farming and ultimately inhibit the development of ecological seed.

Variety Registration

In this process, enforced by the CFIA, committees across the country recommend new field crop varieties to be registered to ensure they meet crop-prescribed agronomic, quality, and/or disease resistance standards before release into the market. Recommending committees rarely involve ecological sector representatives, nor do they include evaluation criteria relevant for ecological farming (e.g. genotype-environment interactions, intercropping capabilities, weed suppression, etc.).¹⁶ Variety trials are performed under conventional conditions, with evaluation criteria mostly suited to conventional farming. Within this context, ecologically-bred seed will often underperform and will generally not be permitted for registration.^{12, 13, 16}

It is – with a few exceptions – illegal to sell unregistered varieties of field crops. As such, this registration system ill-suited for ecological agriculture inhibits the development of field crop seeds bred for those production systems. There is also pressure from private seed corporations to deregulate variety registration to expedite the process of bringing new varieties to market.^{10, 19} Although deregulation may remove some regulatory barriers to entry for ecological seed varieties, it also poses the risk of private seed companies further concentrating the seed market with proprietary seed, limiting the diversity of seed available for all types of farming.¹⁹

Pedigreed Seed Certification

Pedigreed seed certification, administered by the CSGA, allows designated field crops to be sold by variety name, if they meet specific varietal identity and varietal purity standards. Pedigreed seed is identified with a CFIA blue certification tag, and commands a premium in the market. All designated crop varieties that are not certified as pedigreed seed cannot be sold by variety name and must be sold as “common” seed.²⁰ Most organic field crop varieties that circulate in the organic market are sold as “common” seed. Many growers argue that pursuing pedigreed certification for ecological seed would ensure a quality standard and a fair price. However, some growers cite concerns: challenges in attaining the standard for weed seed contamination, lack of accommodation for producers that intercrop, and testing, registration, and certification expenses.^{15,16} There is also a concern that pursuing pedigreed seed certification for ecological seed would lead to a concentrated market of a few varieties that meet the commercial and regulatory specifications of large-scale producers only.¹⁶

Plant Breeders Rights Act

The *Plant Breeders Rights (PBR) Act* allows breeders the voluntary option to obtain exclusive rights to propagate material they register as a protected plant variety. The *PBR Act* is Canada’s domestic application of UPOV ‘78.^{vi} Essentially, farmers are allowed to produce, and save seed from protected varieties, and breeders are allowed to use them for further breeding, but neither is allowed to sell seed from protected varieties without authorization.^{21,22} Discussions are currently underway to adopt UPOV ‘91, to align our plant breeding regulations with the standards of international trading partners. The *PBR Act* protects and rewards investments of time, knowledge, technology, and labour in breeding new crop varieties. However, evidence suggests that this system penalizes the production systems that farmers have maintained for centuries.¹⁹ This trend would intensify with the adoption of UPOV ‘91, placing farmers at greater risk through royalty payments and further restrictions on saving seed.²³

Decline of Public Breeding Programs and Extension Services

The past few decades have seen a decline in public breeding programs and an increase in proprietary seed breeding by private corporations.^{19,23,24,25} The breeders and farmers working to advance ecological seed are a very small minority in Canada. The costs of breeding programs for ecological field crops and vegetables are far too high for farmers and breeders to absorb alone. Moreover, many of the public breeding programs only fund researchers who can obtain matching funds from private sponsors. As a result, breeding programs meant to advance the public good are highly influenced by the interests of proprietary seed companies.^{16,19} Ultimately, ecological seed cannot advance without innovative funding strategies to support farmer-scientist collaborations on varieties designed specifically for ecological production. Agricultural extension services in Canada are also on the decline.²⁴ For conventional farmers, these responsibilities have, in part, been absorbed by the private sector through the provision of agricultural inputs that reduce the need for agronomic advice on farms. Ecological growers need more support, since their production is more knowledge-intensive. They cannot rely on agro-chemicals and fertilizers to address challenges of pests, disease, and soil fertility. While there are differing opinions about potential solutions to this issue, any long-term resolution must include a diversity of funding sources to mitigate the loss of public support in agricultural extension.¹⁶

^{vi} *Int’l Union for the Protection of New Varieties of Plants (UPOV)*: intergovernmental institution est’d to provide a system of intellectual property arrangements, to protect/reward the innovation/development of new varieties.

Economic Challenges

Corporate Concentration of the Seed Market

The global seed market is no longer considered competitive. The commonly accepted concentration ratio of 40% in the industry has been exceeded: 56% of the global proprietary seed market is controlled by four firms.²⁴ These actors influence the market through control of private breeding and seed distribution, and also by maintaining lead roles in seed industry consortia (e.g. Canadian Seed Trade Association (CSTA), Canadian Seed Alliance (CSA), etc.).^{10,24} These consortia carry a great deal of lobbying power that can influence national policies, often to the detriment of small farmers and ecological growers. Consolidation is common across the seed sector, with significant impacts on the infrastructure for building ecological seed capacity: “[Larger seed firms] have a clear strategy of purchasing independent seed companies, many of whom once served the organic market with untreated conventional seed and certified organic seed”.²⁴

Market Fragmentation and Lack of Market Data

A supply-demand paradox exists in the market for ecological seed in Canada. Vendors question whether there is enough demand to justify scaling up production, while buyers find the supply insufficient. Since the sector is very small, there are very few private and/or public resources to leverage for market development. There is also virtually no documented market research on the production and circulation of ecologically-grown seed. This absence of data makes it difficult to present a financial case to farmers, seed producers, plant breeders, and funding institutions to invest in the development of ecologically-grown seed.

Informal-Formal Seed Market

With the exception of a few small regional seed companies and mills supplying ecological field crops and vegetable seeds, there is a glaring gap between the commodity-based, export-oriented formal seed market, and the value-based informal seed market. The ‘middle ground’ contains many potential buyers (e.g. market gardeners, artisan bakers and brewers, niche market processors etc.) who have strong ecological and social values, but require quality, quantity, and consistency levels that regional ecological seed producers are not currently able to meet.

Economies of Scale

Scales of production and the number of crops grown in ecological farming are more diverse than in conventional operations. Thus, in a national food system that privileges a select number of varieties for a select number of crops, it is difficult for these growers to reap satisfactory economies of scale in costs related to transportation and delivery, processing equipment, testing services, certification, etc.¹⁶ Field crop seed producers have the capacity to grow large amounts of a particular cultivar; the challenge is producing enough of *many cultivars* at reliable quality levels and to find buyers that can offer a fair price for that seed. For vegetable seed, scaling-up production introduces challenges in quality assurance, labour demands, isolation distances, shipping costs, inventory management, and storage. A profit margin that favours selling seeds in small packets versus selling in bulk can also discourage producers from scaling up production. Without external support to buffer initial risk, small regional seed companies question whether a shift to greater production volumes would be financially worthwhile.^{16,17}

GM/GE-Contamination

The risks of genetically-modified (GM) and genetically-engineered (GE) crop contamination have been identified by ecological and conventional growers as risks to not only the economic viability of their farming operations, but also to the ecological integrity of their farming communities. The intellectual property arrangements in Canada encourage the development of proprietary seeds, more and more of which are genetically engineered.^{23,26} With the introduction of GM-alfalfa and the implementation of low-level presence policies for seed imports on the horizon, there is a justified concern among ecological seed producers that their fields could easily be contaminated and their organic certification compromised. Contamination of neighbouring fields by GM/GE food crops is a huge concern in the organic industry, in which these seeds are prohibited. As such, the growth of a proprietary system that increasingly features GM/GE food and seed crops is very troubling for ecological growers.^{26,27}

Agronomic Challenges

Regional and Climatic Adaptation

The demand for more regionally-adapted ecological seed reflects a growing belief that in an age of climate extremes, it is essential to cultivate intra-specific and inter-specific crop diversity, as well as crops that are well-adapted to their growing region.^{6,8,11,16,28,29} While we cannot expect a northern country like Canada to be entirely self-sufficient in seed and food production, our seed security will be improved vastly if we select and breed for performance on Canadian landscapes and under ecological farming conditions.³⁰

Knowledge Development and Quality Assurance

Training on the production of high quality field crop and vegetable seed in a cost-efficient manner is one of the most important requirements to advance ecological seed production in Canada. While basic seed-saving training is widely available, more advanced quality assurance and crop-specific training is sorely needed.

Sustaining Agricultural Biodiversity

The small numbers of cultivars that currently populate the global commercial seed market are bred to meet the standards of large-scale farmers, food processors, and distributors. Yield, uniformity, identity-preserved characteristics, and capacity to adapt to agro-chemicals take precedence over biodiversity, nutrient density, natural pest/disease resistance, and ability to handle environmental stresses.^{8,11,30} Support for ecological seed is, in part, a reaction to this troubling dynamic. Any attempt to scale up the production and sale of ecological seed varieties with high market potential must include a careful assessment of the impact on agricultural biodiversity. A model favouring increased production of a few varieties of ecological seed could result in the same narrowing of genetic diversity we currently see in the conventional sector.

EXPANDING ECOLOGICAL SEED PRODUCTION IN CANADA – OPPORTUNITIES AND STRATEGIES

Regulatory and Certification Solutions

The proliferation of ecological seed could benefit from non-proprietary variety registration and certification systems that consider the interests and contributions of ecological producers. There are debates regarding potential solutions. Some actors argue that the current standards should be amended to embrace the agronomic, quality, and disease considerations of ecological modes of production. Others want to abandon variety registration and pedigreed seed certification entirely, suggesting that efforts should focus on serving small-scale farmers willing to experiment with ecological varieties and engage in the informal seed market.¹⁶

This argument demonstrates how needs and interests shift with scale of production. At small scales, growers have fewer procurement restrictions and are less at risk of crop failure given the intra-specific and inter-specific diversity in their fields. Small-scale growers that sell into niche markets (e.g. local bakeries, artisanal processors, farmers' markets, etc.) that do not require IP traits, or vegetable growers requiring small amounts of forages and green manure seed, have more freedom to experiment with field crop varieties better suited for ecological production. Seed growers seeking to scale-up their production, especially field crop seed producers, must understand regulatory barriers and strategies to address them. Inspiration may come from outside Canada, as producers, breeders, public and non-profit groups in other countries are experimenting with novel ways to keep seed in the public domain and enable producers to grow and exchange seed without legal risk.

Market Development

While there is significant potential for ecological seed in Canada, producers need more confidence that there is a solid market for their product. Buyers, in turn, must be sure that their requirements will be met. This mutual assurance may be achieved initially through buyers and sellers agreeing on a small number of varieties to be produced and purchased in bulk quantities.

A number of mechanisms have the potential to link seed vendors and purchasers and expand the number of varieties being grown at high quality levels and sufficient quantities. Many growers believe that the most logical and desirable next step to distribute larger quantities of seed is to pool seed production at the regional level, to sell through a virtual store or a co-operative seed enterprise.¹⁶ Members of these groups could sell exclusively to, and through, this body; they could also opt for a mixed approach, maintaining their own catalogue and selling only their bulk seed through a collective body. Another option is to engage in contract growing relationships with larger seed re-sellers. This would allow growers to specialize in the varieties they grow best, and also decrease costs of marketing and packaging. Some experimentation on approaches is needed to determine which practices best support enhanced volumes of regionally-adapted, ecologically-grown, biodiverse seed.

Applied Research

A broad range of actors – from farmers to researchers to seed vendors – expressed the urgent need for on-farm participatory research that links farmers with scientists and considers the value chain of ecologically-grown seed.³⁰ For field crop seed, the particular call was for partnerships linking processors, plant breeders, and producers to help align supply and demand needs at each step in the value chain. Vegetable seed producers favoured researcher-farmer collaboration on production strategies at differing scales and under divergent growing conditions.

Research partnerships can be challenging for growers who are often overworked and time-constrained. Plant breeding also requires patience and a sufficiently long timeline. Like any partnership, efforts need to be made on the front-end to ensure objectives are clear and everyone's interests are served. The BFICSS has developed a four-year participatory breeding and research program that will consider the following¹⁶:

- Ecological methods to address pests and diseases
- Understanding genotype-environment interactions
- Testing crops in multiple marginal agroecosystems
- Identifying crops with high climatic stress and variability tolerances
- Breeding under low phosphorus conditions
- Mycorrhizal associations with plants in nutrient-scarce soils
- Nutrient density in food grown from seed bred under ecological conditions
- Value of heritage varieties vs. newly improved varieties in ecological conditions
- Sustaining heterozygous lines of breeding
- Diversifying seed mixes within one species for field crops

Training and Knowledge Exchange

Across the country, training on ecological seed production and conservation was identified as a key area to develop. Fortunately, farmer training organizations have demonstrated interest in integrating seed production into their programs. Regional networks are also bringing producers together to share knowledge and experience on topics related from agronomy to business management to regulations. Online education, networking, and the development of information platforms are important mechanisms for knowledge exchange and learning. Seeds of Diversity Canada will develop and deliver such a resource as a key component of The BFICSS. The program will also deliver training on the following priority topics.

TOPIC	FIELD CROP SEED PRODUCERS	VEGETABLE SEED PRODUCERS
<i>Work systems and business management</i>	<ul style="list-style-type: none"> • Inventory management and storage of surplus seed • Efficient transportation and distribution systems • Equipment appropriately adapted to different scales of production • Working with value chain actors on distribution and market development • Integrating seed production into farming operations 	
<i>Quality control systems</i>	<ul style="list-style-type: none"> • Pedigreed seed certification for ecological producers • Organic certification for pedigreed seed producers 	<ul style="list-style-type: none"> • Record-keeping and documentation of variety trials • Using seed labs and other 3rd-party actors for testing and treatment • Growing out varieties before they are sold each year
<i>Agronomic knowledge</i>	<ul style="list-style-type: none"> • Differentiating between <i>food</i> production and <i>seed</i> production (i.e. issues of varietal/genetic degradation) • Weed management, suppression, and competition 	<ul style="list-style-type: none"> • Differentiating between <i>crop</i> improvement and <i>trait</i> improvement • Progeny row selection breeding: pedigreed (narrowing selection towards an ideal variety) versus population breeding (rogueing and selecting from a large population)
<i>Crop planning</i>	<ul style="list-style-type: none"> • Working with value chain actors to find marketable crops and crop traits • Identification of cross-pollination risks from GM/GE-fields 	<ul style="list-style-type: none"> • Planning seed production with high-value crops • Establishing isolation distances to maximize land-use • Working with value chain actors to find marketable crops and traits
<i>Pest and disease management</i>	<ul style="list-style-type: none"> • Seedborne diseases and treatment • Pest-plant-insect interactions as related to resistance 	

Engaged Producer Community and Support from other Sectors

In this extremely under-resourced field, groups of seed producers have pooled their knowledge and capacity in impressive ways to advance ecological seed production in Canada. BC Seeds and the Eastern Canadian Organic Seed Growers Network (ECOSGN) are but two examples of emerging producer-driven networks across the country that are innovating on training, market development, crop development, and biodiversity conservation. They are joined by an increasing number of farmers, researchers, organic industry representatives, government and non-governmental partners willing to contribute their own strengths and resources. Collaboration within and among these groups is central to the success of building the ecological seed sector, and will help maximize opportunities in co-operative production and marketing, participatory plant selection and breeding, collaborative funding, and knowledge-sharing.

CONCLUDING REMARKS

More and more Canadians are interested in regionally-produced, synthetic-free food that can be grown successfully under the increasing pressure of climate change. This scan confirms trends, needs, and interests that favour the production of the ecologically-grown and biodiverse seed at the heart of a healthy and robust food system. Meeting this need will not be easy. This kind of effort is not foreign to Canadian ecological seed producers and advocates who have already volunteered long days, months, and years to get this seed work off the ground. We are extremely thankful for their path-breaking work, and excited to support their vision of a seed-secure Canada.

APPENDIX

In addition to hundreds of individual farmers, seed producers, researchers, and industry representatives, the following list provides a sample of organizations consulted for this report.

REGION	ORGANIZATION	WEBSITE
International	GRAIN	www.grain.org
	USC Canada	www.usc-canada.org
	REAP Canada	www.reap-canada.com
	Family Farmer Seed Cooperative	www.organicseedcoop.com
	FedCo Seeds	www.fedcoseeds.com
	High Mowing Organic Seeds	www.highmowingseeds.com
	Johnny's Selected Seeds	www.johnnyseeds.com
	Réseau de semences paysanne	www.semencespaysannes.org
National	Agriculture and Agri-Food Canada	www.agr.gc.ca
	Canadian Food Inspection Agency	www.inspection.gc.ca
	Canadian Organic Trade Association	www.ota.com
	Canadian Seed Growers' Association	www.seedgrowers.ca
	Food Secure Canada	www.foodsecurecanada.org
	National Farmers Union	www.nfu.ca
	Organic Agriculture Centre of Canada	www.oacc.info
	Plant Gene Resources of Canada	www.pgrc3.agr.gc.ca
	Seeds of Diversity Canada	www.seeds.ca
	Canadian Biotechnology Action Network	www.cban.ca
Atlantic	Abundant Acres	www.abundantacres.org
	ACORN	www.acornorganic.org
	Perennia	www.perennia.ca
	Annapolis Seeds	www.annapolisseed.com
	Good Food Farm	N/A
	Hope Seeds*	www.hopeseed.com
	Maple Farm	www.maplefarm.com
	Speerville Flour Mill	www.speervilleflourmill.ca
	The Organic Farm	www.theorganicfarm.net
	The Pollination Project	www.pollinationproject.org
	Vesey's Seeds	www.veseys.com
Ontario	Ecological Farmers of Ontario	www.efao.ca
	Greta's Organic Gardens*	www.seeds-organic.com
	Hawthorn Farm*	www.hawthornfarm.ca
	Hendrick Seeds	www.hendrickseeds.com
	Homestead Organics	www.homesteadorganics.ca
	Organic Council of Ontario	www.organiccouncil.ca
	JustFood	www.justfood.ca
	Everdale	www.everdale.org
	Saugeen River CSA	www.saugeenrivercsa.com
	Speare Seeds	www.speareseeds.ca
	FarmStart	www.farmstart.ca
	Toronto Food Policy Council	www.tfpc.to
	University of Guelph	www.uoguelph.ca
	William Dam Seeds	www.damseeds.ca

REGION	ORGANIZATION	WEBSITE
Quebec	Action Communiterre	www.actioncommuniterre.qc.ca
	Coop la Mauve	www.lamauve.com
	Equiterre	www.equiterre.org
	Kamouraska Societe des Plantes et Semences	www.lasocietedesplantes.com
	La Coop. Agrobio du Quebec	www.coopagrobioquebec.com
	La Milanaise	www.lamilanaise.com
	Les Jardins de l'écoumène	www.ecoumene.com
	Les Moulins des soulanges	www.moulinsdesoulanges.com
	Nature Québec	www.naturequebec.org
	Ferme Tourne-Sol*	www.fermetournesol.qc.ca
	Prairies	Assiniboine Food Security Alliance
Organic Alberta		www.organicalberta.org
Canadian Seed Institute		www.csi-ics.com
Farmer Direct Co-op		www.farmerdirect.coop
The Grain Chain		www.grain-chain.com
Interlake Forage Seeds		www.interlakeforageseeds.com
Loiselle Organic Family Farm		sites.google.com/site/loisellema
Manitoba Agriculture, Food and Rural Initiatives		www.gov.mb.ca/agriculture
Manitoba Organic Alliance		www.manitobaorganicalliance.com
Midmore Farm		N/A
Morinville Seed Cleaning Co-op		www.seed.ab.ca/plants/morinville
Nodricks Norsask Seeds		www.meratradox.com
Prairie Garden Seeds		www.prseeds.ca
Saskatchewan Organic Directorate		saskorganic.com
Stonehenge Organics		www.stonehengeorganics.com
University of Alberta		www.education.ualberta.ca
University of Manitoba		www.umanitoba.ca
University of Saskatchewan		www.usask.ca
Western Applied Research Corporation	www.warc.ca	
B.C.	Central Island Seed Savers	N/A
	Denman Island Community Seed Savers	N/A
	Farm Folk City Folk/BC Seeds	www.farmfolkcityfolk.ca
	Fieldstone Granary	www.fieldstoneorganics.ca
	Full Circle Seeds^	www.fullcircleseeds.com
	Planting Seeds Project^	www.plantingseedsproject.ca
	Salt Spring Seeds^	www.saltspringseeds.com
	Stellar Seeds^	stellarseeds.com
	Sunshine Farm^	www.sunshinefarm.net
	Twin Meadows Organics	www.twinmeadowsorganics.com
	Two Wings Farm^	www.twowingsfarm.com
	University of Victoria	www.uvic.ca
	West Coast Seeds	www.westcoastseeds.com

* Members of ECOSGN: www.seeds.ca/ecosgn

^ Members of BC Seeds: www.bcseeds.org

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