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Research Brief

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Advancing Regional Food Value Chains in the Okanagan Bioregion

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Abstract

The Okanagan bioregion has the potential to increase food self-reliance by reorienting food production to meet the needs of the local population. However, reaching food self-reliance potential within the bioregion and realizing the economic benefits that accompany food system regionalization requires development of regional food value chains that connect producers and consumers locally. Dominant, conventional supply chains that are long and opaque tend to favour 'efficiency' while sacrificing transparency, and marginalizing small and mid-scale producers. As demand for locally grown food increases, new models must and are emerging to facilitate food processing, aggregation, and distribution within regional food value chains. These models are redefining producer-consumer relationships and have the potential to address local economic development, increase market access to small and mid-scale producers, develop trust between supply chain actors, and address environmental issues associated with global food trade. This study examines existing infrastructure, relationships and business models within emerging regional food value chains to better understand the common challenges faced and strategies for supporting the development regional food value chains. A review of existing models revealed key strategies necessary for to support development of regional value chains including; creating space for post-production activities, supporting producers, encouraging collaboration and cooperation and developing leadership capacity in the sector.

Background

At local, national and global scales there are structural, regulatory, and economic frameworks that shape the food systems and determine how food moves from farm to plate. These frameworks have largely had a detrimental impact on small and medium-scale farmers, and on the growth of local food economies (Carter-Whitney & Miller, 2010, Dillemuth & Hodgson, 2016; Rogoff, 2014). Globalization, consolidation, and intense industrialization, which characterizes dominant, conventional food supply chains, has created significant gaps in the infrastructure and networks that support regional food systems (MacRae, 2011; Todorovic et al., 2018). At the same time, these gaps are being filled by innovative businesses and infrastructure types that are redefining relationships between producers and consumers while supporting broader regional food system development (Blay-Palmer & Donald, 2006).

Proponents of food system regionalization largely agree that moving away from a centralized, and consolidated food supply chains towards more flexible, regionally focused ones is a key requirement for the development of sustainable, regional food systems (Carter-Whitney & Miller, 2010; Stevenson & Pirog, 2008; Day-Farnswoth et al., 2009). Within the post-production sector in particular, there is significant potential for local economic development that can be captured by regionally focused enterprises. Established regional food supply chains can also increase producer income and reduce economic uncertainty, which can help sustain small farm businesses, and rural economies, and have a positive impact on local employment (Todorovic et al. 2018; Jarzębowski, Bourlakis & Bezat-Jarzębowska, 2020). Supporting local food economies can also raise the profile of local agriculture which can enhance efforts to protect farmland, and ensure its productive use for agriculture (Day-Farnswoth et al., 2009). As food supply chains become shorter there are also fewer intermediaries, which brings actors closer together both physically and relationally. This has the potential to build social capital by deepening connections between supply chain actors and redefining relationships between producers and consumers (Fondse, 2012; Glowacki-Dudka, Murray & Isaacs, 2012; Jarzębowski, Bourlakis & Bezat-Jarzębowska, 2020).

Building Regional Food Value Chains

Conventional, global-industrial food supply chains have evolved to 'efficiently transport food around the world. Within this structure producers are input suppliers with limited influence over the price they receive for raw goods (Ecotrust, 2015). As 'price takers' in the global market they most often lose out on the value created as food is processed and delivered to consumers (Bloom & Hinrichs, 2011). In these conventional supply chains power is concentrated, primarily within the distribution, manufacturing and retail sectors. As a result, these actors have disproportionate control over what the food system looks like, and whose interests are represented (Steinman, 2019). generally, small and mid-scale producers lose bargaining power and are either pushed out, or forced to work within a system that does not meet their needs (Rogoff, 2014; Lyson, Stevenson & Welsh, 2015).

Regional food supply chains, in contrast, are typically described as 'short' or 'value based' and are characterized by close relationships between producers and consumers, high level of product differentiation and connection to place (Fondse, 2012). Typically, these supply chains are associated with direct-to-consumer markets where relationships can develop between producers and consumers (i.e. farmers markets) that result in higher economic returns for producers. However, with demand for local food increasing, it has become necessary to explore the potential to 'scale up' these models while retaining the inherent values associated with local food systems including economic viability of farmers, environmental protection, social connectivity, and community resilience (Mount, 2012; Clark & Inwood, 2016; Fondse, 2012). With these goals in mind, new models can be described more accurately as local of regional food value chains constructed to maintain the critical values associated with direct-to-consumer markets even as they scale up to meet increasing demand for local food (Ikerd, 2011; Swisher, Ruiz-Menjivar, & Koenig, 2018).

Post-production infrastructure for product aggregation, processing and distribution is a critical part of regional food value chain development.

Aggregation is a critical supply chain step that involves bringing products from different origins together to create a larger, more consistent supply for the market.

Food processing activities generally add value to agricultural products, and it is acknowledged that food processing has the highest economic multiplier among all manufacturing sectors.

Distribution involves activities that complete the connection between producers and retailers or consumers. This includes the people, equipment, and networks involved in transporting food from aggregation, storage and processing facilities to locations where it is purchased or prepared for consumption.

What is the Post-Production Sector?

The post-production sector is a key component in the functioning and growth of agricultural economies, and a necessary link between producers and consumers (Todorovic et al., 2018, Diamond & Barham, 2012). Post-production infrastructure for product aggregation, processing and distribution is a critical part of regional food value chain development. While the food supply chain includes all people, process activities, and networks involved in bringing food from farm to table (e.g. production, processing, aggregation, distribution, retail, preparation, and consumption), this study focuses specifically on the post-production sector (i.e. aggregation, processing, distribution) because of its critical role in building regional food systems.

Food processing is the most varied and complex step in the food supply chain including a variety of activities that transform raw agricultural products into finished and consumable goods (Gwin & McCann, 2017). Processing allows producers to; extend their marketing season, diversify product offerings and revenue streams, access niche markets (i.e. institutions, food service), convert surplus or undesirable products, and provide year-round employment (Dillemuth & Hodgson, 2016; Gwin & McCann, 2017). Processing activities generally add value to agricultural products, and it is acknowledged that food processing has the highest economic multiplier among all manufacturing sectors (MacRae, 2006). Aggregation is a critical supply chain step that involves bringing products from different origins together to create a larger, more consistent supply for the market (Clark & Inwood, 2016; Dillemuth & Hodgson, 2016; Day-Farnsworth et al., 2009). Aggregation of raw products can occur prior to increase volumes for processing or after products have been processed to increase the volume and diversity of products brought to market. Distribution involves activities that complete the connection between producers and retailers or consumers. This includes the people, equipment, and networks involved in transporting food from aggregation, storage and processing facilities to locations where it is purchased or prepared for consumption.

Regional Food Value Chain Potential in the Okanagan Bioregion

Food system modelling for the Okanagan bioregion illustrates that food self-reliance could increase with a shift to regionalized food production. Food self-reliance, or the percentage of the local diets that could be satisfied by locally produced food, increases even as the local population grows by 43% (Polasub & Dorward, 2021). This shift would also lead to economic benefits including an increase in gross domestic product (GDP), tax revenue and employment income in the bioregion (Wijekon, Polasub & Mullinix, 2021). Realizing the future food self-reliance and economic outcomes of a regionalized food system critically depends on development of a regional post-production sector. Table 1 compares the scenario conditions for the current production (2016) and regionalized food production (2050) scenarios. Table 2 shows the local food production for current production (2016) and regionalized production (2050) scenarios in all major food groups. This kind og future food system modelling can help conceptualize the requirements for a post-production sector to support regionalized food systems in the bioregion.

Regional Food Value Chain Gaps

In BC, important post-production infrastructure for many sectors has concentrated in the lower mainland (i.e. Metro Vancouver and the Fraser Valley) due to proximity to production centres, markets and distribution networks (i.e. seaport, U.S. Border crossing etc.). As a result, regions outside the lower mainland, including the Okanagan, have increasingly limited access to necessary post-production infrastructure to support regional food value chains. The following section outlines some of the existing post-production sector gaps in the Okanagan.

Dairy Processing: In BC, dairy processing is concentrated in the Fraser Valley and on Vancouver Island. Large dairy processors located in these regions can have annual processing capacities over 100,000 tonnes (BC Dairy, personal comm., May 8, 2019). In the Okanagan there are nine dairy processors all operating at a small, farm-based or artisanal scale with an estimated total annual processing capacity of approximately 2,000 tonnes.

	Current Food Production (2016)	Future Production (Regionalized 2050)
Population	362,280	517,416
Land for Food Production (hectares)	40,098 ha	40,098 ha
Total Food Production (tonnes)	236,228 t	301,641 t
Food Self-Reliance (total diet)	38%	69%
Total Gross Domestic Product	$134 million	$147 million
Tax Revenue	$17 million	$19 million
Employment Income	$84 million	$101 million

Table 1: Comparison of food system outcomes between current food systems (2016) and future food production (2050).

	Current Food Production (2016), in tonnes	Future Production (Regionalized 2050), in tonnes
Dairy	65,839 t	131,030 t
Egg	330 t	6,500 t
Poultry	11,647 t	28,103 t
Red Meat	1,925 t	12,599 t
Grain, Legume, Fat & Oil	2,699 t	40,471 t
Fruit	142,925 t	27,434 t
Vegetable	10,838 t	73,504 t

Table 2: Comparison of food production for food groups between current food systems (2016) and future food production (2050).

Egg Processing and Aggregation: In the Okanagan bioregion there were 357 farms that reported egg production in 2016. Of those farms, three hold quota and are responsible for 60% of local production. All of the eggs produced by quota holding farmers are transported to facilities in the lower mainland of BC for grading, distribution and further processing. There are two farm-based egg grading stations in the Okanagan bioregion certified with the Canadian Food Inspection Agency (CFIA) as of September 2020, one located in Cawston (RDOS), and one located in Vernon (RDNO). There are no facilities in the bioregion processing eggs for food service or institutional markets.

Red Meat Processing: There are 4 licensed abattoir facilities for red meat in the bioregion, one facility is federally licensed while the remaining 3 are provincially licensed. Of the three provincially licensed facilities in the Okanagan, one is a Class A facility (slaughter/cut and wrap) for beef, as well as pork, llama/alpaca, ostrich, goat, rabbit and lamb, one is a Class B facility (slaughter only) for beef, and the third is a Class A facility licensed to process lamb and goat (BC Ministry of Agriculture, Food and Fisheries, 2020). It is estimated that half of the slaughter capacity for red meat located in the North Okanagan was lost with the introduction of new provincial licensing requirements in 2007 (Johnson, 2008). The BC Ministry of Agriculture, Food and Fisheries is currently engaged in a review of these licensing requirements across the province.

Grain and Legumes Processing: Some grain production for human consumption occurs in the bioregion, mostly in the North Okanagan. Grain, legumes and seed processing occurs, however most of what is processed locally is sourced from outside the bioregion, primarily from other regions in BC, Alberta and Saskatchewan. Based on processing capacity estimates from facility operators, facilities in the bioregion process an estimates 2,600 tonnes of grains, seeds and

legumes annually. These products are sold within BC, and to national and international retail and wholesale markets, and for further processing. The increasing popularity of plant-based diets has created processing demand for plant-based alternatives to meat, milk and other livestock products, many of which are derived from grains and legumes. As a result, the plant-based protein sector is one of the fastest growing and most lucrative food manufacturing sectors globally. In 2020, the Government of Canada invested significantly in companies developing new plant-based protein options for Canadians (Keeve, 2020).

Minimal Processing for Fruit and Vegetables: Much of the tree fruit currently produced in the Okanagan is either sold fresh through direct markets such as farmer's markets and fruit stands, or through co-packers to provincial, national and international markets. Historically, the robust fruit production sector was linked to a post-production sector that included packing houses, storage, distribution and value-added processing such as juicing, drying and canning. By 1992 the last commercial cannery in the bioregion had closed (Jones, 2011). Much of the current processing capacity for fruit is dedicated to juicing for beverage manufacturing and further processing. There is an existing gap in minimal processing capacity for processing of fruits and vegetables, most notably freezing and canning. Infrastructure for Individual Quick Freezing (IQF) of fruits and vegetables has played a role in regional food value chain development in other regions but is notable absent from the Okanagan. IQF infrastructure can allow farmers to produce more during the season, diversify product offerings, and sell their produce throughout the season without compromising quality (Riordan, n.d.; Brooks, 2017a). Increasing capacity for minimal processing could create new opportunities to develop markets for institutional and food service markets which are currently under-served by regional producers (Grube-Cavers et al., 2018).

Regional Aggregation and Distribution: Food supply chain consolidation has also meant that local food marketing and distribution has primarily been facilitated through direct-to-consumer supply chains such as farmer's markets, Community Supported Agriculture programs, farm gate sales etc. These direct-to-consumer markets play a critical role in supporting local food systems and building regional food value chains. However, more diversity in regional marketing channels are required to 'scale up' local food systems and meet growing demand for local food. Small-scale food distributors also operate in the bioregion with come focusing on direct to consumer weekly delivery of fresh, and processed foods. Their offerings often include locally sourced fresh fruits and vegetables, although it is difficult to estimate the volume of fresh produce sold through these channels. Direct-to-consumer delivery models are increasing in popularity as demand for locally produced food is increasing. The COVID-19 pandemic created additional demand for direct-to-consumer delivery models with the disruption of traditional local food distribution channels such as in person farmer's markets.

Regional Food Value Chain Opportunities

Future food system modelling for the Okanagan bioregion demonstrates the capacity of the bioregion to increase local food production and food self-reliance. Achieving this requires development of regional food value chains that can effectively connect producers and consumers within the bioregion. This section outlines existing opportunities in the Okanagan to support regional food value chain development.

Potential for Increased Food Self-Reliance: Food system modelling suggests that the bioregion could increase food self-reliance significantly by producing food locally that first and foremost meets the needs of the local population. This increase in food self-reliance is possible even as the population increases (Polasub & Dorward, 2021).

High Concentration of Small and Mid-scale Farms: In the Okanagan bioregion the majority of producers operate small or mid-scale farms. The average size of farm operations is 78 hectares in the North Okanagan, 26 hectares in the Central Okanagan and 63 hectares in the Okanagan-Similkameen and the majority of farms generate less than $100,000 in farm gate revenue (BC Ministry of Agriculture, Food and Fisheries, 2016). With a high concentration of small and mid-scale farms, the bioregion could be well suited to and benefit from regional food value chain development. Regional food value chain research suggests supply chains gaps disproportionately

impact operators that make up the 'Agriculture of the Middle' who may be too small to engage in conventional supply chains yet too large for direct-to-consumer channels (Stevenson & Priog, 2008; Feenstra et al, 2011; Stahlbrand, 2017; Ecotrust, 2015). 'Agriculture of the Middle' producers can therefore be key actors in regional food value chain development because they are large enough to compete, yet nimble enough to respond to changes in local market demand. Developing adequate 'Infrastructure of the Middle' to serve these producers, involves relationship development, co-learning and support for innovation within the sector (Stahlbrand, 2017). Aggregation infrastructure (i.e. warehousing, trucking etc.) is also particularly important in development of regional food value chains because of the need to consolidate products from a large number of small and medium sized producers (Day-Farnsworth and Morales, 2011; FarmReach, 2012).

Established Producer Consumer Relationships in the Bioregion and Demand for Local Food: Of the 3,210 farms in the Okanagan in 2016, 979 reported direct-to-consumer sales (RDNO: 288, RDCO: 329, RDOS: 362) (BC Ministry of Agriculture, Food and Fisheries, 2016). This included farms selling raw and value-added products through direct-to-consumer markets such as farm stands and kiosks, farmers' markets and Community Supported Agriculture (CSA) programs. There is no data collected about the volume of food sold through direct markets, or the location of these sales. As a result, it is difficult to determine the capacity of existing direct-to-consumer supply chains. However, evidence of these relationships suggests that the bioregion may be able to support new regional food value chains built on strong producer - consumer relationships. In a study conducted by the BC Ministry of Agriculture, Food and Fisheries the Thompson/Okanagan/Kootenay regions included a higher proportion of individuals who have a high interest in premium local food, and are unconcerned about price (BC Ministry of Agriculture, Food and Fisheries, 2018). A survey of restaurant patrons in the Okanagan also revealed a high degree of interest in local food and willingness to pay for local food in restaurant settings (Wijekoon et al., 2020).

Methods

Understanding the potential for regional food value chain development is an important part of realizing the food self-reliance and economic outcomes associated with a regionalized food systems in the Okanagan bioregion. This study employed case study evaluation and typology development to answer two primary research questions: 1) What are the common characteristics of post-production infrastructure in regional food value chains?, 2) What common challenges face regional food value chain development?, and 3) What strategies and lessons learned can be applied to help advance a regional food value chains in the Okanagan bioregion?

The goal of typology construction is to move from a broad heterogeneous sample towards a smaller collection of coherent types that can be used to describe the common characteristics and attributes of the sample (Alverez et.al., 2018, Remali et.al. 2016). Typologies are frequently used in the disciplines of urban design and community planning as a way of emphasizing key qualities and characteristics of buildings, neighborhoods and cities (Remali et.al., 2016; Adam and Jamison, 2014). These methods have been used in assessment of firm types in food supply chains. Fondse (2012) used typology construction to understand the primary drivers for development of short food supply chains in Holland. Carbone (2017) focused on developing typologies to evaluate the participation of various stakeholders and their relationships to one another. Jarzębowski, Bourlakis & Bezat-Jarzębowska (2020) evaluated 'short food supply chains' based on the level of compromise required by producers and consumers as a way of communicating the which stakeholders had more or less control within the supply chain. They also distinguished between value chains operating in local, hyper-local and ultra-local food systems brining into focus questions of scale and efficiency.

In order to construct typologies a number of examples of post-production infrastructure were evaluated. Data was collected using both primary and secondary sources for post-production businesses operating in regional food system supply (value) chains. When possible, brief interviews were conducted with facility owners, operators, and/or managers. In some cases, a list of questions was provided by email for them to respond to. When interviews were not possible secondary sources such as websites, government documents, technical reports, feasibility studies, and other publicly available resources were used to gather information on case examples.

Farm to Institution Food Value Chain Development

In the Okanagan bioregion there are opportunities to expand institutional supply chains to increase the amount of locally produced food in public institutions (Grube-Cavers et.al., 2018). Currently, institutional supply chains rely on large scale distributors and intermediaries which can create barriers to entry for small and mid-scale producers and limit the amount of local food in institutions.

In a study conducted by the Institute for Sustainable Food Systems in 2018, lack of post-production facilities was identified as a barrier to institutional procurement of local food in the Okanagan. Many institutional facilities no longer have onsite kitchens or staff to process and prepare food using raw ingredients. As a result, institutional clients are only able to purchase food that has undergone specific kinds of processing or that meets certain specifications (i.e. serving sizes and specialized packaging). For fruit and vegetables minimal processing activities such as chopping, freezing and dehydrating are all necessary to support institutional supply chains. Specialty processing for dairy, meat and eggs is also required. According to the assessment of institutional supply chains in the Okanagan there are no facilities that currently perform this kind of processing for institutional markets. The lack of food safety testing facilities in the bioregion was also identified as a barrier to building the capacity of local producers to serve institutional supply chains. While there are barriers to institutional food procurement in the bioregion there are also a number of opportunities that have been identified for expanding the post-production sector to increase institutional procurement of local food in the bioregion.

Optimize Existing Facilities: In the Okanagan bioregion there are a number of commercial kitchen spaces inspected and licensed by the Interior Health Authority (IHA). These facilities could be better utilized to process products into value-added goods for institutional and retail markets. Other producer-run facilities may have additional capacity that could be utilized to support expanded regional markets. Greater support for producers to engage in value-added activities and explore new markets could help to advance this.

Creation of New Facilities and Product Specific Processing: The potential for the development of institutional markets in the bioregion could support the development of new post-production infrastructure in the bioregion, particularly for the dairy and meat sectors. Minimal processing of fruits and vegetables is also identified as a need that could be better met with new facilities in the Okanagan. The Just Cut program supported by the Centre for an Agricultural Economy (CAE) in Hardwick, Vermont is an example of infrastructure development to serve institutional supply chains (Brooks, 2017b). Just Cut provides minimal processing of root and storage crops to a core group of institutional clients. The programming is made possible by ongoing relationships between institutions, the CAE and existing regional distributors.

Development of an Okanagan Agriculture Innovation Centre: The study of institutional supply chains in the Okanagan included investigation of the role of an Okanagan Agriculture Innovation Centre. During interviews with producers and processors in the Okanagan both access to food safety lab testing and technical support for navigating food safety certifications was cited. Notably, the idea of shared use kitchens as part of a food innovation centre was a top priority for stakeholders interviewed in the Okanagan. The potential for a group purchasing and product aggregation was also mentioned as an opportunity to support institutional procurement.

Results and Discussion

Regional Food Value Chain Typologies

As alternatives to conventional supply chains, regional food value chains help to advance sustainable development goals and aim to connect producers and consumers locally. Food system modelling in the Okanagan suggests that increased food self-reliance and economic outcomes critically depend on establishing post-production infrastructure and supporting regional food value chain development to help ensure that local food is available and accessible to local residents. This is consistent with research findings that identify post-production and regional food value chain infrastructure as necessary elements to support the 'scaling up' of local-regional food systems (Clark & Inwood, 2016). The analysis of case studies and development of typologies are useful for the development and implementation of support strategies. These strategies are further explained in the next section. Table 3 outlines five regional food value chain typologies developed through case study and literature review and highlights critical success factors, advantages as well as challenges and barriers they face.

Strategies for Regional Food Value Chain Development

Conventional supply chains, and the policy environments that support them have created gaps between local producers and consumers. These gaps have also created opportunities that new models are moving to fill. Evaluation of these emerging models can be instructive for the development of regional food value chains. The following sections identifies key strategies that can supported development of regional food value chains to successfully connect producers and consumers within regions. These strategies focus primarily on actions that can be taken at the local and regional level.

Create space for post-production activities

Contemporary land use planning and the globalization of food supply chains have created challenges in securing space for post-production activities. Even in cases where policy and planning frameworks have successfully protected farmland, and planned for other food system elements there is often a failure to create space for other critical food supply chain infrastructure.

Existing policy and regulatory environments create restrictions on where post-production infrastructure can be located. Restrictive policies for the use of agricultural land in some areas, as well as the high cost and competition for industrial land have had an impact on the development of regional food value chains. Creating space within communities for post-production activities to take place is an important step for growing a regionally focused post production sector. Food/Agricultural Enterprise Zones are one example of how regulatory reform can support the development of regional post-production infrastructure. Enterprise zones create specifically designed zoning, taxation and regulatory environments to encourage key infrastructure development. The Agricultural Food Processing Zone in Chilliwack (British Columbia) allows for development of processing, storage and distribution infrastructure on farmland near major transportation corridors (City of Chilliwack, 2007). In this case the scale of post-production infrastructure development is limited to maintain the viability of agricultural land and serve local producers.

This kind of zoning and supportive land use policies can have additional benefits by encouraging post-production infrastructure to be strategically located in clusters. Clustering and co-locating post-production facilities and other supply chain infrastructure can reduce capital expenditures and operational costs, allow business and sectors to share resources and information, improve market access, and support innovation in the sector. Clustering is a concept that has long been used in a variety of industrial sectors include large scale food manufacturing. For regional food value chain development clustering can also be beneficial. In addition to leveraging shared resources and access to markets clustering regionally focused post-production infrastructure can

Table 3: Common post-production typologies in regional food value chains.

Typologies	Success Factors	Advantages	Challenges/Barriers
Entrepreneurship Model: Developed to meet the needs of single producer, these models are usually innovative and scaled to match production volumes and business characteristics of a producer. These models can be farm based and often rely on building strong connections with customers through producer driven narratives.	• Leadership capacity of an individual or small group of individuals • Offering differentiated product or service • Connecting a "face" to the product and telling compelling stories	• Can be a catalyst for value chain development • More nimble and adaptable to supply and/or market shifts • Drive innovation within Regional Food Value Chain • Developing local food champions	• Raising capital for infrastructure investment • Slower business growth • Challenge accessing appropriate space and equipment to support scale and type of operations • Business viability and competition
Producer Driven Model: Developed to meet the shared need of a group of producers. These models often emerge to increase market share and distribution capacity of small and mid-scale farms.	• Development of producer collaboratives and alliances • Address processing and distribution needs of small and midscale producers	• Contribute to increasing the supply of local food and building producer capacity • Increase supply of local food for local markets	• Product supply consistency and quality • Logistics of working with a number of small and mid-scale producers
Institution/Government Supported Model: Developed to meet address shared need and meet local economic development goals. These models rely on administrative support and funding from institutions (e.g. government). Often designed to meet the needs of small scale producers and include support services that encourage business growth, product development and partnerships.	• Coordination by backbone organization • Internal leadership and "champions" to support programming, source funding etc. • Constantly gathering and integrating feedback from users/clients	• Can meet post-production needs of small-scale producers • Low barriers to access • Provide business development support • Provide key supports such as: business incubation, food safety testing, product development etc. • Can leverage municipal funding and partnerships	• High capital and infrastructure investment required • Can be impacted by policy and funding shifts within institutions • Finding staff with the right set of skills • Ongoing operational funding
Non-Profit Driven Model: Developed to fulfill a mission - usually connected to the development of stronger local food systems. These models could emerge to support the mission of an existing non-profit or support the development of new non-profit organizations. May also be developed to support a specific community need (e.g. increasing healthy food access).	• Established vision and mission • Stable funding support • Tracking and communicating social, economic and environmental impact indicators • Integration of food security and equity programming	• Can facilitate new relationship development in regional supply chains (i.e. farm to school) • Designed to advance core values of local food system (e.g. social, environmental, economic)	• Finding staff with the right set of skills • Balancing economic social and environmental goals • Logistics and working with small and mid-scale producers • Ongoing operational funding
Retail/Consumer Driven Model: Developed to meet and serve the needs of local consumers. Usually focused on product aggregation, distribution, and retailing but can also include processing. These models compete with conventional models by offering differentiated products, advancing social and environmental goals and contributing to public education.	• Capacity to aggregate products from a variety of producers • Developing "marketplaces" for interaction between producers and consumers	• Drive development of consumer-focused local food marketplaces • Provide marketing opportunities for a broader range of local products • Play a key role in educating the public	• Building and sustaining consumer demand for local food • Accessing space close to markets (e.g. near urban centres) • Balancing needs of producers and consumers

support development of regional food identities, expand opportunities for aggregation of locally produced food and respond to growing demand for local services (Knezevic et al., 2015).

Creating space for these activities is important in supporting the development of regional food value chains that rely on product aggregation from a variety of small and mid-scale producers. Increasing land prices in and around urban areas, limited availability of industrial land and land use competition in urban and industrial areas can restrict the development of 'last mile' infrastructure which includes food storage, warehousing and distribution and a critical link for regional food value chains. Public investment and support for in 'last mile' food warehousing and storage is creating new opportunities for small and mid-scale producers and supporting economic development in a number of communities. The Central New York Regional Market (Syracuse) is a hybrid, public-private retail/wholesale food terminal that has been in operation since 1938. The Regional Market provides low-barrier retail and wholesale opportunities for small and mid-scale producers and cultivates a food identity for the greater Syracuse region (CNYRMA, n.d.). The Ontario Food Terminal (OFT) (Toronto) is the large produce distribution hub that has been in operation since 1954 serving the City of Toronto and surrounding communities. Increased demand for local food and policy changes recently prompted conversations about the role of OFT in the region's food system and economy (CUI, 2019). New recommendations presented by the Canadian Urban Institute include development of an site retail farmer's market, municipal and provincial policy reform to reduce the facilities operating costs and continuing to develop digital and logistical innovations for food distribution. The proposed Circle City Wholesale Food Terminal in Madison (Wisconsin) would coordinate aggregation and distribution for producers within a 200 mile radius of the facility. The proposed local food terminal would leverage public-private partnerships to create space to buy and sell locally produced foods for businesses of different scales (Miller & Day-Farnsworth, 2018). Producers, governments and retailers in the region have all expressed interest in supporting this proposal.

In the United States, a focus on food hub development has increased the number of food hubs across the country and elevated conversations about wholesale markets, warehousing and food retail space as important public infrastructure (Barham, 2017). A partnership between the US Department of Agriculture and the Project for Public Spaces is exploring the role local food markets can play in community health, livability and resilience (Davies, 2019).

Support producers to engage in post-production activities

In the development of regional food value chains producers often take on new roles and responsibilities in processing, distribution, marketing, sales etc. While the direct involvement of producers is critical, the growth of regional food value chains can often be directly linked to the capacity of producers. Providing technical assistance and business development support for producers and food entrepreneurs is a key strategy for 'scaling up' regional food value chains.

There are a number of areas where support for producers can have a positive impact on the development of regional food value chains. The first is in providing technical supports and training in key post-production activities, including regulatory compliance, processing techniques and product development. In BC, the Small-Scale Food Processor Association (SSFPA) provides support and education for small-scale food processors to develop and implement required health and safety plans, such as Hazard Analysis and Critical Control Points (HACCP) plans. The SSFPA also supported development of Food Metrics, BC's first community food lab, located in the Comox Valley on Vancouver Island (COABC, 2019). Facilities of this kind provide the necessary technical assistance to small-scale producers and processors and as a result could support the development of regional food value chains.

The second area of producer support is related to business development. Engaging in a regional food value chains may require producers to scale up or restructure their business to better serve regional markets. In the U.S. established agricultural extension units have played an important role in supporting post-production business development and the growth of regional food value chains. Such extension services often involve critical partnerships between research and education institutions, local and state governments, and the private sector local to advance

policy, conduct research, and provide extension education opportunities for producers. As an example, the University of Wisconsin-Madison has developed a Community Food Systems Program as part of is Agricultural Extension Division with resources and extension supports for the development of small-scale food businesses (University of Wisconsin-Madison, n.d.). The Cornell Small Farms Program similarly advances research and extension programming to provide farmers with access to business development supports including courses, workshops and networking opportunities to advance regional food value chains (Cornell University, n.d.).

Food business incubators and shared-use processing facilities have been developed in many cases to provide both technical assistance and business development support for producers engaging in post-production activities. A number of these facilities were identified as part of this case study evaluation and have contributed to regional food value chain development by providing essential support for small-scale producers and processors. Importantly, these facilities rely on support from a strong backbone organization with a mandate to support local food system development. Shared use facilities are important spaces for stakeholder collaboration and relationship building critical for the development of regional food value chains. In some cases, they are facilitate collaboration for the development of regional farm-to-institution supply chains. The BC Food Hub Network initiative is currently providing funding and support for the development of critical shared use, and business development infrastructure across the province. The program is supporting development of a regional food hubs in Vancouver, Surrey, Port Alberni, Quesnel and Salmon Arm (BC Ministry of Agriculture, Food and Fisheries, n.d.). The District of Summerland and other partners are actively seeking funding and support for development of a South Okanagan Food Innovation and Processing Hub to support processors and a regional food system.

Encourage Collaboration and Cooperation

Regional food value chains are differentiated from conventional supply chains because of the engagement of a large number of small and mid-scale producers, processors and other stakeholders. Unlike conventional supply chains which may seek to consolidate processes and participants, regional food value chains operate in ways that aim to empower and maintain autonomy for these actors. As a result, collaboration and cooperation must be supported.

Within regional food value chains cooperation at the producer level is a common strategy that can support the increased capacity of regional food value chains while retaining producer autonomy and values. Producers cooperatives and informal alliances are common in regional food value chains. When producers work together, productivity and capacity to serve local markets can be increased. Studying regional food value chain models revealed the role producer collaboratives and alliances can play in increasing product volumes and efficiency. Producer cooperatives and alliances can increase the volume of local food available while retaining farmer autonomy and the core values of local food systems.

Networking is also necessary and can support relationship building and help reveal and develop synergies between different sectors. An ISFS study of farm-to-restaurant supply chains in the South Okanagan aimed to identify the challenges and opportunities for increasing local food availability in restaurants. Through in-depth interviews with chefs and farmers this study found that building and maintaining relationships was a central strategy to building stronger farm-to-restaurant supply chains (Wijekoon et al., 2020). The project also organized a networking event for farmers and chefs to meet and establish connections. These kinds of events are valuable and, in this case and others, can result in the development of lasting relationships. In addition, it is important to consider how more structured collaboration can be supported over the long term (Ecotrust, 2015). Establishing physical infrastructure for local food distribution, developing working groups and engaging in research to better understand and address the needs of different groups within regional food value chains are worthwhile pursuits. The Short Supply Chain Knowledge and Innovation Network (SKIN) is a research and innovation collaborative active across the European Union that aims build the capacity of regional food system by sharing knowledge, best practices and supporting demand-driven research (Jarzębowski, Bourlakis & Bezat-Jarzębowska, 2020). Food hubs also operate as networking sites and have demonstrated capacity to develop mutually supportive relationships (Rogoff, 2014).

Government Support

Establishing scale appropriate regional food value chains and post-production infrastructure requires policy development and coordination across levels of government.

In BC, the provincial government has indicated support for the post-production sector through the 'Grow BC, Feed BC, Buy BC' mandate. In particular, the 'Grow BC' mandate aims to help BC producers and processors to expand local food production, while the 'Feed BC' mandate aims to increase the use of BC grown and processed foods in hospitals, schools, and other government facilities (BC Government, n.d.).

Local governments can take action by developing policy, building local partnerships, leveraging local economic development resources and engaging in regulatory reform to create supportive business environments for regional food value chain development. For example, some municipalities in BC have recognized the post-production sector as a key element of local food systems and integrated this support into comprehensive plans. The City of Victoria's Official Community Plan (OCP) recognizes food processing and distribution infrastructure as important part of the local food systems (City of Victoria, 2012). The District of Squamish OCP includes an objective to develop a broader range of post-production capabilities such as regional infrastructure, and relationships (District of Squamish, 2017). Most local governments already dedicate resources to economic development through staff time, coordination, business grants and program development (Jenkins et al., 2014). By focusing local economic development efforts on post-production food system business, these efforts can be leveraged for regional food value chain development.

Conclusion

An important goal for regional food value chain development is to provide scale appropriate food processing, aggregation and distribution solutions to meet the demands of regionalized food systems in the future. While conventional supply chains have succeeded in transporting food around the globe, they have failed to build relationships between producers and consumer while ensuring fair economic returns for producers and food security for communities. Regional food value chains on the other hand tend to be far more nimble and responsive to local shifts in supply and demand leading to greater resilience over time. The COVID-19 pandemic created food supply chain disturbances highlighting vulnerabilities within the food system. There is evidence that established regional food value chains were better able to pivot to meet the needs of producers and consumers while adjusting to the new realities of pandemic related restrictions. This display of resilience and adaptability makes a compelling case for investment in regional food value chain development to increase local food production, access and economic development.

Increasingly complex food supply chains and unrestrained consolidation of economic power in food processing, manufacturing, distribution and retail have resulted in supply chain gaps at the regional level. These gaps disproportionately impacts small and mid-scale producers, processors and distributors and ultimately limits the availability of locally produced food. At the same time, these market gaps can create new opportunities that regional food value chain actors are moving to fill. This study explores existing regional food value chains models to understand how development can be supported in the Okanagan bioregion. These case examples revealed that solutions are not purely market driven. Developing regional food value chains populated by locally oriented post-production businesses and infrastructure relies on actions by governments, and development of strategic partnerships to address existing barriers and mitigate challenges. At the local level comprehensive policy reform that removes existing regulatory barriers to create supporting environments for the post-production sector is essential. There is also a need for greater coordination and policy alignment across local, provincial and federal jurisdictions.

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About the Institute for Sustainable Food Systems

The Institute for Sustainable Food Systems (ISFS) is an applied research and extension unit at Kwantlen Polytechnic University that investigates and supports sustainable agriculture and regional food systems as key elements of sustainable communities. We focus predominantly on British Columbia but also extend our programming to other regions.

Our applied research focuses on the potential of regional food systems in terms of agriculture and food, economics, community health, policy, and environmental integrity. Our extension programming provides information and support for farmers, communities, business, policy makers, and others. Community collaboration is central to our approach.

About the Okanagan Bioregion Food System Project

Communities and governments are increasingly looking to strengthen regional food systems as a way to address many complex agriculture and food challenges. The Okanagan Bioregion Food System Project explores the social, economic, and ecological outcomes of a regional food system in the Okanagan. This multidisciplinary research project, initiated by ISFS and regional partners, can guide conversations among communities and decision-makers seeking to advance their regional food system.

The Okanagan Bioregion Food System Project considers and builds upon existing food system planning and other related work to support local and regional food systems in the bioregion.

For the full report and more research briefs visit: www.kpu.ca/isfs/okanagan-bioregion

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