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Research Brief

From the Southwest BC Bioregion Food System Design Project 2016

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Food Self-Reliance Status of the Southwest BC Bioregion in 2011

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Abstract

In this research brief we review the emerging concept of food self-reliance (the ability to satisfy food needs with food grown locally) and highlight its relevance to the study of food system localization. We describe a method to evaluate current food self-reliance and report on its application to the Southwest BC bioregion (an area comprising five regional districts in the southwest mainland corner of British Columbia, Canada (Harris et al., 2016)) for the year 2011. Food need, agricultural land use, food production, and food self-reliance are discussed. Key findings are that any measurement of food self-reliance is greatly impacted by whether or not livestock fed with imported feed are considered "produced locally" or not.

Note: This research brief draws largely from "A novel methodology to assess land-based food self-reliance in the Southwest British Columbia bioregion" (Dorward et al, 2016), published in the Journal of Renewable Agriculture and Food Systems.

At its simplest, food self-reliance measures the amount of a population's diet that could theoretically be satisfied by locally produced food by comparing the quantity and types of foods produced in the region to those consumed there.

Background

There is growing awareness that issues such as climate change, food and energy price instability, population growth, and changing dietary preferences are limiting the capacity of our food systems to provide sufficient food for the growing global population. It is widely recognized that our food systems must evolve in the face of these challenges, but little agreement exists as to what that evolution should look like (Foley et al. 2011; Kastner et al. 2012; Neff et al. 2011; Ostry and Morrison 2010; Wheeler and von Braun 2013).

Some argue that re-localizing our food systems will ensure a sustainable food supply into the future. Local food systems have been said to have social benefits (Arfini, Mancini, and Donati 2012; Connell, Smithers, and Joseph 2008; Halweil 2002), reduce negative environmental impacts associated with bringing food from farm to plate (Horrigan, Lawrence, and Walker 2002; Ikerd 2004), improve community health, nutrition, and food safety (Enshayan, Wilhelm, and Clancy 2004; Harvard T.H. Chan School of Public Health - Center for Health and the Global Environment 2015; Matt et al. 2013; Meehan, Yeh, and Spark 2008), and strengthen economies (Conner et al. 2008; Feenstra 1999; Hughes et al. 2008; Mullinix et al. 2013).

Local food systems are characterized by increased food self-reliance, which is defined as the ability to satisfy food needs with food grown locally. In British Columbia (BC), Canada, food security experts have identified increasing food self-reliance as a key climate change adaptation strategy (BC Food Systems Network 2012; Lee et al. 2010) and argue that increasing local fruit and vegetable production capacity "makes sense in a future where produce from California [the main source of fruit and vegetable imports to BC] may not be as available as it is at present nor at prices as low as they are at present" (Ostry, Miewald, and Beveridge 2011).

In the Southwest BC Bioregion (SWBC) specifically, many local governments have introduced policies supportive of food system localization (Feeney, Sussmann, and Kilford 2014) and members of the public are increasingly interested in the concept. In 2014, a series of food system dialogues were held across SWBC. When asked to rank a series of eight priorities which related to the economic, environmental, and social sustainability of SWBC's food system, participants at five out of six events identified increasing SWBC food self-reliance as their number one priority (Fortin 2014). Furthermore, many social sector organizations in SWBC advocate for and support food system re-localization (e.g. BC Food Systems Network, Farm Folk/City Folk, Society Promoting Environmental Conservation, Surrey-White Rock Food Action Coalition, Whistler Centre for Sustainability, and others).

To inform the discussion about food system localization in SWBC, our study measured the current food self-reliance status of the region. Outcomes can be used as a baseline against which to compare scenarios of future food self-reliance.

Methods

At its simplest, food self-reliance measures the amount of a population's diet that could theoretically be satisfied with locally produced food by comparing the quantity and types of food consumed in a region to the quantity and types of food produced there.
To measure the food self-reliance status of SWBC, we developed a methodology that incorporates elements used in previous studies of British Columbia and other regions.

We considered it especially important that food self-reliance be measured based on a diet that satisfies both nutritional recommendations and food preferences. Therefore we estimated the diet of SWBC residents using a Statistics Canada dataset to determine food preferences (Statistics Canada 2011b) and Canada's Food Guide to determine nutritional recommendations

by age and gender group (Health Canada 2011).

To determine what crops are produced in SWBC, we used data from the Census of Agriculture (Statistics Canada 2011a). Because trade data for agricultural products is not tracked at the bioregional scale, or in units pertinent to the study of food self-reliance (commodity weight), we had to assume that all food produced in SWBC is consumed in SWBC, not exported. This assumption is standard among food self-reliance studies from other regions and previous studies done in BC (Government of British Columbia - Ministry of Agriculture and Lands 2006; Griffin et al. 2014). We wanted to understand how the source of livestock feed – imported or grown in SWBC -– impacts food self-reliance. Therefore we estimated self-reliance in livestock products (meat, milk, and eggs) in two ways:

- Based on an estimation of the amount of livestock products that could have been produced only using the livestock feed grown in SWBC (self-reliance "excluding feed imports"); and,
- Based on an estimation of the amount of livestock products that could have been produced by the livestock that were present in SWBC in 2011 but fed with imported feed (self-reliance "including feed imports").

A more detailed explanation of our methodology for assessing food self-reliance can be found in Dorward, Smukler, and Mullinix (2016a).

Results and Discussion

Food Need: the population of approximately 2.9 million requires over 2.6 million tonnes (commodity weight) of food per year (Table 1).

Land Use: Approximately 107,000 hectares of land were farmed in 2011 (Statistics Canada, 2011a). Nearly three quarters of this land (78,466 hectares) was used for livestock feed (hay, pasture, and silage). Some may have supported livestock not associated with food production (e.g., horses). The second most common land use was fruits and vegetables, which together made up 19% of the total (19,893 hectares). The remaining 7% of land was used for production of pulses (e.g. dry beans), fats & oils, non-food crops and for sheltering livestock.

Food Production - Crops: Southwest BC has a reputation as a provincial centre for horticultural crop production characterized by substantial greenhouse and berry industries (Government of British Columbia - Ministry of Agriculture Statistics and Research, 2013). Therefore it is unsurprising to note that vegetables and fruit make up the majority (87%) of SWBC's total food crop production by weight. Berries (blueberry, cranberry, raspberry, and strawberry) make up 96% of fruit production and greenhouse vegetables (bell pepper, tomato, and cucumber) make up 42% of vegetable production. Very little grain or oilseed is produced in this bioregion (Table 1).

Food Production - Livestock Products: Although much of Southwest BC's agricultural land is used as pasture and for the production of hay, the region produces very little grain (either for food or livestock feed). Given that dominant contemporary livestock production practices rely heavily on grain as a livestock feed (rather than pasture), there would be little capacity to produce livestock products in Southwest BC without importing feed. By our calculations, with no imports the most dairy that could be produced is 44,500 tonnes (fluid milk) and this at the expense of any meat or egg production.

Actually, Southwest BC imports large quantities of grain to feed the 51,419 milking cows, 9,400 sheep and lambs, 76,700 hogs, and 118 million broiler (meat) chickens, layer hens, and turkeys that were present in Southwest BC in 2011 (Statistics Canada, 2011a). The levels of production possible from these livestock is reported in Table 1.

Comparing the level of livestock production with and without imported feed reveals the degree to which Southwest BC's livestock operations currently depend on feed imports to the region. This trend is not unique but, rather, mirrors a global trend toward the decoupling of livestock production from a local land base (Galloway et al., 2007; Naylor et al., 2005). By the year 2000, for example, 72% of global poultry production and 55% of global pork production was sustained by feed imported from other regions (Galloway et al., 2007).

Food Self-Reliance

We calculated food self-reliance by food type and for the whole diet. For crop-based food groups, self-reliance was highest in Vegetables (35%) followed by Fruit (3%), and Grain, Fats & Oils and Pulses (all 1%). These values reflect the dominance of the horticulture sector in Southwest BC. This is unlikely to change significantly in the future given both the climate, which is more conducive to the cultivation of horticultural crops than grains, as well as the high price of farmland (grain requires large acreage which is expensive and difficult to acquire in Southwest BC) and lower crop value.

For livestock-products, we can report self-reliance including livestock raised with imported feed ("with imported feed") and excluding livestock raised with imported feed ("without imported feed"). "With imported feed", Southwest BC would be 86% self-reliant in dairy and 49% self-reliant in meat & alternatives overall. "Without imported feed", self-reliance in these food groups would be 10% and 0% respectively.

For the whole diet, Southwest BC was 40% self-reliant "with imported feed", or 12% "without imported feed.

Increases in self-reliance could potentially be achieved by shifting production toward crops that are currently produced in quantities lower than the amount needed, or by increasing the use of agricultural land for food production. In 2010, almost 18,000 hectares of agricultural land in Metro Vancouver (a regional district in Southwest BC), was classified as having potential for

Table 1: Quantities of food needed and produced in Southwest BC (tonnes commodity weight) and corresponding levels of food self-reliance[1], with and without imported feed (2011)

FOOD TYPE	QUANTITY NEEDED	QUANTITY PRODUCED		FOOD SELF-RELIANCE	
CROP PRODUCTS					
Vegetables	627,193	244,343		35%	
Fruit	450,237	84,979		3%	
Grain	227,103	2,114		1%	
Fats & Oils	189,739	290		1%	
Pulses	14,635	75		1%	
LIVESTOCK PRODUCTS		"With Imported Feed"	"Without Imported Feed"	"With Imported Feed"	"Without Imported Feed"
Eggs	40,466	33,286	0	82%	0%
Poultry	112,112	200,281	0	100%	0%
Red Meat (Pork, Beef, Lamb)	158,358	15,549	0	10%	0%
Dairy	812,738	496,334	44,500	87%	10%
TOTAL (WHOLE DIET)	2,632,582	1,655,764	705,548	40%	12%

[1]Because self-reliance per food type is calculated based on individual crops, and takes into account seasonality of production, self-reliance values are not equal to the quotient of quantity produced and quantity needed.

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Our results highlight Southwest BC's dependence on feed and food grain imports.

farming but not farmed (Government of British Columbia - Ministry of Agriculture, 2014). This comprised 25% of Metro Vancouver's total area of land protected for farming by the provincial ALR (Government of British Columbia - Ministry of Agriculture, 2014).

Implications

Measuring food self-reliance in SWBC highlights its dependency on imports of both feed and food grain. Including livestock raised with imported feed, SWBC was 40% food self-reliant in 2011, but only 12% if excluding livestock raised with imported feed.

The de-coupling of livestock production from the land base that supports it has drastically shifted global patterns of land and water use and the discharge of effluents such as nitrogen away from a balance with crop need (Galloway et al. 2007). SWBC exemplifies this shift; the concentration of livestock operations in SWBC's Fraser Valley Regional District, which is enabled by the ability to import feed, is a source of ongoing environmental concern as it has been linked to nitrogen contamination of groundwater (Castle, 1993). It may be however, that the continued importation of food and feed grains for livestock makes sense for SWBC from an economic perspective given the bioregion's high population density, expensive and limited farmland, and climate more suitable to horticultural crop production. Comparing self-reliance measured according to these two definitions of "local" livestock enables the evaluation of these environmental and economic trade-offs and represents a positive step towards reconciling those trade-offs in the design of a sustainable future food system.

While measuring "current" food self-reliance is important, it is only a first step in informing the discussion around the evolution of the food system. The next important step is to evaluate whether SWBC has the capacity to increase food self-reliance in the future, and what agricultural land use would look like in a scenario of increased food self-reliance. This is the subject of "Capacity for future land-based food self-reliance in the Southwest BC Bioregion" (Dorward, Smukler, and Mullinix 2016b) which evaluates the potential to increase self-reliance in SWBC in the future, given population growth projections, dietary trends, and bio-physical resources.

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About ISFS

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

About the Southwest BC Bioregion Food System Design Project

The Southwest BC Bioregion Food System Design project was conceptualized at ISFS in 2012 and concluded in 2016. The project was conceived as a "research project within a research project," with the broad goals of developing a method to delineate the interconnected economic, food self-reliance, and environmental stewardship potentials of a bioregional food system and applying the method to the Southwest BC bioregion. To our knowledge, this project is the first of its kind. Project research briefs are one means used to present project findings. They are intended to report detailed, topic specific project methods and results. For other research briefs from the project, as well as the project report and summary, and peer-reviewed publications, please visit kpu.ca/isfs.

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