Planning for Sustainability in the Food System Using Demand-Supply Coordination

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Abstract

The Canadian food system may seem to be functioning normally but it is in turmoil. Food system issues are manifested socially, economically, and environmentally. Too many in Canada are food insecure, and a lot more are malnourished; farmers are often not compensated fairly, and face ample threats to their livelihoods as corporate control over the food system steadily increases; food and agriculture sectors are significant contributors to climate change and ecological damage more broadly. These issues were not created out of a vacuum, and are the result of intentional lack of proper regulation and oversight.

To date, food system interventions in Canada have failed to address the root causes of the food system's core issues with the notable exception of the innovative governance of the food system during World War II. Looking back to history at how interventions were successfully orchestrated can provide guidance on facing the current challenge of climate change. This research posits that a systemic, and intentional re-design of the food system using similar tools to those that were used in the past is vital in facing the substantial challenges facing the food system. Using the beef sector as a microcosm of the broader food system, this paper argues that matching food supply with demand based on principles of health and sustainability can solve some of the issues affecting food systems today.

Foreword

Food is a social, environmental, economic, cultural, and social phenomenon. In addition to the notion of food being essential to human survival, food is embedded in societal challenges we face such as climate change, hunger, rural decline, and social inequality. Food is placed in a position that allows those involved in it to create positive change in many different facets. I started my journey with academia broadly interested in trying to eliminate many of the symptoms of a broken food system that I see and experience every day in urban areas I have lived in. My education so far has led me to understand that to deal with those symptoms, we must, collectively, dig deeper in understanding, and fighting the causes of urban food insecurity through looking for solutions beyond municipal borders. Pothukuchi and Kaufmann (2000) believed that food was an issue that didn't receive enough attention from urban institutions. Sonnino (2016) believes that now the opposite is happening. She says that that food scholars and policy-makers are not thinking critically about food beyond urban environments. This research can help and encourage food systems practitioners, activists, planners, and citizens more broadly who wish to eliminate symptoms of a broken food system to understand why the food system works the way it does, and how could it be re-designed to address many of the challenges we face today. Being involved with many different actors that seek various levels of change in the food system ranging from community-based research projects, to grassroots organizations, and large public institutions has enabled me to form a deep, and critical understanding of the problems with our food system and what food policy re-configuration and food system redesign can look like. Conducting this research has helped me complete my main learning objective of

engaging in food system planning, and conceptualizing what role can food policy can play in achieving a sustainable food system.

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Chapter 1: Introduction; Complexity of Food System Issues

The food system is not broken, it is working exactly as it was designed to. The way food is produced, consumed, and everything in between those two processes is synonymous with the capitalist mode of production. Before introducing the research, and noting the case-specific complexities and challenges within the food system, it is important to recognize that many food related issues can be traced to capitalism. The fight and journey to create a sustainable, healthy, and equitable food system for all must be placed within the context of a struggle against capitalism more broadly. Nevertheless, food is uniquely positioned in such a way to challenge capitalism and create alternatives to it on many fronts.

Food systems are dynamic networks in which many processes occur; creating spaces and opportunities to organize for change on many different levels. Food systems can provide environmental services, enhance human welfare, and promote community-based socio-economic development (Haddad et al., 2016). This means food systems can contribute to broader sustainability, resilience, and equity (Ruben et al., 2019). As is often the case, the food system does exactly the opposite, and the issues caused by the food system still plague highly developed countries like Canada. Conversely, there are many different avenues which food system proponents can use to create desired results in the food system including but not limited to, policy, awareness initiatives, and direct food programming. This research places food policy and system re-design as central tools to create change mainly due to their ability to address the root cause of problems in the food system. “Rethinking food policy presents a major opportunity to improve nutrition and health, protect the planet and contribute to economic and social prosperity,

equitably" (Centre for Food Policy, 2019, p.2). The central purpose of this research is to identify and propose a different food system design enacted through policy change. I argue that a demand-supply coordinated system can be a systematic approach which the Canadian government can use to overcome certain food system challenges. I use the beef sector in Canada as a point of analysis and as an example in which a demand-supply coordinated system could be applied to overcome economic, environmental, and social challenges both on the production and consumption levels.

In Chapter One, I introduce the main issues plaguing the food system and those who rely on it while outlining the need for an urgent and radical approach to food system design. Chapter Two outlines the methodological, conceptual, and theoretical frameworks guiding this research. In Chapter Three, I outline what policies and food system intervention efforts have been made in addressing food system issues. Chapter Four begins introducing the beef sector as an example of how demand-supply coordination could be applied and why the beef sector is an ideal candidate for a wide-scale food system intervention. Chapter Five describes the details and workings of demand-supply coordination, the proposed food system intervention here. Chapter Six concludes the research, identifies its limitations, and identifies areas which further research is needed on demand-supply coordination. In sum, the research proposes a new tool for food systems change, specifically how food supply can be matched with optimal demand in a healthy and sustainable manner.

Urgency in Addressing Food System Issues

To understand what a sustainable food system might look like, what a food system *is* needs first to be conceptualized. A food system is a formally organized set of links between food production, distribution and consumption (Beardsworth and Keil, 1997). Similarly, Pothukuchi

and Kaufmann (2000) define the food system as a "chain of activities connecting food production, processing, distribution, consumption, and waste management, as well as all of the associated regulatory institutions and activities" (p. 113). On the surface, it may seem like the global food system is broken given that it is largely failing humanity. The food system is a major contributor to climate change, and hunger is widespread but it is working as it was designed. The food system is largely run by private actors with specific interests directed towards profit-making.

> "Our food system is acting precisely as a capitalist food system during a period of late capitalism is supposed to work. It's supposed to concentrate land and resources and power in the hands of the few, and it's supposed to offload all of the social and environmental externalities onto the rest of society. And that's what it's doing. It's an exploitative, extractivist food system and it does what it does" (Holt-Gimenez, 2018).

Because of this capitalist mode of production described above, the problems caused by the way the food system are plenty. They are too many to mention here, however, the biggest issues within the food system presently in terms of scale, impact, and urgency are environmental and health issues.

Food & The Environment

Currently, the biggest threat to the food system is climate change. Paradoxically, climate change is a challenge to the food system because dominant agri-food actors rely on processes that contribute to climate change but the integrity of the food system is also threatened by these processes. Climate change threatens food production on local and global scales (Tito et al, 2018; Lychuk et al, 2019; Wheeler & Von Braun, 2013). It is important that the food system and its actors take partial responsibility with regards to climate change both for their own sake in keeping the food system running and for the sake of humanity in general. While food and agriculture are not the sole contributors to climate change, globally, the food and agriculture

sector contributes about 20-25% of carbon emissions (Smith et al., 2014). More importantly, because of the complexity of food systems and its entanglement with other natural systems such as water and land usage for example, "the "improvement" of agriculture and the overall food system is rightly perceived as being a significant step toward the sustainable development of our planet" (Campbell et al., 2017, p.6).

Agricultural lands take up approximately 40% of earth's total land surface, amounting to the most extensive form of land use (Foley et al., 2005). Independent of context, this statistic alone is not an issue, as farming can be an ecologically sound process that nourishes human health and acts in harmony with nature (or at least one that does not contribute to environmental degradation). However, agricultural lands often are created at the expense, and in lieu of natural landscapes and ecosystems such as rainforests, which offer crucial environmental services to both humans and the broader ecosystem (Gibbs et al., 2010). This is also an issue because much agricultural land is increasingly controlled – a process known as land-grabbing – by corporate and state actors that "impose a scorched-earth mentality on resource management - no trees, no wildlife, and endless monocultures" (Rosset, 2011, p.28). This is a common characteristic of the current system of industrial agriculture which contributes to environmental degradation.

> "Monocultures are eroding biodiversity among both plants and animals. Synthetic chemical pesticides and fertilizers are polluting soil, water, and air, harming both the environment and human health. Soil is eroding much faster than it can be replenished—taking with it the land's fertility and nutrients that nourish both plants and those who eat them. Water is consumed at unsustainable rates in many agricultural areas" (Horrigan et al., 2002, p.445).

The way the food system operates is profitable in the short term mainly for the few who own pieces of it. The food system, however, operates in a paradoxical way because ultimately what is currently making it profitable is what will lead to its demise.

Environmental pressures on the food system are increasingly threatening the core of its functionality (Davis et al., 2016). Rising temperatures could lead to an increase in water usage for agriculture as increased evapotranspiration due to warmer temperatures will result in drier conditions during the growing season (Boland et al., 2004). This is a problem amidst concerns that current use of global water resources is unsustainable (Rockström et al., 2009). Climate change also poses health risks to humans including farmers whose role is crucial in maintaining food production. Pickett et al. (1998) suggest that there may be a biological link between exposures to certain pesticides (which are commonplace in agriculture) and suicides among Canadian farmers and food workers. Friel et al. (2009) found a correlation between greenhouse-gas emissions in the food and agricultural system with both climate change (which has its own separate health implications) and ischaemic heart disease. The current food system does not only affect the natural environment by contributing heavily to climate change, it negatively affects public human health when it has the potential to become preventative medicine for all.

Intersections Between Food & Public Health

Currently, conditions around food in Canada affect the health of many. Notably, northern communities, primarily consisting of Indigenous peoples, in Canada already face many health-related challenges with regards to their food systems. One challenge is the limited ability of northern communities to grow their own food due to land and climate limitations such as permafrost (Spring et al., 2018). Public policy to alleviate food challenges such as food insecurity in northern parts of Canada, is not achieving its intended goals due to lack of accountability coupled with lack of control over retailers' price-setting (Galloway, 2017). It is important to note that Indigenous peoples have been coerced into growing their own food as their surrounding ecosystems, which have historically provided them with adequate nourishment, are

being damaged by a mixture of pollution and the ongoing effects of colonialism (Native Women's Association of Canada [NWAC], 2018). Additionally, Inuit women, in particular, are experiencing higher rates of food insecurity exacerbated by climate change in the north (Beaumier et al., 2010). These stresses and lack of food availability are clear indicators of low public health. Indigenous peoples in Canada disproportionately face food system inequalities, and yet, food system inequities are common throughout Canada. I present the disproportionate effect of food system inequalities on northern communities to note the case-specific health related challenges across Canada. This research uses Canada as the scale in which the proposals mentioned are to be enacted, however there needs to be further attention to different communities within Canada.

Nationwide, food pricing is projected to be heavily affected as the effects of climate change unfold (Nelson et al., 2010; Wheeler & Von Braun, 2013). This, undoubtedly, will affect those with lower socio-economic status the most and could possibly increase Canada's food insecurity rates. According to the FAO [Food and Agriculture Organization] et al. (2017), contrary to popular belief that the world is constantly getting better fed than at any point in history, malnourishment increased from 777 million people in 2015 to 815 million people in 2016. This is felt both in the global north and south. In Canada, 4 million people (1.15 million being children) live in food insecure households (Tarasuk et al., 2013). Some are quick to jump to conclusions that food insecurity is caused by high food prices. Food pricing does directly limit food purchases, however the solution to food insecurity does not solely lie with food pricing. Some suggest that food pricing is already too low and does not reflect food's true cost (Carolan, 2018). Decreasing food prices could potentially alleviate food insecurity briefly, but it may indirectly lead to more issues in the future such as low incomes for farmers.

Food pricing seldom reflects the true cost of food. Often ignored in the pricing of food is the cost and implications of food on human health. A study finds that one in five deaths, globally, could be attributed to poor diets (Afshin et al., 2019). Comparably, Wang et al. (2019) found that improving dietary quality could substantially decrease premature deaths. Failing to address public health concerns and maintaining the status quo with regards to food production and consumption in Canada also carries a large economic burden with increased direct health care and indirect costs (Lieffers et al., 2018). The Canadian government is evidently aware of issues around diet quality through its publication of the Canada Food Guide, which stresses the importance of healthy eating. However, evidence shows that many Canadians are not following the recommendations presented in the previous versions of The Canada Food Guide (Garriguet, 2009).

Evidence on strategies for improving the health implications of food is not particularly new and yet the Canadian government still largely resorts to relying on individual informed choice interventions, such as the food guide, to change diets (Olstad et al., 2019). This strategy has been proven ineffective in changing behavior and is one that does not improve population diet quality (Olstad et al., 2019; Adams et al., 2016). Some have suggested that for the Canada Food Guide to work, it needs to adopt a social policy approach (Saul, 2019). The socioeconomic realities of many people cannot be ignored at a time when the most accessible foods (financially) are often the unhealthiest. Thus, addressing the root causes of poor diets is much more effective in achieving the desired change from a public health intervention perspective. Given that there is scientific evidence on what works and what doesn't in terms of improving public health and creating environmentally sustainable food systems, why are those responsible not implementing policies recommended by experts?

Food System Design

As mentioned prior, these problems are the results of bad system design. With a global food system in place, it is hard to blame one specific aspect or country completely for a broken food system. There are clear actors who have responsibility over the food system that can be blamed but food system issues are attributable to a systematic design problem. The issues within the food system were not created in a vacuum. Spitz (1985) notes that modernization of agriculture was coherent with a large-scale introduction of high-yield varieties of agricultural inputs (e.g., fertilizer, water, pesticides, energy). The modernization and globalization of the food system has been caused by the "internationalization" of American oligopolies, where the majority of food and agricultural businesses are controlled by a handful of corporations (Leopold, 1985). It could also be interpreted that the internationalization of North American production was caused by the increase in corporate control over the food system. Friedman (1989) says that these changes in the food system have been a factor in the widening and deepening of capitalist relations within the world economy. This capitalist system neglects the human and environmental costs of industrialization in the name of economic efficiency. Simply providing affordable food is insufficient; environmental contamination cause serious health concerns, and raises questions over food autonomy for a region (Bellows, 1999). At the forefront of the creation of the modern, industrial food system is the Green Revolution.

The Green Revolution was an integral part of making the modern food system. The Green Revolution occurred roughly between the 1930s and 1960s when there was constant development in agricultural technology. This development included the introduction of pesticides, and increased foreign aid. The Green Revolution started with a series of publicly funded agricultural research institutes that were charged with the task of developing new

varieties of crops and modification of the Green Revolution package for specific geographic locations (Clapp, 2012). According to Clapp (2012), the Green Revolution was, in part, an effort by the US to appear more productive than Soviet Russia during the Cold War. Thus, a cold-war based intimidation policy is effectively a key driving force behind the development of the food system we know today. Proponents of the Green Revolution such as Stevenson et al. (2013), claim that the Green Revolution has enhanced global food security levels. However, as mentioned previously, global hunger has been on the rise recently. Additionally, even when hunger is not rising, externalities of this mode of production are brushed aside in the name of efficiency. A highly developed country like Canada is not immune to these problems. However, these issues could be preventable by paying attention to the way the food system is designed.

According to De Schutter (2012), Canada has failed to adequately respect, protect, and fulfill the right to food. Specifically, De Schutter (2012), (then the United Nations Special Rapporteur on the Right to Food), pointed out that inadequate levels of social assistance, the need for a living wage, short-sighted agricultural policies, increasing health problems stemming from poor diets, and the particular challenges facing northern and Indigenous communities are the main reasons Canada is not fulfilling its right to food. What De Schutter reveals through his assessment of the Canadian food system is that many different aspects of the food system need government attention. These issues can be addressed separately, or they can become a part of a system design. The Interacademy Partnership (2018) urge an end to "business-as-usual" and call for an urgent restructuring of the global food system with science-informed innovation and policy. The overall state of the food system appears bleak, but major challenges such as climate change can be an opportunity for positive action to strengthen health systems and transform governance structures (Costello et al., 2011).

This chapter showcased some of the main issues affecting the food system and why they are occurring. They are large, and complex enough to a call for radical systemic re-structuring. Additionally, there is an added layer of urgency as the issues become exponentially worse the more they are neglected. Many of the issues are stemming from a capitalist mode of production and lack of oversight on profit-driven food system actors. Governments in Canada have been largely inactive on food issues other than being signatories on international agreements (Blay-Palmer, 2012). This negligence for many years means that there ought to be a systematic re-design process as the current system is not adequately equipped to face the challenges it has brought on itself and humanity more broadly. The next chapter provides frameworks that could be used to systematically address some of the issues in the food system.

Chapter 2: Frameworks for a Healthy and Sustainable Food System

> "We are going to have to sacrifice our immediate emotional satisfaction and comfort for the wellbeing of our grandchildren." (Interview Participant – Academic)

The arguments made in this paper are mainly informed by the theoretical framework of food system thinking. Food systems thinking, in itself, is a broad concept and thus two aspects of the food system thinking are the focus. These frameworks both set the vision for the paper, the knowledge gathering process, and inform the analysis. This chapter unpacks the idea of food system thinking as a broad concept and explains how key theoretical concepts within food systems thinking inform this research.

Food Systems Thinking

The reason food system thinking as the theoretical framework was used in this research is to address as many areas of the food system as possible. This is because all the different aspects of the food system are interrelated and interdependent. Thus, orchestrating a food system intervention in one area of the food system cannot be done without inevitable impact on other areas. Food system thinking is not a concept that has a set definition, and methodology. The food system thinking approach generally takes into account how the food system, as a whole, contains a multitude of different activities run by a number of different actors, who generally have differing interests but are involved in the same system. These activities and processes (including but not limited to food production, distribution, management, consumption, and disposal) are ultimately all interconnected and impact each other. The way in which these activities function together affects outcomes that relate to population health, ecosystem health, and the economy

(Van Berkum et al., 2008). "A foundational consideration [of food system research] is that social, environmental, and economic sustainability find the appropriate mix or balance." (Blay-palmer et al., 2013, p.228). Thus, food systems thinking can represent a more holistic understanding of the food system.

"The inquiry [into food systems] must try to be both *historical* and *holistic*. It must be historical, because the past inevitably sets the stage for the present and provides a key to understanding the original purpose of current arrangements" (Winson, 1993, p.9). As this research attempts to address various areas within the food system at once, food systems thinking is essential to fully grasp the impacts of changing any one aspect of the food system on another. "Food systems thinking is important because changes at one system level might lead to undesirable results elsewhere in the food system, and improved knowledge on these interactions could possibly give rise to other types of interventions." (Ruben et al., 2018, p.2). MacRae and Donahue (2013, p.2) also share a similar sentiment and write,

> "Food systems thinking reflects an awareness of how actions by one group in the system affect other groups, as well as affecting the environment, the economy, the fabric of society, and the health of the population, and ultimately consumers."

Food systems thinking has also been used by government bodies such as Toronto Public Health. In their report on steps to enhance the food system in Toronto, they use a food systems perspective. They write that "Food system thinking is a way of seeing the bigger picture, of developing solutions to food problems by seeing and leveraging their connections to other health, social, economic, and environmental issues (Timmings et al., 2010, p. 3).

While food system analysis (or research) is a broad concept that is widely used amongst researchers and practitioners, it can be categorized into three distinct types, according to Ruben et al. (2018, p.3):

(a) descriptive analysis of the structure of food systems with emphasis on the identification of key components.

(b) explorative analysis of different policy options and opportunities for improving food systems performance.

(c) interactive analysis of food system transitions and adaptive innovation strategies for creating synergies and coherence between key agents.

This research presented throughout Chapters 4, 5, and 6 is mostly aligned with categories (b) and (c) as it explores ways in which the food system can be operated differently in order to have more health and sustainability focused outcomes. This research also presents possible strategies to both transition out of the current food system and start implementing a new mode of production for the food system. The ideas presented here are mostly driven by need for a preventative strategy to attempt to mitigate the food system's effects on climate change. The work presented here can also be used as a framework for the type of thinking needed for a radical adaptive strategy in the food system. Demand-supply coordination, the central driver of proposed food system change in this research, is largely an attempt to join-up food policies and create a coordinated design to deal with different aspects of the food system at the same time.

Sustainable Food Systems

The first framework used for this research under the umbrella of food systems thinking is the Sustainable Food Systems framework. The concept came about when sustainable development was identified as the framework used to grow, economically, without compromising the needs of future generations. Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet

their own needs according to Brundtland (1987). This is applicable to any form of social, environmental, or economical phenomena including food.

Food system sustainability has been increasingly linked to proximity (Pollan, 2006). This implies that for a food system to be more sustainable, food ought to have less food miles and be more localized. Food miles is a measure of the distance foods have travelled from their initial production to consumption. Food system localization also implies that there are to be local voices present in choosing what food is available. Localization of food system does not necessarily guarantee sustainability. Foley (2016) points out that long form food trade can be more efficient than local food because of the large volumes and economies of scale they work in.

What a sustainable food system means, is hard to pin down into one definition. "In general, sustainable food systems are attributed with being more environmentally sound, more socially, culturally and spiritually healthful" (Feenstra 2002, p. 100). Sustainable food systems also need to be economically sustainable and accessible. The American Public Health Association defines a healthy, sustainable food system as one that:

> "Provides healthy food to meet current food needs while maintaining healthy ecosystems that can also provide food for generations to come with minimal negative impact to the environment. A sustainable food system also encourages local production and distribution infrastructures and makes nutritious food available, accessible, and affordable to all. Further, it is humane and just, protecting farmers and other workers, consumers, and communities" (American Public Health Association, 2007, paragraph 4).

A sustainable food system is one that keeps all the different aspects of the food system such as production, distribution, and consumption healthy and available for use by future generations. Feenstra (2002) believes that a sustainable food system must create a different set of spaces. Social space is at the top of list of spaces which Feenstra (2002) indicates should be included in a

sustainable food system. These spaces can be manifested in the form of public gardens or farmer's markets where programing can help people come together to:

> "Talk, listen to each other's concerns and views, plan together, problem-solve, question, argue and come to agreement, compromise, learn another's language and how to speak so someone else can hear you, and to get to know and trust one another in the context of a common purpose or vision." (Feenstra, 2002, p. 102).

Feenstra (2002) also argues that political, economic, and intellectual spaces are necessary for sustainability as they create a culture of public participation, partnerships, and principles. These spaces lead to food system resilience which is vital for its sustainability and survival. Other scholars have different ideas on the characteristics of a modern food system.

Garnett (2013) believes a sustainable food system must have three pillars. First, it ought to be efficient by using new technologies that use less energy and waste less water for example. Post-harvest, Garnett (2013) believes there ought to be efficiency through adoption of refrigeration, manufacturing, and transportation technologies that are more energy efficient or based on renewable energy sources. Minimizing waste disposal is also at the essence of sustainability. It is worth noting that Canadians waste approximately $31 billion worth of food per year, with 47% being wasted at home (Food Banks Canada, 2015). Another report suggests that more than half of all food produced in Canada is lost or wasted (Gooch et al., 2019). The second pillar is demand restraint. Garnett (2013) believes that reducing demand of high impact foods (such as ones with high food miles) can lead to a more sustainable food system. That is because high impact foods, such as beef, place a heavy strain on land, water, and biodiversity (Pelletier, & Tyedmers, 2010). The third pillar of a sustainable food system according to Garnett (2013) is food system transformation. "The food system transformation perspective considers both production and consumption in terms of the relationships among actors in the food system, interpreting the problem as one of inequality or imbalance" (Garnett, 2013, p.13). This ideal is

based on social justice and puts the responsibility of the success of the food system on the system itself rather than the responsibility being only on its consumers or producers.

Every aspect of the food system is important in maintaining a sustainable food system, not just popular concepts like reduced food miles, for example. Sustainability can still be achieved without completely cutting off global ties and halting trade. As previously mentioned, food system inquiry needs to be holistic and historic (Winson, 1993). Historic inquiry is useful in understanding what mechanisms and pathways were used to achieve sustainability in the past. This can inform food systems work moving forward. The following framework presents a historic outlook.

Food Regime Theory

Food regime theory, a theory dedicated to understanding the phases the global food system went through in the past, is relevant for interpreting the failures and successes of governments to govern food systems. Food regime theory is also helpful for understanding the broader global pressures and limitations governments face in the food system. Food regime theory is specifically important in understanding demand-supply coordination as well as informing analysis of the policy mechanisms that were implemented during WWII.

Food regime theory offers an explanation of the global political economy of food over time. Food regime theorists attribute the failures of today's modern industrial food system, sometimes referred to as the third food regime, to the over-emphasis on transnationalism in the second food regime. Thus, to understand the failings of today, we need to understand the characteristics of the first and second food regime.

In their original analysis of food regimes, Friedmann and McMichael (1989) wrote that the first food regime was built on colonialism. European countries began importing foods for low

prices from settler states which had some consequences. First, European grain production was somewhat in crisis in European agriculture since there was an over reliance on grain exports from the settler states. It was not noted what exactly happened for the first food regime theory to end in Friedmann and McMichael's (1989) paper. However, others such as Magnan (2012, p. 377) write that it was likely the beginning of World War I which coincided with the collapse of world grain prices. After two world wars, the face of global agriculture changed drastically, which gave rise to the second food regime. Hodges (2005, p.1) critiques the policy of feeding the growing cities of the developing world with imported Western food because it would remove domestic markets from poor farmers and would also risk large-scale famine when global food trade breaks down. The second food regime was more complex than the first food regime because of its geographical unevenness. As this essay is largely focused on Canada, I only write about the effects of the second food regime on the global north. The second food regime is characterized by two main developments: the rise of the US as a global trading partner and the increasing power of agribusiness corporations (Friedmann and McMichael, 1989).

The US, formerly controlled by Britain, had to deal with the crisis of overproduction it was facing as part of the first food regime. In a move that further encouraged overproduction, Bernstein (2015) writes that the US started moving towards price supports. To counter the effects of surplus food production, food aid became a central piece of US's foreign policy initially to facilitate post-war reconstruction in Europe but then through selling food to "friendly countries" through the enactment of public law 480. This law allowed allied countries to purchase surplus foods from the US using their local currency.

The US's involvement in food aid did not have as drastic an effect as agribusinesses did. In his genealogy of food regime theory, McMichael (2009) writes that the second food regime

was built off the free movement of surplus capital (in this case, food) from the US to postcolonial states, which the US had strong indirect control over. It was a strategy to secure allies in the US fight against communist Russia (McMichael, 2009). "Meanwhile, agribusiness elaborated transnational linkages between national farm sectors, which were subdivided into a series of specialized agricultures linked by global supply chains" (McMichael, 2009, p. 141). This change led to:

> "(i) intensification of agricultural specialization (for both enterprises and regions) and integration of specific crops and livestock into agro-food chains dominated at both ends by increasingly large industrial capitals; and (ii) a shift in agricultural products from final use to industrial inputs for manufactured foods" (Friedmann and McMichael, 1989, p.105).

This restructuring mainly was manifested in two sectors: meat and durable foods. Beef became a "symbolic centre of the post-war diet" (McMichael, 1989, p,105). While this continued until the early 1970s, the decline of the second food regime (and rise of the third food regime) is generally aligned with the decline of the power of national agricultures and the rise in power of agro-food corporations.

Trade still is an integral aspect of the third food regime, however, contrary to the second food regime, corporations are leading the charge as showcased by Lang & Heasman (2004) who extensively write about the corporatization of the food system. Friedman (1993) says that agro-food corporations are now (past the second food regime) establishing the rules and conditions of food and agriculture. The corporate class rules with a particular vision for the food system. Friedman, (1993, p.3) writes that they rule with "principles of distance and durability, the subordination of particularities of time and place to accumulation". While the third food regime is defined by these principles, it can also be defined by what it is not. Friedman (1993, p.53-54) writes that democratic principles,

> "by contrast, emphasize proximity and seasonality- sensitivity to place and time... healthy food and environmentally sound agriculture must be rooted in local economies. A democratic food policy can reconstruct the diversity destroyed by the monocultural regions and transnational integration of the food regime. It is also about employment, land use, and cultural expression".

These two theoretical frameworks, sustainable food systems, and food regime theory have also informed and guided the methodology of this research.

Methodology

The purpose of this section is to outline the research design behind this research. My main example for this research is the beef sector in Canada. I analyze how the beef sector would be reconfigured by the needs of today: an urgent and systematic, health and sustainability focused food system intervention. I chose the beef sector to fill a knowledge gap; no studies have been conducted on a wide-scale reconfiguration of the beef sector in Canada in response to climate change and public health concerns. The beef sector is mostly pertinent to my research question, outlined below. It is also the sector that needs the most restructuring amidst calls to decrease meat production and consumption to combat climate change.

The methodology was mostly informed by Yin (2007). The goal of this research is to demonstrate that demand-supply coordination is relevant and a useful mechanism to apply to food systems more broadly. Informed by Yin & Davis (2007), I use the beef sector to demonstrate how demand-supply coordination would work on a small scale (one sector) and the case serves as an important contextual piece to understand how it could be applied to many sectors in a real-world scenario.

My main research question is: given a public health and climate crisis, how can demand-supply coordination restructure the food system to respond to these challenges? This question is based mostly in normative thinking with some follow-up questions about specifics that include:

a. What are the pathways to a demand-supply coordinated food system?
b. What are the barriers and limitations of implementing demand-supply coordination?
c. In what ways could demand-supply coordination, in theory, achieve optimal health, environmental, and economic benefits to society?
d. What are the limitations and disadvantages of a demand-supply coordinated system?
e. How can the federal government's interventions in the food system during WWII inform interventions like demand-supply coordination.

The idea of demand-supply coordination was introduced to me by Professor Rod MacRae when I was searching for mechanisms in food system re-design. The idea of demand-supply coordination is not extensively written about, nor has it been tested before in the form which I propose. There have been instances throughout history where some elements of demand-supply coordination were implemented that I use for inspiration and evidence. My main sources of information are: historical food and agricultural policies in Canada (especially during WWII), documents produced by stakeholders or observers of the beef sector in Canada, semi-structured interviews with some experts and stakeholders, reports about and from the supply-managed sectors (the program closest in resemblance to demand-supply coordination), academic literature on what aspects of the food system need restructuring, and finally, my own normative thoughts on what a demand-supply coordination could and should look like. I note and stress that this research is largely an exploratory normative exercise.

To build on the available knowledge and literature about the subjects, I conducted four semi-structured interviews. The motivation behind conducting interviews was to supplement the

policy and informational analysis in this research. The interviews are not meant to act as a foundation for the research; they were conducted to refine and hone the arguments made. The interviews were all conducted over the phone and were approximately half an hour to an hour in length. Interviews were recorded using a digital voice recorder, and partially transcribed manually. After analyzing the transcriptions, I identified themes and ideas revealed during the interviews. The interviewees provided case-specific information, thoughts and opinions on the future of the beef sector, and their perspectives on demand-supply coordination.

Interview participants were contacted first by e-mail with a follow-up phone call to ascertain their participation. Interviews were conducted with an academic, a historian, a farmer, and a farm organization official. As some participants requested anonymity, I am anonymizing all of their comments as to not privilege or single out one specific perspective for this research. Additionally, while I did not officially interview my supervisor, Professor Rod MacRae, I had many meetings and brainstorm sessions with him in which I gained many valuable insights on both the beef sector and demand-supply coordination. I used a semi structured interview guide with a uniform set of core questions (see Appendix). The interview guide merely served as a guiding document for what I was broadly trying to understand. Depending on the flow of the conversation and each interviewee's area of expertise/experience, some further, unique follow-up questions were asked. After the core portion of the interview was complete and there was time remaining, I asked the interviewees more about the ideas presented in this paper.

The research and conclusions found in this document will be specifically valuable to government policymakers and stakeholders of the beef industry. I believe it is the first academic study proposing a system such as demand-supply coordination in the beef sector. This research can also be valuable to civil society organizations or associations wishing to propose a different

future for farming in Canada. Finally, the study is not entirely conclusive and has its limitations. The limitations and further research questions are identified in Chapter 5.

Chapter 3: Current Policy and Program Landscape

The ideas presented in this research around food system redesign center on policy changes. I argue that long-lasting positive change in the food system ought to be a redesign initiative. Food policy restructuring can be the manifestation of such a design. The food system is currently an unsustainable profit-making mechanism working mostly to the interest of the few who own it. This happens largely because of the intentional lack of oversight from public institutions (largely a result of the political philosophies around government's relationship to food). This chapter reviews the current food policy and programming landscape in Canada which creates the conditions for the food system to operate in its current manner. This section also starts building the case for more cohesive food policies in support of broader redesign initiatives.

For many years food scholars, activists, and proponents have been calling on governments of different scales in Canada[1] (and beyond) to enact food policies (MacRae, 2011; Riches, 2002; Lang, 1999; Seed et al, 2013; Rideout et al, 2007). While there has been pressure from the food movement, the biggest highlight of the food policy landscape in Canada is its lack of a country-wide comprehensive, and joined-up food policy. There is ambiguity about what level of government is responsible for food.

> "Over the years, the federal government has expanded its jurisdiction over income tax, unemployment insurance, social welfare programs, and a national health care plan. Yet, the administration of many food-related levers such as education, labor, health care, agriculture, and social legislation have remained under provincial jurisdiction" (Koc et al., 2008, p.126).

[1] Municipal, provincial, and federal

The federal government might be best positioned to enact a comprehensive food policy that addresses food security as recommended by the FAO (1996).

There have been many policies enacted by both federal and provincial governments that deal with food which is a step in the right direction, but these policies largely work in silos which makes them ineffective (MacRae, 2011). Historically, Canada has had some policy with regards to food, however policies often primarily address food production, designed to increase profitability, supply, and assure food safety to garner market confidence. According to MacRae (2011), while these policies were focused on the increased production of food, they indirectly affected food consumption, as well. He believes they were designed to encourage people to overconsume food, leading to negative health outcomes. Canadian federal government policies that affect food include the Healthy Eating Strategy, Canada's Food Guide, Pesticide Risk Reduction Program, Federal Sustainable Development Strategy Prenatal Nutrition Program, the Supply Management System (only applicable to certain industries), and the Agreement on Internal Trade among many other programs and policies (Martorell, 2017). Recently, in the summer of 2019, the Canadian federal government rolled out its first ever national food policy. However, the policy leaves a lot to be desired – a matter that is discussed further below. Parallel to federal programs and policies, there are other food and agricultural related programs and policies that are enacted at the provincial level. Provincial policies are mostly outside the scope of this research as it is mainly focused on federal programming. A federal or nation-wide food policy will need to be implemented in collaboration with provincial governments to ensure its effectiveness.

Lack of Food Policy and Lack of Coordinated System in Canada

Prior to the release of the national food policy, the lack of national food policy in Canada was explained by both logistical difficulties and certain philosophical approaches. Hedley (2006) believes that government inaction on food policy in Canada is historically based on John Stuart Mill's view that government ought not to intervene in citizen affairs (including food). This remained true up until the federal government started intervening in agricultural affairs in the 1930s through the adoption of Keynesian principles amidst market failures to provide adequate food for the general population (Hedley, 2006). Canada still relies on market forces to govern food with some interventions on the supply side. Governments typically do not formally intervene on the demand side, but does so indirectly through agricultural subsidies, regulations, food safety regulations, and guidelines (Souter, 2017).

The Canada Food Guide could be the closest thing to a policy intervention on the demand side. However, the Canada Food Guide is merely advisory and its influence on dietary patterns is not obvious to end users. Many are aware of it, however, the Canada Food Guide's reported use is low (Vanderlee et al., 2015). The Canada Food Guide faces competition from corporations over influencing Canadians' diets. The integrity of the food guide itself has been questioned. Some argue that food lobbyists, especially meat and dairy, have historically had too much of an influence on the guide (Mintz, 2019). Although the most recent version was developed, perhaps consequently of these critiques, without the food industry as a stakeholder. Children are notably susceptible to advertisements from food corporations that prompt them to eat unhealthy foods (Kent & Wanless, 2014; Ashton, 2004). The Canada Food Guide has also been criticized for being out of touch with the reality that many Canadians cannot afford the diet in which the government of Canada recommends (Picard, 2019; Saul, 2019). Evidence has also been clear that

nutrition policies, particularly ones that are information based, are not effective in changing behavior since the root causes of low diet quality are not addressed (Olstad et al., 2019). This can lead us, as a society, to the conclusion that food is a wicked problem that needs to be met with a holistic approach. That approach could be a comprehensive food policy, but there are some barriers to its development.

MacRae (2011) writes that Canada embodied neoliberal ideas and policies post-1980s leading to the country's participation in many trade agreements. Consequently, the government of Canada had to align many of its policies and programs to key trading partners like the US (MacRae, 2011). Many believe that signing of certain trade agreements restricts the government's ability to enact sustainable and self-determining food policy (MacRae, 2014). Examples of trade agreements that Canada has signed on to include rules and commitments through the World Trade Organization's Uruguay Round Reform Programme. These rules have restricted the way in which governments can provide domestic supports to agriculture. However, in his review of trade agreements that could affect the development of local and sustainable food systems through policy and programming in Canada, MacRae (2014) found that there are many exceptions in trade deals that provide for the development of a more local and sustainable food system. There is a common misinterpretation of these rules among those who have the power to enact certain developments. MacRae (2014, p. 105) writes, "A commonly expressed view in policy and business circles is that some trade articles and disciplines do significantly limit the range of policy and program instruments that can be applied by governments." In contrast to this view, Smythe (2018) argues that the political realities of Canadian governments, which have been mainly either Liberal or Conservative (two political parties that support free trade agreements), have led to an expansion of trade agreements and a shrinkage of policy space to

support domestic food policy. Elsewhere, Smythe (2018) concludes that provisions under Canada-European Union Comprehensive Economic and Trade Agreement (CETA), the Trans-Pacific Partnership Agreement (TPP), and Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) have created barriers for the development of a national food policy. It is difficult to fully blame trade deals for the lack of development of a comprehensive food policy in Canada as there are other factors involved in the development of policy. Overall, there is contradicting information regarding the barriers trade deals pose. It is important to take into account that trade deals do eventually expire and their terms are re-negotiated. Thus, planning for a food system for the future should not be restricted by the current regulations. Additionally, tools such as local and social procurement are legal under many trade agreements. While these barriers are largely external, there are also internal logistical challenges to the development of a national food policy.

As previously mentioned, one of the main challenges for the development of a comprehensive national food policy is, as MacRae (2011) argues, the complexity of a food system governed by many policy systems that are historically divided. For example, the following federal departments among others all have certain controls and powers over food in Canada: Agriculture & Agri-Food Canada, Environmental Canada, Health Canada, Fisheries and Oceans Canada. Thus, having no centralized department or agency that deals with food creates a challenge (MacRae, 2011). Otherwise, food policy development is a challenge for policy makers, according to MacRae, (2011, p.428) because:

- supporting new approaches means extensively confronting many existing and entrenched policy frameworks and traditions;

- it means having to address the externalized costs of conventional food, health, and economic and social systems, and these externalized costs are only partially understood and quantified;
- it means understanding food as more than a marketable commodity, which creates problems for certain departments;
- it challenges many of the central tenets of current agricultural and economic development and a health care system that concentrates on cures rather than prevention.

There have been, however, significant enablers of change towards the creation of a national food policy identified by Martorell and Andrée (2019). First, they write that there has been some food policy experimentation on the provincial and municipal levels that can be scaled to a national policy level (Martorell and Andrée, 2019, p.269). MacRae and Donahue (2013) have demonstrated that municipal food policy initiatives have had many successes (and challenges). These successes on smaller scales showcase the potential for food policy to be scaled-up. Second, there is currently a strong civil society 'food movement' in Canada (Levkoe, 2014). The food movement is diverse in its focus areas, however there has been significant policy advocacy undertaken in Canada (Koc et al., 2008). Pressure from Canada's food movement, consisting mainly of farmers in this case, has arguably led to policy innovations such as supply management in the poultry, dairy, and egg sectors, which pays producers based on a formula related to their costs of production (Winson, 1993). More recently, the food movement has had positive contributions to the discourse around food and food politics through the establishment of Food Secure Canada (FSC), a non-profit pan-Canadian alliance of organizations and individuals committed to zero hunger, a sustainable food system, and healthy and safe food

(Food Secure Canada, n.d). FSC spearheaded campaigns such as the People's Food Policy Project (PFPP), and the Eat Think Vote campaign in the 2015 federal election. The latter was centered around pushing specific policy demands from political candidates: "(1) to assess the feasibility of a basic guaranteed income for addressing food insecurity in Canada; (2) to overhaul the Nutrition North program; (3) to increase support for the next generation of farmers; and (4) to invest in a national healthy school food program" (Martorell and Andrée (2019, p.270). What followed this was a promise from Canada's new Liberal government to develop a national food policy and the policy was delivered in June 2019.

The previous section may indicate that a national food policy does not exist, however this is not the case. A national food policy does exist, but it is not the joined-up piece of policy that the food movement has been calling for. It is a welcome and positive contribution towards food system change but it could be too little, too late. The policy is mainly positioned in a health framework. Parts of it first made an appearance in the government's 2019 budget which mentions "All Canadians should have access to safe, healthy, affordable, culturally appropriate and locally produced food" (Government of Canada, 2019, p.161). As was named in previous documents (see Agriculutre & Agri-food Canada, 2018a) by Agriculture & Agri-food Canada[2], the food policy was to be coordinated and collaborative. When announced in preparation for consultations on the policy, the four areas were: 1) increasing access to affordable food; 2) improving health and food safety; 3) conserving our soil, water, and air; and 4) growing more high-quality food. While this was promising, the final food policy does not fully fulfil to its promise. MacRae (2019a) outlines five main causes for concern from the national food policy, summarized below:

[2] the department responsible for the development of the national food policy.

1. The policy does not indicate any efforts to manage food demand.
2. The policy does not address the issue of food access or food insecurity especially as it pertains to people with lower income. This indicates the government's continued reluctance and negligence in taking appropriate measures to fill in the gap which the market created.[3]
3. The policy does not include any mechanisms that attempt to manage and improve population health as it relates to the nutritional quality of food consumed.
4. The Canadian Food Policy Advisory Council [4] will be led and controlled by the Minister of Agriculture, meaning that they will have the last say over who gets to become a part of the council. The effectiveness of an advisory council is also questionable given the history of food policy councils throughout North America.
5. The programs announced in the policy, a national school food program, and $134.4 million over five years mostly for contribution agreement programs is not enough to achieve the goals and statements included in the policy.

Overall, the policy leaves more questions than answers and is disappointing given that the government had four years from its initial announcement in 2015 to develop a policy that would include detailed and well thought of mechanisms, legislations, and pathways to transition to a more healthy and sustainable food system. Nevertheless, the national food policy serves an important lesson to food advocates. Perhaps what the food movement needs is to consolidate its efforts around demands for food system (re)design rather than just a food policy. A national food

[3] There is some mention of food security as it relates to northern communities, but the policy does not discuss in any detail steps to achieve that.

[4] A proposed oversight body that would ensure the food policy is implemented.

policy has been the main focus for many in the food movement for years, and yet it likely will not deliver the change that was called for. What is needed is policy for food system redesign and the creation of the food system as a public good that works for many, and not just a select few. While Canada never had a formal national food policy prior to 2019, there were times when there was a consolidated national approach to make the food system work for everyone in the face of catastrophe. Most notably, food policy during World War II resembled much of what was being called for in a national food policy almost 75 years later. Understanding how the food system was governed during WWII is important to this research because lessons can be learned from the government interventions at the time in the face of catastrophic event. I liken WWII to climate change as they share similar defining characteristics. Similar to WWII, climate change threatens the day-to-day life of people throughout the world and requires immediate and radical action to mitigate.

Food Policy During World War II

> "Where do we find actually-existing radical imagination? Creative activity can of course generate it – from micro-level social relations to artistic activity. But we also find it in history (by its very conception, history negates the present!). It is especially powerful when we're able to look into history to conceptualize different social relations, not with the intention of returning to them, but because they put the social relations of the present in stark relief" (Paulson 2010, p.36).

Perhaps the only time in Canadian history when a fully joined-up approach was during WWII. Since it was a time of crisis and food was deemed crucial to Canada's war efforts, the state went to considerable effort to introduce and implement radical measures that affected food production, distribution, and consumption (Mosby, 2014; Fowke,1946). Some have argued that our current climate crisis should be seen in the same slight as a world war (Roberts, 2016; Moran, 2018). "Without societal transformation and rapid implementation of ambitious greenhouse gas reduction measures, pathways to limiting warming to 1.5°C and achieving

sustainable development will be exceedingly difficult, if not impossible, to achieve" (Roy et al., 2018, p. 448). Given the alarming projected results of inaction on climate change in the latest Intergovernmental Panel on Climate Change Report (IPCC, 2018), the argument that we need WWII level of efforts stands ground. "Only large scale, well-funded, and sustained state interventions will realistically challenge and transform the global food system" (Selwnyn, 2009). This argument also acts as a key focus of this research. Thus, gathering insights from previous radical interventions from the state into the food system is key to informing the design of a new food system intervention.

> "Societies that have faced life-threatening shortages of food – such as for example, a number of European countries during the Second World War – have often enacted legislation to ensure adequate supplies of foodstuffs. This kind of legislation has sometimes shaped the entire agriculture policy of a nation … For example, the main objective of agricultural policy in Sweden throughout most of the post-World War II period was to safeguard the provision of food during times of peace, blockade, and war. Food security, then has been closely tied to a national defense policy that established the level of support that would go to agriculture to ensure the agricultural reserves deemed necessary to meet a sustained national emergency" (Winson, 1993, p.4).

MacRae (2019b) writes that the main motivation behind the introduction of thousands of regulations during WWII was to avoid some mistakes of WWI, specifically avoiding malnutrition within the general population, feeding soldiers, and being able to fulfil commitments on exporting foods to allies such as the US and Britain. This took place through a mix of restructuring both on the supply and demand side. This was arguably the first time that the Canadian government was directly involved in both supply, and demand management.

The main changes related to food that came about under demand-supply coordination during WWII were changes in land use, labor practices, food prices, and consumption. The first set of changes that were implemented to affect supply were subsidies for farmers to produce key commodities during the time: flax, beef, butter, cheese, and hogs (Britnell & Fowke, 1962;

Fowke, 1946; Mosby, 2014; MacRae, 2019). The same instrument (financial subsidies) to increase the production of key products could similarly be used today to support farmers who use specific agricultural practices such as agroecology as it is a practice or strategy that is used to combat an ecological crisis, climate change. Mosby (2014) writes that another government instrument that was used to encourage a shift in supply during WWII was a patriotic mobilization to have citizens grow more food through a campaign around victory gardens. Mosby (2014) believes that the contribution of victory gardens to enhance food supply is generally exaggerated, however its main impact came in how Canadians viewed their roles as citizens as it related to the war. Today's government could replicate a similar campaign but rather than encourage the country's residents to become patriotic citizens, the government could adopt the idea of food citizenship. Food citizens are folks who are more than mere consumers of food, they are engaged in their communities and deeply connected to the food they eat (Welsh & MacRae, 1998). Arguably, these values of food citizenship[5] could create food citizens who are more aware and proactive on ecological and health issues. Overall, national food policy during WWII included important positive steps for the food system. Campaigns similar to the victory garden campaign would be a welcome contribution at the current context but more needs to be done if Canada's government is to do its part in mitigating climate change and improving public health. One unrecognized dimension of the Canadian food system that might be the closest thing to an intentional and deliberate food system design is the supply management system.

A system re-design can be modelled off the supply management system coupled with policy change. Elton (2015) quotes professor Rod MacRae in saying "Environmental degradation—this is a symptom of market failure…. There's the potential to use the supply

[5] Values that were arguably present during WWII before the term's conception.

management model to seriously encourage sustainable production." Supply management is also key to rural livelihoods as it maintains smaller dairy farms which contribute more to rural communities than larger corporate conglomerates operating in rural areas (Elton, 2015). Seeing that supply management is a step in the right direction in terms of strong, and semi-coordinated legislation with potential for improvement, it can act as a solid base from which we can imagine, re-think and re-design a new food system, better adapted for the 21st century.

Supply Management

> "We need a food system in Canada that has a balance of economics, environment, and health. The old idea of supply management is a new idea for ecological, healthy, sustainable systems. It should be modified if necessary but the principles remain sound" (Caldwell, 2018).

In Canadian agriculture, supply management is a system that allows certain sectors (dairy, poultry and eggs) to control and limit the amount farmers in that respective industry can produce. The main motivation behind the introduction of the supply management system was to ensure producers get a fair price for their products and stable prices for consumers. To do that, the supply managed sectors has three main pillars: production control, pricing mechanisms, and import / export control. Each industry has a board, in the form of a crown corporation or national agency, that controls two of those pillars; price and production control. Import control is not within the jurisdiction of the supply management boards as matters relating to trade are pre-determined through trade agreements negotiated by the federal government. Instruments regarding import controls, include the Export and Imports Permits Act, Agricultural Marketing Programs Act, and the Canadian Dairy Commission Act. Imports of products such as cheese are not necessarily banned in Canada, however, very high tariffs are charged, which means that consumers would either have to pay a high premium for international products or the international producers would have to take a cut to sell their products at a competitive price in

Canada. There are some exceptions as CETA allows 5,333 tons of EU cheese to be imported in 2018, and 8,000 tons in 2019, eventually leading up to 16,000 tons in the sixth year of the agreement and in subsequent years. North American Free Trade Agreement and World Trade Organization rules also allow certain volumes of tariff-free entry. Each of the supply management industries can (and do) lobby the Canadian federal government to put specific clauses within trade agreements that work in favor of the supply managed industries. However, the decision is ultimately with those who negotiate broader trade agreements.

Production control, the first pillar of supply management, is often determined based on provincial demand (Heminthavong, 2018). The Farm Products Agencies Act, which was introduced in 1972, gives each national agency the power to restrict production (Heminthavong, 2018). Production quotas are set by the national agency for each province and each provincial board then distributes the quotas to producers within the province (Heminthavong, 2018). While that is the case throughout, small operations in some sectors are exempt from the supply management system. For example, the quota system does not apply to producers with under 300 broilers, 50 turkeys and 99 laying hens in Ontario (Heminthavong, 2018). When the supply management system was first introduced, quotas were given by the national agencies for free, however as the number of quotas is limited and the supply management sectors are attractive due to relatively stable incomes, quota has been monetized and prices have risen dramatically over the years. As an example, according to the Canadian Dairy Information Centre (2019), the price of milk quota in Manitoba in February 2019 was $30,001/kg compared to $12,000/kg in December 1998. This amounts to an increase of 250% in price. If adjusted for inflation, $12,000 in 1998 would be considered $17,736 in March 2019, but the price increase is still considered sizable. In Ontario, Quebec, New Brunswick, and Nova Scotia the price of quotas has been

capped at $25,000. All four provinces require a minimum quota of 10kg of butterfat to start production. Thus, a beginner/young farmer has to invest $250,000 in order to milk 10 cows (Union Paysanne, 2014, p.14).

While the production control system has changed over the years, the quota pricing mechanism pillar of supply management has largely stayed the same. Similar to production control, price control is also under the authority of the provincial boards. Each provincial board determines the minimum price at which products can be sold to processors and whoever is purchasing products directly from the producers (Heminthavong, 2018). The Turkey Farmers of Canada, for example, base their minimum prices on the following: "production costs (feed and poultry primarily) and market conditions, including consumer demand, turkey meat inventories (how much turkey meat is on hand in the marketplace), and prices for competing meats" (Turkey Farmers of Canada, 2019). This system guarantees farmers a minimum price for their products and thus a relatively stable income. One possible reason for this is that the producer associations collectively negotiate price with processors rather than retailers. Prices seen at grocery stores are determined by retailers and thus, the price for the same products will not be uniform throughout a province. One interviewee (Farmer) mentioned that banks are more likely to offer loans to those in supply managed sectors due to the stability in the sector. Supply management has its merits beyond economic benefits, as stability within its respective industries has large benefits. Not only did producers benefit from stability, processors were guaranteed a set number of products and a stable price. This allowed them to invest into their plants and markets (Mclsaac, 2008). Processors do not have quota, thus it is left to the market to decide production quantities. However, the economic conditions are favorable enough for processors to ensure that there is an adequate supply of processors. Consumers are also offered peace of mind with regards to the

quality of the products they buy. The entirety of a supply management sector goes through the same safety procedures and regulations. Supply Management has also been identified as a tool for food sovereignty (Desmarais, 2002; Pimbert, 2009; Rosset,2008; Mount, 2017). Broadly, food sovereignty is a set of principles that prioritizes democratic control of food systems that puts people's needs, such as an ecologically sound and equitable food system, at the center of food policies. Supply management is not strictly a food sovereignty policy or system but it embodies some of the values of food sovereignty.

The main strength of supply management as it pertains to food sovereignty is located in its ability to keep control of the supply managed sectors locally and be relatively immune from globalized supply chains. Supply management boards are democratically elected and provincially incorporated, allowing farmers in each province to take actions based on their respective provincial priorities (Holstander, 2016). Another way supply management acts for food sovereignty is that provides fair prices to food producers for their labor, allowing them to have a decent living. Finally, supply management, whether by design or not, has some environmental benefits. The makings of supply management, namely the way in which sectors have uniform farming standards create conditions that allow ecological practices can be scaled up, if its members decide to implement standards. The first example is the reduction of food miles in that milk in Canada does not travel across international borders. With regards to animal welfare (as it relates to ecological sustainability), dairy farmers, as a collective, opposed the genetically modified bovine growth hormone, rBST, developed by Monstanto, who have a history of working against the interest of food sovereignty and small farmers. An EU report finds "clear evidence from several countries of significant positive associations between milk yield and mastitis, foot disorders, reproductive disorders and other production related diseases"

(SCAHAW, 1999), all things rBGH approval would have aggravated. Instances like this show how supply management somewhat challenges the traditional power distribution in the food system in Canada.

Given the high consolidation rate in Canada's retail sector, with only 3 major companies being responsible for 66% of retail food sales in Canada (Agriculture & Agri-Food Canada, 2017), supply management allows producers in their respective sectors to act collectively to counter the increasing consolidation in the retail sector. Producers collectively negotiate prices with food processors rather than retailers. This usually affords producers a higher share of a food's price at a time when a majority of the dollar value of foods goes to retailers and not producers (Mclsaac, 2008). On the intersections between supply management and food sovereignty, Meinema (2018) says,

> "…as the leader of Canada's food workers' union, I can tell you that the dairy sector provides good jobs to more than 220,000 hard-working people across the country. Many of those folks are proud union members, with strong wages and benefits, who spend their earnings at small businesses in their local communities. But this is more than an economic argument. Canada's sovereignty as a country is also at stake here. Because of ultra-conservative ideology, we've already lost key infrastructure – like highways – to foreign consortiums based in Europe".

While there are some issues with supply management that might go against food sovereignty principles that will be mentioned on page 44, supply management broadly aligns with food sovereignty which will be explored below.

Since this research is arguing for the demand-supply coordination, which would use some of the mechanisms in the supply management system, it is essential to understand the history of supply management. Delving into the history of progressive food and agricultural policies and designs can help inform us of the conditions under which such policies and programs came to be enacted. With this knowledge, we can either try to recreate the conditions of the enactment of

these policies (with appropriate adaptation for the 21st century), or simply point to the successes of old policies in achieving their respective goals.

History of Supply Management

O'Brien (2013, p.202) writes that, "...capitalist societies are permanently scarred in one of two ways: either by a crisis of excess – where there are simply too many goods on the market and the restricted consumption of the masses prevents their sale – or because the productive forces themselves are left to stagnate in order to offset precisely [a] crisis of underconsumption." To start moving away from the precarious nature of capitalism, this crisis of excess or under consumption needs to be transformed into a more equilibrium, sustainable, and just system. In Canada, the crisis of excess referred to by O'Brien (2013) was ever-present in the poultry, egg, and dairy industries, particularly in the 1950s. This excess was mainly due to the second agricultural revolution dating from the late 1800s when the mechanization of agriculture, use of fertilizers, herbicides, antibiotics, and scientific management drastically improved yield (Muirhead, 2014). In the late 1800s, dairy farmers first pressured the government to assist with reducing the precariousness of their sector. This led to the installation of the first dairy commissioner in 1890. What followed was several public investments in support of dairy farmers like an iced butter railway car service, cow testing programs, and funding for cheese curing rooms among others (Canadian Dairy Commission, n.d). Soon after, the farmer lobby grew stronger and established the Dairy Farmers of Canada. At a time of overproduction, in order to save farmer livelihoods from the low prices they were getting, the Canadian government bought up food surpluses (Union Paysanne, 2014). These changes were initially seen as positive as it was claimed that this would end hunger (Muirhead, 2014). However, it turned out not to be the

case; farmers realized they had to try and control the price fluctuations that were hurting them financially.

During World War II, the dairy sector turned its focus to exporting to Great Britain in aiding their war efforts. After the war, the sector needed to re-structure as their primary market was lost. According to the Western Dairy Digest (1999), the Agricultural Stabilization Board (ASB) was established in 1958 to carry out tasks such as support prices, export surplus products, and limit imports which have been already taking place since the 1940s. "Although it provided the necessary structure for price stabilization operations, the ASB was not in a position to tackle two major problems affecting the dairy sector: a lack of coordination between federal and provincial policies, and the absence of an effective mechanism to control milk production" (Western Daily Digest, 1999, p.1). As the ASB was failing at solving the issue, the Canadian Dairy Commission (CDC) was created on the recommendation from the 1963 Canadian Dairy Conference (Western Daily Digest, 1999). The CDC was involved with passing on subsidies from the federal governments to milk and cream producers, followed by the implementation of the Subsidy Eligibility Quota (SEQ) program. The SEQ program was not successful in limiting milk production because producers could merely ship their excess products abroad (Western Daily Digest, 1999). It is important to stress that while this was happening, many farms went bankrupt and rural economies devastated due to years of fluctuating prices (Mclsaac, 2008). At the time, supply management was deemed the solution as the other two alternatives were: To continue with farm bailouts and allow the cycle to repeat itself, and Encourage consolidation and vertical integration (Mclsaac, 2008).

Supply Management Elsewhere

This research will not discuss how demand-supply coordination can be applied internationally, but to understand what the dairy sector could look like without supply management in Canada, I look at the dairy sectors in the US, New Zealand, and Australia. In the US, some states have some forms of supply management while others do not. Both Australia and New Zealand have had supply management policies within their respective dairy sectors, but they are now both defunct. This comparative exercise helps understand the potential implications of dismantling (or keeping) supply management in Canada.

Supply management is often synonymous to Canada in global discourse and there is vocal opposition to it from the US – mostly from President Donald Trump – but the system is being implemented in the states of Montana and California. In both states, supply management rules are not as strict as they are in Canada. For example, in California, the quota system is not mandatory. However, those who choose to participate in it get a higher price for their product according to the pool price (Sumner & Wolf 1996). In Montana, supply management has generally stabilized the industry but has restricted growth for some farmers, while stopping the growth of 'mega-dairies' (Ginsburg, 2013). The industry, as a whole, is not thriving in Montana, however that could be in spite of supply management. The key lies in the comparison between the dairy industry in Montana and states like Wisconsin. The dairy industry in Wisconsin has been slowly deteriorating in recent years. Farm sizes and yields have been steadily increasing, and the total number of farms is decreasing, meaning that farms are getting bigger, likely caused by corporate consolidation and retirements (Kirwan, 2018). This type of decline in the industry across the US prompted the 14,000 members of the Dairy Farmers of America to pass a resolution asking staff to do research on adopting a system similar to Canada's supply

management (Blackwell, 2018). This might not directly translate to the introduction of a supply managed system in the US, however, it is at the very least, a signal that the lack of regulation across the industry is not working and coming to an end.

Australia had a supply management system within its dairy industry that went through a de-regulation process in the early 2000s. The results of the de-regulation were as follows[6]:

- A shift in production from northern regions of Australia to southern ones where productions costs are lower and climate conditions are more favorable.
- An initial overall increase in dairy production mainly in exports, at a time when international dairy product prices were increasing.
- A steady decline in exports since 2000 at an average annual rate, eventually returning to 1996 levels in 2013.
- An increase in consolidation led by international processors with little local competition.
- A decrease in consumer price for drinking milk, but an increase faster than inflation in other dairy products including cheese and butter.
- A consumer tax on milk upon deregulation for an initial eight year period to finance a transition fund for dairy farmers to accommodate for the elimination of quotas and price floors.

In 2016, these changes have been felt on the producer level to an extent that the Australian government also committed $AUD 555 million in concessional loans towards dairy farmers amidst cuts in farmgate prices for milk[7] (Karp, 2016). One final effect to note that has largely

[6] Adapted from Boston Consulting Group (2018).
[7] Farmgate prices in Australia are set by the country's two biggest private processors, Murray Goulburn and Fonterra, who control most of the market.

gone under the radar is the link between mental health and economic hardship in the Australian dairy sector. One interviewee (Historian) cited high suicide rates amongst Australian dairy farmers as one cause for concern. While close in proximity to Australia and having dismantled its supply management system under similar conditions, New Zealand has had different results from dismantling its supply management system.

This could be explained through a number of factors, however, one clear advantage which New Zealand has is in the country's natural environment. New Zealand's wet climate and vast pastures create ideal conditions for milk production. According to Boston Consulting Group (2018), after dropping supply management and dairy industry became largely deregulated, the following happened:

- A merger involving the two largest dairy cooperatives in New Zealand led to the creation of Fontera, a new cooperative which representing 96% of the dairy market.
- The dairy industry experiences an annual growth of 4% since 2000. The growth can be explained through the increase of high international prices for dairy.
- 95% of local production is designated towards exports.
- While supply management is dismantled, since Fonterra is the biggest dairy co-op in the country, it controls milk sales and provides quasi quotas.
- New Zealand is now the world's biggest exporter of dairy.

The structure of the dairy industry in New Zealand is highly de-regulated, however, because Fonterra owns and controls almost all production of dairy, supply management (while not formally named as so) practices have been passed on from the government to a multi-national dairy co-operative.

Supply management seems to have many benefits but is not without its drawbacks and critiques. The next section introduces some problems plaguing the supply management system in Canada which need improving. These critiques are relevant to this research as they will be taken into consideration in proposing the design of a new system built on principles similar to supply management. I will also take this opportunity to address some common critiques of supply management that would also likely be directed towards demand-supply coordination.

Supply Management Critiques and Issues

> "You can start to see that supply management to rural Canadians is a bit like our health care system. Both have their problems, but both serve us very well." (Caldwell, 2018)

While there have been many benefits to supply management, the system is not perfect and needs to be updated to reflect the realities of the 21st century. The supply management system in Canada has undergone some recent changes, mainly due to new trade deals with more relaxed trade barriers. These changes ultimately are weakening the effectiveness of supply management. Supply management, provided it is re-structured and updated for 21st century needs, has the potential to become a progressive system that could contribute to solving a wider set of issues within the food system (Graddy-Lovelace & Diamond, 2017). Before undertaking work on re-structuring supply management, first, the flaws of supply management as they relate to the health and sustainability crises must be set.

The most vocal critique of the supply management mainly comes from free trade enthusiasts. Critics mainly point to the high prices of supply managed products as the main drawback of the system (Schmitz 1983; Veeman 1982). This is a contentious issue as other studies have found that consumers that rely on supply managed products do not necessarily pay more in comparison to other places with de-regulated industries (Export Action Global, 2018. Cardwell et al. (2015) argue that the supply managed industries, as evidenced in the price

question, do not engage or consider consumer stakeholders in the development of supply management policies and practices.

The reality is that it is somewhat difficult to pinpoint exactly whether the introduction of supply management automatically leads to higher prices to consumers. That is because there are many different factors in determining the price of food. One important and crucial factor to take into consideration is the amount of control retailers have over pricing. While supply management boards set farmgate prices for products, retailers get the final say in determining the price that the consumer sees. It is true that Canadian consumers pay more per liter of milk than many of those in the US who do not have a supply management system within their dairy sector. Canadians pay considerably less money per liter than those in Norway and China, for example, two countries who also do not have supply managed sectors (Powers, 2016). It is also worth considering the "true" cost of our food products and considering the price of externalities (Muirhead, 2014). One common externality of deregulated agricultural sectors is the social cost to farmers. When prices are low and farmers are unable to make ends meet, the government typically steps in to support farmer incomes. Canadian farmers in supply managed sectors receive no subsidies from governments for supply management (although they might receive production insurance through other measures). Their counterparts both in the US and in Europe receive subsidies from the government because the US farmers' incomes are generally not sufficient due to the low price of their products. According to World Trae Organization (2016), the US government spent US$3.2 billion on subsidies to dairy farmers. In Canada, dairy farmers receive almost no direct subsidies from the government.

Besides pricing of products, another critique of the supply management is the difficulty for new farmers to enter supply managed sectors; creating an environment where only those who

can afford farm quota can be in business. Union Paysanne (2012, p. 16), have called this process "the slow cartelization of supply management". As mentioned earlier, quota prices are extremely high due to the low supply of quota and the high demand for entry to the business. This means that the upfront capital costs for starting a business within the sector pose a barrier for new farmers (de Schutter, 2012). At a time when the average age of farmers is steadily climbing (Statistics Canada, 2019), this will likely lead to high turnover rates in the near future. However, aging farmers have few options for passing on their farms. Aging farmers can either sell their farms to new farmers, or sell to other farmers [or corporations] currently in business to consolidate their respective business (Beaulieu, 2015). The latter is the most likely scenario considering the high price of quotas and need for upfront capital which young farmers typically do not have. There have been some efforts, mostly in the egg sector, to address the barriers of entry for new farmers but they are insufficient.

> "We have to decide what it is we want to accomplish with re-envisioned supply management…It has to seek to achieve far broader outcomes that's supporting an increasing number of family farmers. It has to go beyond creating an oligopolistic sectors" (Interview Participant – Academic).

For example, Gibson (2016) believes that while there are efforts to support small scale producers within the egg industry in Ontario, supply management as a whole still generally favors larger producers as smaller producers do not benefit from the economies of scale (Young & Watkins, 2010). Since smaller and artisanal producers would have different production costs, the set price for supply management products often does not reflect their reality (Young & Watkins, 2010). These issues could be resolved if all the existing actors within the sectors attempt to reconcile their difference and put into place provisions that allow new entrants a pathway to success. Additionally, supply management still largely does not consider the environment as much as it could at a time when sustainability efforts need to be increased.

Geloso (2018) writes that supply management contributes to climate change, citing that because the cost of poultry is higher due to supply management, consumers choose to buy beef instead, which is a bigger producer of GHG emissions. However, there are no significant studies to date that outline that Canadians choose chicken over beef due to price. In practice, supply managed products are more environmentally friendly because of their lower food miles and because there is no overproduction of goods which leads to less waste. However, what is not addressed within all the supply managed sectors, mostly dairy, in Canada, is the intrinsic high health and environmental cost of both producing and consuming livestock. For example, Canada's 2019 Food Guide does not heavily emphasize dairy products like milk and cheese as it did in its previous versions (Abedi, 2019). The newest food guide recommends a move away from meats and dairy, this may mean that Canadian producers would have to rely on exports more as local demand goes down (Sagan, 2019). Although this is not an option with current supply management and trade rules. Instead of accepting the findings of the food guide and finding a way in which the sector can adapt to the clear health and environmental needs of today, the Dairy Farmers of Canada released a statement outlining their disagreement and concern with the Canada's 2019 Food Guide (Dairy Farmers of Canada, 2019). This might be more of an issue with the design of the supply management system as it is an option with current supply management and trade rules the industry does not focus or try to manage demand based on recommendations. All supply managed sectors try to increase population demand so that their farmers can produce more. This is evident by the campaigning done by marketing and promotion arms of the supply managed sectors.

This chapter has shown various policy-level food system interventions in Canada. In sum, there have been some failures, and successes, but most importantly food policy is seemingly

evolving towards a more positive, and holistic approaches. Although, it is not quite at the level it needs to be. The next section of this paper is a theoretical food system planning exercise that uses lessons from previous food system interventions in Canada to propose a new form of managing the food system. The focus of this exercise is on the beef sector in Canada.

Chapter 4: Applying Demand-Supply Coordination to Beef

This chapter begins by introducing the case study for this paper, the beef sector in Canada. The beef sector was specifically chosen because it is one that is perhaps the most in-need of a demand supply coordinated system. The beef sector is also at a historically interesting position as there is a lot of attention directed towards it from politicians, environmentalists, and concerned citizens. The beef sector suffers from many problems and a change might be needed. The external conditions for change are present, but as the next section will discuss, the internal and political conditions have not quite reached a stage where the sector's stakeholders are willing to drastically change the way the sector operates.

State of the Canadian Beef Sector

For a long time, the Canadian beef sector has been plagued with problems. These issues have led to low profit margins, liabilities, financial stress, and general financial instability (Mussell, 2009). It can be argued that this instability is caused by the constant fluctuations of the price of feed, which impacts the general reliability and stability of the industry (Forbes et al, 1982). In an increasingly export-oriented global economic environment, international competition also always poses a threat to Canadian cattle producers (Forbes et al., 1982). Sarker and Ratnasena (2014) find that Canadian beef is not as competitive as some of its international counterparts.

> "This is a market that is in a very precarious situation…No two consecutive years are the same in the cattle market and [it is] prudent that producers alter their marketing strategies accordingly" (Classen, 2018).

The current saving grace for the beef sector in Canada has been exports. Today, more than 50% of beef produced within Canada is exported (Finnigan, 2017). Around 74% of exports are to the US, with the remaining mainly going to Japan (8%), mainland China & Hong Kong (8%), Mexico (4%), Southeast Asia (1.8%) and South Korea (1%) (Canadian Cattleman's Association, 2019). This overwhelming reliance on exports may be sustaining for some producers for the time being, however, it puts the entire sector at risk. Should Canada's trading partners decide for any reason to halt exports of products or if international demand for beef decreases, the sector would be in turmoil.

All of these inherent risks mentioned within the sector have led to an ever-increasing prevalence of corporate consolidation with no end in sight as larger corporations have better capacity to deal with risk and sustain losses (Galyean et al., 2011). Corporate consolidation generally affects the whole food system as addressed in Chapter 1 of this paper. However, as it relates to beef demand, corporate consolidation in both the retail and processing sectors both limit consumer choices and affects commodity prices (Jensen, 2006). Retailers were not affected as much as producers by the Bovine spongiform encephalopathy (BSE) outbreak in 2003, when producer prices plummeted while retail prices were less affected (Sparling et al., 2005). In Canada, the number of federal facilities processing beef decreased from 400 in 1976 to 43 in 1999 (Thompson 2003). In Canada, there has been significant vertical integration in beef and pork (although not as significant as it is in the US) but less in chickens due to the supply management system (Sparling et al., 2005). Overall, the export oriented nature of the beef sector currently keeps it afloat but it also causes considerable vulnerability.

At the time of writing, China had just started halting exports of Canadian beef and the impacts of that are yet to be fully revealed. What is known so far is that the government is

providing the beef sector with $8.3 million to address loses, with $5.3 million going towards the marketing arm of the beef sector to boost international sales (Krugel, 2019). This support from the federal government represents export-oriented solutionism, which arguably has led to these problems in the first place. Thus, taking the attention further away from the root cause of these issues. As the situation with beef is still unfolding, this section will focus on how vulnerable export-oriented sectors are in the current political climate, using canola as an example.

In March 2019, China, who imported $2.7 billion worth of Canadian canola the previous year, halted canola imports from Canadian producers (Evans, 2019). While China cited food safety issues as the reason, there is much speculation that this was a political message amidst rising political tensions between Canada and China (Evans, 2019). Canada's Prime Minister, Justin Trudeau, has said that China's halted import of Canadian canola is "…an excuse to prolong what is fundamentally a conflict, not even with Canada, but between the two largest economies in the world" (The Canadian Press, 2019). China is also halting Canadian pork imports (Atkins, 2019). Although this may be less connected to wide-angle politics and more about international food safety issues. All this has severely affected Canadian agriculture. In response to the damage caused by this trade dispute, the Canadian government has amended the Advance Payments Program (APP), a program targeting canola farmers. APP is a low-interest loan program that is, while not explicitly mentioned, designed to help canola producers deal with current market volatility (Agriculture & Agri-Food Canada, 2019).

Beef producers do not need to look far back into history to understand the risks of relying on export oriented agriculture. BSE, also known as 'mad cow disease' was found in Canadian beef in May 2003. In that year, farm cash receipts were $2.5 billion (33%) lower than that of the previous year (Mitura & Di Pietro, 2004). This loss mostly stemmed from decreased beef

demand abroad (Cranfield, 2012). Demand for Canadian beef has yet to surpass its pre-BSE levels (Klein and Le Roy, 2010; Le Roy et al., 2006). In addition to concerns regarding food safety, Lim et al., (2013) demonstrated that in the US (Canada's biggest importer of beef), consumers prefer domestic beef to imported beef and would require a significant decrease in price for them to prefer imported beef.

In addition to all of these export related challenges the beef sector faces, issues around lowering domestic demand also pose a significant threat to the sector. Farm Credit Canada (2016, p.7) reports that declining domestic demand is largely due to four main reasons:

- Canada's aging population.
    - As people age, their consumption of red meat declines. Given Canada's aging population, it is a factor that could contributing to decline in meat consumption.
- Immigration patterns and changing food preferences.
    - "While many immigrants will incorporate a more western diet that includes beef, Canadian diets will change to reflect food trends that favor proteins such as pulse crops, fish, pork and chicken". [8]
- Health-related concerns.
    - Innovations in technology and lower daily energy expenditures are one of the reasons consumers eat less meat is that their daily protein requirements have allegedly declined. Additionally, there are new studies which link red meat consumption, even in small amounts, to cancer (Bradbury et al., 2019; Ruan et al., 2019). Ringwall (2018) writes that health concerns do drive demand for beef

[8] While immigrant food preferences might be significant factor in deciding beef demand, there are no studies that back this claim up or contain information about beef demand by ethnicity (Lambert et al., 2006, cited in Farm Credit Canada 2016, p.7).

products but since they offer acceptable caloric contents, they offer a healthy alternative. This line of thinking ignores the growing body of literature which indicates that thinking about health needs to go beyond calorie-focused eating (Lucan & DiNicolantonio, 2014) (Camacho & Ruppel, 2017) (Fernandes et al., 2016).

- Increase in beef prices.
    - At the retail level, the price of beef has increased at a rate faster than that of other proteins like chicken and pork (Statistics Canada, 2019). From 1984 to 2013, beef prices increased a total of 157% as opposed to 107% and 122% for pork and chicken, respectively. Incomes also generally affect beef demand (Ringwall,2018).

Another potential reason beef demand is low in Canada is the increasing realization among Canadians of the impacts beef consumption has on climate change and the need to reduce consumption to meet climate change targets (Hedenus et al., 2014; Nijdam et al., 2012). Veermani et al. (2017) conclude that the only way to reduce global warming potential in Ontario is to reduce beef consumption. In the past, attempts to change farming practices to be more sustainable did not significantly reduce Ontario's contribution to climate change (Vermani et al., 2017). Findings like this are ignored and the beef sector largely focuses on small adjustments and on-farm practices to combat climate change. This is a positive step, but might not be what is needed. The industry's sustainability efforts like the "certified sustainable" initiative championed by McDonald's Canada, is a good first step, but critiques can be made regarding corporate greenwashing. These sustainability efforts could just be efforts to increase profits within the industry. Deborah Wilson, adviser to the Verification Committee for the Canadian Roundtable

on Sustainable Beef writes that incorporating sustainability practices in the beef sector will "have a bright future in the Canadian beef industry, with the possibility of being able to demand prices higher than those currently being paid for commodity beef on the world market" (Wilson, 2016, p.3) This approach expands the concentration of wealth of those who control the food system without addressing the root cause of the consolidation of power and the need to implement profoundly sustainability initiatives in the first place (Katz-Rosene & Martin (2017). These initiatives do not address how the constant need for profit-driven growth is the primary driving force behind environmental destruction. De Souza et al. (2017) have concluded that the sector can be doing more with regards to sustainability amidst largely escalating environmental concerns. Katz-Rosene & Martin (2017) write that meat production has a triple threat which worsens environmental degradation, inequality, and health. Meat production uses the most land globally, contributes heavily to biodiversity loss, and water degradation (FAO, 2016). Katz-Rosene & Martin (2017) believe that meat contributes to inequality where there is a divide between those who overconsume meat, and those whose nutrition demands are unmet. The final threat is related to the effects of meat consumption on public health (Walker et al., 2005).

As mentioned prior, recent studies have linked red meat consumption to cancer (Bradbury et al., 2019; Ruan et al., 2019). Studies also find that low meat intake is associated with a significant decrease in risk of death (Singh et al., 2003). Claims that any meat consumption can lead to negative health effects is a cause for alarm and reason to take action, however this research is not advocating for completely halting meat production and consumption. This research is informed by the recognition that meat can be an important source of nutrients, but it is also associated with some negative health effects, primarily as it relates to over-consumption in places like Canada. Walker et al. (2005) write that people in high income

countries are, overall, consuming meat more than their individual nutritional needs causing a plethora of health issues such as cardiovascular disease and cancer. Accordingly, we need solutions to address the problems associated with beef to improve public health and well-being in an environmentally sustainable manner.

Addressing Beef's Complex Relationship with Demand-Supply Coordination.

In their comprehensive study of the Canadian beef sector, the Canadian Agri-Food Policy Institute writes: "Canada's beef sector needs a robust, long-term strategy – and a sustained commitment to execute the strategy – if it wishes to secure its place as a competitive force in domestic and global markets" (CAPI, 2012 P.5) This need is largely born out of the issues mentioned in the previous section. Perhaps what would be the most alarming statistic to beef producers is that the average retail price of beef has increased by $5.67 per kilogram while farm prices for beef increased by just 14 cents (McIsaac, 2008). Recent reports suggest that "volatility remains with high prices creating large risk on a per head basis for producers" (Canada Beef, 2017, p.10). If this trend continues, it poses a significant threat to producers' livelihoods amidst rising inflation. Overall, this leaves us with a wicked problem: beef producers are not making enough money, their products are sold for cheap on the market, and both production and consumption need to be curtailed as a part of efforts to combat climate change and improve public health.

Often the proposed solution within the sector is more exports. Canada's National Beef Strategy, orchestrated by a coalition of industry leaders, is largely focused on reaching global markets (Canada National Beef Strategy, 2015). This ignores the evidence of the need to lower meat consumption and represents the same framework which causes problems to begin with. Some efforts have been made to establish 'nudges' and raise awareness in hopes of shifting

consumption, but they are largely ineffective (Marteau and Mantzari, 2015; Theresa & Marteau, 2015).

There is virtually no discussion to move away from export-oriented agriculture. This is likely due to the fact the food system in general is largely run by private interests with little appetite for government intervention (MacRae, 2019). Supply management is already proving to be more unpopular given many calls in the media to dismantle it. One interviewee, who was involved in an attempt to introduce supply management to another farming sector[9], mentioned that the attempt to introduce supply management had very little appetite because the perception among those in the sector was that its seen as highly regulated and does not respond to market forces. When discussing solutions for the beef sector, it is crucial that the issues plaguing the sector be put in a broader context of both climate change and public health – two issues that require radical change to solve. While these issues are not explicitly caused by the beef sector, red meat, is a significant contributor to climate change and some health problems (Veeramania et al., 2017). Conversely, climate change will inevitably change and affect the beef industry through "decreased quality of animal products, and enlargement of land desertification and the worsening of animal health…" (Bernabucci, 2019, p. 5). Accordingly, change ought to address all of these issues at once, and that change could be demand-supply coordination.

Since humanity has not faced a challenge of the scale of climate change before, there is little evidence of systems implemented to deal with problems of this magnitude. What we do know for certain is that the current system is not working. As mentioned earlier, perhaps the closest challenge Canada has had to face, as a country, was WWII. However, WWII was almost 75 years ago. The same principles of public control of the food system can be used today, but

[9] Undisclosed for anonymity purposes.

now we are facing a very different set of challenges that requires a different set of solutions. Demand-supply coordination will not solve climate change nor will it eradicate public health issues. What it can do is put into place a system that provides fair incomes for those involved in food production to cover their production costs, while adhering to ecologically sound practices that are desperately needed to curtail our collective environmental footprint. On the demand side, the system can put into place deterrents that are proven to work towards discouraging consumption of unhealthy foods and optimize nourishment for the population. Currently, there are significant social and political barriers to enacting such a system. Those will be addressed further on in this paper but political realities can and will likely change quickly. Therefore, normative exercises such as this are important to, at least, start a conversation surrounding major changes in the food system. The next chapter will discuss in more detail how a demand-supply coordinated system works.

Chapter 5: Possibilities of Demand-Supply Coordination

> "To a large extent, we haven't yet gone beyond the first step of radical imagination: the negation of the given reality. Even when we accept that another world is possible, the obstacles to creating it remain substantial" (Paulson, p.38)

Imagining and outlining how a new food system with radical new approach informed by history would look like is an important exercise. What is equally important is outlining pathways to transition from the current system towards a newer one. Conceptualizing how we transition to a better food system without leaving those who are most vulnerable behind is just as crucial as designing what an improved food system might look like. This chapter discusses both how a demand-supply coordinated system might look as well as how to make such a transition from the current food system. Few studies have outlined what a demand-supply coordinated system should look like in the food system, and thus much of the information presented below is a result of normative thinking. This chapter will also discuss what conditions are needed for these changes to materialize in the future. Finally, this chapter will attempt to address some of the potential issues and areas for further research.

The main premises of the previous chapters can be summed up in the following points:

1. The food system, while not solely responsible for climate change, ought to change if it is to mitigate and adapt to climate change.
2. Overall, the food systems coerces eaters into consuming too much food with low nutritional value.

3. System re-design can push food producers and consumers through a mix of incentives and regulations towards the production and consumption of foods that are both healthy for humans and the planet's health.

These three premises are broadly ones on which demand-supply coordination is built and are important to keep in consideration while designing a new system like demand-supply coordination.

Principles and Mechanisms for Demand-Supply Coordination

> "There is no room for excess production beyond our needs. The concept of matching supply to demand began as an economic idea but it is truly now an ecological idea which needs to be expanded to other jurisdictions in the world, not discarded in Canada" (Caldwell, 2018).

As with all program (re)design, the work must start with a vision and a goal. Once those have been set, a strategy must then be put into place whose primarily objective is to achieve the goal and vision of a better designed system. Broadly, the main principle and goal behind a demand-supply coordinated system is optimal nourishment and engaging in practices that contribute to the health and sustainability of the food system and its actors. This means that the food that our lives center around should contribute to our personal and collective health whilst not contributing to the destruction of the environment, and, at an advanced stage, possibly even mitigating the effect of climate change. Thus, to achieve these goals, this system needs certain organizing mechanisms that can contribute to these goals. Inspired by supply management, the three main mechanisms, I argue, to achieve health and sustainability are: demand management, price setting, and support for transitions. The strategies presented here include a combination of: direct regulation, market-based tools, and information and communication tools.

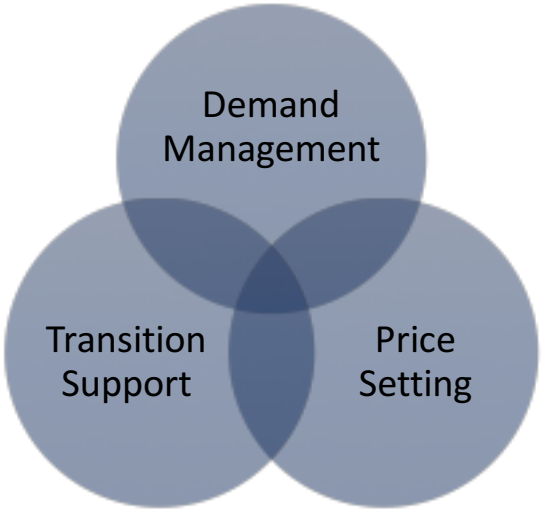

Figure 1 Venn Diagram of Demand-Supply Coordination Mechanisms

Price Setting

The first principle of demand-supply coordination is price-setting. The reason for this is that under a market economy, price is a strong driver of decision-making both in production and consumption. Price-setting has also proved an effective mechanism during WWII to change both production and consumption of foods. Under demand-supply coordination, prices need to be set with the following in mind: economy, environment, and health. First and foremost, producers need to be assured that the foods they produce are profitable for them. Thus, similar to supply management, this mechanism ensures that producers receive fair farmgate prices that cover the costs of production. Putting in place production quotas would complement price setting well; however, it could cause more harm than good. Under supply management, production quota has become a large deterrent for new farmers. This creates a system where only those with large amounts of capital can afford to start farming under a supply managed sector. A possible solution for the issue of inaccessible quota is creating a quota system without monetary value. However, this would require a lot more regulations in the beef sector, an idea that is already not popular.

Seemingly contrary to the goal of this system, an ideal scenario and result from demand-supply coordination would be for more people to start farming beef. One interviewee (Historian)

mentioned that a potential consequence of decreasing beef production is that rural economies could be devastated. They proceeded to cite how supply management keeps rural economies alive and mentioned that he would encourage more people to get into farming rather than the opposite. The sector currently has a high number of corporate consolidation and the introduction of a production control mechanism could cement their status as leaders. Ideally, the goal would be for overall production to decrease, but that family farms and independent farmers would make up the majority of producers as opposed to corporate producers. Another piece of price-setting under demand-supply coordination as opposed to traditional supply management is the reflection of a price of the true cost of food.

In the beef sector, setting prices in way that would reflect the true cost of food could be viewed by both the public and the industry as a meat tax. The movement to introduce a meat tax is gaining momentum since the Paris Agreement to the point where "the implementation of the Paris Agreement will lead some governments to tax meat in the same way many now tax sugar, carbon and tobacco" (FAIRR, 2017). It is important to differentiate price-setting from a meat tax. It is not the same as a tax as the revenues from beef sales under demand-supply coordination would not go to the government. Revenue split would occur in the same way it currently does, with the hopes of less influence from the retail sector. However, the increasing momentum for beef-tax may mean price-setting could be seen as some form of compromise. An increase in farm gate price of meat in a demand-supply coordinated system may seem to hurt farmers, as consumer demand will ultimately decrease. However, coupled with adequate transition management and programming for substitution to healthier food production, a strain on farmers can be avoided, and it can be utilized as an opportunity for growth. This is an area where quota implementation could be helpful, but is not proposed in this research due to its added layer of

complexity. On the issues of quotas, one interviewee (Academic) expressed concerns about its commodification.

> "I understand and appreciate the motive for supply management vis-a-vis supporting family based agriculture and functioning as a mechanism to maintain economic viability of family based agriculture. I'm not convinced that it is exactly functioning to do that. We've seen in the supply managed sectors substantial consolidation and systems getting larger and larger" (Interview Participant – Academic).

We can look to the supply management sector for inspiration regarding the benefits of price setting. Under demand-supply coordination, beef farmers would be decreasing their production, however they would need not worry about fluctuations in price and benefit from guaranteed incomes as is the case within current supply managed sectors. In the dairy sector, mandated decreased production has occurred with little to no disruption. Overall, dairy production in Canada had a net decline of 10% between 1989-2009 and the sector remains relatively stable. Another challenge under this system lies in how will prices be set.

The easiest way in which we can set prices based on environmental impact is through a carbon tax – something that has been recommended by the IPCC. The issue with that route is that impact on the environment is not caused only by release of carbon into the atmosphere. MacRae (2019c) writes that things such as: reductions in corporate concentration at various levels, regionalization of food chains, labor and wages, and marketing need to be taken into consideration. Thus, a holistic environmental perspective is required to be taken into consideration. Both human and environmental health ought to be taken into consideration and act as central aspects to price-setting. Currently, public health is not easily quantifiable but there are recent studies that outline the high health care costs of foods, including meat (Lieffers et al., 2018; Nshimyumukiza et al., 2018). As innovations in research unfold over time, and more similar studies are undertaken, we will have adequate information for health to be used as factors

in pricing. Thus, the price of restorative work to human and environmental health could be used as the central pricing factor. The philosophy behind this is informed by the study by Afshin et al. (2019) about how the food system needs to eventually operate in a manner that acts as preventative medicine rather than one that merely nullifies the negative costs of its production.

Springmann et al. (2017) argue that increasing the price of certain foods through taxation, (a demand management mechanism), can act as a health-promoting climate policy in high-income countries, such as Canada. They have also found that fiscal incentives work best, however, they must exist with other policy interventions to work effectively. This includes paying attention to the political economy of food including "agricultural policy, in trade, in food provisioning infrastructure and in public and private sector investment" (Garnett et al., 2015, p. 79). A political economy approach in the form of policy intervention is needed as it is not in the food industry's best interest to change their current practices (Garnett et al., 2015). Evidence shows that relying on individuals to change their behaviors is also not impactful (Garnett et al., 2015). Accordingly, under a system like this, there needs to be more policy and supports in place to encourage and "nudge" people towards more healthy consumption. The challenge is setting prices in a manner that farmers can sufficiently support themselves without having to export their products coupled with decreased consumption. This is where the other principles of demand-supply coordination can fill the gaps which price setting alone cannot.

Demand Management

The idea of nudging people to be more likely to consume a specific set of products has been happening for a long time. Laid out in plain terms, the idea may seem unpopular that governments ought to control the types of foods we consume. However, as mentioned previously, governments have been "meddling in food and nutrition for a long time", indirectly

through various instruments such as farm subsidies, taxations, and food guides (Souter, 2017). Accordingly, we need to accept the fact that demand management is a tool which governments use to affect our food consumption. A report finds British families are coerced and manipulated into systematically eating unhealthy foods due to lack of regulation of demand management like food advertising (Fletcher, 2016). While there has not been a similar systematic study in Canada, the conditions found in the report such as the lack of regulation of food marketing are the same.

Demand Management then becomes the second pillar of demand supply coordination to counter negative effects of market coercion to consume poor quality food. Demand management may not have been very effective in pushing, encouraging, and facilitating healthy food consumption because it was not designed to do so. It may seem counterintuitive but this is encouraging as it shows that the tools for demand management are already in existence and being used and can be used in the future in a positive rather than negative manner.

Demand management compliments the first pillar (price setting) well, as price is often a large factor in determining consumption of foods – but not the only one. Its importance cannot be understated in a fight against climate change and for better public health. Bajželj et al. (2014) write that food demand management is essential in the fight against climate change in that we need to decrease our consumption of certain foods. Parallel to this, others have argued that agricultural policy needs to be dictated by the nutritional requirements of a population and not vice versa (Simopoulos et al., 2013).

Since price is not the universal determinant of what foods people choose to consume, food marketing, labelling, and public discourses around food are needed around food consumption. For example, in 2017, the Ontario government introduced the Healthy Menu Choices Act which mandated food service providers to clearly indicate the number of calories in

food items sold. This is an example of a government-led public health intervention. Unfortunately, the Healthy Menu Choices Act is misguided in that it does not adopt a holistic view of health beyond the number of calories consumed. McGeown (2019) found that this policy has a negative impact in that calorie-focused health interventions can cause or exasperate eating disorders. "Instead, placing legislative pressure on the food industry to serve reasonably portioned meals with greater nutritional value can expose institutions' shared responsibility and temper purely internal attributions for obesity, thus reducing stigma" (McGeown, 2019, p.4).

Accordingly, effective demand management needs to take a combination of different approaches. We can look to WWII for inspiration on which instruments were used to effectively change consumption. The Canadian government introduced many measures during WWII to shift food consumption. The table below from MacRae (2019b), adapted from Britnell and Fowke (1962) & Mosby (2014) shows the different ways in which demand management took place during WWII and, along with other instruments including price setting and shifted food consumption.

Instrument	**Purpose**	**Target / Outcomes**
Production subsidies and price guarantees.	Increase production of key commodities, particularly flax, beef, butter and cheese, hogs.	Most targeted commodities saw significant production increases, but weather was also a factor. Accordingly, Hog production doubled.

Canadian Wheat Board made primary marketing agent for grain (1943).	To deal first with surpluses, then later shortages. Depending on crop, offered price floors, ceilings or fixed prices.	Shifted wheat production to oil crops and animal feed which were facing pressing shortages
Other marketing boards established.	Increase production or consumption of other commodities.	Helped deal with apple surpluses early in the war after loss of export markets. Increased domestic consumption.
Subsidies to processors (sometimes passed on to growers through processors).	Hold down pressure on the price ceilings and maximize canned goods for when fresh out of season so that imports were not required.	For canning crops and soft tree fruits, and berries for jam.
Subsidies to defray freight charges.	To reduce the differential between imported and domestic prices; to move products from high production areas to low ones.	Evened out supplies for processors.
Victory Gardens campaign / program.	Take pressure off the vegetable supply chain.	By 1944, 209, 200 victory gardens producing 57000 tons of vegetables. 82% at home.

		15% in nearby vacant lots, 3% in community allotments; more middle than low income activity. Impact may have been more symbolic than real.

Under a demand-supply coordinated system, similar measures would be taking place. Mandated meatless days at restaurants is one mechanism that can be emulated as it was during WWII that will decrease meat consumption. It is also a strong public message by the government that will change the discourse around meat and how its consumption ought to be decreased. Information campaigns around food consumption have been proven to be ineffective on their own, but coupled with the other guiding principles and mechanisms under demand-supply coordination, public educational campaigns have a role to play.

The Canada Food Guide is an important piece of messaging from the Canadian government to the public; however, it has been proven to be largely ineffective. This could be attributed to the lack of adequate marketing of the food guide, or the fact that there are many other food systems actors competing with the government for influence over what is on Canadians' plates. In lieu of completely abolishing pre-existing mechanisms like the Healthy Menus Act, they could be amended to reflect the recommendation in the Canadian Food Guide. As mentioned prior in Chapter 3, one of the main issues with food policy in Canada is how many different policies work in silos. Linking the food guide to policies like the Healthy Menus Act present an opportunity to connect some of the many tangled pieces of food policy. In addition to

linking positive pieces of food policy, there ought to be mechanisms to restrict, or limit the negative implications of the areas where there is little to no regulation.

Food corporations notoriously advertise unhealthy foods specifically to children as children can become lifetime customers, "a lifetime customer may be worth $100,000 to a retailer, making effective 'cradle-to-grave' strategies extremely valuable." (Lindstrom et al., "Brand Child," Kogan Page Limited, 2003, P. 193). Accordingly, as part of demand management, this type of predatory behavior by corporations needs to be stopped with legislative restrictions on the ways in which those food companies and producers can market their foods. Under demand-supply coordination, acts like Bill S-228: Child Protection Act, which proposed to prevent food and beverage marketing directed at children, would be essential in complementing health-positive food advertising.

Overall, both demand management and price setting offer admirable and achievable goals for demand-supply coordination. However, what is as equally important is a path to be laid out towards achieving those goals. The third pillar of demand-supply coordination, support for transitions, offers a pathway towards demand-supply coordination and transitioning out of the current system.

Support for Transitions

The two prior discussed pillars of demand-supply coordination, on their own, would lead to a food system that is arguably healthier than what we have today. The issue is that they would largely lead to siloed programming within the food system without much consideration for "joining up" a food policy. Both demand management and price setting ultimately discourage and restrict unhealthy and unsustainable practices within the food system, however, for them to work effectively, there needs to be a viable alternative. The third pillar of demand-supply

coordination, support for transitions, aims to answer questions like how will true-cost reflective pricing affect beef farmers? And how can we ensure that a meat tax does not destroy the livelihoods of farmers in a sector that is already experiencing significant challenges.

There is a notable lack of strategies in Canada to support the transition from conventional to sustainable beef production (MacRae et al., 1990). Thus, this pillar of demand-supply coordination aims to provide a strategy towards transitioning. This pillar seeks inspiration from WWII in how the federal government created supports for transitions to encourage both the production and consumption of certain foods pertinent to the needs of the war. According to Britnell and Fowke (1962) and Mosby (2014) some examples of this include:

- Production subsidies and price guarantees for key commodities such as: flax, beef, butter, cheese, and hogs.
- Subsidies to defray freight charges to discourage imports and exports and encourage local production.
- Regulations on the size of processed food packaging. The government moved from allowing 116 possible sizes for tin cans to only 9 possible sizes.

Similarly, demand-supply coordination ought to enact mechanisms that encourage the production and consumption of foods that will assist both the fight against climate change, and maintain good public health. Some example of this currently exist to support a better food system, however, they exist on a small scale that is not significant enough to transform food systems. As one example, the federal government recently announced its commitment to support the growth of the organic sector by providing financial support to cover the costs associated with the 2020 Canadian Organic Standards review. However, the intentions behind this are questionable. The government's news release announcing this subsidy praises the organic industry for being a fast-

growing agricultural sector and one that "will contribute to our government's ambitious goal of reaching $75 billion in annual agri-food exports by 2025" (Agriculture & Agri-Food Canada, 2018b). This subsidy is a welcome addition as it supports the growth of an importance sector, however, it seems as if the sector would not have been supported by the government if it weren't for the sector's contributions to Canada's export goals. Accordingly, we should be collectively re-aligning our values in what we choose to subsidize. Under demand-supply coordination, the organic sector would still be subsidized, but the motivation behind its subsidy would be to encourage production for local organic food consumption (arguably better for both human and the environment's health). To avoid working in silos, transition management needs to operate in a way which targets sectors that need to be transitioned out of, in addition to sectors that need more support to produce a better food system. This needs to happen on a large scale across a variety of different sectors, however, for the purposes of this paper, the focus is on transitioning out of beef production and transitioning towards more vegetable farming or horticulture.

Studies have documented successful transitions in agriculture, particularly organic agriculuture (Dabbert & Madden, 1986; MacRae et al., 1990). It is also important to stress that the goal of transitioning is not to completely halt beef farming. Its goal is to curtail overall production and create conditions and standards which beef farming can become ecologically sound. Transitions could be done in two different ways:

1) *Total buyout of the farm*

In the pork sector in the mid to late 2000s was hit with several issues including H1N1 (Swine flu) and new labelling laws in the US, that heavily affected the livelihoods of hog farmers. Accordingly, many wanted to leave the sector all-together and the federal government offered a plan to transition these farmers out of the sector. In 2009, the federal government

offered a $75-million buyout fund to help farmers get out of the struggling pork industry (CBC News, 2009). As the beef sector is facing similar challenges (such as the trade restrictions from China and fluctuating prices in the market), a buy-out similar to the one that was done for hog farmers could prove to be attractive to beef producers. This would reduce the supply of beef on the market and assist in price setting. However, the potential issue here is that many beef producers are corporate entities, and this program could ultimately become a mechanism for government to buy out corporations for not being profitable. Therefore, there needs to be careful consideration on who is eligible for a program like this. It is possible to set parameters to avoid buyouts to corporations by focusing on cow-calf operations of a particular size. Current programs and subsidies like the Agricultural Greenhouse Gases Program, AgriDiversity Program, and AgriAssurance are restricted to specific groups such as Aboriginal and minority owned businesses, as well as small and medium enterprises. Another concern with this type of transition is that the smaller farmers would be the only ones choosing to go with a buy-out as they are less likely to withstand the fluctuations in price, leaving only large corporations in business as they are more likely to withstand and survive financial shocks. Regardless, this program would lead to a decrease in beef production, however it needs to be coupled with a program to ensure that this does not only benefit corporations.

2) *Transition to alternative crop production*

The second option for a transition out of beef production is through providing an incentive for beef farmers to grow another agro-food commodity – ideally a crop that is needed for optimal nourishment for humans. The way this can happen is that producers would get compensated for switching from beef production towards the production of another crop. This has happened in the past when the Canadian government deemed the production of a certain crop

desirable in an effort to decrease demand for that product. However, this can be difficult as there have not been any publicly documented cases of beef farmers transitioning to alternative crop production. There has, however, been cases of successful transitions from crops such as tobacco towards growing healthier crops. As an example, In Northumberland County, Ontario, a farmer couple transformed 10 acres of former tobacco fields to kale production, creating space for a healthier crop while maintaining their livelihood (Bitti, 2015). Cases like this happened with some government support. In 2005, the Ontario government set up a transition fund for tobacco farmers to transition towards alternative crops. The fund, worth $50 million, was set for tobacco farmers who wanted to transition to growing alternative crops like beans and sweet potatoes that were in demand at the time (CBC News, 2005). Shortly after, in 2008, the federal government set up an additional fund of $300 million for tobacco farmers to "exit the industry, transition to other crops or find new opportunities outside agriculture" (CBC News, 2008). It is worth noting that the money is given to tobacco farmers exiting the industry with no strings attached, meaning that they are not obliged to start farming new crops.

The stories of both the tobacco and pork industries with regards to how government is encouraging and offering support to the respective farming groups shows and can provide inspiration to prospective governments on managing beef. It shows that a transition out of beef, a product which has been shown needs to be scaled down in its production and consumption, is possible. Mixed farms could scale down beef and scale up other commodities they might already be producing. They could also shift to pasture based systems which would involve lowering stocking densities. Overall, the transition would be made easier given that the other two pillars of demand supply coordination would be working in tandem with publicly-funded transitionary efforts.

Issues and Areas for Further Research

This proposed system and its pillars is likely to be met with much criticism ranging from concerns about feasibility to how it could potentially exasperate the very issues it tries to solve. This section both aims to quell some of these potential critiques and identify areas where further research and consideration is needed.

1) Demand-supply coordination as a barrier to food security

There are concerns that, amidst heightened global food insecurity, intervening in demand to lower consumption of certain foods may lead to more food insecurity (Golub et al., 2013; Havlik et al., 2014). These concerns are valid, as it is important to not exacerbate one issue in the hopes of solving another. On the surface, it may seem logical that we should not be decreasing production of foods like meat amidst rising hunger, but it is established that, globally, we produce more food than we need (Holt-Gimenez et al., 2012). To appease the concerns of agricultural productivists, if beef production were to decrease, land used for grazing cattle could still be used to produce in-need products based on the Canada Food Guide.

~~W~~hat is mostly needed with regards to achieving global food security is a more equitable way of distributing our food. Equitable food distribution is outside the scope of this research; however, it is important to note that demand-supply coordination in the beef sector would not exacerbate high food insecurity rates. Food system intervention efforts ought to be joined-up and intersectional if demand-supply coordination is to not increase food insecurity rates. In contrast, demand-supply coordination presents an opportunity to introduce a joined-up approach that addresses climate change, and public health, including food insecurity.

2) Defining health

One crucial piece to demand-supply coordination which needs further consideration is finding a common definition and agreement on what is to be classified as a healthy optimal diet and what is not to be. For the purposes of this research, I used the 2019 version of the Canada Food Guide as the signifier for a healthy diet and the basis for the argument that we need to consume less beef than we currently do. As argued earlier, agricultural practices ought to be aligned according to optimal nourishment. As it stands, the Canada Food Guide does not have any demonstrable effect on agricultural practices. Accordingly, if official food guides are to be used to direct agricultural policies, then food guides need to take into consideration both local agricultural capacities and acknowledge both the different regional and cultural needs within Canada.

Identifying and defining health is a crucial task for demand-supply coordination because whatever is identified as a healthy diet would translate to on-farm practices and translate to the demand management pillar as well as the support for transitions since subsidies need to reflect the foods that are in demand. Additionally, the goal is not to completely phase out beef. Understanding exactly how much beef consumption is ideal for optimal health is important in determining how much supply of beef is required.

Finally, it needs to be acknowledged that demand-supply coordination does not delve into the social determinants of healthy eating. Demand-supply coordination alone will not automatically lead to better public health, and further policy and programming directed at income equality are needed for a better population health.

3) Likelihood of beef farmers to accept demand-supply coordination

This research focused on the beef sector as an industry which demand-supply coordination could be and needs to be implemented. However, it is unlikely that beef producers,

collectively, choose to work in system that has similar principles to supply management. This is largely due to the export-oriented nature of the beef industry, as well as trade commitments which means that there needs to be many structural changes. It is also unfair to blame problems within agriculture and public health on the beef sector. One Interviewee (Farm Organization Official) mentioned that beef farmers already feel enough scrutiny and are fighting to keep their reputation intact amidst the perception that beef is a big source of issues in the food system.

Many of the issues pertaining to beef are also common in other sectors, and many other sectors also need to step-up to contribute to the fight against climate change and declining public health. Ideally, demand-supply coordination would be a food industry-wide coordinated effort led by the federal government. This would create a level playing field as to not scapegoat one specific sector.

4) Lack of political will

Under current federal and provincial governments, it is highly unlikely that a system like demand-supply coordinated is installed even though the need for a new modus operandi in the food system has been clearly demonstrated. There seems to be no indication from current and previous governments that the Canadian food system will be governed any differently than it has been since the start of the third/current food regime in the 1970s. The National Food Policy, which represents the federal government's latest thinking on the way forward of the food system, shows that there likely will not be much change in the way the food system is governed as it stands.

5) What happens between production and consumption?

This research discusses what demand-supply coordination looks like on the production and consumption fronts, and how to transition from current to future production and

consumption targets. An area which this research does not address is the distribution system under demand-supply coordination. What happens from when foods leave the farm until they reach the consumer's plate is a series of crucial processes including food processing, transportation, waste management, and marketing. These processes will inevitably change under demand-supply coordination and thus, it should not be left to markets to decide what that change looks like. As part of the broader efforts to shift production and consumption, attention ought to be paid to what happens between these processes.

Overall, there could be concerns regarding the implementation of demand-supply coordination but it is an idea that has yet to be tested. It is clear that the system we are currently operating under is not working. Thus, it is at least worth exploring serious alternative options. With further research and testing in the forms of pilot project(s), results could prove that demand-supply coordination is a system with, at least, large potential to solve some environmental, economic, and health problems in the food system simultaneously.

Chapter 6: Conclusions

> "[Demand-supply coordination] is macro scale, broadly positioned within the arena of Integrated Resource Planning… If properly designed [it] could help optimize food consumption by changing the mix and quantity of products the food system provides, re-orienting production to resource efficient approaches, reducing the distance food travels, and creating greater food utilization along the supply chain" MacRae (2019c).

It has been clear for many years that the Canadian food system is failing many of those who depend on it for survival and sustenance every day. Some call it a broken food system but those controlling it are deliberately operating it in such manner. What has also been clear for some time is that the current approach in the Canadian food system (and elsewhere) cannot be sustainable for long mainly as it is pushing nature to its limit. There have been many responses and attempts over the years from both the private sector and governments to mitigate the externalities of the food system but they have largely been band-aid approaches that seek only to mitigate symptoms. Often, these attempted solutions exacerbate the issues at hand as they operate from the same framework of productivism and profit-making. This research presented an alternative view of food system interventions and proposed a preventative framework in approaching the issues at hand.

What this research concluded is that any proposed solution for many issues in the food system first must be positioned from intersectional lens of the food system that can recognize the food system's impact on public health, the economy, and the environment. The recognition of food's entanglement with many facets in society is powerful due to its ability to tackle many issues at once. For years, food scholars have been calling for joined-up approaches to food to take advantage of the unique opportunity food is positioned in with little response from policymakers and politicians. It has been proven that siloed government-initiated approaches do

not achieve adequate intended outcomes. In parallel, strictly market based solutions are not adequately catching up with society's needs for a 21st century food system. Demand-supply coordination's move away from market based solutionism relies on strategic publicly orchestrated interventions to create change.

Demand-supply coordination, a food system design initiative that reconciles food supply with demand based on principles of health and sustainability, can create a food system based on today's needs. While it may take place in the form of a food policy, demand-supply coordination is not just a food policy, it is a deliberate system (re)design that challenges the power distribution of the current food system. By placing the food system back into the public domain, it can become one that ensures food producers are well compensated for their labor, incentivized to produce what is needed to adequately nourish the population, and curtail climate change as much as possible. Throughout this paper, two main arguments have been made in support of demand-supply coordination: (1) it is crucial, even though it might seem daunting given the current social and political realities, that we engage in radical food system re-design before it is too late; and (2) that reorganizing how we collectively manage our production and consumption of food as a society can be a strong starting point in food system re-design.

To support these arguments, first, the chapters in this paper presented evidence for the need of a large-scale food system wide intervention and why the principles of health and sustainability need to be at the forefront of such an intervention. The paper also reviewed food policy broadly in Canada with particular attention paid to the much anticipated first Canadian National Food Policy, and the supply management system mainly due to their significance and scale. Food system interventions in Canada were analyzed based on their effectiveness and ability to create positive change. Through analyzing the capacities and results of prior food

system interventions, a gap revealed from this review was that there have not been any deliberate food system re-design initiatives in many years. Accordingly, the central point of this paper is to propose and present demand-supply coordination to fill that gap.

To understand what demand-supply coordination could look like and to learn from previous successes and failures, an inquiry of the history of food system interventions in Canada was conducted. What was found was that food policy during WWII might be closest in resemblance to the type of food system interventions that is needed today. The interventions during WWII were a series of policies (food and non-food related) that, in conjunction, re-designed and completely re-shaped the way the food system operated during WWII. This shows that identifying a specific vision, adopting regulatory tools to transition to a new system, and getting the public support amidst a national (and global) crisis is possible and can produce desirable results such as maintaining adequate food supply during a war. By closely examining food policies during WWII, it was understood that radical government intervention in the food system in Canada is possible, and can be effective.

The principles of demand-supply coordination are health and sustainability for the food system and for those who rely on it for survival. To achieve this vision, three key mechanisms, built off the supply management system, were identified: price setting, demand management, and support for transitions. The whole of this mechanism is greater than the sum of its parts. In short, price setting serves to price products in a manner that is based on optimal demand; demand management aims to make it easier for consumers to eat foods that are healthier and more ecologically sound; and transition support can assist producers and the like to scale down their production of unhealthy foods, and transition to production of foods aligned with health and sustainability principles. Demand-supply coordination needs a series of other policies in place

for it to be effective such as high tariffs on certain imported goods so that domestic production can thrive and be scaled up. A system with these characteristics has not been implemented before, and would ideally need to be tested in a sector first. For demand-supply coordination to be most effective, however, its implementation throughout the whole food system would produce the best results. Accordingly, this research proposed the beef sector in Canada as one which demand-supply coordination could be implemented in. This argument is based on the need of the sector itself to find a solution to the issues plaguing it; and as a response amidst calls by experts that meat consumption and production need to be drastically scaled down for the sake of enhancing human health and reducing GHG emissions.

In conclusion, demand-supply coordination can be a signal of intent in outlining collective priorities for the food system and in moving away from the inequalities and externalities imbedded within the modern food system. If demand-supply coordination is implemented with principles of health and sustainability, it could signal a change in the food system more broadly. It could represent a way of organizing our modes of production and consumption that is based on pressing societal needs and values. Demand-supply coordination can challenge the organizing principles of the food system and the inequitable realities it produces by putting into place measures that are both preventative and adaptive.

Appendix

Interview Guide

1. What is your perception of the current supply management system?
    1a. What areas of it need improving and what needs to be kept as is?

2. What are your thoughts on demand management as a supplement to supply management for a healthier and more sustainable food system?

3. If you believe demand management needs to be added, how would you adapt supply management to it? (i.e suggestive?, taxing?)

4. Given current general attacks on supply management, do you see any civil society or political support for this?

5. My case study for a sector that could use a demand-supply coordinated system like this is the beef sector. What would have to happen in the beef sector for this to be put to a vote by beef producers?
    5a. What alternative future exists for the beef sector?

6. What do you think is the social / political climate needed to implement these changes within the beef sector?

7. Is there anything else that you think is worth mentioning for this research?

8. Do you have anyone else you recommend I speak to?

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