



NIAGARA'S AGRIBUSINESS SECTOR: TOWARDS A MORE RESILIENT INNOVATION CLUSTER

Introduction

It is a generally accepted fact that agribusiness industries in Niagara form a well-established sector endowed with natural competitive advantages of favourable soils and microclimates, a talent asset of experienced entrepreneurs and specialized operators, a world-class pool of researchers and research facilities that together make the region a credible node with a wider regional and international value chain. Agribusiness is one of the region's top four economic sectors, along with tourism, manufacturing, and transportation/logistics. The agribusiness value chain in Niagara runs the full spectrum of the sector, from basic operations to high-end, value-added industrial processes and products – spanning a range from the globally renowned viticulture to cash crop, dairy farms and greenhouses, including flowers, fruit, vegetables and the more recent developments in cannabis growth.

Recent data shows that Niagara's agribusiness sector consists of about \$1.41 billion annual agribusiness GDP and almost 20,000 jobs covering more than 215,000 acres of farmland, and 22 million square feet-plus of greenhouse area. There are more than 1,800 farms, about 200 greenhouses, nearly 100 wineries, and more than 112 food processing companies¹. A recent study completed by Niagara Region indicates that Niagara's agribusiness sector (with a focus on agrifoods - defined as growing, harvesting, processing, and distributing of food, beverage, and bioproducts derived from agriculture, as well as their support services) had reported farmgate sales in the Greater Golden Horseshoe of \$2 billion in 2016, with 43 per cent of that coming from Niagara². The study however, also acknowledged certain gaps in the sector's production,

processing, distribution chains, and value-added opportunities. In addition to these gaps, an earlier report published in 2011 by the Greater Golden Horseshoe Farming Alliance identified a lack of awareness about the cluster, a lack of integration within the cluster, and gaps in infrastructure that prevented this integration³.

There thus seems to be two conflicting realities surrounding Niagara's agribusiness sector. On the one hand, there are indications the sector legitimately boasts world-class agribusiness assets and strengths, while on the other hand, there are some underlying gaps and challenges in leveraging the sector's full potential. The purpose of this brief, therefore, is twofold. First, we provide a portrait of recent trends in the agribusiness sector in Niagara relative to similar mid-sized regions in southern Ontario. In doing so, we take a deeper dive into some of the industry-specific strengths of the agribusiness sector as well as highlight existing weaknesses and gaps. Second, we draw some inferences from the underlying currents of these trends to provide an analysis of how to further leverage the agribusiness sector's potential and address existing problems in pursuit of greater resilience and adaptability.

The discussion is structured as follows: First, we provide a brief description of the research method. Second, we highlight key industry-specific trends in the agribusiness sector. Third, we draw policy inferences from these trends and then conclude the discussion by exploring the key attributes of resilient and adaptive economic clusters, and how Niagara could build the institutional infrastructure for a more vibrant agribusiness innovation ecosystem.

¹ Statistics Canada Census of Agriculture, 2016; Statistics Canada, Canadian Business Counts, 2017

² Niagara Region Economic Development, Niagara Agriculture Economic Impact Report, 2018

³ Golden Horseshoe Food and Farming Alliance: Agriculture and Agri-food Economic Profile for the Golden Horseshoe, 2014

Research Method

We define the agribusiness sector as a composite of industries consisting of agricultural produce, the processing, storage, and distribution of such farm produce, the manufacturing and distribution of farm equipment and supplies, and the provisions of requisite services in support of farming operations. As the name “agribusiness” implies, we see the sector as a composite of activities that transcend and connect agriculture and business with an emphasis on the interdependence of the various industries and activities within the production and distribution chain. These industries consist of the following: Agricultural supplies merchant wholesalers; Agricultural, construction and mining machinery manufacturing; Beverage manufacturing; Beverage merchant wholesalers; Farm product merchant wholesalers; Farm, lawn and garden machinery and equipment merchant wholesalers; Farms; Food merchant wholesalers; Fruit and vegetable preserving and specialty food manufacturing; Meat product manufacturing; Other food manufacturing; Pesticide, fertilizer and other agricultural chemical manufacturing; and Support activities for farms.

For purposes of data analysis, we focus on a set of industries listed under the four-digit NAICs and NOCs. The data was sourced from EMSI’s Labor Market Analytics and consists of three distinct sets of data that serve as prisms for analyzing trends in agribusiness, namely: Jobs by Industry; Jobs by Occupation; and Business Counts data. The Jobs by Industry and Jobs by Occupation data cover the period 2011 to 2018 and consist of absolute and percentage changes over this seven-year period. It also consists of the provincial location quotients for each of the industries. We included the location quotients because they indicate an area’s level of specialization in industries that have a location quotient above 1.5. The location quotients indicate a region’s job concentration in the sector relative to total jobs concentration in Ontario’s agribusiness sector. The Business Counts data consist of total number of agribusiness firms without employees compared with total number of firms with employees. The data also breaks down the distribution of agribusiness firms with employees across various sizes, from microenterprises

employing between one and four workers to companies with more than 100 employees.

The data cover a select number of CMAs within southern Ontario that have sizeable agribusiness sectors. These include St Catharines-Niagara, Chatham-Kent, Guelph, Hamilton, Sarnia, Waterloo, Windsor, and Peterborough.⁴ The comparative analysis also juxtaposes Niagara with regions that share geographical proximity and thus holds the potential for an agribusiness cluster that spans the breadth of these regions. We have excluded major cities like Toronto, Ottawa and the like in order to focus on mid-sized and smaller regions that are relatively comparable across agribusiness industries. Moreover, our focus is on regions where the agribusiness sector commands a sizeable proportion of the local GDP relative to other sectors, which is not the case for the larger regions with mega-cities and a wider range of other thriving economic sectors.

Finally, the statistical data described above is backed up by in-depth interviews with key actors across Niagara’s agribusiness sector. Interviewees include business leaders, industry associations, officials in post-secondary institutions and research centres, and several economic development offices in the region. We conducted a total of 24 interviews over a period of six months (June - December 2018). We asked interviewees to identify the prospects and challenges facing the agribusiness sector in Niagara and Ontario. We also asked about possible governance arrangements to fully leverage the potential and address the existing gaps in the sector. The analysis in this report is thus the result of the integration of statistical data and in-depth interviews.

Data Analysis

Table 1 below presents a portrait of agribusiness jobs by industry as reported in 2018 for the St Catharines-Niagara CMA. As the table indicates, Niagara had a total of more than 9,000 jobs in the agribusiness sector, and the region’s top two performing industries were in Farms with 4,398 jobs (leading by a wide margin) and Beverage Manufacturing with 1,510 jobs.

⁴ It is important to note that for this study, we used the geographical area of the St. Catharines-Niagara CMA, which does not include Grimsby and West Lincoln. We had to do this in order to compare the St. Catharines-Niagara CMA to other economic regions in Ontario.

These two sectors considerably outperformed all other industries in the region's agribusiness sector. A list of other industries such as Bakeries with 692 jobs, Food Merchant Wholesalers with 620, Beverage Merchant Wholesalers with 306, and Grain and Oilseed Milling with 305 also registered strong job figures. Other notable industries are Farm Product Merchant Wholesalers (280 jobs), Meat Product Manufacturing (201 jobs), Other Food Manufacturing (194 jobs) and Farm, Lawn and Garden Machinery and Equipment Merchant Wholesalers (194 jobs).

The strong showing of the Farms industry in the region comes as no surprise. Equally affirming for the agribusiness sector is the strength of the region's job numbers in beverage manufacturing. The point worth noting, however, as a cause for concern and further deliberation, is the modest to weak showing of job numbers in sectors like Other Food Manufacturing; Farm, Lawn and Garden Machinery and Equipment Merchant Wholesalers; Support Activities for Farms; Agricultural, Construction and Mining Machinery Manufacturing; and Pesticide, Fertilizer and other Agricultural Chemical Manufacturing. These industries are often central building blocks in the higher echelon of a sector's value-chain associated with a vibrant knowledge-driven economy and a resilient innovation ecosystem.

Table 1: Niagara Agribusiness Jobs in 2018 by Industry

Industries	2018 Jobs
Farms	4398
Beverage manufacturing	1510
Bakeries and tortilla manufacturing	692
Food merchant wholesalers	620
Beverage merchant wholesalers	306
Grain and oilseed milling	305
Farm product merchant wholesalers	280
Meat product manufacturing	201
Other food manufacturing	194
Farm, lawn and garden machinery and equipment merchant wholesalers	194
Support activities for farms	149
Agricultural supplies merchant wholesalers	133
Agricultural, construction and mining machinery manufacturing	112
Pesticide, fertilizer and other agricultural chemical manufacturing	76
Sugar and confectionery product manufacturing	73
Fruit and vegetable preserving and specialty food manufacturing	65
Support activities for forestry	7
Grand Total	9313

Nevertheless, the picture is not bleak. As Table 2 and Figure 1 indicate, a look at percentage changes between 2011 and 2018 in agribusiness jobs by industries point to significant and promising trajectories of knowledge-intensive growth activities. Industries like Support Activities for Farms; Farm, Lawn and Garden Machinery and Equipment Merchant Wholesalers; Other Food Manufacturing; and Agricultural, Construction and Mining Machinery Manufacturing all report strong growth trends. These are sectors that often indicate innovative, research-intensive and value-added activities in the agribusiness sector – that is, activities consistent with indicators of higher-than-average innovation, resilience and adaptability. For instance, developments in machineries are prerequisites for a sector's advances in innovation systems aimed at precision agriculture, computer-enabled sustainable food production, biomechanical plant growth and horticultural practices, explorations into new frontiers in greenhouse operations (especially with the emergence of the cannabis industry), aquaponics and renewable energies.

Table 2: Percentage change (2011 – 2018) in Niagara Agribusiness Jobs by Industry

Industries	% Change
Support activities for farms	190%
Farm, lawn and garden machinery and equipment merchant wholesalers	154%
Other food manufacturing	106%
Beverage merchant wholesalers	55%
Bakeries and tortilla manufacturing	28%
Pesticide, fertilizer and other agricultural chemical manufacturing	27%
Agricultural, construction and mining machinery manufacturing	26%
Farms	8%
Beverage manufacturing	-2%
Food merchant wholesalers	-6%
Sugar and confectionery product manufacturing	-27%
Meat product manufacturing	-30%
Grain and oilseed milling	-31%
Fruit and vegetable preserving and specialty food manufacturing	-40%
Farm product merchant wholesalers	-49%
Support activities for forestry	-60%
Agricultural supplies merchant wholesalers	-64%

In light of these considerations, an upswing of 190 per cent in Support Activities for farms; 154 per cent in Farm, Lawn and Garden Machinery and Equipment Merchant Wholesalers; and 106 per cent in Other Food Manufacturing Industries, is no small feat. Even Agricultural, construction and mining machinery manufacturing reports a growth trend of 28 per cent change. The one noteworthy blot in an otherwise positive trajectory of knowledge-intensive change is the slight drop of two per cent in the beverage manufacturing industry. A deeper inquiry could probe further into factors that account for this somewhat peculiar trend in a region registering high scores of upward swings in agribusiness activities associated with creativity and innovation.

Figure 1: Percentage Change (2011 – 2018) in Niagara Agribusiness Jobs by Industry

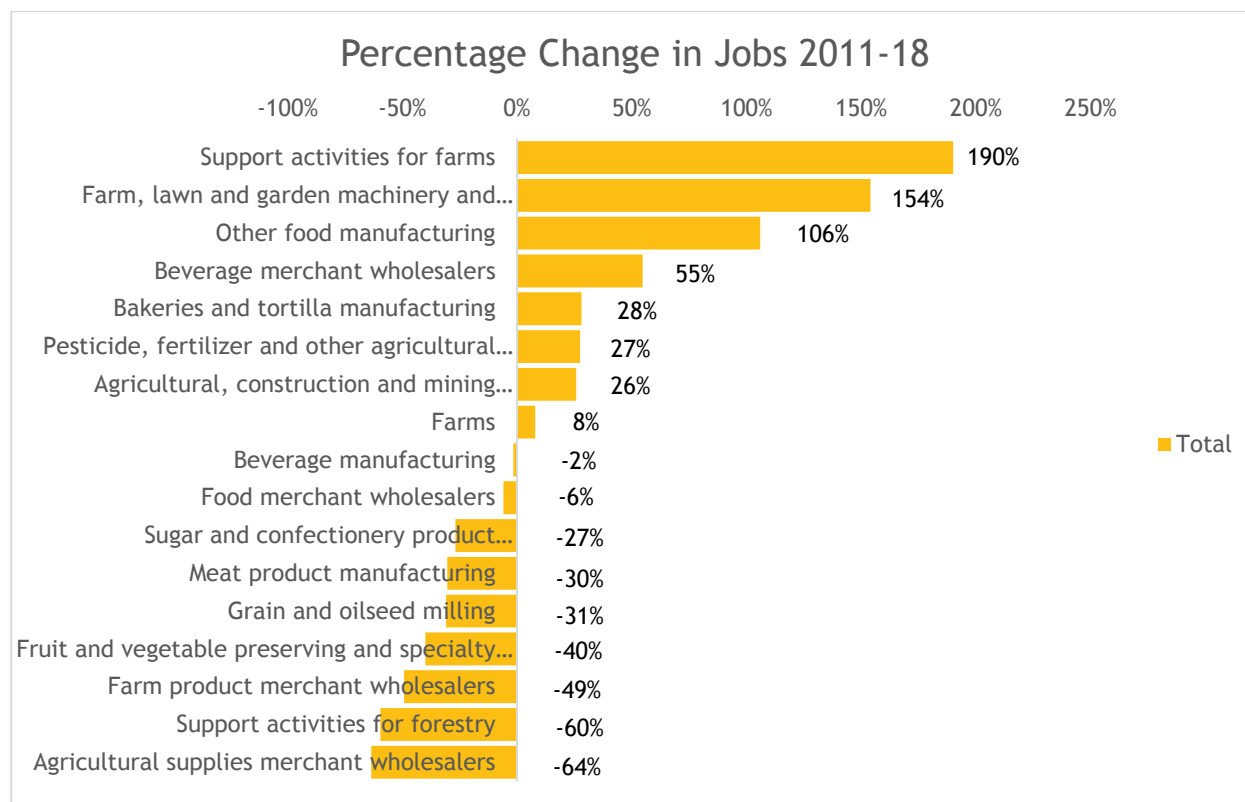
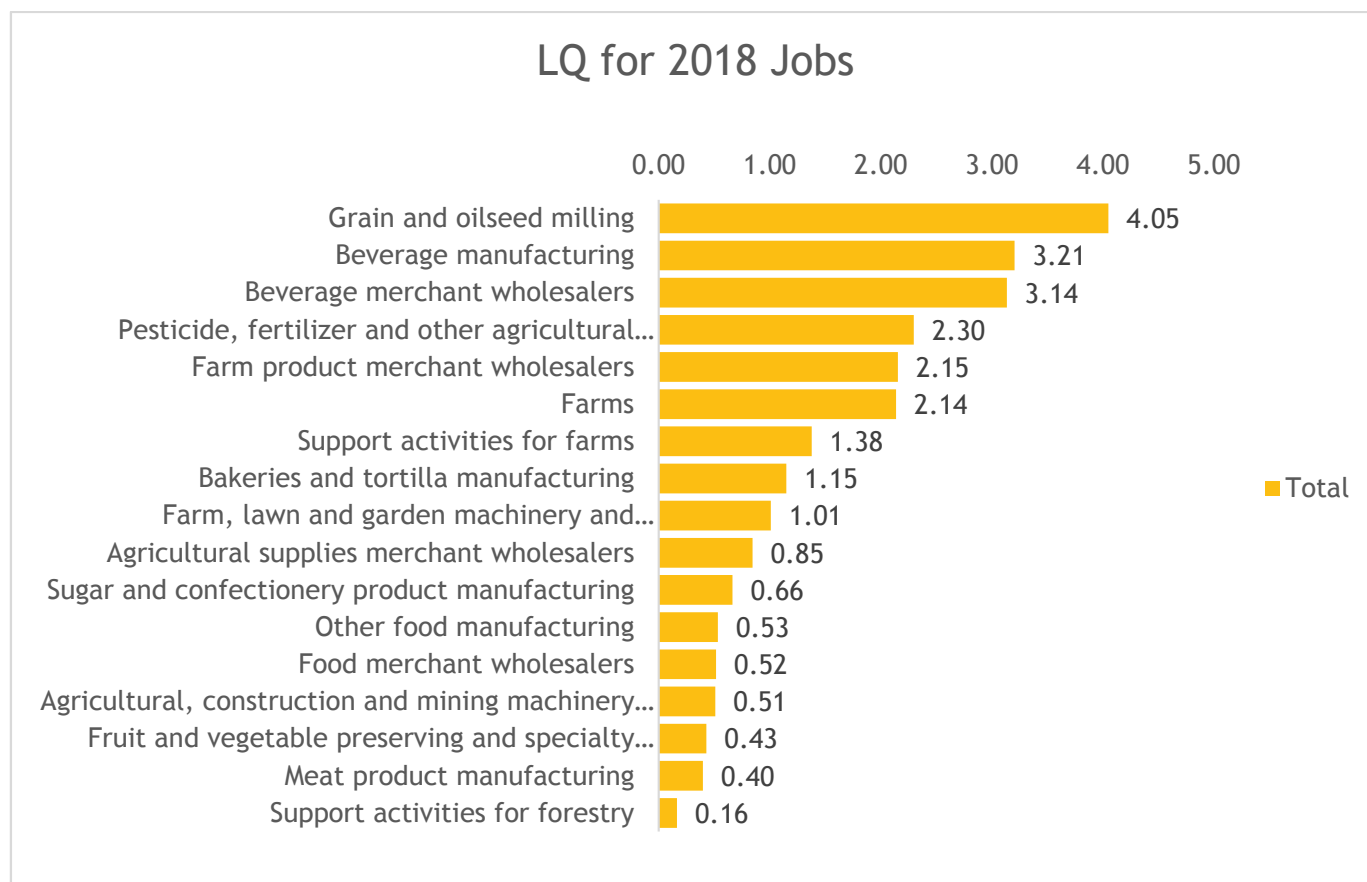


Table 3: Provincial LQ of Niagara Agribusiness Jobs in 2018 by Industry

Agribusiness Jobs in Niagara	
Industries	2018 Provincial LQ
Grain and oilseed milling	4.05
Beverage manufacturing	3.21
Beverage merchant wholesalers	3.14
Pesticide, fertilizer and other agricultural chemical manufacturing	2.30
Farm product merchant wholesalers	2.15
Farms	2.14
Support activities for farms	1.38
Bakeries and tortilla manufacturing	1.15
Farm, lawn and garden machinery and equipment merchant wholesalers	1.01
Agricultural supplies merchant wholesalers	0.85
Sugar and confectionery product manufacturing	0.66
Other food manufacturing	0.53
Food merchant wholesalers	0.52
Agricultural, construction and mining machinery manufacturing	0.51
Fruit and vegetable preserving and specialty food manufacturing	0.43
Meat product manufacturing	0.40
Support activities for forestry	0.16

Another lens through which we can understand the current state of agribusiness in Niagara is the location quotients (LQs) of jobs in the respective industries that make up the sector. As noted earlier, the LQ scores indicate an area's level of specialization in industries, with a score above 1.5 indicating a significant degree of specialization compared to other regions in the province. As Table 3 (illustrated in Figure 2) indicates, relative to other Ontario CMAs, Niagara boasts a strong showing in Grain and Oilseed Milling with a LQ score of 4.05, Beverage Manufacturing with a LQ score of 3.21, Beverage Merchant Wholesalers with a LQ score of 3.14 and Pesticide, Fertilizer and Other Agricultural Chemical Manufacturing with a LQ score of 2.30, Farm Product Merchant Wholesalers with a LQ score of 2.15 and Farms with a LQ score of 2.14.

Figure 2: Provincial LQ of Niagara Agribusiness Jobs in 2018 by Industry



What stands out in the LQ scores is a demonstrably strong performance in beverage-related industries. Another related implication of these scores is the strong showing of agribusiness manufacturing-related activities, attesting to an agribusiness innovation ecosystem with a critical mass well above the provincial average. Nevertheless, the modest LQ scores in industries like Support Activities for Farms; Other Food Manufacturing; Agricultural, Construction and Mining Machinery Manufacturing; and Fruit and Vegetable Preserving and Specialty Food Manufacturing should draw our attention to the need for some policy deliberation about expanding local innovation capacities across the full spectrum of the agribusiness sector.

To further shed light on how Niagara is faring in each of these agribusiness industries compared to other regions in Ontario, we juxtapose Niagara's LQ scores with other regions that share some geographical proximity, agribusiness concentration and roughly similar population density. Table 4 provides the industry LQ scores of seven such Ontario CMAs (including St Catharines-Niagara) with established reputation in the agribusiness sector.

What the table also offers is a panoramic portrait that highlights potential opportunities to explore collaborations across regions sharing similar agribusiness sector strengths but with variation in industry-specific specialization within the sector. For instance,

discussions about a mega-cluster strategy involving Niagara and Hamilton would require a juxtaposition of the respective industry LQ scores in the two regions to identify areas of relative strengths. What this means then is that innovation systems supporting the agribusiness sector in the two regions could leverage their respective specializations to build integrated networks of value chains with agglomeration advantages and shared learning between the two regions.

The cultivation of an agribusiness "mega-cluster" strategy provides a wider industrial corridor wherein key industries and their respective associations in the sector align their resources and investment priorities with various adjacent regions. One good (even if still nascent) example is the emergent Golden Horseshoe Food and Farming Alliance formed to strengthen the agrifood cluster in Canada's most densely-populated region. For a region the size of Niagara, mega-clusters provide strategic opportunities for the region to leverage its assets, "gang up" with the bigger players, punch above its weight and carve its own niche in a highly competitive global agribusiness landscape. As the concluding section elaborates, building such mega-clusters spanning two or more regions requires appropriate platforms of locally embedded and integrated processes of strategic visioning, planning, and implementation.

While the distribution of jobs by industry gives us a good picture of current trends in Niagara's agribusi-

Table 4: Seven Ontario CMAs' Provincial LQs for Agribusiness Jobs by Industry

Description	Niagara	Brantford	Chatham	Guelph	Hamilton	Waterloo	Windsor
Farms	2.14	1.66	6.04	0.90	0.71	0.75	0.52
Support activities for farms	1.38	1.65	3.87	2.34	1.05	0.94	0.22
Grain and oilseed milling	4.05	1.10	<1	0.51	0.86	1.25	2.28
Fruit and vegetable preserving and specialty food manufacturing	0.43	6.34	2.80	0.36	1.53	0.48	2.64
Beverage manufacturing	3.21	0.39	0.49	4.78	0.72	1.12	2.06
Pesticide, fertilizer and other agricultural chemical manufacturing	2.30	1.03	3.92	1.48	0.36	0.41	0.69
Agricultural, construction and mining machinery manufacturing	0.51	6.42	1.32	5.11	0.78	4.26	0.61
Farm product merchant wholesalers	2.15	1.23	3.85	9.65	1.26	0.68	0.80
Food merchant wholesalers	0.52	1.23	0.59	1.02	0.71	1.08	0.53
Beverage merchant wholesalers	3.14	<1	<1	<1	1.13	0.57	0.58
Farm, lawn and garden machinery and equipment merchant wholesalers	1.01	<1	3.60	0.61	1.03	1.13	0.80
Agricultural supplies merchant wholesalers	0.85	3.73	7.72	3.89	1.31	1.38	0.22

ness sector, another lens through which we can view such trends is the distribution of jobs by occupation. The importance of this lens is that it sheds light on the human and talent dimensions of the agribusiness sector, providing insights into the nature of skillsets or expertise in the sector. This information in turn allows us to make inferences about the region's existing talent pool and its implications for innovation, adaptability and resilience of the agribusiness sector.

As Table 5 indicates, Managers in Agriculture command the highest score with 1,079 positions, General Farm Workers with 972 and Nursery and Greenhouse Workers with 943 jobs in the region. While most of these occupations are not readily associated with high levels of skills and creativity, the scores of 927 jobs for Process Control and Machine Operators, Food and Beverage Processing point to a critical mass of expertise in high-end, value-added and innovation-related activities.

Table 5: 2018 Agribusiness Jobs by Occupation

Agribusiness Occupations	2018 Jobs
Managers in agriculture	1079
General farm workers	972
Nursery and greenhouse workers	943
Process control and machine operators, food and beverage processing	927
Contractors and supervisors, landscaping, grounds maintenance and horticulture services	695
Labourers in food and beverage processing	372
Landscape and horticulture technicians and specialists	291
Supervisors, food and beverage processing	248
Managers in horticulture	213
Agricultural service contractors, farm supervisors and specialized livestock workers	161
Testers and graders, food and beverage processing	118
Supervisors, forest products processing	95
Harvesting labourers	90
Industrial butchers and meat cutters, poultry preparers and related workers	62
Agricultural and fish products inspectors	46
Agricultural representatives, consultants and specialists	35
Fish and seafood plant workers	22
Labourers in fish and seafood processing	14
Managers in aquaculture	12
Aquaculture and marine harvest labourers	11
Grand Total	6407

It should be noted that rather than dwelling on static scores of skills distribution, an even more significant indicator of a region's adaptability and resilience is the direction of change in critical occupations and specializations. As Table 6 reveals, Niagara has seen its largest job growth between 2011 and 2018 in Landscape and Horticulture Technicians and Specialists, with a 110.34 per cent change over this seven-year period. This figure underscores a trend towards an increasing stock of skills requisite for high-density creativity and value-added activities within a cluster or sector's value chain.



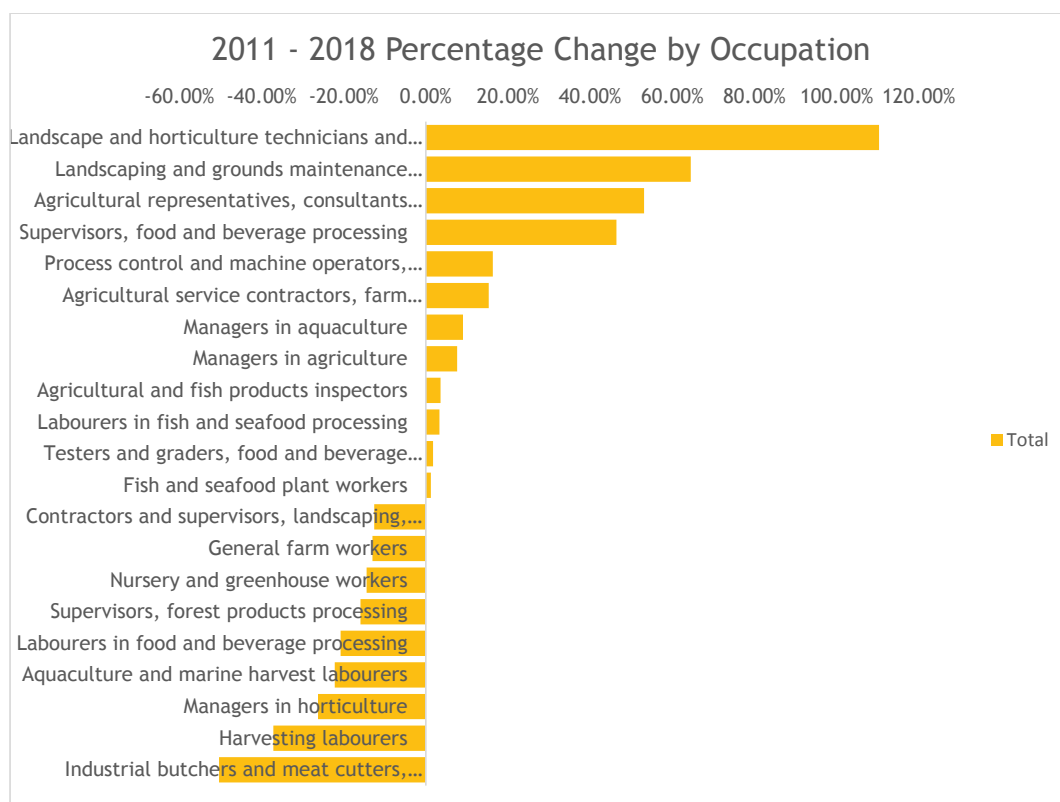
Table 6: Niagara's Percentage Change of Jobs by Occupation from 2011 to 2018

Agribusiness Occupations	% Change
Landscape and horticulture technicians and specialists	110.34%
Landscaping and grounds maintenance labourers	64.49%
Agricultural representatives, consultants and specialists	53.14%
Supervisors, food and beverage processing	46.43%
Process control and machine operators, food and beverage processing	16.30%
Agricultural service contractors, farm supervisors and specialized livestock workers	15.31%
Managers in aquaculture	9.06%
Managers in agriculture	7.64%
Agricultural and fish products inspectors	3.58%
Labourers in fish and seafood processing	3.33%
Testers and graders, food and beverage processing	1.75%
Fish and seafood plant workers	1.25%
Contractors and supervisors, landscaping, grounds maintenance and horticulture services	-12.56%
General farm workers	-12.98%
Nursery and greenhouse workers	-14.40%
Supervisors, forest products processing	-15.89%
Labourers in food and beverage processing	-20.73%
Aquaculture and marine harvest labourers	-22.18%
Managers in horticulture	-26.25%
Harvesting labourers	-37.12%
Industrial butchers and meat cutters, poultry preparers and related workers	-50.35%



In fact, upon a closer look at Table 6, one can clearly see that most of the positive trends of growth are in occupations requiring some level of advanced education. For instance, as Figure 3 highlights, occupations like Landscape and Horticulture Technicians and Specialists; Agricultural Representatives, Consultants and Specialists; Supervisors, Food and Beverage Processing; Process Control and Machine Operators in Food and Beverage Processing; Agricultural Service Contractors, Farm Supervisors and Specialized Livestock Workers; and Managers in Agriculture all report positive change over the seven-year period. Equally worth noting is the fact that most of the decline over this same period are in labour-intensive manual

Figure 3: Percentage Change of Jobs by Occupation





occupations such as General Farm Workers; Nursery and Greenhouse Workers; Labourers in Food and Beverage Processing; and Harvesting Labourers. This negative trend could be largely indicative of the increasingly mechanized nature of the agribusiness sector rather than a decline of the sector in absolute terms. In fact, over the seven-year period covered by the study, Niagara witnessed a total growth by all occupations combined from 7,685 to 8,119 jobs.⁵

More importantly, as the provincial location quotients of Jobs by Occupation in Table 7 indicate, relative to other regions in Ontario, Niagara registers considerable strength in the overall density of agribusiness occupations across a wide range of occupations, spanning Nursery and Greenhouse Workers; Landscape and Horticulture Technicians and Specialists; and Testers and Graders, Food and Beverage processing.

Table 7: Provincial LQ by Occupation for 2018 Jobs

Niagara's Agribusiness Industries	Provincial LQ
Nursery and greenhouse workers	5.00
Managers in aquaculture	3.88
Managers in horticulture	3.10
Fish and seafood plant workers	2.32
General farm workers	1.78
Landscape and horticulture technicians and specialists	1.68
Contractors and supervisors, landscaping, grounds maintenance and horticulture services	1.66
Agricultural representatives, consultants and specialists	1.57
Process control and machine operators, food and beverage processing	1.44
Agricultural service contractors, farm supervisors and specialized livestock workers	1.42
Harvesting labourers	1.40
Aquaculture and marine harvest labourers	1.40
Testers and graders, food and beverage processing	1.39
Labourers in fish and seafood processing	1.28
Agricultural and fish products inspectors	1.15
Supervisors, food and beverage processing	1.15
Managers in agriculture	1.12
Supervisors, forest products processing	1.05
Labourers in food and beverage processing	0.67
Industrial butchers and meat cutters, poultry preparers and related workers	0.49

⁵ 2011 – 2018 Jobs by Occupation

Combined Occupations in Agribusiness	2011	2018
Grand Total	7685	8119

A final lens for determining the vitality of Niagara’s agribusiness sector is the number of enterprises. Table 8 provides a comparative snapshot of businesses with and without employees as well as the frequency distribution of business counts from small, medium, to large enterprises. As the table shows, there is a total of 685 businesses with employees whereas the sum of businesses without employees is almost twice that amount at 1,035 businesses.

Moreover, most of the businesses (246 in total) with employees are microenterprises with about 1 to 4 workers, followed by 134 businesses with somewhere between 5 and 9 workers. There is a total of 123 businesses employing between 10 and 19 workers, 125 business with 20 to 49 workers and only 34 businesses with anywhere between 50 and 99 employees. A total of 23 businesses in Niagara reported employing more than 100 each, with the majority of those (19 businesses) having 200 or fewer workers. The region has zero businesses reporting more than 500 workers. This need not be a cause for concern since the literature on regional innovation systems points to regions with a high density of small and medium-sized businesses as opposed to larger businesses as often the most nimble, adaptive and resilient.

Table 8: 2018 Niagara Agribusiness Business Counts



Employee Composition	Business Counts
Business Without Employees	1035
Business With Employees	685
1-4 Employees	246
5-9 Employees	134
10-19 Employees	123
20-49 Employees	125
50-99 Employees	34
100+ Employees	23
Grand Total	2405

Discussion, Conclusion, and Policy Implications

The above analysis provides a multidimensional understanding of recent trends as well as industry-specific insight into Niagara’s agribusiness sector. The prospects are evident in the fact that the agribusiness sector is growing, and if current trends continue, the sector serves as one of the primary pillars of the region’s economic resilience. Niagara has businesses in every major industry of agribusiness, except for the fisheries: livestock, cash crops, fruit and nut trees, viticulture, and greenhouses. Each industry accounts for its own supply chain, from raw materials through to retail: Raw materials, growers/farmers, processing and manufacturing, transport, warehousing wholesale, retail, input suppliers secondary, and support.

The analysis also reveals industry-specific location quotients that highlight the region’s specific strengths relative to other regions of Ontario. Such strengths and specialization are critical for building a cluster niche within a larger agri-industrial corridor spanning the Niagara and Hamilton regions. Even thinking beyond the Niagara-Hamilton corridor, the region’s well-established reputation in tender fruit orchards, grape and wine production (boasting about 80 per cent of Canada’s total grape and wine production), cash crops, greenhouse growers, and poultry and egg producers make it a compelling case to serve as a critical node within a larger Golden Horseshoe and cross-border agribusiness value chain.

However, having a thriving sector does not by itself make a region a cluster in the technical sense of the term. The concept of an economic cluster partly rests on a critical concentration of industries within a given sector, but it means much more. A cluster would have a deep specialized labour market, a collective psyche of institutional self-awareness among firms making up the sector, the presence of institutionalized intermediaries linking workforce, research and entrepreneurship, and a strategic role for the state at multiple scales of governance (Clark 2013). In short, a cluster requires a combination of natural and physical assets as well as institutional features that can credibly support a

resilient and adaptive innovation ecosystem. Economic clusters are geographic spaces with “concentrations of inter-connected companies, specialized suppliers, service providers, firms in related industries, associated institutions... in particular fields that compete but also cooperate” (Porter 1998, 197). An operative word in this definition of cluster is “cooperate”. Cooperation is a central determinant of value creation that arises from networks of direct and indirect interactions among private businesses, and between firms, customers, local public agents (such as economic development officials), post-secondary institutions, research centres and related entities with vested interests in a given economic sector. Important elements of economic clusters, therefore, are conduits for mobilizing shared assets and synchronized governance platforms which provide the basis for communities to plan investment priorities, human capital, land use, industrial supply chains, export strategies and market expansion (Asheim, Cooke, and Martin 2011).

Viewing Niagara’s agribusiness sector through the lens of the cluster literature, the region thus has some challenges to address. These challenges in Niagara could be viewed through the lens of three broad categories of cluster syndromes, namely: lock-in, organizational thinness, and internal fragmentation (Todtling and Tripple 2005). Lock-in refers to the tendency of an economic sector to become stuck into a mold of cognitive seizure from which reinvention and renewal seems nearly impossible or staunchly resisted.

Globalization and technology are disruptive forces that need to be leveraged and managed for a region’s key economic sectors to remain relevant and competitive. For the agribusiness sector in Niagara to embrace a cluster mindset, the sector should be seen not as isolated from other sectors such as manufacturing. Rather, the goal should be to build conduits of research and innovation that transcend sectors in order to maximize synergies along the full spectrum of value-chain activities from primary agricultural activities to tertiary or advanced agribusiness processes. The latter end of the value chain spectrum thus intersects with other sectors like manufacturing (equipment manufacturing, for instance), tourism (as in viticulture) and the like. Moreover, an obvious but no less poignant point worth noting is that regional agribusiness clusters cannot be cultivated in isolation from surrounding regions. Their resilience and adaptability lie precisely in how well they are interconnected with other sectors across value and supply chains (Clark 2013).

The second syndrome – organizational thinness – refers to the lack of institutional platforms or networks for strategic visioning and planning to sustain an economic cluster’s resilience and adaptability in the face of change. Organizational thinness speaks to the quality of local governance but should not be confused with government. Governance refers to any platform that commands the legitimacy to mobilize key actors from government, the private sector, post-secondary institutions, research centres and other community groups to coordinate efforts and align strategies for building a resilient and adaptive innovation ecosystem. For instance, some of the central players within Niagara’s agribusiness innovation infrastructure support system consist of the following: Brock University’s Cool Climate Oenology and Viticulture Institute (CCOVI) and Advanced Biomanufacturing Centre (ABC), Niagara College’s Agriculture and Environment Innovation Centre (AEIC) and Canadian Food and Wine Institute (CFWI), the Vineland Research and Innovation Centre (VRIC); and Niagara Parks Botanical Gardens and School of Horticulture. Each of these organizations are distinct centres of excellence but a resilient cluster requires building synchronized platforms that leverage and share knowledge across these organizations and the specific industries they serve.

This means building an infrastructure of knowledge generation and mobilization that is well aligned with the needs of not only particular industries but the sector as a whole across the value chain of activities. This is what transforms a sector into a cluster. Therefore, the next frontier of agribusiness innovation systems in Niagara is to align the region’s assets of post-secondary institutions and research centres into strategic platforms of collective and continuous learning rather than isolated pockets of research projects often disconnected from each other, and even worse, sometimes in competition with each.

This leads to the third syndrome mentioned above – internal fragmentation. This refers to the absence of shared cognitive frames and narratives that provide the glue for binding together the key actors in a given sector. One key characteristic of Niagara’s agribusiness sector is the plethora of small to medium-sized enterprises (SMEs). This is not a weakness. The most adaptive industrial ecosystems are known for the prevalence of SMEs. The constellation of actors in such a crowded policy space would consist of farmers, entrepreneurs, workers, local industry associations, regional and provincial agribusiness officials, research and educational institutions. From a cluster strategy, the key

question is whether actors within the sector share a common understanding of sector trends, including emerging opportunities and challenges. A shared cognitive frame positions a constellation of actors to jointly exploit emerging opportunities. Such a cognitive frame sustained by institutionalized and regular policy deliberations is a prerequisite for strategic information flows between research centres and industry groups and across the industries that make up a sector's value chain.

To conclude, we have provided some analysis of recent trends in Niagara's agribusiness sector and then explored next steps for a more integrated and synchronized value-added agribusiness service that can effectively support the sector in its next frontier of innovation, productivity and job creation. Understanding the nature and implications of recent trends in Niagara and Ontario's agribusiness sector provides the basis for discussions about the next steps toward an innovation milieu supporting agribusiness in the region. Central to our analysis are mechanisms to deepen the infrastructure of resilient and innovative platforms of synchronized knowledge generation and mobilization among educational institutions, research centres, business owners and workers right across the full spectrum of value chains in the region's agribusiness sector.

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The Niagara Community Observatory at Brock University is a public-policy think-tank working in partnership with the Niagara community to foster, produce, and disseminate research on current and emerging local issues. More information on our office, and an electronic copy of this report, can be found on our website brocku.ca/nco

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