

# YORK REGION: CLIMATE CHANGE RESEARCH STUDY

Climate Change Impacts on the  
Agriculture and Agri-Food Industry





## Land Acknowledgement

We acknowledge that York Region is located on the traditional territory of many Indigenous peoples including the Anishinaabeg, Haudenosaunee, Huron-Wendat and Métis peoples and the treaty territories of the Haudenosaunee, Mississaugas of the Credit First Nation and Williams Treaties First Nations. Today this area is home to many diverse Indigenous Peoples, and we recognize their history, spirituality, culture and stewardship of this land. We also acknowledge the Chippewas of Georgina Island First Nation as our closest First Nation community.

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# Executive Summary

The agriculture and agri-food industry is an essential sector to human health and well-being in addition to providing billions of dollars to Canada's economy annually.

York Region (or "the Region") is a key contributor to this sector as it is home to some of Canada's most productive agricultural areas and one of its largest food and beverage manufacturing sectors. As greenhouse gas concentrations increase across the globe and temperatures rise, York Region may be vulnerable to an increase in frequency of extreme weather events from devastating droughts to intensive wildfires. This research study sought to identify the major impacts from climate change across each stage of the value chain to support climate resiliency across the Region and agri-food businesses. To complete the study, key literature sources were reviewed to gain an understanding of impacts and recommendations and to build upon this to support York Region specific findings.

Overall findings showed that these unpredictable climatic events can impact each stage of the agri-food value chain from input supply all the way to restaurants and retailers. Several of the potential negative impacts found included a loss of crop yields, reduction in key food supplies, and an overall increase in operational costs for agri-food businesses.

Potential positive impacts were also identified including an increase in crop yields from longer growing seasons and a potential increase in reputation throughout the sector by showing commitment to the climate transition.

Identifying and categorizing these impacts is key for York Region to be able to adapt and mitigate to climate change, while ensuring opportunities are identified to position the Region as a leader in climate and to future-proof this vital sector. Recommendations found through the literature review were provided for both the broader region to implement and individual businesses. This included key areas such as conducting a climate baseline assessment, integrating sustainable agriculture practices, supply chain technology and efficiencies, innovation and diversification, government/financial support, and education and capacity building. This study was conducted and the report was developed by KPMG.

# 1.0 | Introduction and Background

The agriculture and agri-food industry is a critical sector to Canada's economy.

In 2023, the sector employed over 2.3 million people and generated approximately \$150 billion in gross domestic product (GDP) across Canada<sup>1</sup>. With an abundance of resources and access to strong research and development capabilities, Canada is set to remain a trusted producer in the agricultural sector. However, the growth and success of this sector is extremely dependent on climate and weather patterns. A change in typical climate patterns can have cascading effects throughout each area of the agri-food value chain, causing numerous impacts to agriculture and agri-food businesses.

Research and climate models across the globe indicate that greenhouse gas (GHG) concentrations are rising worldwide, leading to a warmer climate in the future and an increase in extreme weather events. Canada has already seen these impacts firsthand with an annual mean temperature increase of 1.7°C between 1948 and 2016<sup>2</sup>. This temperature increase has led to devastating extreme weather events across the nation including droughts, heatwaves, wildfires, and floods. These unpredictable and changing weather events are leading to numerous challenges and costly adaptation measures across the agri-food value chain.

These farms have contributed to York Region ranking first in total farm revenue per acre in the Greater Toronto Area<sup>3</sup>. Farms across the Region generate millions in operating revenue which contributes to the local economy while providing nutritious food both regionally and across Canada. York Region is also home to one of the largest food and beverage processing sectors in Canada with over 300 food and beverage manufacturers. The broader agri-food value chain employs almost 67,000 people and generates \$3.8 billion in GDP for the Region<sup>3</sup>. However, the Region is already seeing the impacts of changing climatic patterns.

It is expected that York Region and others in central Canada will see warmer and wetter spring weather, higher evaporation rates and droughts, an increase of approximately 3.3°C in annual mean temperature by 2050, and an overall increase in the unpredictability of weather including events such as freezing rain, hail, snowstorms and heatwaves<sup>2,3</sup>. The Region has already experienced some of these weather events, like the Town of Georgina which saw a damaging tornado in 2016 that led to flooding and power outages, and southern Ontario which experienced a large ice storm in 2013 that led to loss of power for over 500,000 users<sup>4</sup>.



York Region is home to **more than 600 farms** and some of Canada's most productive agricultural areas, like the Holland Marsh.



To promote a sustainable and local resilient food system, York Region has collaborated with industry experts and community partners to conduct a research study to identify potential climate change impacts across the Region's agri-food value chain (**Figure 1**).

This study is part of the Region's broader Climate Change Action Plan which aims to enable two overarching goals including the achievement of net-zero emissions by 2050 and increasing York Region's resiliency against climate change through adaptation measures<sup>5</sup>.

The plan identifies 20 key actions to support achievement of these goals, with Action 10 promoting a sustainable and local resilient food system. This research is also aligned to York Region's 2024-2027 Agriculture and Agri-Food Sector Strategy where goal 2C.8 is to conduct research to promote climate resilience in the sector<sup>3</sup>. Building on these strategies, this research also aims to strengthen York's business community by understanding potential climate change impacts and promoting innovative solutions to address Goal #1 in York's Region's Economic Development Action Plan<sup>6</sup>.

Overall, this research study aims to develop a baseline understanding of the potential climate change impacts across the agri-food value chain in York Region and highlight potential risks, vulnerabilities and opportunities throughout the agri-food sector. Raising awareness of the potential climate-related risks and associated impacts can help York Region understand where there are opportunities to adapt and mitigate challenges arising from climate change, while maintaining a robust and resilient agri-food sector to achieve the actions across the Climate Change Action Plan, Agriculture and Agri-Food Sector Strategy, and the Economic Development Action Plan.



**Figure 1** | A visualization of each step of the agri-food value chain in York Region.<sup>3</sup>



## 2.0 | Methodology

To identify climate change impacts on the agriculture and agri-food value chain in York Region, a detailed literature review was conducted, which included the following steps:

- Scope and Objective:** The scope and objective of the research study was defined to structure the literature review and analysis. This ensured that relevant climate change impacts were identified as well as the potential actions and recommendations for businesses and the Region.
- Literature Search and Review:** A literature search was conducted to identify approximately 40 sources of literature outlining types of climate impacts across the agri-food value chain. Literature was collected from a diverse set of sources, including government sites, industry pages, academic articles and news sources, among others, to ensure a comprehensive list of impacts could be identified. For example, these included reports from groups such as the United Nations (UN), Government of Canada, Government of Ontario, York Region, Farm Credit Canada, Canadian Agri-food Policy Institute (CAPI), Food and Beverage Ontario, and many others.
- Findings Consolidation:** The findings from each source were consolidated to identify common themes within the literature, including relevant climate impacts across each area of the agri-food value chain.
- Analysis and Recommendations:** The findings were then analyzed to determine the most relevant climate change impacts for York Region and provide high-level recommendations for mitigations and adaptation measures. The findings, including impacts and recommendations, are presented in the sections below.

## 3.0 | Climate Change Impacts

Across York Region, climate change and the associated impacts are a priority issue for many agri-food businesses. An agri-food business survey conducted by York Region along with stakeholder interviews indicated that respondents see climate change as a top economic issue and threat that will impact the Region<sup>3</sup>. Further, almost half of respondents mentioned that climate change could limit the growth of the agriculture and agri-food sector, with 86% believing it will be a moderate to high impact<sup>3</sup>. These types of climate change impacts on the agri-food value chain can result from two different types of risks: physical or transition<sup>7</sup>. Physical risks include the direct impacts of climate on environmental and social systems. These can manifest in either acute risk drivers such as extreme weather events (wildfires, flood, droughts) or chronic risks including long-term changes in precipitation, temperature, atmospheric carbon dioxide (CO<sub>2</sub>), and air pollution.

Transition risks are risks associated with the transition to a low-carbon economy. These can include changes in regulations, policies, technology, and broader economic markets. Both physical and transition risks produce a variety of drivers (i.e., temperature, precipitation, economic, etc.), which can lead to climate-related impacts across the agri-food value chain as visualized in **Figure 2** below. Climate change impacts can manifest in both positive and negative ways on the agri-food value chain. For example, negative impacts from physical risks can include decreased crop yields from extreme weather such as floods and tornadoes, whereas positive impacts from physical risks could include higher crop yields and longer growing seasons from warmer temperatures in Ontario. Additional information on the climate change drivers and impacts across York Region’s agri-food value chain can be found in the **Appendix**. The potential impacts for each area of the agri-food value chain are discussed below.

Risk Type	PHYSICAL Direct impacts of climate on environment and social systems	TRANSITION Impacts associated with the transition to a low carbon economy
Drivers	Temperature Extreme Weather Precipitation Atmospheric CO <sub>2</sub> Air Pollution	Economic Policy and Regulatory Technology
Impacts	Decreased Feed Supply Decreased Water Supply Decreased Water Quality Decreased Livestock Yields Decreased Worker Health Decreased Food Availability Decreased Crop Yields Increased Input Cost Increased Infrastructure Damage	Increase Crop Yields Increase in Reputation Decreased Profitability Increased Costs Increased Achievement of Climate Targets

*\*Note: These impacts can occur across each section of the agri-food value chain*

**Figure 2 |** Visualization of the types of physical and transition risks and their associated drivers and impacts. These impacts can occur across multiple sections of the value chain (i.e. increased costs can be an impact for storage and transporters, and also for distributors, wholesalers, and packagers).

### 3.1 Input Supply

Input supplies to agriculture include critical resources and materials for agricultural production. These can include items such as seeds, fertilizers, pesticides/herbicides, water, farm equipment, and animal feed. Since inputs are the first step in the value chain, a consistent and reliable supply of inputs is essential to the function of the rest of the value chain. Climate change can have numerous impacts on input supplies through various drivers including extreme weather events, precipitation changes, altered temperatures and policy/regulatory updates.

- **Increased Input Costs:** The affordability of inputs may decrease due to temperature and extreme weather events, in addition to policy and regulatory drivers. An increase in temperature can lead to the deterioration of farmland which requires producers to spend more on inputs such as fertilizers and seeds to offset damage<sup>13</sup>. More extreme weather events are putting increased stress on farm equipment leading to increased costs of critical machinery. According to Farm Credit Canada (FCC) and Agricultural Manufacturers of Canada (AMC), equipment cost per acre has now surpassed \$100<sup>14</sup>. Finally, changes to policy and regulation can also increase the cost of inputs. For example, a domestic carbon tax or an international tariff could lead to a rise in the cost of inputs such as seeds, fertilizers, machinery, livestock equipment and irrigation systems. This is an example of how a transition risk could impact the agri-food value chain.

- **Decreased water supply and quality:** Changes to precipitation and temperature patterns can lead to impacts on water supply. Prolonged periods of drought can put water supply at risk as an input to many steps throughout the value chain. Higher temperature can also lead to a two-to-three times increase in water consumption, putting even more pressure on already stressed water supplies<sup>11</sup>. Heavy precipitation events can cause significant flooding and run-off of fertilizers, pesticides and nutrients leading to an impact on water quality across the Region<sup>12</sup>. For example, the extreme flooding that took place across Lake Simcoe in 2017 and crops in the Holland Marsh may have caused significant run-off, as floods carried pesticides, fertilizers and other chemicals into waterways.
- **Decreased supply of inputs and increased costs:** Increased frequency of extreme weather events such as floods, wildfires, and hurricanes can lead to an unpredictable supply of animal feed, seeds, and machinery as key infrastructure and processes are damaged<sup>8</sup>. For example, heavy rainfall events around the Lake Simcoe area in 2017 led to extreme flooding and road closures across Holland Marsh. These road closures not only impacted the steady supply of inputs, but they also put millions of dollars of cropland at risk of damage<sup>9</sup>. These events can further lead to a decrease in supply of critical fertilizers, while also raising associated costs and putting increased pressure on the supply chain<sup>10</sup>. These inputs are critical to downstream steps of the agri-food value chain to feed livestock and sow crops, therefore the impacts of climate change on input supply will affect stakeholders across the entire value chain.

### 3.2 Primary Producers

Primary production across York Region encompasses livestock and crop cultivation, where 59% of the Region's farms produce crops and the other 41% produce livestock<sup>3</sup>. From oilseed and grain farming to beef cattle ranching, farmers lay the foundation for the rest of the agri-food value chain and produce essential products for the population of York Region and those across Canada. Climate change has the potential to impact the productivity of certain farms due to an increase in extreme weather events, air pollution, temperature and precipitation changes. However, certain changes may also have benefits for farmers in southern Ontario including extended growing seasons and improved productivity across specific crops as described below.

- **Decreased crop yields:** Crops across York Region including floriculture, fruit and tree nut, vegetable and melon, and oilseed and grain farming amongst other crops, may all see impacts from physical climate changes. An expected increase in heavy precipitation events can lead to the erosion of soil and depletion of key nutrients from crops, causing a potential reduction in yield<sup>12</sup>. Extreme precipitation events or droughts are also expected to specifically affect field crops as they are most exposed to these changing elements<sup>15</sup>. For instance, in 2024, farmers in Ontario faced a much wetter summer season which led to the loss of leafy greens, tomato crops and other key crops which farmers and the Region depend on<sup>16</sup>.

An increase in the mean annual temperature across York Region along with extreme weather events and air pollution are also expected to have impacts on crops.

- An increase in temperature can lead to an increase in pests and particularly damaging diseases through more generational cycles and larger habitable ranges<sup>11</sup>. These pests can severely impact the health and production of crops across York Region and noticeable impacts are already being witnessed from farmers. An increase in temperature can also affect plant-pollinator interactions. Pollinators across Canada, including bees, butterflies, hummingbirds, bats, and others, are essential to the production of many key crops such as fruit trees, canola, melon, alfalfa, and squash. Honeybees alone are thought to contribute \$3.18 billion to the Canadian economy annually<sup>17</sup>. However, warmer temperatures cause plants to bloom much earlier than expected leading to a mismatch in timing between pollination and blooming season and a reduction in crop yields<sup>18</sup>.
- These warmer temperatures can also lead to an increase in ground-level ozone as this type of pollution is amplified in summer months. Ground-level ozone can have significant impacts on photosynthesis leading to a reduction in productivity from many crops<sup>11</sup>.
- Extreme weather events such as wildfires, droughts, and extreme precipitation events can further reduce crop yields as they can impact the health of pollinators and damage key productive farmland<sup>13</sup>. Finally, a changing climate can also lead to an increase in freeze-thaw cycles during the spring and fall, which can damage particularly important crops across the Region, such as cereals and corn<sup>15</sup>.



- **Decreased worker health:** Farmers, producers and farm workers across York Region may also face health impacts from climate change. Higher temperatures and extreme heat days can lead to heat stress and other health repercussions as farmers are exposed to the elements<sup>19</sup>. As a result, this may impact the length and number of working hours in a day, which could impact productivity. Additionally, there may be increased risk of exposure to tick-borne diseases across York Region as ranges expand due to higher temperatures and precipitation<sup>12</sup>. Climate change impacts, like changes to water quality, may also impact farmers and farm workers who rely on well water as a primary source of drinking water. Not only can these impacts affect farmers' physical health, but they can also lead to mental health implications. The livelihoods of farmers are constantly faced with uncertainty due to a range of climatic and economic factors that are beyond their control. Extreme weather events, like an ice storm or drought, in the Region has the potential to wipe out crops and cause increased stress among farmers and those throughout the agri-food value chain that rely on agricultural inputs. In fact, over 75% of Canadian farmers who took part in a survey in 2021, say they have felt moderate or very high stress throughout the job<sup>21</sup>. Ensuring that farmers have adequate support to navigate the mental and physical impacts of climate change is an important part of climate adaptation and resiliency measures.
- **Increased crop yields:** Although climate change is typically expected to negatively impact crops due to unpredictable weather events and extreme heat, there is also the potential for crop yields to increase across York Region because of increased temperatures. Temperature increases across the Region can lead to milder winters with fewer extreme cold and frost days which may extend the growing seasons for farmers, therefore improving

productivity. Increases in atmospheric CO<sub>2</sub> can also improve photosynthesis rates for certain crops such as small grains and oilseeds, while also increasing the ability of these crops to use and retain water<sup>2</sup>. Considering that crops and agriculture already play a major role in carbon sequestration, farmers across York Region also have the opportunity to increase crop yields and indirectly sequester more CO<sub>2</sub> from the atmosphere. Although these changes in climate may improve crop productivity across the Region, it is the unpredictable nature of the changing climate that can be a consequence to this improvement<sup>15</sup>.

- **Decreased livestock yields:** Livestock production across York Region including hog and pig farming, poultry and egg production, sheep and goat farming, dairy cattle and milk production, beef cattle ranching and other livestock (including bee colonies), are also sensitive to the impacts of climate change such as extreme weather events and changes to precipitation and temperature. An increase in temperature can impact overall animal health including reduced availability of water, susceptibility to heat stress, and behavioural and reproductive impacts in response to extreme heat<sup>12</sup>. This same increase in heat and more extreme precipitation events can also act as a breeding ground for pests and diseases to livestock<sup>11</sup>. Within York Region this includes disease vector carrying ticks and other damaging pests. Extreme weather events such as intensive floods, droughts or even ice storms can further reduce useable rangeland for animals, impacting the overall health and activity of livestock<sup>19</sup>. For example, the Ontario Beekeepers' Association reported a winter loss of 51.6% for the 2024 winter, citing three major reasons for loss including fluctuating weather events, weaker colonies going into the winter, and increasing levels of mites – a damaging pest to bee colonies<sup>20</sup>.

### 3.3 Storage and Transport

The storage and transport of raw materials to processing facilities including on and off farm storage, cold storage facilities, and cold chain transport are essential to getting food products to processors and eventually to end consumers. However, this step in the agri-food value chain may also be impacted by the changing climate through damage to infrastructure, supply chain disruptions, impacts to food products, and additional costs.

- **Increased damage to transportation infrastructure:** Transportation networks across the agri-food value chain are particularly vulnerable to damage from extreme weather events<sup>22</sup>. Intensive precipitation events and flooding can damage roads and railways or make them impassable. For instance, in 2009 an F2 tornado touched down in Vaughan causing an estimated \$730,000 in public infrastructure damage<sup>23</sup>. Roadways were faced with heavy debris, uprooted trees, and powerlines leading to an extensive recovery process to recover these key transportation networks. Extreme heat can also lead to buckling of roadways leading to expensive repair costs and the creation of hazards for transporters. These extreme weather events can cause further damage to technology networks such as GPS and communication systems leading to hazards and routing issues for agri-food transporters.

- **Decreased food availability:** Increases in temperature and extreme weather events can also cause damage to food products as they are stored and transported to processors. Extreme wind, flooding events, high temperatures and other storms can cause power outages in cold storage facilities leading to damaged food and post-harvest losses<sup>15</sup>. This increase in temperature is also expected to increase the levels of rats, mice, insects and other microorganisms in storage facilities and transportation vessels leading to the damage of harvested food and materials<sup>11</sup>. This impact can also lead to an increase in food recalls further down the agri-food value chain causing food availability disruptions and impacts to human health across the system<sup>24</sup>.
- **Increased costs:** Storage and transport stakeholders across the agri-food value chain may also face impacts from a changing climate. Increases in temperature can add to operational costs as more refrigeration may be required for food products in trucks and storage facilities to prevent premature food spoilage or the growth of certain micro toxins<sup>22</sup>. Policy and regulatory pressures through the transition to a low carbon economy such as carbon pricing or other taxes and fleet electrification can also add to these operating costs while representing an opportunity for businesses to show leadership in the climate space.



### 3.4 Food and Beverage Processors

York Region is a hub for food and beverage processors with over 300 operating businesses working to transform harvests and raw materials into high quality and nutritious products. Processing and manufacturing are an essential step in the agri-food value chain to ensure the health and well-being of York Region residents and beyond. However, food and beverage processors are also susceptible to the impacts of climate change through physical climatic events and other transitional impacts.

**Decreased worker health:** Workers within food and beverage manufacturing facilities may also be impacted by the changing climate. Higher annual mean temperatures may also lead workers in non-temperature-controlled environments to experience heat stress, such as heat exhaustion and heat stroke<sup>25</sup>. Increasing temperatures and humid environments may also expose workers to higher levels of airborne pollutants such as mold and dust, which have been linked to various diseases such as asthma and heart disease<sup>26</sup>. Workers are also prone to mental health implications, as climate change is “the greatest threat to global health” in the 21st century<sup>27</sup>. Food and beverage processors operate in an uncertain landscape with constantly changing climatic and economic actors, putting high levels of stress on these workers. Ensuring workers across agri-food businesses have access to mental health services is an important step to take within the value chain.

- **Decreased food availability and increased infrastructure damage:** Food and beverage manufacturers across York Region require energy and power infrastructure to operate on a consistent and productive basis. However, extreme weather events can damage this infrastructure causing power cuts and a pause in processing leading to potential food availability disruptions across numerous products such as raw materials (i.e. staple grains, fruits and vegetables, and dairy products), as well as already processed foods like frozen foods and snack products. These disruptions can cause cascading impacts across the agri-food value chain, and lead to significant food waste as power influxes can cause food to spoil prematurely<sup>22</sup>. Other extreme weather events such as droughts and high heat days can reduce water supply required in processing and manufacturing further amplifying food availability disruptions across the value chain<sup>15</sup>.

- **Decreased nutritional quality:** As processors transform harvested materials into consumable products for York Region, increasing concentrations of CO<sub>2</sub> may lead to an overall reduction of nutritional quality in product outputs. As crops uptake more CO<sub>2</sub> from the atmosphere, tradeoffs are being seen through the reduction of key nutritional content such as zinc, iron, and protein across wheat grain, field peas, soybeans, and rice grains<sup>11</sup>. As these harvested materials are manufactured and processed into food outputs and eventually consumed by people across the Region, nutritional deficiencies may be amplified across the community.
- **Decreased profitability:** Policy and regulatory drivers and outdated technology in energy and water usage from climate transition risks may also impact profits across the food and beverage processing sector. As emissions pricing schemes and other climate policies are implemented, the cost of using energy and water to process and manufacture food products will increase. Both energy and water are heavily used in food and beverage processing and have an interconnected relationship. Water is required in various stages of processing such as washing and cooking, and energy is required to heat and cool this water. Therefore, an increase or decrease in water usage can correspond to a further increase or decrease in energy usage and vice versa. Although as of April 2025, the Canadian government has removed the federal fuel charge, which included a regulatory charge on using fossil fuels like natural gas during food and beverage processing. There is the possibility that new policies and charges could be put in place in the future, which can lead to an overall reduction in profitability for this sector if faced with increased taxes and charges<sup>28</sup>.



### 3.5 Distributors, Wholesalers, and Packagers

Distributors, wholesalers and packagers play a key role in getting high quality food products transported through various market channels. Both physical climate impacts and impacts from transitional risks through policy and regulatory change may impact this key section of the agri-food value chain.

- **Increased damage to infrastructure:** Distributors, wholesalers and packagers rely heavily on transportation and communication networks to get food products to key market channels across York Region. However, like the storage and transport step in the value chain, increasing frequency of extreme weather events can damage this critical infrastructure through the buckling of roads or destruction of other key distribution infrastructure like railways and warehouses<sup>22</sup>. Damage to infrastructure can have cascading impacts down the value chain and indirectly cause food waste, as items delayed in distribution can spoil and perish pre-maturely. Excessive amounts of food waste ending up in landfills, rather than properly being disposed of with organic waste, can lead to an increase in the amount of methane produced, a much more potent greenhouse gas than CO<sup>2</sup><sup>29</sup>. Methane in landfills across Canada is a major source of greenhouse gases, and preventing food losses across the agri-food value chain can support in reducing these emissions.



- **Increased costs:** Due to the changing climate and an increased need for circularity amongst regional economies, the government of Canada has consulted on several draft plastic packaging requirements. These consultations are part of Canada's commitment to the Ocean Plastics Charter which is an international agreement to reduce plastics across global markets<sup>30</sup>. The current consultations in Canada include a proposal to require at least 50% recycled content in plastic packaging by 2030 and a pollution prevention planning notice (P2 Notice). Although the P2 Notice would not affect packaging that comes in direct contact with food, it would still impact beverage packagers and several other products. These would put more costs onto agri-food packagers to innovate and re-design packaging across numerous products. Agri-food distributors, wholesalers and packagers may also see increased costs from potential tariffs, especially if importing good from various countries. Tariffs can disrupt existing supply chains and cause distributors to seek out new suppliers or alternative logistics, furthering the potential for additional costs.
- **Increase in reputation and achievement of climate targets:** Although these packaging laws would put pressure on agri-food packaging businesses to re-design packaging, they also present an opportunity for leadership in the circular economy. Innovating at this stage in the value chain would ensure emissions and waste are mitigated across the entire system, allowing York Region to showcase innovation in circularity. For example, Riverside Natural Foods is a food company in Vaughan which is experimenting with alternative paper-based packaging to reduce plastic usage and show the company's commitment to climate and circularity. Please refer to [Case Study 3](#) for more details on Riverside.



## 3.6 Retailers

Retailers act as a key connector in the agri-food value chain between production and processing and the end consumer. Across York Region, retailers including grocery stores, specialty food stores, bakeries, liquor stores and others account for thousands of jobs and are essential to providing consumers with final stage products. However, retailers are also prone to the physical and transitional impacts of climate change such as temperature change and changing policies which can affect profits and worker health.

- **Decreased profitability:** As extreme weather events increase and annual mean temperatures rise, retailers across the Region may face impacts on profitability. Extreme weather events such as floods, ice storms, or other intensive storms can physically damage retail infrastructure such as stores or interrupt supply chains leading to a pause in operations and an overall loss of profit. These unanticipated weather events and interruptions in operations can further exacerbate the problem of food waste, as perishable food is lost from power outages or floods. For example, in March of 2025 an ice storm hit much of Central Ontario and some parts of York Region, with some residents and businesses losing power for more than a week<sup>31</sup>. It was recommended by health units to throw out any perishable food such as meat, poultry, eggs, dairy products, and prepared foods if the power outage lasted longer than just two hours and food was stored above 4°C<sup>32</sup>.

Therefore, this unexpected weather event contributed to food waste across the agri-food value chain. Additionally, higher temperatures across the summer months and an increasing number of days over 30°C could lead to discomfort among consumers causing reduced visits or time spent in retail locations. Increasing air conditioning and thermal comfort to abate this can add to operational costs for retailers, thereby further amplifying the impacts to overall profits.

Climate change impacts to retailers may also be influenced by certain economic and market drivers. As climate change becomes more pronounced, consumer preferences may change towards more sustainable and healthy products which can negatively impact profitability for retailers who do not adapt to changing market demands<sup>33</sup>. Emissions pricing schemes and potential tariffs can further lead to an increase in food prices, which can not only have far-reaching health impacts across the Region from food inaccessibility but can also reduce profitability for retailers facing higher prices across the supply chain<sup>34</sup>. Although this can have a negative impact, complying with economic drivers such as emissions pricing schemes can also have positive impacts and be an opportunity for retailers to become sustainability leaders as discussed further below.

Regulatory changes including those surrounding plastic and circularity can also influence the profitability of retailers across the Region<sup>35</sup>. The federal government has proposed a pollution prevention planning notice, also referred to as the P2 Notice which would require Canada's major grocery retailers to develop a pollution prevention plan with the aim of achieving zero plastic waste<sup>36</sup>. Additionally, shifting towards Extended Producer Responsibility (EPR) in Ontario also has the potential to increase costs for retailers. Developing and implementing these requirements may require a significant capital and operational investment for retailers which has the potential to negatively impact profitability. However, regulatory changes can also have numerous positive impacts as discussed further below.

**Decreased worker health:** Like the climate change impacts across the upstream value chain, extreme weather and temperatures can lead to various health impacts to retail workers throughout the Region. Increasing days of extreme heat can lead retail workers to experience heat stress, heat exhaustion, or heat stroke if retail locations air temperature is not controlled. This increase in heat also promotes the presence of more airborne pollutants such as mold, dust, ozone and other particulate matter<sup>26</sup>. Each of these can have impacts to retail worker health and well-being throughout York Region businesses.

- **Increased reputation and achievement of climate targets:** Although several of the economic and regulatory drivers from climate change can have profit impacts to agri-food businesses across York Region, they also present opportunities for these businesses to become leaders in the climate space and achieve any sustainability targets and goals that may be set. The federal P2 Notice can be a significant business opportunity for retailers to implement thorough pollution prevention plans and show consumers their commitment to sustainability while also promoting a circular economy within the Region. Provincial EPR regulations also offer the industry greater opportunities for retailers to align packaging design with upgraded recycling technology, have access to more recycled material inputs, and have a financial incentive to reduce packaging. This can further encourage collaboration in the industry, such as innovative reusable and refillable packaging programs like the Reuse Ottawa program<sup>37</sup>. Further, as consumer preferences change towards sustainable and healthier products from climate change, businesses which adapt to this changing customer demand may see an increase in overall profits through improved reputation and leadership in the space. Creating more sustainable retail businesses has the potential to help mitigate the impacts of climate change and contribute to numerous positive impacts, both financial and environmental.

## 3.7 Food Service and Restaurants

As the final step in the value chain, food services and restaurants across York Region play a crucial role by delivering food products from the previous steps in the value chain to multiple channels of consumers. These service providers include restaurants, cafes, catering services, street vendors, among others, and are also susceptible to the changing climate and the impacts that come along with it.

- **Decreased food availability and increased menu changes:** As discussed in previous sections, extreme weather and physical climate events can damage critical infrastructure leading to cascading impacts throughout the agri-food value chain<sup>22</sup>. This can cause a disruption in food availability to restaurants and food services across the Region which may not only reduce profitability but may also require restaurants to re-think menu offerings as supply of certain food products becomes more and more unpredictable.
- **Decreased profitability:** Food services and restaurants across York Region may also face similar impacts to retailers in terms of climate change impacting profitability. Increasing temperatures and days over 30°C may potentially affect customer comfortability leading to reduced visits or time spent in restaurants which can impact profitability for these businesses across the Region.

Further, extreme weather events causing power outages can potentially increase the rates of food spoilage causing excessive food waste and therefore decreased profitability. Like retailers, market demand can also change towards consumers requesting climate-friendly products such as vegan items or items with lower carbon footprints<sup>33</sup>. Altering menu items and adding new products can lead to additional costs and impacts to profitability. However, this also represents an opportunity for businesses to show leadership in the climate space and adapt to changing preferences.

- **Increase in reputation and achievement of climate targets:** As extreme weather events increase in frequency and the impacts of climate change are continued to be felt by businesses across the Region, restaurants and food services also have the opportunity to improve reputations and achieve any climate targets and goals they may have set. By adapting to consumer preferences and re-thinking how food items are produced, restaurants can offer climate-friendly products with lower carbon footprints to consumers. This can improve reputation amongst consumers while contributing to a circular economy across York Region to increase overall health and well-being.



## 4.0 | Recommendations

To ensure a resilient and sustainable food system in York Region, several potential adaptation and mitigation measures have been identified in the literature<sup>1</sup>. These measures span across the agri-food value chain and address numerous potential impacts to help future-proof York's Region's vital industry. These recommendations focus on actions that York Region (the municipality) can take, as well as recommendations for agriculture and agri-food businesses in the Region.

Note: This is not an exhaustive list of adaptation and mitigation measures.

### 4.1 Climate Baseline Assessment

It is important for businesses to understand both their environmental impact and the influence of environmental changes on their business and operations. Establishing an initial understanding of emissions, vulnerabilities, and risks from climate change is crucial for making informed, data-driven decisions to build business resiliency. This process might involve conducting a greenhouse gas emissions inventory to identify areas of high impact within operations or performing a climate scenario analysis and risk assessment to explore potential future risks and opportunities. Both can enable businesses to set targeted mitigation and adaptation strategies to ensure sustainable and resilient futures.

#### Greenhouse Gas (GHG) Emissions Inventory

Establishing a greenhouse gas (GHG) emissions baseline can provide companies with valuable insights into how their business activities impact the environment. By performing a baseline GHG assessment, organizations can measure direct and indirect emissions resulting from their operations. For example, a food and beverage processing company might assess emissions tied to water usage, while a storage and transportation business could evaluate emissions stemming from transporting raw agricultural materials to processing sites. Mapping emissions sources across the company's operations can help identify hotspots, inform strategies to reduce emissions, decarbonize operations, help reach sustainability goals and targets, and create a baseline to measure progress against. Companies can also look to established frameworks, such as the Greenhouse Gas Protocol, for guidance on preparing accurate and thorough emissions inventories.

A baseline assessment is an important step that businesses can take to not only reduce their environmental impact, but also to ensure resiliency in a rapidly changing climate.

#### Climate Risk Assessment and Scenario Analysis

A climate risk assessment refers to the process of identifying, analyzing, and evaluating the potential impacts of climate change on a business, organization, community, or region. It focuses on identifying both the physical risks (e.g., extreme weather events) and transition risks (e.g., policy changes) associated with climate change. The purpose of a climate risk assessment is to understand vulnerabilities and strengthen the ability to adapt and respond to identified risks while facilitating long-term sustainability and resilience planning. For example, a climate risk assessment often includes evaluating hazards, exposure to risks, sensitivity to those risks, and the adaptive capacity to mitigate adverse effects.

Using established practices like climate scenario analysis, these assessments may explore future risks and opportunities under different climate scenarios and assist in decision-making to reduce risks and enhance preparedness. Conducting a climate risk assessment or climate scenario analysis is an important exercise to understand regional or sector-specific climate risks and set a baseline for long-term planning that will allow for the adaptation and mitigation of potential climate impacts. In 2016, York Region underwent a similar exercise to identify historical climate impacts and future climate trends using a variety of data sets and scenarios<sup>38</sup>. Since publishing this report, several updated models and datasets have been released that could provide more accurate predictions.



## 4.2 Sustainable Agriculture Practices

Supporting a sustainable and resilient agricultural system and mitigating the most extreme impacts of climate change can be done by implementing environmental best management practices within primary production.

These best management practices can also include regenerative agriculture which is a subset of sustainable agriculture that focuses on practices which actively restore ecosystems, biodiversity, and soil health. For example, McCain's has created a detailed [Regenerative Agriculture Framework](#) that they use to support potato growers facing increasing challenges from climate change, rising input costs, and regulatory uncertainty.

Around 20% of farms across York Region are already making use of some of these environmental management best practices, however increasing this percentage, combined with amplifying government support can ensure the Region is resilient in the face of potential climate impacts<sup>3</sup>.

Examples of sustainable agriculture practices (including regenerative agriculture) are provided below:

- **Diversification and crop rotation:** Diversifying crop systems and rotating crops versus a monoculture system can help reduce risk of climate change impacts for primary producers<sup>39</sup>. Crop rotations can also enhance soil organic matter and further amplify positive yield results.
- **Cover crops and no-till:** Cover cropping and no-till farming across the Region's farms are other ways to reduce soil erosion in extreme weather events while also protecting soil organic matter to improve yields.
- **Rotational grazing:** Using rotational grazing practices on farms has numerous benefits as the climate changes. This type of grazing allows vegetation a chance for regrowth while improving soil health, carbon sequestration, biodiversity, drought resilience, and improvements in livestock health and animal productivity<sup>40</sup>.
- **Integrated pest management:** As pest and disease ranges expand with the warming climate, it is important for primary producers to use a mix of integrated strategies to eradicate pests and eliminate crop and livestock damage, while improving farmer health through decreased exposure to potential disease-carrying insects<sup>41</sup>.
- **Other nature-based solutions:** Other nature-based solutions such as agroforestry with the integration of trees and shrubs onto farms, biodiversity protection through methods such as pollinator habitats and planting native species, and wetland restoration can all ensure York Region's farms have the means to buffer intensive climate change impacts.

As a result, it would be beneficial for York Region to conduct an updated climate risk assessment, incorporating climate scenario analysis, to better understand the material risks and impacts (likelihood and consequence) under different future climate scenarios and create targeted strategies for adaption and mitigation. The analysis could cover a broad range of climate-related risks and opportunities across the Region, or focus on a specific aspect of the Region, such as the agriculture and agri-food sector.

For example, a climate scenario analysis could identify how crops in the Region would be impacted if the average temperature rose by 1.5, 3, or 5 degrees over the next 10 to 40 years, or examine the potential impacts on transportation infrastructure using a similar scenario.

Understanding different scenarios and their related impact allows governments, organizations and researchers to better understand the likelihood of potential risks posed by climate change over various timeframes and develop precise and targeted strategies for adaptation and mitigation.

A climate risk assessment using scenario analysis can also be conducted at the individual business level for organizations to understand the specific risks to their own operations. This can help businesses and key stakeholders across the agri-food value chain in York Region be prepared to mitigate and adapt to the impacts of climate change and focus their efforts appropriately; future proofing and derisking their business operations and activities.

While conducting a climate risk assessment may not be possible for all businesses, it is still beneficial to understand common potential climate-related risks and opportunities related to the sector and/or region and to adapt business strategies and operations accordingly to increase business resiliency. Businesses can refer to guidance on conducting scenario analysis from standard setters such as the International Sustainability Standards Board (ISSB) or can seek support in undertaking this type of risk analysis.

### 4.3 Supply Chain, Technology and Processing Efficiencies

Input supply and processing are key steps to the functioning of the rest of the agri-food value chain. Implementing efficiency measures in these steps and protecting the supply chain will ensure York Region has a resilient food system. Examples of these measures are provided below.

- **Supply chain management and automation:** Using advanced data and technology to model supply chains and demand for agricultural products in real-time can ensure optimal efficiencies and a resilient agri-food supply chain amidst potential climate hazards<sup>42</sup>. Digital platforms in warehouses and storage facilities can also precisely manage stock, operations, and deliveries to reduce inefficiencies.
- **Diversification of inputs:** Farms across York Region can also diversify the suppliers they use for inputs such as seeds and fertilizers. These will ensure primary producers can de-risk their input supply as climatic events cause disruptions across the supply chain.
- **Renewable energy use and improvement in cold chain:** Using renewable energy across agri-food supply chains can reduce fossil fuel usage while improving cold chain storage and prevent premature food spoilage and the presence of other micro-organisms that may thrive in warmer temperatures.
- **Water and waste reduction:** As the changing climate puts pressure on water supplies and water quality, food and beverage processors can implement water and waste saving techniques such as recycling and reuse of water, closed-loop systems, and more efficient equipment to reduce the increasing pressure on water supplies. Further, considerations and practices can be put in place to mitigate food waste throughout the agri-food value chain, especially steps which are more vulnerable to food loss such as transportation, storage, and distribution.

### 4.4 Innovation and Diversification

Alignment with innovative practices and diversification strategies across York Region can ensure stakeholders within the agri-food value chain are well-equipped against the changing climate. Several ways in which the sector can integrate these practices are described below.

- **Climate resilient varieties:** Certain varieties of crops are more drought tolerant, wind resistant, and hardier against extreme weather events<sup>43</sup>. These can come from innovative genetic modifications or from native plants to York Region which thrive in the Region's climatic zone.
- **Agri-food tech:** Innovative tech solutions can also be integrated across the agri-food value chain to optimize processes and improve yields. Agri-food tech can include innovations such as advanced satellite imagery, sensors, and drones to ensure efficient crop production through more precise applications of water, pesticides, and fertilizers<sup>44</sup>. This can be supplemented with Artificial Intelligence to analyze real-time data and further optimize these processes. Businesses can draw insights and learnings from York Region farms which are already implementing these such as Haven Greens.

Please see **Section 5: Case Studies** for more details. There are also various funding and accelerator programs available to businesses in Ontario that explore technology to advance agriculture, such as the [Grow Ontario Accelerator Hub \(GOAH\)](#).

- **On-farm diversification and agri-tourism:** York Region farms can also be innovative across their revenue streams. By implementing diverse on and off-farm revenue generating activities such as farmers markets, event venues, Christmas tree farms, hosting festivals/educational events, and overall agri-tourism can ensure farms are attracting visitors and improving revenue streams against a changing climate<sup>45</sup>.

- **Menu and product diversification:** Local businesses across York Region can also be innovative across their revenue streams. Restaurants, bakeries, catering services, and other agri-food businesses can diversify their offerings or alter menus to support more climate-friendly and local products. This can reduce emissions and resources across the entire value chain and provide businesses with alternative sources of revenue.
- **Integrating the circular economy:** Adopting circular practices helps to create new and resilient value chains that are adaptable to uncertain climate events and potential market disruptions. Applying circular economy principles to the agri-food sector can help address food loss and waste while producing a number of co-benefits, such as increased food security, supply chain resilience, job creation, and new economic opportunities<sup>46</sup>. For example, York Region Food Network (YRFN) has worked with numerous farms to redirect over 720 pounds of food and ingredients nearing the end of life to a community food skills program in Georgina<sup>47</sup>. These workshops brought over 300 people together and encouraged collaboration across the Region's partners such as Sutton Public School, Salvation Army Youth Shelter, and the Good Food Collective. A circular food system also supports lower GHG emissions, biodiversity restorations, and less reliance on virgin inputs.



## 4.5 Government / Financial Support

Government programs and financial support for agri-food businesses and farms across York Region is key to implementing mitigation and adaptation strategies against climate change. The upfront cost to invest in new technologies and climate adaptation measures can be large, especially for farmers. Government and financial support can help lessen this barrier to adoption. Several examples of these measures are provided below.

- **Crop and livestock insurance:** Crop and livestock insurance schemes will become increasingly important to protect farmers against damages and loss of critical revenues<sup>11</sup>. These schemes will compensate farmers for losses from various climate hazards such as floods, droughts, wildfires, and other extreme weather events. Businesses can access insurance through programs such as the federal government's [AgrilInsurance Program](#), or more local Ontario-based companies with similar offerings.
- **Government funding and programs:** Funding programs from federal and provincial governments will be key to supporting agri-food businesses in implementing technology and innovative solutions to combat climate change. Example programs include:

### Government Programs

- [Sustainable Canadian Agricultural Partnership](#) (Sustainable CAP) is a five-year, \$3.5 billion program to support resiliency of the agri-food sector along with several other federal funding programs.
- [Local Food Infrastructure Fund](#) (LFIF) which works to strengthen food security across communities by providing between \$150,000 and \$500,000 in funding to projects which support equal access to local and nutritious food.
- [AgriSuite](#) is a free online tool developed by the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFRA) where farmers have access to a variety of resources which can support in nutrient management, protection of water sources, reduction of soil erosion and the management of off-farm waste.

### Local Programs

- [Circular Economy Initiatives Fund](#) in York Region for community-driven projects that reduce waste in the Region.
- [Water saving incentive programs](#) for businesses who improve water efficiency across York Region.
- [On farm funding](#) for projects such as those that improve soil health and efficiencies in crop production. This program is run through the Lake Simcoe Region Conservation Authority (LSRCA).



## 4.6 Education and Capacity Building

Education and capacity building is a key component to the adaptation and mitigation of climate impacts in York Region. In order to be proactive in addressing potential impacts, stakeholders across the agri-food value chain need to be informed of the potential risks and vulnerabilities the sector faces and have the capacity to address their impacts. Below are some examples of how capacity can be built in this area.

- **Mental health resources and support:** One of the impacts found throughout the research was the mental health implications of a changing climate on agriculture and agri-food business workers. Expanding access to mental health support throughout York Region is key to ensuring farmers and agri-food businesses have the support they need for the unique demands of this sector. Although there is still room for expansion in this space, workers can reach out to initiatives such as the [Farmer Wellness Initiative](#) which provides free and unlimited counselling for farmers in Ontario.

- **Resources for agri-food businesses:** To build capacity for agri-food businesses, York Region can continue providing educational materials across the [yorklink.ca](#) website for what climate change could mean to stakeholders across the agri-food value chain. Businesses can visit the York Link website for a variety of materials and resources, such as support on tariffs and a platform to connect with other businesses and experts. To further build out these resources, the Region can consider providing toolkits for these businesses specifically on climate risk identification, adaptation and management, and information on practices to improve worker health. York Region can draw upon the current talent pool and knowledge base and learn from farmers and other businesses which are already proactively addressing climate change and building out resiliency strategies to support a sustainable food system.
- **Modification of diets and local foods:** Amidst a changing climate and an unpredictable economic environment with tariffs and other policies, it is critical that York Region promote local food production and products across agri-food businesses. Businesses can host educational events and awareness campaigns, promote local farmers markets, incentivize local and sustainable food purchases through subsidies or rewards programs, and partner with local chefs to promote seasonal and local food.
- **Skill-building and educational partnerships:** To ensure York Region maintains a robust agri-food system, it is essential that the Region have a skilled pool of resources to promote sustainable agriculture and business processes. This can be through partnerships with post-secondary institutions, such as the [York Region Food and Beverage Accelerator Program](#) run through York University's YSpace, or youth engagement to develop the next generation of leaders. The primary producers across York Region can also explore educational partnerships with universities such as the [Ontario Crops Research Centre](#) which is run by the University of Guelph to research best management practices across key regional crops.

# 5.0 | Case Studies





Throughout the agri-food value chain in York Region, businesses are showcasing how mitigation and adaptation measures can be incorporated to address climate change impacts.

The three case studies below highlight real examples of how these measures can be incorporated into business models and activities to foster a resilient agri-food sector.



## Case Study #1: Kinghaven Farms

Adapting to climate risk through advanced greenhouses and ag tech

- 
**Location:**  
King City
- 
**Value Chain:**  
Primary Producers
- 
**Climate Change Impacts:**  
Crop yields; worker health (pests); costs
- 
**Mitigation and Adaptation:**  
Sustainable agriculture practices; innovation and diversification

## Initiative Summary

Kinghaven Farms was originally established as a horse breeding and racing farm in 1967 and has since evolved to be a leader in sustainable agricultural practices by implementing projects such as solar panel installations and sustainable beekeeping. The farms are in King Township, Ontario and remain family-owned and operated to this day.

One of Kinghaven Farms' sustainable practices has been the launch of Haven Greens, an innovative and advanced company to grow local Ontario lettuce in fully automated greenhouses. Most of the lettuce purchased in Ontario is produced in the western United States. This can cause it to be expensive for consumers to purchase, but it also exposes lettuce to extreme weather impacts, particularly in states like California. The physical impacts of climate change, like extreme weather events such as wildfires and droughts, are leading to huge losses in lettuce production with more costs being passed onto consumers. Additionally, extreme weather may also lead to supply chain disruptions which could impact getting the product to the consumer. The advanced greenhouse technology deployed by Haven Greens has provided a solution to these potential climate impacts through a number of innovations.

Haven Greens' greenhouses utilize solar power, advanced automation, and Artificial Intelligence to grow lettuce in temperature-controlled environments. This endeavour uses advanced ag tech and a hands-free system to eliminate manual transplants which typically decrease efficiencies. This innovative use of ag tech also maximizes space while transforming the way that lettuce is grown across the country and contributing to significant savings across energy, water, emissions and even costs.

This type of environment can mitigate and adapt to several impacts from climate change, while ensuring consumers have access to nutritious and affordable food. This includes:

- Crop Yields:** Growing lettuce in a controlled and enclosed environment, means that crops are not exposed to the elements or extreme weather events. Climatic events such as droughts, extreme heat, floods, and wildfires are all detrimental to lettuce grown outdoors, however greenhouses can offer protection while ensuring market-ready lettuce.
- Worker Health:** Greenhouses also offer protection from pests and other diseases which are expanding their range due to climate change. This not only protects crop yields from insect damage, but also ensures that workers are safer from pests, such as ticks carrying disease vectors.
- Transport Costs:** Growing lettuce in greenhouses locally in York Region means that food does not have to travel thousands of kilometres as it typically would from the western United States. This decreases transportation costs as well as improves the quality of lettuce on shelves in grocery stores and supermarkets. Producing lettuce this way also significantly reduces emissions which can restore air quality and support reduction across the agri-food sector.
- Operating Costs:** Haven Greens is also able to drastically reduce operating costs by using energy efficient systems to power the fully automated greenhouse. Sources include solar power and rainwater which reduce emissions while keeping operating costs down.


Haven Greens greenhouse grown lettuce is supporting adaptation to the uncertain and ever-changing impacts of climate change. Sustainability remains one of the farms main pillars as they are "deepening this commitment and working to change the way Canadians get their veggies by offering crisp, fresh, salad greens that are better for you and the environment."





Image of Ozery Family Bakery products.  
Source: Ozery Family Bakery.


## Case Study #2: Ozery Family Bakery

Offsetting emissions in food  
and beverage processing

- 

**Location:**  
Vaughan
- 

**Value Chain:**  
Food and Beverage Processors
- 

**Climate Change Impacts:**  
Water supply and water quality; nutritional quality; reputation; profitability/costs
- 

**Mitigation and Adaptation:**  
Supply chain, technology, and processing efficiencies

### Initiative Summary

Ozery Family Bakery is a family-owned bakery headquartered in Vaughan, Ontario. The bakery started in the back of a sandwich shop in 1998 and has since grown to sell products across national grocery chains and within food service markets. The bakery focuses on healthy baked goods made with whole grains and fresh fruit and seeds and has become known for their flat breads with contain no GMOs or artificial preservatives. To combat climate change, the bakery has prioritized the environment by becoming a certified B Corporation while taking the lead to offset operational emissions with its sister company SeedWise.

By prioritizing the environment and efficiency in processing, Ozery Family Bakery has been very successful in “creating a more viable, healthy environment, as well as diverse, active communities.” Various sustainability initiatives have led to a 21% reduction in the operational carbon footprint, a 34% reduction in total water usage, and a 4.5% reduction in total energy consumption throughout the bakery’s processes. In addition to these initiatives, Ozery Family Bakery offsets its natural gas and electricity usage to strive towards becoming a carbon neutral company by 2030. Carbon offsets are purchased through AIM Environmental Group where the project eliminates methane released from landfills by treating organic waste aerobically, and electricity credits are offset by purchases from Ontario’s Clean Energy Credit program. Each of these initiatives supports the overall mitigation of climate change impacts on the agri-food value chain.

- **Water Supply and Quality:** To mitigate the impacts of climate change on water supply and quality, Ozery Family Bakery has focused on operational efficiency in their processing. As climate change continues to put pressure on water supplies from prolonged periods of drought and other weather events, the bakery has been able to reduce total water usage by 34% which can significantly contribute to the conservation of water and overall mitigation of climate impacts. Less water usage in the bakery’s processing also means the potential for less wastewater which could end up in water supplies, thereby contributing to an increase in water quality across the Region.

- **Nutritional Quality:** Nutritional quality is being impacted in food items across the agri-food value chain due to the increasing concentration of CO2 in the environment. Ozery Family Bakery is supporting a reduction in CO2 emissions from not only offsetting their emissions, but also through increased efficiencies across their operations including a 21% reduction in the manufacturing footprint. These efforts can play a role in improving nutritional quality and the overall supply of food across York Region.
- **Reputation:** A positive climate impact from transitional drivers such as policy/regulations and economic pressures can be the reputation of a company. As Ozery Family Bakery responds to policy and stakeholder pressure to prioritize environmental matters, they have become a certified B Corporation. This certification demonstrates a company’s commitment to high environmental and social performance, while mitigating the impacts of climate change and improving Ozery Family Bakery’s reputation in the market.
- **Profitability and Costs:** By taking the lead in offsetting the bakery’s operational emissions, Ozery Family Bakery can reduce the risk of being fined for non-compliance as the market changes and mandatory standards are adopted. Although purchasing offsets may have additional costs in the short term, the bakery can save money in the long term through improved reputation and revenue to make up costs and savings from increased efficiencies in overall operations.



Image of Riverside Natural Foods products.  
Source: Riverside Natural Foods.

## Case Study #3: Riverside Natural Foods

Regenerative agriculture and sustainable packaging across the agri-food value chain



**Location:**  
Vaughan



**Value Chain:**  
Food and Beverage Processors



**Climate Change Impacts:**  
Crop yields; nutritional quality; costs; profitability; reputation



**Mitigation and Adaptation:**  
Sustainable agriculture practices; innovation and diversification; education and capacity building

## Initiative Summary

Riverside Natural Foods is a food processing company focused on creating healthy and natural foods, founded in 2013 by siblings Nima, Salma, and Sahba Fotovat. The company has since evolved to over 400 employees and become a certified B Corporation with popular brands such as MadeGood and Good to Go. Riverside works to have a positive impact across the agri-food value chain from primary producers up to packaging, all while aligning to their purpose of “to inspire a healthier and more compassionate world, where access to good food is a reality to all.”

Starting with regenerative agriculture, Riverside plays a key role in funding the Regenerative Organic Oats (ROO) program. This program focuses on supporting Prairie-based farmers in implementing regenerative agricultural practices. The ROO program also works to provide education and knowledge sharing across the industry, while also using ag tech to provide participants with key data such as satellite imagery showing farmers baseline soil organic carbon. These actions can support mitigation and adaptation of climate change across Canada.

- **Crop Yields:** In 2023, Riverside’s funding of the ROO program helped to support 24 oat farmers across the Prairies. As Canadian farmers face increased temperatures and extreme weather, especially drought risk across the Prairies, regenerative agricultural practices are key to adapting to some of these impacts. Practices used by the ROO program such as keeping a living root in the soil and protecting the soil are key adaptation measures to help crops thrive even in the face of droughts.
- **Nutritional Quality:** Regenerative agriculture practices are also important in restoring the nutritional quality in food. Increasing temperatures and higher concentration of CO2 are diminishing uptake of other key nutrients such as nitrogen and phosphorus. However, a focus on improving soil health can improve microbial activity which supports the increased release of readily available nutrients for plants.

Moving across the agri-food value chain, Riverside is also focused on reducing plastic packaging in their products. The company is in the early stages of testing various packaging alternatives which work to reduce single-use virgin plastic (newly made plastic from raw materials) with bio-based renewable packaging. In 2024, Riverside was able to partner with AMCOR and utilize their AmFiber packaging solution, a paper-based packaging, for MadeGood granola bars. This led to a 77% reduction in virgin plastic packaging for Riverside as they work to carry this across more products. By working to utilize alternative packaging, the company is adapting to several potential impacts of climate change as outlined below.

- **Costs/Profitability:** With the government of Canada implementing several draft standards and requirements for plastic packaging, Riverside is taking on a leadership role in the space and adapting to packaging requirements. These government standards would require at least 50% recycled content in plastic packaging by 2030 and could put significant costs on companies. However, Riverside is working to offset the cost of this transition risk by experimenting with paper-based alternatives across their products.
- **Reputation:** By maintain its B Corp Certification and working to have a positive impact across the agri-food value chain, Riverside is showing its commitment to sustainable and healthy foods, while aligning with the values of eco-conscious consumers. Having a positive reputation and brand image can improve loyalty while encouraging collaboration and knowledge sharing across the industry (such as AMCOR and Riverside’s partnership for packaging). Maintaining this reputation can support a continued positive impact while encouraging the growth of the circular economy across York Region.

Riverside continues to adapt and mitigate the impacts of climate change across the agri-food value chain from primary producers all the way up to packaging, while providing nutritious and healthy food for York Region and across Canada.

# 6.0 | Conclusion and Next Steps

York Region is home to some of the most productive agricultural lands in Canada and is a key region producing food and beverage products for populations both locally and beyond. However, climate change poses a threat to this vibrant and thriving agriculture and agri-food hub. Each section of the Region's agri-food value chain, from input supply and primary producers to retailers and restaurants, will face varying degrees of climate-related impacts as a result of the changing climate in Canada. This can include physical aspects of climate change, such as an increase in annual mean temperature and more frequent extreme weather events, and transition impacts associated with moving toward a lower carbon economy, such as policy and regulatory changes.

Both physical and transition risks and their related impacts will affect numerous York Region stakeholders and agri-food businesses across the value chain and may have cascading effects across industries and food systems more broadly. Potential climate-related impacts such as a reduction in livestock and crop yields, reduced input affordability, water supply depletion, additional operating costs, reduction in profitability and impacts to human health are all possible with a

warming climate. However, businesses across York Region can implement various mitigation and adaptation strategies to respond to some of the most intense impacts of climate change while positioning the Region as a leader in climate adaptation and resilience. It is critical to future-proof the agri-food sector to protect this vital part of the economy against potential climate impacts and maintain a resilient food system.

Businesses across the agriculture and agri-food value chain have the opportunity to incorporate climate adaptation and mitigation measures into their business strategies and operations to support a more resilient agri-food sector in York Region. As outlined in **Section 4**, there are numerous actions businesses can take to address climate-related impacts. Incorporating adaptation and mitigation measures is not only good for future-proofing this vital sector but will help York Region to achieve the overarching goals within the Climate Change Action Plan, the Agriculture and Agri-Food Strategy, and the Economic Development Action Plan, including reaching net zero by 2050.

Building on the recommendations identified in the literature, York Region could consider several next steps to advance the Region's climate-related goals, support businesses in their fight against climate change, and foster a more resilient agriculture and agri-food sector. Next steps for York Region could include:

- Conduct a climate risk assessment that incorporates scenario analysis (or update past research) specific to York Region (the municipality) and/or the agriculture and agri-food sector in the Region to further understand potential future climatic conditions and their associated impacts and opportunities across the value chain. This can help both the Region and businesses understand where to focus mitigation efforts that will make an impact in the short, medium, and long-term.
- Build capacity among stakeholders across the agri-food sector by leveraging existing knowledge in the Region. This could include working with farmers, the business community, and other climate professionals who are already proactively addressing the impacts of climate change in their business operations to facilitate knowledge transfer across the value chain.
- Promote funding programs to support agri-food businesses within the Region and/or supporting/educating businesses on how and where to access other forms of funding. This could include helping to convene partnership opportunities within the community and beyond, providing support for writing government grant applications, creating resources for stakeholders through York Region's website, among others.

- Work with agri-food businesses to incorporate circular strategies and principles to reduce identified impacts while supporting Action 10 of the Climate Change Action Plan. Embedding circular principles into strategies and operations can reduce waste and optimize resources use. Additionally, circular solutions can contribute to building resiliency against market fluctuations and resource scarcity, helping to strengthen local economies and keep resources within local communities.
- Continue to provide education and awareness related to the potential impacts of climate change across the agri-food value chain to promote adaptive capacity and support resiliency efforts. This can include incorporating a climate-lens into current educational activities and partnerships, like those with York University and Seneca College. Additionally, it is important for the Region to continuously hear directly from farmers and agri-food businesses about the climate impacts they are experiencing, raise awareness of those impacts, and work to support their mitigation efforts. Working with groups like the Region's Agriculture and Agri-Food Advisory Committee to obtain ongoing insights on climate-related impacts could be beneficial for York Region.

Overall, this research aims to provide a baseline understanding of the potential impacts of climate change across each step of the agri-food value chain in York Region. This broad understanding can help to raise awareness among key players while building capacity and identifying opportunities for farmers and businesses to adapt to and mitigate the impacts of climate change. By continuing to promote innovation in climate mitigation and adaptation across the agri-food value chain, York Region can support a resilient and sustainable food system while maintaining some of Canada's most successful food production areas.



# 7.0 | Appendix

The table below provides an overview of the drivers and impacts of climate change related to each step of the agri-food value chain and are categorized as either a physical or transition risk.

**Table 1 |** Climate change drivers and impacts across York Regions agri-food value chain.

Value Chain Step	Physical/ Transition	Drivers	Impacts
Input Supply	Physical	<ul style="list-style-type: none"> <li>• Extreme Weather</li> <li>• Precipitation</li> <li>• Temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased feed/input supply and increased costs</li> <li>• Decreased water supply and water quality</li> <li>• Increased input costs</li> </ul>
	Transition	<ul style="list-style-type: none"> <li>• Policy and Regulatory</li> </ul>	<ul style="list-style-type: none"> <li>• Increased input cost from carbon pricing</li> </ul>
Primary Producers	Physical	<ul style="list-style-type: none"> <li>• Air Pollution (Ground level ozone)</li> <li>• Carbon Dioxide</li> <li>• Extreme Weather</li> <li>• Precipitation</li> <li>• Temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased crop yields and livestock yields</li> <li>• Decreased worker health from pests/temperature</li> <li>• Increase in crop yields from longer growing seasons and improved plant productivity from higher levels of CO<sub>2</sub></li> </ul>
Storage and Transport	Physical	<ul style="list-style-type: none"> <li>• Extreme Weather</li> <li>• Temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Increased damage to transportation infrastructure</li> <li>• Decreased food availability</li> <li>• Increased costs to keep food cold and reduce spoilage</li> </ul>
	Transition	<ul style="list-style-type: none"> <li>• Policy and Regulatory</li> </ul>	<ul style="list-style-type: none"> <li>• Increased costs from carbon pricing<sup>2</sup> and fleet electrification</li> </ul>
Food and Beverage Processors	Physical	<ul style="list-style-type: none"> <li>• Carbon Dioxide</li> <li>• Extreme Weather</li> <li>• Precipitation</li> <li>• Temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased nutritional quality of food products from increasing CO<sub>2</sub></li> <li>• Decreased food availability Increased processing and manufacturing infrastructure damage</li> <li>• Decreased worker health from heat and airborne pollutants</li> </ul>
	Transition	<ul style="list-style-type: none"> <li>• Policy and Regulatory</li> <li>• Technology</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased profitability from emissions pricing schemes and outdated technology</li> </ul>

Value Chain Step	Physical/ Transition	Drivers	Impacts
Distributors, Wholesalers, and Packagers	Physical	<ul style="list-style-type: none"> <li>• Extreme Weather</li> </ul>	<ul style="list-style-type: none"> <li>• Increased infrastructure damage of distribution channels</li> </ul>
	Transition	<ul style="list-style-type: none"> <li>• Policy and Regulatory</li> </ul>	<ul style="list-style-type: none"> <li>• Additional costs from sustainable packaging laws</li> <li>• Increased reputation in packaging and climate</li> </ul>
Retailers	Physical	<ul style="list-style-type: none"> <li>• Temperature</li> <li>• Extreme Weather</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased profitability from increased operational costs (air conditioning, infrastructure damage)</li> <li>• Decreased worker health from heat and airborne pollutants</li> </ul>
	Transition	<ul style="list-style-type: none"> <li>• Policy and Regulatory</li> <li>• Economic</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased profitability from emissions pricing<sup>2</sup> and packaging laws</li> <li>• Opportunity to increase reputation in packaging and climate</li> </ul>
Food Service and Restaurants	Physical	<ul style="list-style-type: none"> <li>• Extreme Weather</li> <li>• Temperature</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased food availability</li> <li>• Decreased profitability from extreme heat and operational costs</li> </ul>
	Transition	<ul style="list-style-type: none"> <li>• Economic</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased profitability from changing consumer preferences and tariffs</li> <li>• Increased reputation due to climate action</li> </ul>

<sup>2</sup> As of April 2025, the carbon tax has been removed. However, the potential implementation of future taxes or similar schemes could continue to put pressure on businesses across the agri-food value chain.

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