

CITIES AND CIRCULAR ECONOMY FOR FOOD

GUELPH, CANADA



ELLEN
MACARTHUR
FOUNDATION

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EXECUTIVE SUMMARY

Guelph, Canada

Situated in a rich agricultural area 100 km west of Canada's largest city, (Toronto, Ontario), the City of Guelph and surrounding County of Wellington are striving towards becoming Canada's 'first technology-enabled circular food economy by 2025'. By forming a strong partnership to leverage their unique set of local assets – including the presence of major agri-food industry players, agriculture research institutions, and strong residential organic waste collection schemes – Guelph-Wellington can establish enabling policies and mobilise existing major local food industry players to demonstrate that a circular economy for food can be realised. Their success can help catalyse a broader shift to a healthier food system throughout Canada with significant economic, health, and environmental benefits.

THE CITY OF **GUELPH** CAN HARNESS THE THREE AMBITIONS DESCRIBED IN THE **CITIES AND CIRCULAR ECONOMY FOR FOOD REPORT**:

- 1) Source food grown regeneratively, and locally where appropriate
- 2) Make the most of food
- 3) Design and market healthier food products

THE FOLLOWING ASSETS COULD BE LEVERAGED TO BUILD A THRIVING CIRCULAR FOOD SYSTEM IN **GUELPH**:

Abundance of farming in the region

Pioneer of residential organic waste recovery

Proximity to major economic markets

High concentration of agri-food industry

High agri-food research capacity

CIRCULAR ECONOMY INTERVENTIONS FOCUSED IN GUELPH REPRESENT A USD 39 MILLION+ OPPORTUNITY WITH ECONOMIC, HEALTH, AND ENVIRONMENTAL BENEFITS.

The following benefits could be achieved in a scenario where all of the city's biosolids processed in sewage treatment is valorised and turned into commercially-viable organic biofertiliser for Wellington farms, and 50% of edible food waste is avoided.¹



ECONOMY

USD 37 million
worth of edible food that is prevented from going to waste by households.



HEALTH

USD 1.1 million
in reduced health costs due to, due to a reduction in the negative health impacts from food production and food waste.



SOIL HEALTH

1,000+ hectares
of cropland applied with nutrient-rich commercially-viable organic biofertiliser made from sewage treatment biosolids



EMISSIONS

72,000 tonnes
GHG emissions reduction worth
USD 826,000
to society



WATER SAVINGS

934,000 m³
freshwater saved due to reduction in water used to produce food that would otherwise be wasted

¹ All benefits are calculations by the Ellen MacArthur Foundation, see Appendix and City Analysis Guide for further details



1. GUELPH'S UNIQUE ASSETS

As Canada's second fastest growing mid-sized city, Guelph embodies the 'growing community' city archetype,² and has strong regional relations and assets that can be leveraged to accelerate the shift to a circular economy for food.

Situated within 'Canada's Innovation Corridor', this region is considered an economic powerhouse of high-growth companies, talent, innovation, and discovery, spanning a 112 km distance between the Greater Toronto Area and the Waterloo Region.³ The County of Wellington surrounds the City of Guelph and together they make up a region that represents influential food system players from across the value chain, ranging from major agricultural input companies and farming communities, to agricultural research institutions and food and beverage manufacturers. For the purpose of this analysis, County of Wellington was considered the peri-urban area.⁴

² See *City Analysis Guide* for details on defining factors for each city archetype

³ The Corridor (7th December 2018). <https://thecorridor.ca/>

⁴ This area aligns with the definition of peri-urban area defined for the *Cities and Circular Economy for Food* report, representing an area equivalent to a 29 km circle around Guelph's boundaries.


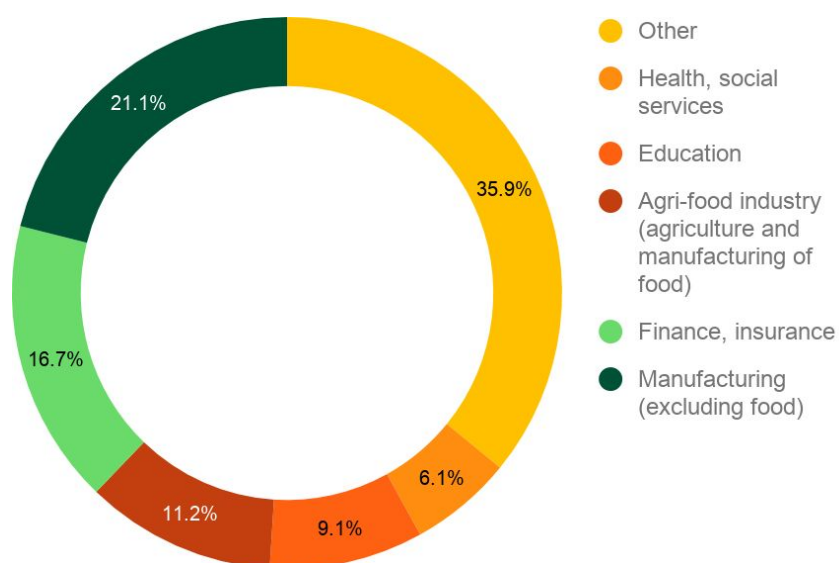
GUELPH'S LOCATION	GUELPH-WELLINGTON DEMOGRAPHICS ^{5,6}	
 <p>Guelph is located in Wellington County.</p>	Guelph population	131,794
	Proportion of Guelph population who are immigrants	20%
	Guelph population growth rate	1.6%
	Population density in Guelph	1,511 persons/km ²
	Guelph-Wellington population	222,726
	Population density in Wellington	35 persons/km ²
	Guelph-Wellington GDP ⁷	USD 10.9 billion
	Guelph income per capita ⁸	USD 36,056

Figure 1: Economic activities Guelph has a balanced economy, with a mix of agri-food, education, and manufacturing as major sectors.⁹



⁵ Statistics Canada, Guelph (29th November 2017), CY [Census subdivision], Ontario and Wellington, CTY [Census division], Ontario (table). Census Profile. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001, <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=3523008&Geo2=CD&Code2=3523&Data=Count&SearchText=guelph&SearchType=Begin&SearchPR=01&B1=All&TABID=1>

⁶ All currency converted using CAD to USD rate (0.74) as of 5th February 2019

⁷ Provided by City of Guelph in CAD and converted to USD (June 2018); Metro Economics (2017), *Population, Employed by Place of Work by Industry and Real GDP by Industry*,

⁸ Ibid.

⁹ Data from Infogroup Canada 2018, provided by the City of Guelph by email (June 2018)

Guelph-Wellington's unique assets include:

HIGH CONCENTRATION OF AGRI-FOOD INDUSTRY BUSINESSES AND INSTITUTIONS (SEE BOX A):

agri-food industry activities are a key economic driver in the region and represent over 11% of Guelph's annual revenue (see Figure 1).

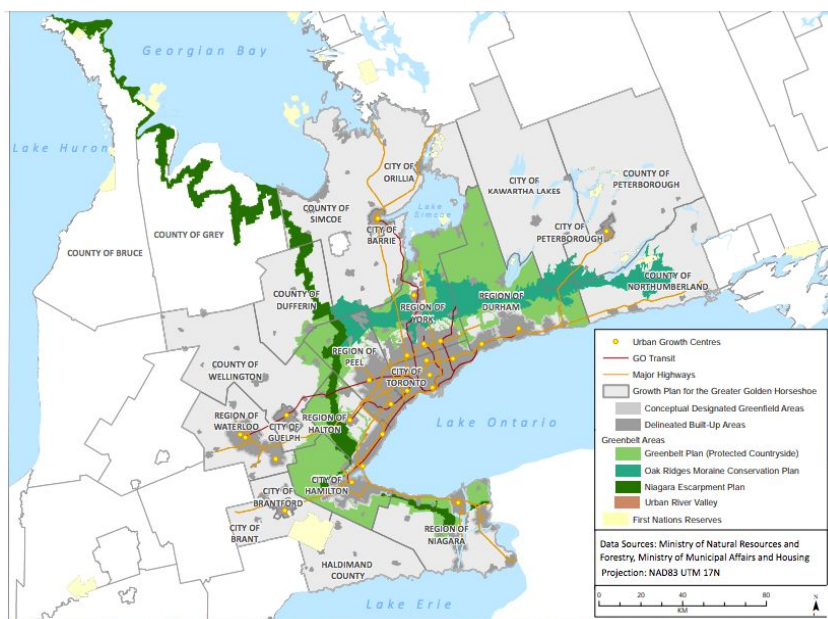
STRONG REGIONAL PARTNERSHIPS: the city and county have teamed up to apply for an Infrastructure Canada Smart Cities Challenge grant for their Data Driven Circular Food Economy project. Their collaborative circular economy vision has already won Guelph-Wellington a CAD 250,000 grant in the initial round of the challenge and the region is now further developing its bid for the top CAD 10 million prize, to be awarded in 2019.

WOVEN INTO CANADA'S AGRICULTURAL FABRIC: Guelph is located in the Greater Golden Horseshoe (see Figure 2), which contains 42% of Ontario's best quality (Class 1) farmland.¹⁰

PROXIMITY TO MAJOR ECONOMIC MARKETS: The Greater Golden Horseshoe area, where Guelph is located, is home to 25% of Canada's population and drives 66% of Canada's GDP.¹¹ With a well-connected transport network, Guelph-Wellington has strong access to Canada's largest city, Toronto (95 km away), and US markets (150 km to Buffalo, New York) (see Figure 2).

AMBITION TO ACHIEVE A CIRCULAR ECONOMY FOR FOOD: In 2018, Guelph-Wellington developed a vision of a circular food economy outlined in their grant-winning Data Driven Circular Food Economy project.¹² By 2025, the region aims to *increase access to affordable, nutritious food by 50%, create 50 new circular businesses and collaborations, and increase circular economic revenues by 50% by recognising the value of food by-products.*

Figure 2: Guelph's location Guelph is situated in an agriculture-rich region with close proximity to the economic powerhouse of Toronto and the Canadian–US border.¹³



¹⁰ Ontario Federation of Agriculture, Environmental Defence (2015), *Farmland at risk: Why land-use planning needs improvements for a healthy agricultural future in the Greater Golden Horseshoe*, https://cdn.dal.ca/content/dam/dalhousie/pdf/management/News/News%20&%20Events/Canada_Food_Price_Report_Enq_2018_.pdf

¹¹ Dalhousie University and University of Guelph (2018), *Canada's Food Price Report*, https://cdn.dal.ca/content/dam/dalhousie/pdf/management/News/News%20&%20Events/Canada_Food_Price_Report_Enq_2018_.pdf

¹² City of Guelph (2nd June 2018), *Guelph-Wellington is Creating Canada's First Circular Food Economy*, <https://guelph.ca/2018/05/guelph-wellington-creating-canadas-first-circular-food-economy/>

¹³ Ontario Land Use Planning Review (5th June 2018), *The Greater Golden Horseshoe Region*, <http://www.mah.gov.on.ca/AssetFactory.aspx?did=10852>



BOX A: AGRI-FOOD ORGANISATIONS IN GUELPH-WELLINGTON¹⁴

Guelph-Wellington is home to a number of agri-food organisations, ranging from government agencies and food manufacturers to academic institutions that have programmes focused on food and agriculture. The concentration of agri-food industry players, research institutions, and policy-making agencies, can all play a role by leveraging their individual capabilities to co-create solutions, advance research, and shape policy in a way that supports the progression towards a circular economy for food.

Agri-food organisations in the region include:

- Canadian Food Inspection Agency, Agriculture and Agri-food Canada, Public Health Agency of Canada, Ontario Ministry of Food and Agriculture (OMAFRA)
- 1,600+ food businesses (see appendix for examples of food industry companies in the region)
- The University of Guelph, which is regularly ranked amongst the top agriculture, food and veterinary science schools in the world,¹⁵ and includes the Bioproducts Discovery and Development Centre
- Conestoga College, which provides educational programmes in food technology and processing



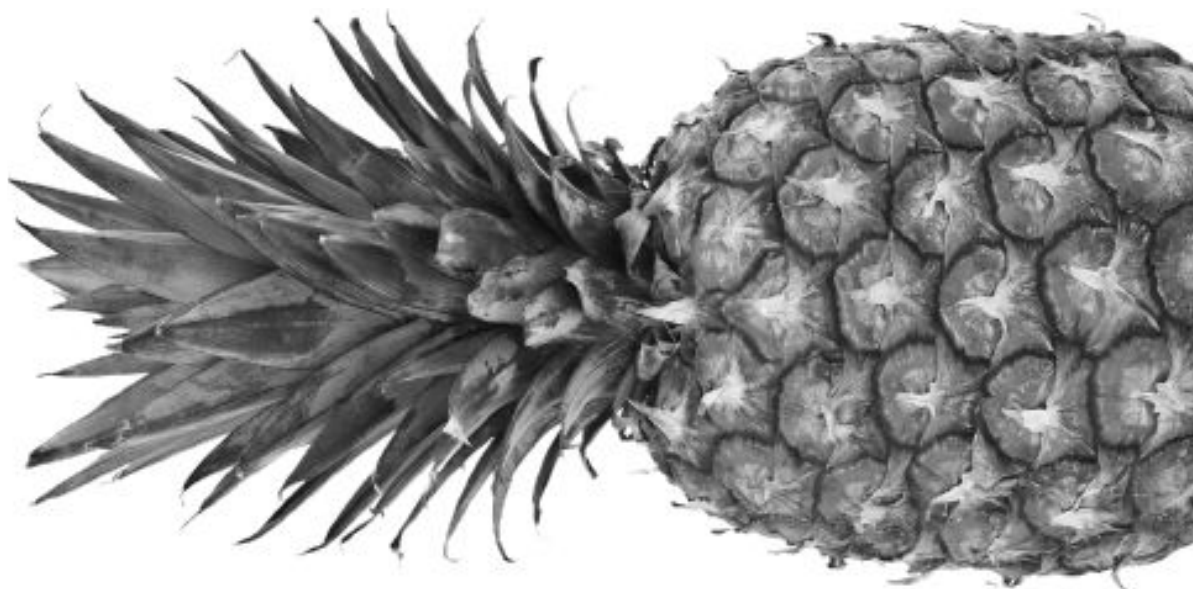
BOX B: NURTURING INNOVATION

Guelph's existing assets include infrastructure and programmes that help Guelph entrepreneurs and university students drive innovation. The city co-developed the Civic Accelerator programme with the Guelph Lab – a programme designed to work with entrepreneurs, other businesses, and innovators to create and adapt emerging solutions to solve municipal and community challenges. This is an important approach to support a broader smart city strategy. The programme leverages the local innovation ecosystem engaging Innovation Guelph, the Guelph Chamber of Commerce, and the University of Guelph's Research Innovation Office and the Centre for Business and Student Enterprise (CBaSE).

With the presence of top research institutions such as the University of Guelph, Guelph-Wellington has a great opportunity to drive innovation and research to advance a circular economy for food through powerful partnerships. For example, the University of Guelph's Accelerator Guelph programme provides mentorship and practical support for agri-food entrepreneurs to commercialise their innovations. Such programmes can lead to new ideas that can be tested locally and scaled nationally and internationally. For example, one of the Phase 2 Accelerator Guelph companies, EloNergia, developed an innovative airlift pump that can reduce energy needs by 50–70% compared to traditional centrifugal pumps. These pumps can be used in a series of applications, including aquaponic facilities, which can support circular urban farming initiatives.

¹⁴ City of Guelph, provided by email (November 2018)

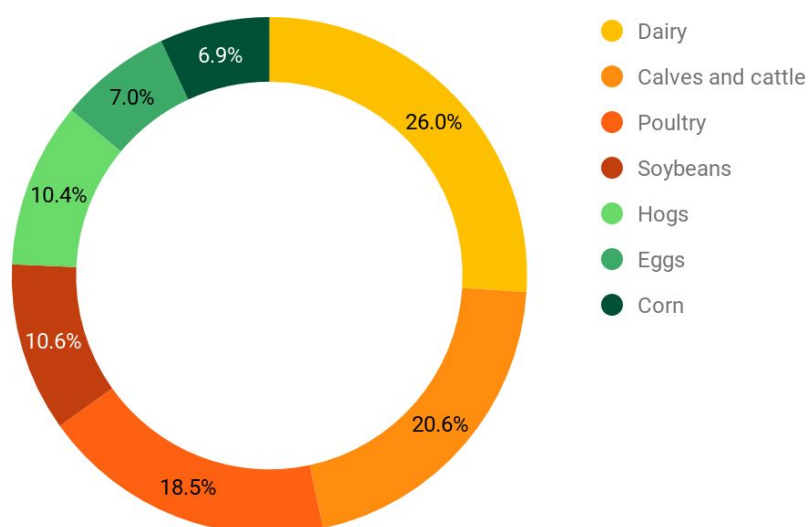
¹⁵ University of Guelph (7th December 2018), <https://admission.uoguelph.ca/rankings>



2. URBAN AND PERI-URBAN FOOD PRODUCTION

Food and agriculture play an important role in the Guelph-Wellington region, with 72% of the land area in the county dedicated to food and agriculture production, with over 20,000 people employed across the agri-food value chain.¹⁶

Figure 3: Top food items by cash receipts.¹⁷ Dairy, beef, and poultry are the top food types produced in Wellington County.



Historically, livestock and grain were produced together:

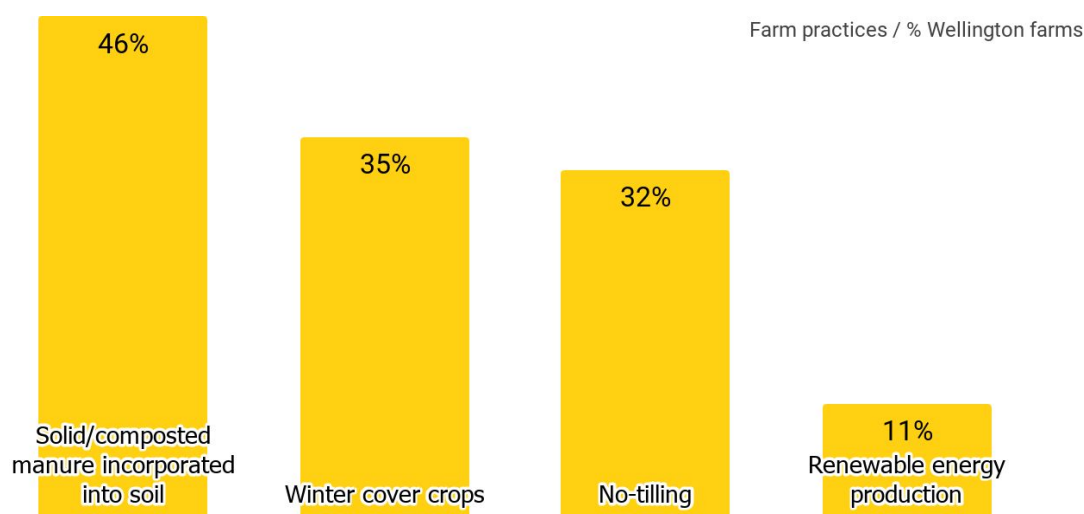
¹⁶ OMAFRA (2018), *County Profiles: Agriculture, Food and Business*, http://www.omafra.gov.on.ca/english/stats/county/western_ontario/wellington.xls

¹⁷ Cash receipts refer to the revenue received by farmers for their products, as well as producer payments

As a major beef-producing region, Wellington farmers have historically integrated the production of livestock and grain for animal feed, allowing on-site application of manure to cropland, which can help minimise the need for synthetic fertilisers. Farmers in the area have increasingly shifted from integrated production methods that combined grains *and* cattle to solely growing grains (the number of cattle farmed declined by 8% from 2011 to 2016),¹⁸ reducing the amount of on-site manure available and potentially increasing the need for farmers to use external soil enhancers to replenish soil organic matter and nutrients that manure previously provided.¹⁹

While a comprehensive view of farming practices used on each farm in Wellington is currently unavailable, existing farm data shows a significant proportion of Wellington farmers are using practices that, when combined, support the health of local ecosystems and human health (see Figure 4).²⁰ Comprehensive use of regenerative food production practices (see Box C) can ensure the health of the region's soils, allowing to fuel a thriving Canadian agriculture industry in the long term.

Figure 4: Regenerative farming practices. A significant proportion of Wellington farmers are currently using farming inputs and practices that, when combined, best support living systems and align with regenerative food production.



¹⁸ OMAFRA (2018), *County Profiles: Agriculture, Food and Business*, http://www.omafra.gov.on.ca/english/stats/county/western_ontario/wellington.xls

¹⁹ Information provided during interviews with OMAFRA representatives, July 2018

²⁰ OMAFRA (2018), *County Profiles: Agriculture, Food and Business* (2018), http://www.omafra.gov.on.ca/english/stats/county/western_ontario/wellington.xls



BOX C: REGENERATIVE FARMING PRACTICES DEFINED

In a broad sense, regenerative food production²¹ is considered as encompassing any production techniques that improve the overall health of the local ecosystem. Examples of regenerative practices include shifting from synthetic to organic fertilisers, employing crop rotation, and using greater crop variation to promote biodiversity. Farming types such as agroecology, rotational grazing, agroforestry, conservation agriculture, and permaculture all fall under this definition. Regenerative food production focuses on outcomes including healthy soils indicated by improved soil organic material, water-holding capacity, and microbial population, along with improved diversity of crops and animal species on the farm, and the biodiversity of the local environment. While conventional farming practices can erode soils and deplete nutrients, thereby necessitating an increase in synthetic fertiliser application, regenerative practices help bring soils to life, ensuring that they are rich with the microorganisms and nutrients needed to support long-term food production. Farming practices, when shaped to be regenerative, have the potential to create an array of beneficial ecosystem services that support human health. Healthier soils help prevent flooding, have a greater ability to sequester carbon from the atmosphere, and have enhanced water filtration capabilities for cleaner drinking water.

Wellington farmers have access to several initiatives designed to support healthy soils, which can be further shaped and leveraged to provide educational and financial mechanisms for increased adoption of regenerative farming practices.

Current funding and education programmes available to farmers in the region include:

- [Ontario Ministry of Agriculture, Food and Rural Affairs grants](#): up to CAD 16,000 awarded for largescale multi-year projects aimed to support soil health, nutrient management, and seed health.
- [Canadian Agricultural Partnership](#): a five-year federal-provincial-territorial initiative to strengthen the agriculture, agri-food, and agri-based products sector by providing funding for projects such as improved manure application, equipment modification to reduce soil compaction, etc.
- [Grand River Conservation Authority](#): provides funding for farmers to undertake projects that protect the waterway, including planting cover crops, manure storage, and on-site composting.
- Associations: [Ontario Soil and Crop Improvement Association](#), [Wellington Soil & Crop Improvement Association](#).
- The [Ontario Agri-Food Innovation Alliance](#) is a collaboration between the Ontario Ministry of Agriculture, Food and Rural Affairs, and the University of Guelph. This partnership is working to usher in the next generation of agri-food innovations by supporting the people, places, and programmes that generate solutions in Ontario that can make a global impact.

²¹ To learn more about regenerative production practices, see *Cities and Circular Economy for Food* report and the outcome chart in the Appendix of this Guelph focus city document



3. URBAN FOOD CONSUMPTION

HOW MUCH DO PEOPLE IN GUELPH SPEND ON FOOD? The average Guelph household spends approximately 11.5% of their annual income on food.²²

HOW DO PURCHASES IN STORES VERSUS RESTAURANTS COMPARE? 64% of household food spend is in stores, versus 36% in restaurants.²³ The role of restaurants is likely to grow in Guelph, as Canadian households are expected to spend half of their food budgets in restaurants by 2035 or sooner.²⁴

WHERE DO PEOPLE BUY THEIR GROCERIES? Large retailers are the most popular choice for Guelph residents, with major Canadian and North American retail chains accounting for approximately 85% of Guelph's total food grocery purchases (by value).²⁵

CONSUMING FOOD GROWN LOCALLY: Limited data currently exists to determine where food grown in Wellington is ultimately eaten, but there is data available at the provincial and national level. Although Canada is a net exporter of food products, 30% of food eaten in Canada is imported from elsewhere.

FOOD INSECURITY ISSUES: Guelph is a relatively high-income city, yet 14% of households are food insecure.²⁶ The average price of food in Guelph increased by approximately 27% between 2009 and 2016, and food insecurity issues are likely to be exacerbated as fresh fruit and vegetable prices are expected to rise.²⁷ See Box D for an example of one organisation in Guelph that is taking action to tackle hunger issues.

²² Environics Analytics, Guelph (ON) Foodspend 2017, provided by City of Guelph via email, (October 2018)

²³ Environics Analytics, Guelph (ON) Foodspend 2017, provided by City of Guelph via email, (October 2018)

²⁴ Dalhousie University and University of Guelph (2018), *Canada's Food Price Report*, https://cdn.dal.ca/content/dam/dalhousie/pdf/management/News/News%20&%20Events/Canada_Food_Price_Report_Eng_2018_.pdf

²⁵ Calculations based on data provided by City of Guelph with data sourced from Infogroup. Provided via email (on 5th July 2018).

NB: Food spend data provided by the City of Guelph sourced from Environics Analytics does not specify the share of spend at different types of retailers (small independent stores versus national and international retailers)

²⁶ Needham (2017), *Nutritious Food Basket for WDG 2018*, https://www.wdgpúblicahealth.ca/sites/default/files/file-attachments/basic-page/bh.01.nov0718.r33_-_nutritious_food_basket_for_wdg_2018_with_appendices_acc_ess.pdf?utm_source=guelphmercury.com

NB: A median-income household would need to spend approximately 12% of its income to purchase healthy food, compared to a low-income household that would need to spend 36% of its income to purchase healthy food

²⁷ Dalhousie University and University of Guelph (2018), *Canada's Food Price Report*, https://cdn.dal.ca/content/dam/dalhousie/pdf/management/News/News%20&%20Events/Canada_Food_Price_Report_Eng_2018_.pdf

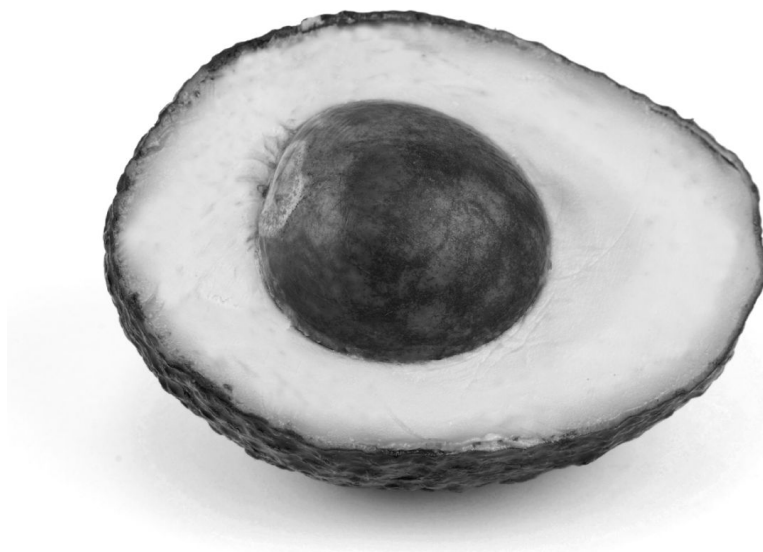


BOX D: TACKLING HUNGER ISSUES - THE SEED

The Seed is a non-profit organisation offering programmes to address food insecurity issues and provide fresh food boxes to those who lack access. Funding is provided by partners, including the City of Guelph's Wellbeing Fund. The organisation offers an array of interventions:

- Garden Fresh Box programme provides boxes of produce at half the retail cost.
- Good Food Distribution is a hub that provides food at lower prices than wholesalers to organisations that deliver fresh food to Emergency Food Providers, as well as schools for student meals.
- Guelph Youth Farm is a quarter-acre plot of land in Guelph that employs local young people and hosts educational programmes to encourage food literacy in the community.
- Community Food Markets are four markets that sell fresh produce at 30–50% off the retail price and customers pay what they can afford within the price range.

There is opportunity for organisations like The Seed to drive a circular economy by sourcing food grown regeneratively in the region. Such organisations can further support people's connection to local food by teaching them how to cook and eat seasonally and by incorporating this understanding into food literacy programmes.



4. ORGANIC WASTE AND FOOD BY-PRODUCTS

Making the most of food by-products and preventing edible food waste from the outset is an important step towards achieving, and even surpassing, Guelph's established waste diversion targets.

The city aims to divert 70% of solid waste from landfill by 2022,²⁸ in an effort to overcome challenges that include increasingly limited landfilling sites and growing amounts of waste created by a rising population. Diverting food waste and by-products from landfill also avoids unnecessary greenhouse gas emissions, creating an additional benefit for the city.

Guelph was an early adopter of separate household organics collection, first introducing their green bin programme in 1996 and now collecting 10,000 tonnes of food by-products each year, diverting 32% of organics from landfill.²⁹ The city authority is responsible for collecting solid waste from residents, while private contractors manage organic waste from the commercial and institutional sector. Achieving transparency about the food by-products generated by the commercial and institutional sector is an important step in successfully turning existing waste streams into revenue streams. For example, food by-products from the large food processing facilities in Guelph could be transformed into valuable products for use on local farms and in the broader bio-economy (See Box E).

²⁸ City of Guelph (2014), *Solid Waste Management Master Plan*, <https://guelph.ca/plans-and-strategies/solid-waste-management-master-plan/>

²⁹ Ibid.



BOX E: INNOVATIVE WAYS TO MAKE THE MOST OF FOOD BY-PRODUCTS

- [Oreka Solutions](#) is a Wellington-based company that uses black soldier flies to turn food waste and by-products into livestock and fish feed, as well as liquid biofertiliser. Oreka Solutions collects pre-consumer food waste and by-product streams from food retailers and processors in the Wellington-Waterloo region and black soldier flies feed off these nutrients, converting them into three products: a solid fertiliser for soil-based farming that enhances the soil's microbiome, a liquid biofertiliser that can be used in aquaponic growing solutions, and a feedstock for fish, pigs, and chickens.
- The [Bioproducts Discovery and Development Centre](#) at the University of Guelph has created new solutions for using by-products from the local corn and soy crops and other sources of bio-based materials to substitute non-renewable materials to make containers, packaging, and building materials as well as car parts for Ford Motor Company's nearby car manufacturing facility.
- [Rothsay](#) is a Wellington-based company that turns old cooking oil, grease trap maintenance, and meat by-products from restaurants, retailers, processing facilities, and livestock raising into valuable animal feed and biofuel.

5. BENEFITS OF REALISING CIRCULAR ECONOMY SCENARIOS

Note: All calculations for the following benefits are based on estimated global benefits applied to the region. See City Analysis Guide document for further details on the factors used to calculate the estimated benefits. The local food spend was used to calculate economic savings for the third scenario, to provide greater accuracy than the global food sale values.

SCENARIO A

What if Guelph uses 100% of its biosolids from wastewater treatment to support regenerative peri-urban farming?

DETAILED DESCRIPTION

Currently, the biosolids generated by the wastewater treatment plant are beneficially reused. The existing process sees the biosolids applied as a certified biofertiliser or a non-agricultural source material (NASM) to agricultural land. Certified brokers apply the biofertiliser according to provincial regulations.

Biosolids from the wastewater treatment facility can play an important role in supporting regenerative farming. At the end of 2018, Guelph initiated a contract with Lystek Inc., to help convert and manage the 4,500 tonnes of biosolids generated each year by the city's tertiary wastewater treatment facility and turn them into a commercially viable liquid organic fertiliser. Lystek Inc. is contracted by the city to manage, sell, and safely apply the high-nutrient organic fertiliser on farms in the surrounding area of the wastewater treatment facility. It is estimated that Guelph's wastewater treatment generates a number of annual benefits.

BENEFITS



NEW BUSINESS MODELS AND REVENUE STREAMS

enhance the value of the biosolids generated from the wastewater treatment facility by turning them into a high-quality liquid organic fertiliser that is applied by Lystek Inc. By providing both the product and application service, Lystek Inc.'s innovative business model helps local farmers to overcome the common challenge of needing to purchase new equipment to apply organic fertilisers that come in a different format from conventional synthetic fertilisers.



MAKE THE MOST OF FOOD

recover valuable nitrogen and phosphorus with a nutrient market value worth an estimated

USD 34,000
annually.



SUPPORT REGENERATIVE FARMING PRACTICES

transform biosolids into enough commercially viable organic liquid biofertiliser to cover

1,000 hectares of cropland in the region, which can help offset the need for deriving nutrients from synthetic fertilisers.

SCENARIO B

What if households in Guelph prevented 50% of edible food waste?

DETAILED DESCRIPTION

While Guelph has a mature household organics collection programme with a high collection rate and treatment process to convert the organic by-products into high-quality compost that is used on nearby farms, there is still an opportunity for households to prevent edible food waste. Each year, Guelph's 52,000 households throw away an estimated 9,700+ tonnes of avoidable food waste.³⁰ If 50% of that food waste was prevented from the outset, the annual benefits would be significant.

BENEFITS**ECONOMIC SAVINGS**

USD 37 million

could be saved, representing the value of the food that is no longer wasted.³¹

**HEALTHIER CITIZENS**

USD 1.1 million

in health savings could be generated, due to a reduction in the negative health impacts from food production and food waste.

**CLIMATE CHANGE MITIGATION**

7,200 tonnes

of saved greenhouse gas emissions worth USD 826,000 to society, stemming from a reduction in emissions from the production of food and treatment of food waste.

**WATER SAVINGS**

934,000 m³

freshwater could be saved, stemming from a reduction in water used to produce food that goes to waste.

³⁰ Calculations (see Appendix) based on data provided by City of Guelph on household organic waste and findings from University of Guelph (August 2016), *Synthesis of Guelph Residential Food Waste Audits 2015*

³¹ Calculated based on the average cost of a tonne of food in Guelph, see Appendix for details

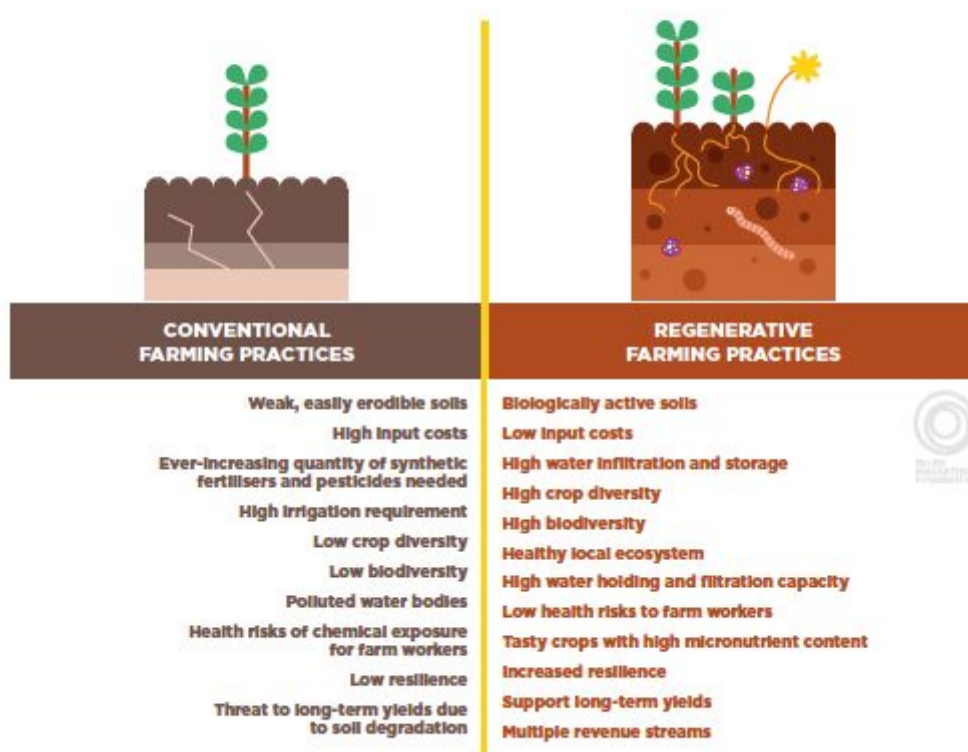
APPENDIX

FURTHER BACKGROUND INFORMATION ON REGENERATIVE FARMING PRACTICES

The figure below displays expected long-term outcomes from the use of conventional practices when compared to the use of comprehensive regenerative farming practices. This figure is from page 27 of the *Cities and Circular Economy for Food* report, where further information about regenerative practices can be found.

FIGURE 5: REGENERATIVE FOOD PRODUCTION SUPPORTS NATURAL SYSTEMS.

The outcomes of conventional farming practices tend to degrade ecosystems and pollute the air and waterways, whereas regenerative practices rebuild and enhance ecosystems while preserving air and water quality.



SCENARIO A REFERENCE DATA AND INFORMATION:

- Benefits were calculated for the 4,500 tonnes of biosolids generated by the wastewater treatment facility each year using benefit factors derived by the *Cities and Circular Economy for Food* team for global modelling calculations
- See additional City Analysis Guide's benefit factor table for details

SEWAGE COLLECTION & TREATMENT ³²		
Volume of wastewater treated/yr	Current treatment type	Output product
18.25 million m ³	Municipal tertiary treatment facility with biosolids processing	4,500 tonnes of biosolids, effluent returns to river, a third of electricity needed for the facility is generated on-site

SCENARIO B REFERENCE DATA AND INFORMATION:

ORGANIC WASTE AND FOOD BY-PRODUCTS			
Type	Tn/ yr	Capture Rate	Avoidable
TOTAL RESIDENTIAL	34,059	76%	
Household food waste	15,137	91%	64%
Household non-food organics	12,582	68%	--
Brush (public drop off) ³³	1,850	100%	0%
Leaf and yard clippings (public drop off and pick up) ³⁴	2,670	100%	0%
Loose leaf ³⁵	1,820	100%	0%
TOTAL COMMERCIAL	27,866	25%	
Post-consumer curbside ³⁶	700	100%	78%
Pre- and post- consumer (minus curbside)	27,166	--	59%

Approach for estimating amount of average avoidable food waste:

- Average household food waste per week [5.11 kg]³⁷ x 52 weeks x Number of households [52,098] / 1,000 kg = 15,137 tn/year household food waste
- Total household food waste [15,137 tn] x Proportion that is avoidable [64%] = 9,687 tn/year of avoidable household food waste

Approach for estimating amount of pre- and post- consumer commercial organic waste and food by-products:

- On average, commercial sector accounts for 45% of organic waste and food by-product streams in Ontario³⁸;
- Due to lack of commercial organic waste and food by-product volumes in Guelph, this average proportion for Ontario was applied to Guelph to estimate the volume of annual organic waste and by-products generated in Guelph by the commercial sector

³² City of Guelph, *Wastewater Treatment Plant 2017 Annual Report*, (2017), <https://guelph.ca/wp-content/uploads/Guelph-WWTP-2017-Annual-Report.pdf>

³³ City of Guelph, provided by email (July 2018)

³⁴ Ibid

³⁵ Ibid

³⁶ Ibid

³⁷ University of Guelph (August 2016), *Synthesis of Guelph Residential Food Waste Audits 2015*

³⁸ Ontario Ministry of Environment and Climate Change (2017), *Addressing Food and Organic Waste in Ontario*, http://www.downloads.ene.gov.on.ca/envision/env_req/er/documents/2017/013-0094_DiscussionPaper.pdf

FOOD SPEND AND CONSUMPTION	
Value	Total / yr
Annual food spend in stores ³⁹	CAD 505,124,000
Annual food restaurants and catering food spend ⁴⁰	CAD 226,593,00
TOTAL ANNUAL FOOD SPEND	CAD 731,717,000
Annual tonnes of food consumed ⁴¹	70,972 tonnes

Approach for calculating amount of saved dollars spent on avoidable food waste:

- Total annual food spend [CAD 731,717,000] / Annual tonnes of food consumed [70,972 tonnes] = CAD 10,310
 - Convert to USD using current currency conversion rate⁴², CAD 10,310 = USD 7,629
- Market value per tonne [USD 7,629] x Tonnes of annual avoidable food waste [9,687 tonnes] x Prevention rate [50%] = USD 36,954,362

³⁹ Excluding sales from liquor stores, information provided by City of Guelph with data sourced from Infogroup Canada (2018). Provided via email on 5th July 2018.

⁴⁰ Ibid.

⁴¹ Based on Canadian average, as calculated by removing beverage purchases from data in Statistics Canada, Table 32-10-0054-01 *Food available in Canada*, (2017), <https://www150.statcan.gc.ca/t1/tbl/en/cv.action?pid=3210005401>

⁴² CAD to USD conversion rate (0.74) used on 5th February 2019.

NOTE ABOUT THIS GUELPH CITY STORY AND THE FULL REPORT

The Cities and Circular Economy for Food (2019) report was designed to initiate a deeper exploration of the role that cities, and the businesses and governments in them, can have in the creation of a circular economy for food. It acknowledges cities as only one key driver of change among many others. It advocates the circular economy as one of several approaches that can support the development of a healthier and regenerative food system.

The focus city chapters were developed to demonstrate how cities around the world could benefit from applying the vision set forth in the report. The conclusions draw on an extensive analysis of the current regional food system, and benefit calculations are based on estimated global benefit factors applied to the local context. See City Analysis Guide for further details on the research process and factors used to calculate the estimated benefits.

The authors of this city chapter collected information from a number of articles, publications, and reports, and consulted more than 20 experts during its preparation. However, uncertainties remain within the document as the scientific understanding of the various components of a circular economy for food supply continues to evolve.

The document does not intend to provide diet recommendations or advice on food consumption, although it does highlight the role that food system players have in offering healthy foods with positive environmental impacts.

DISCLAIMER

The Guelph city story has been produced by a team from the Ellen MacArthur Foundation. The city benefit calculations use global factors supplied by SYSTEMIQ as part of the global *Cities and Circular Economy for Food* report analysis. Those were applied to the local context in order to estimate the potential benefits for Guelph in transitioning to a circular economy for food model. The Ellen MacArthur Foundation makes no representations and provides no warranties in relation to any aspect of the city story including regarding the advisability of investing in any particular company or investment fund or other vehicle. Whilst care and attention has been exercised in the preparation of the city story and its analyses, relying on data and information believed to be reliable, neither the Foundation nor any of its employees or appointees shall be liable for any claims or losses of any nature in connection with information contained in this document, including, but not limited to, lost profits or punitive or consequential damages.

The Ellen MacArthur Foundation would like to thank the organisations who contributed to the Guelph city story (see following pages) for their constructive input. Contribution to the the city story, or any part of it, should not necessarily be deemed to indicate any kind of partnership or agency between the contributors and the Ellen MacArthur Foundation, nor an endorsement of its conclusions or recommendations.

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The full *Cities and Circular Economy for Food* report and Guelph city story can be found at:
<https://www.ellenmacarthurfoundation.org/our-work/activities/cities-and-circular-economy-for-food>

To quote the Guelph city story, please use the following reference:
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The Ellen MacArthur Foundation was launched in 2010 with the aim of accelerating the transition to the circular economy. Since its creation, the charity has emerged as a global thought leader, putting the circular economy on the agenda of decision-makers around the world. The charity's work focuses on seven key areas: insight and analysis; business; institutions, governments, and cities; systemic initiatives; circular design; learning; and communications.

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