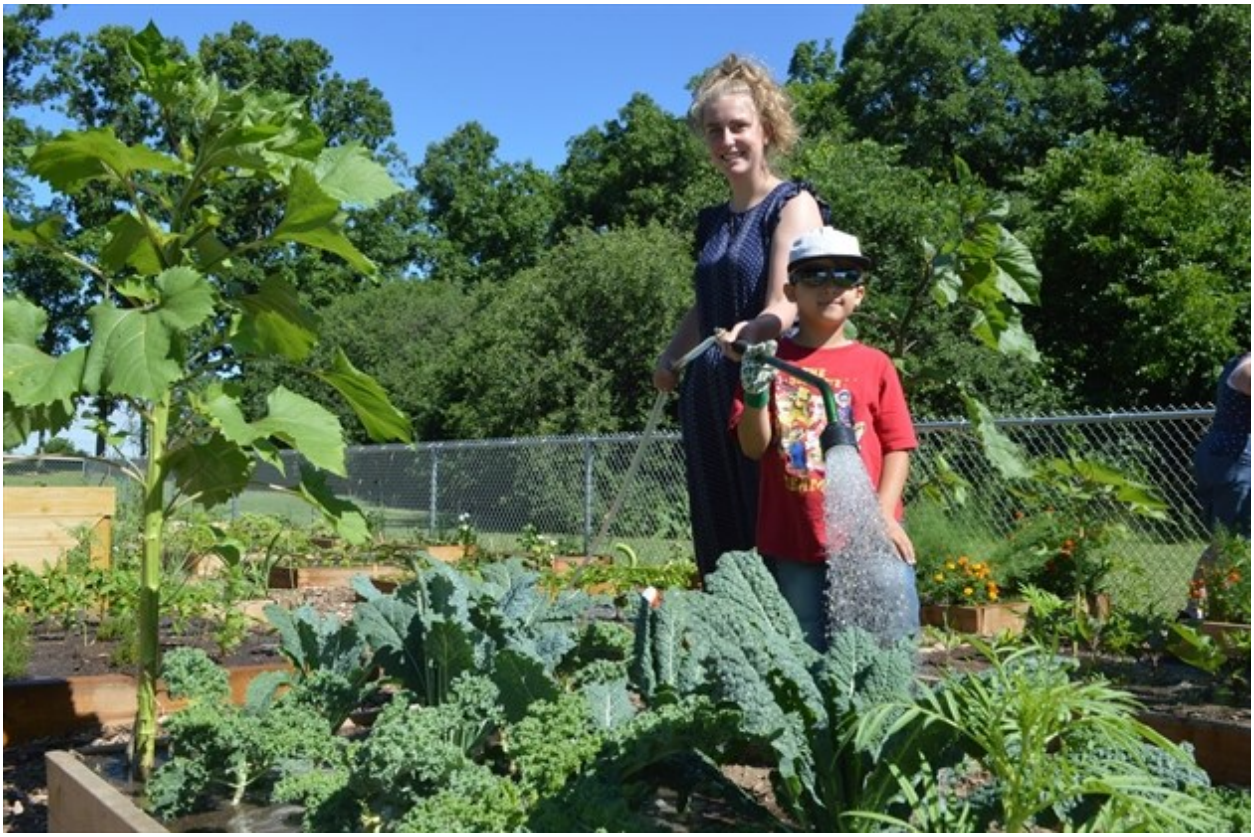
Growing Your Own Way to Micro-Localized Food Security

A White Paper by Nicole Graziano and Brian Baetz, PhD, PEng, FCSCE



(Newman, 2018)

Introduction

As the climate crisis worsens and global temperatures continue to rise, community members are left to question what they can do to combat climate change at the local level. When coupled with pre-existing food insecurity, climate change can dramatically affect the agricultural industry and make fresh, nutritious food financially inaccessible. Climate change and the extreme weather events associated with it have been linked to disruptions in food availability, reduction in food quality, limited access to food and have negatively impacted crop yields and productivity (Environmental Protection Agency, 2017). Moreover, extreme weather can interrupt food delivery, which eventually leads to spikes in the costs of food (Environmental Protection Agency, 2017). Marginalized communities are often disproportionately affected by the impacts of both climate change and food insecurity (Environmental Protection Agency, 2017). A home garden can help alleviate the financial barriers associated with purchasing produce while simultaneously mitigating the effects of climate change. Food grown at home is cost-efficient and reduces the amount of fossil fuels used in food production and transportation, thus limiting the carbon emissions associated with traditional agriculture.

In addition to the already devastating effects of climate change, food security has been threatened by the ongoing COVID-19 pandemic. Public shutdowns have led to an unprecedented amount of global unemployment while many struggle to afford and access food (Centre for Strategic and International Studies, 2020; Food Secure Canada, 2020). Within Canada alone, food insecurity "is expected to double from the most recent statistics of 4.4 million people, before the end of the year" (Food Secure Canada, 2020). The COVID-19 pandemic is "magnifying the structural inequalities in our food systems, the insufficiencies of our social protection programs, and the challenges with the dominant food supply chains" (Food Secure Canada, 2020). Racialized communities are disproportionately affected by food insecurity while our import-oriented, fossil fuel-dependent food chains are extremely vulnerable to market and labour disruptions (Food Secure Canada, 2020). In order to build resilient, "ecological local food systems that shorten and diversify food chains, revitalize communities, ensure greater access to healthy and fresh foods, support lower-emissions food systems, build greater resiliency to shocks and reduce food loss and waste" (Food Secure Canada, 2020), Canada must establish micro-localized food security through individual and community gardening initiatives. This closely aligns with the 100-mile diet, which encourages local food production and aims to make everything you eat grown within a 100-mile

radius of your table (Priebe, 2011a). A more detailed iteration of this initiative is the zero-mile diet, in which you grow your own food and promote ultra-local food production (Priebe, 2011b). Growing your own food builds resiliency to economic and industry shutdowns (like those caused by the COVID-19 pandemic), supports environmental sustainability, leads to economic savings and encourages healthy living (Priebe, 2011a; Priebe, 2011b) (see Figure 1).

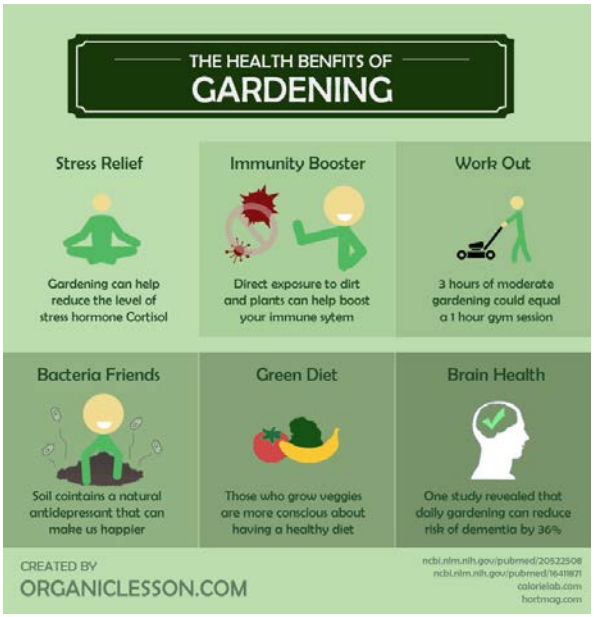


Figure 1: Some of the many benefits of gardening (Choan, 2020).

Contrary to what some may believe, you do not need large pieces of property to garden; a sunny windowsill, balcony or deck, are all capable of supporting a variety of plants. Small steps towards meaningful change and environmentally conscious efforts at the individual level can have a profound impact. Even small herb gardens can enhance food security and reduce carbon emissions. Ambitious gardeners with larger parcels of land at their disposal can replace 20% of store-bought food with home-grown food and "reduce their carbon footprint by about [approximately 30kg] of CO2 per year" (Bruns, 2018). In addition to reducing carbon emissions, growing your own vegetables can save a significant amount of money that would otherwise go towards groceries. When growing from seed, for every $1 you initially spend on the garden, you can receive up to $25 in savings (Salisbury Greenhouse, 2015). Moreover, the food you grow is guaranteed fresh and organic whereas at most grocery stores a package of organic lettuce and greens can cost between $5-$7(Salisbury Greenhouse, 2015). Comparatively, a package of 500 lettuce seeds usually costs less than $3.

Cultivating a garden at home illustrates that high-quality and nutritious food does not have to be expensive. With support from community organizations, information available for free online and upcycling material so that it finds a new life within your garden, you can alleviate many of the upfront costs associated with growing your own food. In order to increase access to gardening and promote localized food security, this white paper will highlight the best and most cost-effective ways of starting a garden and explore existing initiatives within Hamilton. Gardening has the power to make meaningful impacts towards achieving food security and responding to climate change at the individual and international levels.

How Gardening Is Connected to Food Security

With the global population expected to exceed 9 billion by 2050, countries and companies are struggling to increase food production and meet the needs of the growing population (Galhena, Freed & Maredia, 2013). When compared to their wealthy counterparts, both developing countries and marginalized communities in the West are more likely to face food scarcity and pervasive hunger (Galhena, Freed & Maredia, 2013). The growing needs of the rising population has made food security a topic of global concern. Food security requires that there is “regular access to a sufficient quantity of safe, nutritious food, which allows a person to lead an active, healthy life” (Comstock, 2019). According to the United Nations (UN) Rome Declaration on World Food Security, food security can be achieved when "all people, at all times, have physical and economic access to sufficient, safe and nutritious food” (Comstock, 2019). Both the World Health Organization (WHO) and the UN have worked to provide food to countries in dire need, develop long-term food focused plans within various communities and support the growth of micro-localized food security, through gardening initiatives (Comstock, 2019).

The divides in food security between rich and poor communities is worsening. Even though individual communities may have access to food, they may still lack food security. This seemingly paradoxical situation is a result of food deserts. A food desert is an area that does not have a readily available supply of healthy food within one mile of walking distance from a person’s home (Harmon, 2019). Usually, food deserts encompass areas of low socio-economic status with residents that lack access to transportation, therefore making it difficult to travel outside of the area to purchase nutritious food. However, these neighbourhoods often have an overabundance of fast-food and cheap, processed foods (Harmon, 2019). Food security requires access to food that is safe, nutritious and does not merely constitute the presence of food, regardless of its nutritional

value or quality. In addition to ensuring that there is a wide array of grocery stores and markets available across various communities, another means of combating food deserts is through the use of community or individual gardens. Enhancing local food production allows communities or individual households to achieve food security from within. Moreover, backyard gardening supplements food for individual homes, without the use of harmful chemicals and shortens the supply chain, allowing for careful supervision and quality monitoring. Backyard gardening can foster household food security, in a cost-effective and empowering way.

Vegetable gardening "is the oldest and most enduring form of cultivation" and fundamentally involves "food production on small plots adjacent to human settlements" (Galhena, Freed & Maredia, 2013). Home gardening is both an ancient and widespread practice, characterized by its proximity to a residency, a diversity of plants, its ability to supplement consumption needs and income, and can be easily accessed by economically disenfranchised communities (Galhena, Freed & Maredia, 2013).Within developing countries, gardens have been linked to social, economic and environmental benefits (Galhena, Freed & Maredia, 2013). Globally, the most basic and fundamental benefit associated with home gardens is their ability to increase accessibility and availability of fresh and healthy foods. Home gardens are versatile and only require a small parcel of space whether it be a yard, a windowsill or balcony. In addition to increasing food security, home gardens are able to foster good health through nutritious food, preserve indigenous knowledge, offer economic benefits and savings, and reduce the environmental impacts associated with the traditional, production, shipment and sale of food (Galhena, Freed & Maredia, 2013).

Cost-Effective Ways of Starting a Home Garden

Many misconceptions surround gardening and there are ample concerns directed towards the upfront costs associated with buying seeds and plants. Although acquiring certain plants can be costly, the food that a plant produces often make up for its initial cost and reduce the overall costs of food shopping. Within the Greater Hamilton and Toronto Area there are many local stores with a variety of affordable seedlings. For example, Lighthouse Fish Market is located on James Street in Hamilton and has been a community staple for almost 35 years (Howells, 2019). They sell an array of vegetable and flower plants at affordable prices. In addition to local stores, large corporations like Home Depot, Canadian Tire and Terra Greenhouses all sell various plants, seedlings and gardening supplies. Moreover, many vegetable plants do not have to be bought anew

and instead, can be grown from food scraps. Whenever possible, rather than composting or throwing away produce scraps, save them to replant. There are comprehensive articles and video tutorials available online that illustrate how to grow food from what would otherwise be scraps. This section will cover some of the major categories of fruits and vegetables that can fairly easily be grown at home:

- Re-Planting Leafy Vegetables:

  Lettuce, bok choy, cabbage and celery can be grown from the remainder of the plant's base, which normally would be discarded (see Figure 2) (Beaty, 2014; Huang, 2018). The base should be about one inch tall and placed in a shallow dish, with about half an inch of water (Beaty, 2014). The water should be regularly refreshed, and the cut side of the scrap vegetable should be facing upwards and this is where the new leaves will begin to grow (Beaty, 2014). These leafy vegetables can be grown in water on a windowsill with ample sun-exposure year-round (Beaty, 2014; Huang, 2018). Alternatively, once roots and new leaves form, the plant can be transplanted into soil during the later spring months beginning once the last frost has passed. When transplanting, the soil should cover the roots and base of the plant, leaving new leaves exposed. Once planted, lettuce varieties, spinach, cabbage and arugula will bolt (Iannotti, 2019). Bolting is the process by which a plant "sends up a flower stalk and goes to seed" (Iannotti, 2019). Once bolting begins the flavour of the leaves turns bitter, however if left unattended the seeds will naturally spread throughout the garden and new plants will soon begin to grow (Iannotti, 2019). Allowing a few of your plants to begin seeding is an inexpensive way of multiplying your plant quantity.

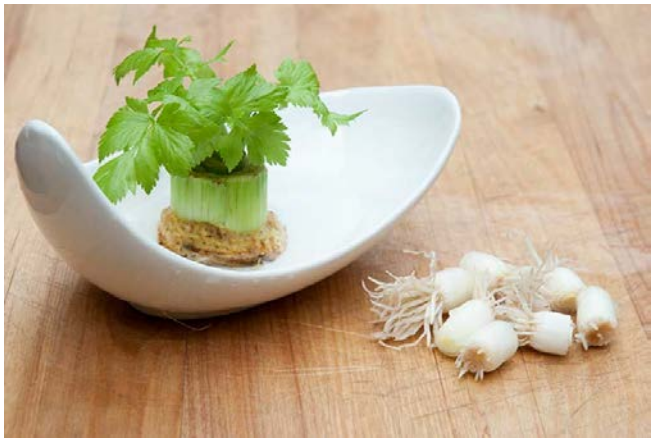


Figure 2: Only a small amount of water is needed to grow many leafy vegetables like lettuce and celery.

- Re-Planting Bulb Vegetables:

  For vegetables with swollen bases that resemble bulbs, the steps to replant resemble those used for leafy vegetables. For leeks, green onions and fennel, the end of the plant with the small roots should be cut into a piece about one inch tall (Beaty, 2014; Huang, 2018). Then, it should be placed in water that is half an inch deep. The shallow water, which must be kept fresh, will allow the plant to grow (Beaty, 2014; Huang, 2018). For vegetables with more mature bulbs, like red onions, scraps grow best when planted directly into soil (Beaty, 2014; Huang, 2018). The root base should be about one inch thick and covered with soil, leaving the top exposed (Beaty, 2014; Huang, 2018). The bulb can either be planted in a window with ample sunlight or if warm enough, planted directly outside (Beaty, 2014; Huang, 2018). If growing indoors, the plant should be regularly repotted into larger containers.

- Re-Planting Potatoes:

  Potatoes are a staple in many homes and can be regrown fairly easily. When using potatoes check if any have begun to sprout (see figure 3). These sprouts are referred to as the potatoes' eyes and can be replanted (Beaty, 2014; Huang, 2018). You can purchase potatoes that are ready to plant from many local garden stores, or simply look for one with eyes when normally shopping for potatoes to eat (Beaty, 2014; Huang, 2018). Cut the eye from the potato and allow it to dry for one to two days before planting it in a pot that is at least 28 oz. large (Beaty, 2014; Huang, 2018). The top of the sprout should be showing just above the dirt (Beaty, 2014; Huang, 2018). Water well and leave in bright light (Beaty, 2014; Huang, 2018). The potato will begin to sprout into a plant, while the potato grows under the soil. Wait until all the leaves of the plant have wilted before harvesting potatoes and pulling them from the dirt.

Figure 3: Usually potatoes with eyes (as shown in the above image) are disposed of. However, you can plant them and create a vibrant and inexpensive garden (Ribbey, n.d.).

- Re-Planting Tomatoes and Peppers:

  Tomatoes and peppers are commonly found in many gardens and can be fairly easily grown from the seeds which would have otherwise been removed or eaten. Seeds that can eventually grow into full plants, are found within basically every tomato and pepper plant. However, tomatoes and peppers typically found at large, chain grocery stores are genetically engineered hybrids (Espoma, 2018). Although you may have some success growing a new plant from hybrid seeds, it is difficult to germinate them successfully and the finished plant will likely not resemble its predecessor (Espoma, 2018). Alternatively, tomato and pepper plants can be successfully grown from the seeds of an heirloom tomato or pepper. An heirloom plant comes from a seed that has been preserved and passed down across many growing seasons and selected from the best fruit. This process allows growers to "select for certain desirable traits" (Delany, 2018). Additionally, heirlooms are pollinated naturally, without genetic modification (Delany, 2018). This also means that they are less resistant to disease and more unique in flavour and appearance (Delany, 2018). New tomatoes can be successfully grown from heirloom tomato seeds and this process can be continued each year with a new set of seeds saved from the past season. Heirloom tomato and pepper seeds and plants can be purchased at gardening and food stores, and the seeds from successful plants can be used in the seasons to come (Espoma, 2018). When using seeds directly from a vegetable, allow the seed to dry for one to two days before planting (Espoma, 2018).

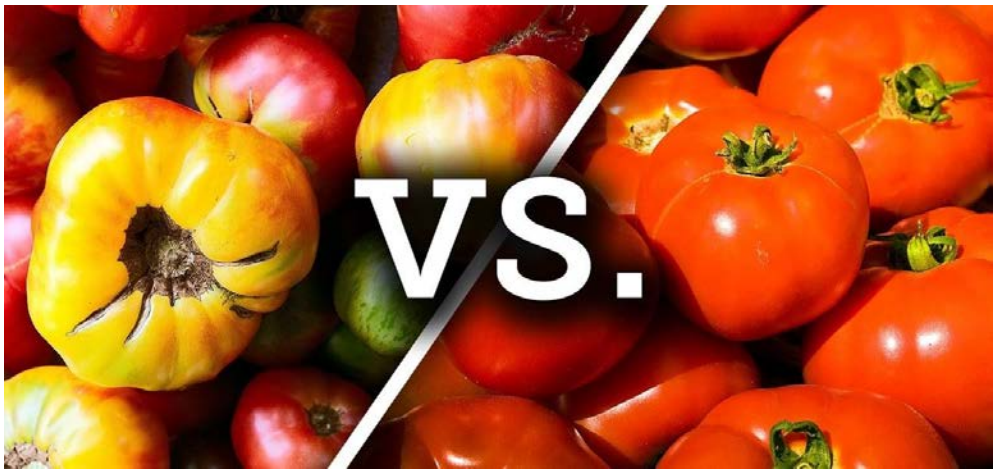


Figure 4: Heirloom tomatoes (left) often come in a variety of colours and shapes. Heirloom tomatoes may have noticeable marks. Comparatively, hybrid tomatoes (right) all appear to be approximately the same size, shape and colour (Fales, 2014).

Although this section is not an exhaustive exploration of re-planting from food scraps, it illustrates the viability of growing vegetables, without purchasing new plants. Gardening can be financially accessible and in turn, reduce the overall costs of food. Many people are unaware that they have the potential to grow their own gardens, based solely on the food scraps and seeds they would have previously disposed of. Once you successfully grow plants from scraps and seeds, you can use the remainders of this new vegetable to continue the growing cycle.

Best Growing Techniques

As previously illustrated, growing your own food does not have to be expensive. Additionally, not all plants require significant time commitments, and many can grow in short periods. For example, alfalfa sprouts will grow in about four days, can be grown inside and are a simple way of adding extra nutrition to your meals (Bertelsen, 2010). Comparatively tomatoes will require frequent watering and pruning. Generally, there are five simple steps needed to grow a vegetable from seed. These steps can be adapted to fit the water and sun requirements of different plants. Usually, plant nutritional needs are listed on the seed pack, displayed on a small tag in the planter or available online. According to Karen Bertelsen, expert gardener and author of The Art of Doing Stuff, you can “start your own vegetables from seed with just a few plastic cups, some seeding mix and a windowsill” (2020). The general steps for growing plants are:

1. Wet your soil and fill seed trays or pots with it (small paper or plastic cups with holes in the bottom can act as planters as well). The “soil” can be a soilless potting mix but if it is unavailable or overly expensive, traditional potting soil also works (Bertelsen, 2020).
2. Press a seed into the top of the soil and gently cover it (Bertelsen, 2020).
3. Cover the trays with something to keep the humidity in while the seed germinates. This can be a clear plastic domes or plastic wrap. Alternatively, you could always use plastic dome from used food packages that otherwise would have be thrown away (Bertelsen, 2020).
4. Once sprouted, remove the humidity dome and put the plant under grow lights or in a south-facing window. If using grow lights, most seedlings require about 15 hours of sunlight/ day (Bertelsen, 2020; Vargo, n.d.).
5. Water when necessary. Watering can be done through a drip tray which is placed under the starting tray or planting pots. Water can then be absorbed through the bottom of the plant and this is the preferred method of many professional gardeners (Bertelsen, 2020).

Once sprouted, many plants can continue to be grown indoors or can be transferred to soil outside, when the weather warms. When transplanting seedlings into larger pots, begin by cleaning the pots of all existing residue and dirt by using a few tablespoons of bleach mixed with an ample amount of water in a spray bottle (Bertelsen, 2011). Spray and soak the pots, leaving them to rest for about a half hour (Bertelsen, 2011). Then, clean the pots in warm soapy water and rinse them off. Fill the now clean pots with fresh soil and gently pull the seedlings up from the original starting tray, ensuring the roots remain intact (Bertelsen, 2011). Make a hole in the new soil that almost reaches its bottom (Bertelsen, 2011). Drop the seedling into the soil and secure it within by pressing the soil around it downwards (Bertelsen, 2011). These larger pots can continue to be grown in a sunny, south-facing windowsill or moved to a balcony or deck. Alternatively, the plants within them can also be eventually transplanted into an outdoor garden, if space allows. When transplanting outside, it is recommended you first harden your plants and get them accustomed to the outdoors. Hardening off plants requires that you bring them outside, every day for a week, and increase their time outdoors each day. Bertelsen has devised a hardening schedule that can be used when the last frost has passed:

Day 1 – Set plants outside in the shade, protected from wind and direct sunlight for 3 hours. Once complete bring inside (Bertelsen, 2012).

Day 2 – Do the same for 6 hours. Once complete bring inside (Bertelsen, 2012).

Day 3 – Do the same for 9 hours. Once complete bring inside (Bertelsen, 2012).

Day 4 – Set the plants where they get a little less shelter for the day. Leave them for 1-2 hours in a partly sheltered area. Once complete bring inside (Bertelsen, 2012).

Day 5 – Repeat the steps of Day 4 and allow 1-2 hours of direct sunlight. Once complete bring inside (Bertelsen, 2012).

Day 6 – Allow the plants a bit more direct sun than they had the day before. You can also allow them to stay outside all night for the first time unless it is unusually cold (Bertelsen, 2012).

Day 7 –Place the plants in the sun most of the day and leave them outside at night (Bertelsen, 2012).

Day 8 – Plant your plants outside once the last frost has passed (Bertelsen, 2012).

Although hardening vegetables and starting seeds indoors is recommended, it is not required, and it is possible to have a successful garden which has been directly planted outside, so long as the last frost has passed, and seedlings are well protected from predators.

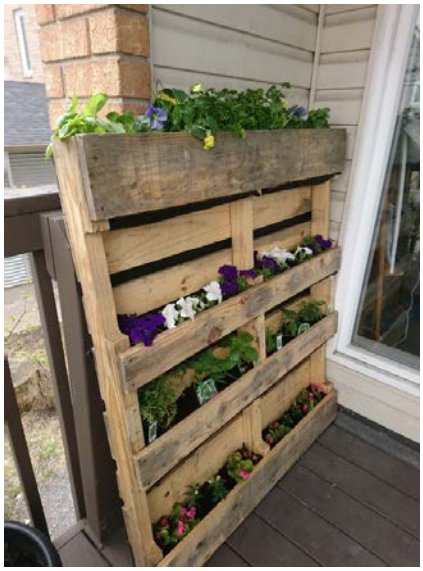
Vertical Gardens

As previously mentioned, you do not need a large plot of land in order to garden. Individual pots and raised beds can fit on most balconies and some windowsills. Another way to maximize the space within your garden is by growing vertically. Vertical gardens amplify growing space while simultaneously reducing plant susceptibility to disease and beautifying small spaces (Jabbour, 2016). Climbing plants like tomatoes and beans will naturally move upwards when supported by trellises, while even non-climbing plants can be used in vertical gardening if placed in hanging pots (Jabbour, 2016; Clarke, 2015). You can purchase trellises at almost every home and garden supply store or construct your own from string and plywood. Using trellises or similar structures to create vertical gardens can increase crop yield and nurture healthier plants (Gibson, 2012). Additionally, gardening vertically can make growing and harvesting your own food more accessible to those with mobility issues who may struggle with constantly bending over to care for plants (Gibson, 2012)

Vertical gardening does not have to be expensive and many vertical growing systems can be created from upcycled materials. Hanging plastic bottles and pallet trays (see figures 5 and 6) can give new life to material that would otherwise been thrown away. To turn an old pallet into a vertical garden you must first acquire a pallet that has not been treated with any pesticides or

preservatives (Cimesa, 2017; Clarke, 2015). Many supply stores dispose of their pallets after receiving a shipment and offer them to the public for free (Cimesa, 2017). After acquiring the pallet, first cover the bottom of the pallet with landscaping fabric and use a staple gun to secure it, this will become the back of the vertical garden (Cimesa, 2017; Clarke, 2015). Then, make "shelves" in between the wooden pieces by stapling more landscaping fabric to the bottom of the selected section (see image x) (Cimesa, 2017). Fill the "shelves" with soil and plant as you normally would (Cimesa, 2017). This is a cost-effective way of creating a vertical garden that can be used for many years and growing seasons.

Figure 5: You can get creative with recycled materials and give new life to objects that would otherwise be disposed of (Clarke, 2015).



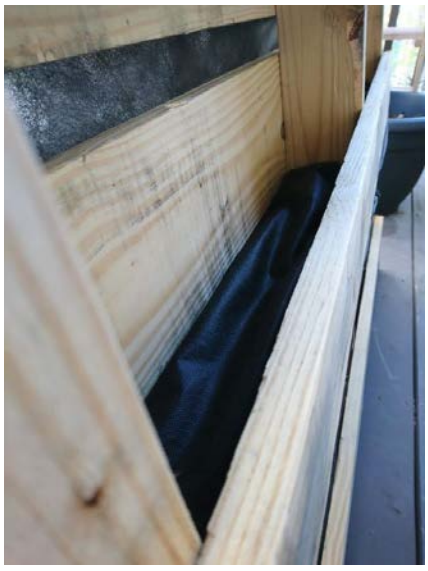


Figure 6: A pallet transformed into a garden is inexpensive to create and perfect for small spaces like balconies and decks (Cimesa, 2017).

Extending The Growing Season

Although season length is dependent on weather and variety of plants, typical vegetable gardens in Hamilton Ontario last, on average from April 30 to October 13, totaling approximately 160-170 days (Ministry of Agriculture, Food and Rural Affairs, 2020). A planting schedule customized to the average weather conditions of Hamilton can be found on the Old Farmer's Almanac Website and is freely available to the public. Outside of the average growing season, it is possible to grow some vegetables year-round. Many herbs, including chives, oregano, rosemary and thyme can be grown inside on a sunny, south-facing windowsill. Most of these plants require at least six hours of sun daily and temperatures between 65 and 70 degrees Fahrenheit (The Editors, 2019). Although herbs are a simple way to introduce fresh, localized food into your diet throughout the year, this section will primarily explore more substantial vegetables, such as tomatoes and leafy greens.

- Transferring Plants Indoors:

  A cost- effective means of extending the life of your plants is to begin a new plant during the late summer and bringing it indoors once it germinates and as the weather begins to cool. This method has been a successful means of growing tomatoes and peppers, but it is unlikely that you will get a large yield (Bertelsen, 2020). The plant should be placed in the windowsill that gets the most sun exposure (Bertelsen, 2020). However, tomatoes and peppers require approximately ten hours of sun a day, which unfortunately cannot be met naturally during December, when the amount of sun reduces to about nine hours a day in southern Ontario (Time and Date, 2020). To pollinate the tomato and pepper plants, it is best to jostle the plants so that pollen from individual flowers spreads. It is still possible to successfully grow peppers and tomatoes, but there is no guarantee this method will work (Bertelsen, 2020). Although this method is relatively inexpensive and requires no extra equipment, it involves a significant time commitment, with a significant chance that all plants will fail to produce fruit.

- Ripen Fruit Indoors:

  Unlike other methods, this approach does not actually involve growing plants inside, but rather serves as a relatively easy means of ensuring you have local, fresh food for an extended time period. This section will once again focus on tomatoes and peppers as they are staples within many gardens, relatively common and easy to access (Durand, 2008;

Bertelsen, 2012b). Before temperatures begin to get significantly colder and well before the first frost, gather all unripe tomatoes and peppers from your garden (Durand, 2008; Bertelsen, 2012b). Place a single layer of them within a crate and cover with a sheet of newspaper (Durand, 2008). If the box is large enough, add another layer of the unripe fruit on top of the last, with another sheet of newspaper. Any more layers will bruise the fruit, so it is best to have a maximum of two. Tomatoes and peppers stored in a warmer room with a temperature of 65-70 degrees will ripen in about two weeks (Durand, 2008 Bertelsen, 2012b). If you want to prolong the ripening and store fruit for longer before use, place them in a cool room (55 degrees or below). By placing the unripe fruit in a cool room, you can expect to have ripe fruit through to late December.

- Hydroponic Systems:

  The desire to extend growing seasons has led to the creation of the Aerogarden. The Aerogarden is a relatively small device that grows plants hydroponically. After purchasing and installing seed pods, all the Aerogarden requires is water and occasional fertilizer (Bertelsen, 2018). The Aerogarden is automated and notifies users when to add nutrients to the device (Bertelsen, 2018). The machine also comes equipped with a number of grow lights, that strengthen the plants. When growing tomatoes using an aero garden, it takes about 35 days for the plant to form flowers and small tomatoes (Bertelsen, 2018). There are a number of units available online with various growing capacities. The prices range from $99.95 for the basic machine to $799.95 for the most sophisticated models. To grow vegetables you need to purchase specialized seed kits, which are available on the Aerogarden website. Seed kits range from $12.95 to $31.96. The cheapest tomato seed pack is $12.95 and includes three pods, which should translate to three tomato plants. Comparatively, local stores like Lighthouse Fish Market and even large corporate greenhouses sell tomato plants for around $1.79-$2.49 each. A pack of tomato seeds, which has the potential to grow dozens of plants costs less than $5.

- Grow Lights:

  Although sunny windowsills can support plants that require low to medium sunlight, like many herbs, “to germinate seedlings or grow high-light edibles” (Halleck, 2020) you will need to boost light levels through the use of grow lights. Grow lights are available in a variety of models and can be adapted to fit the needs of both small and large indoor gardens.

Experts recommend “quality, efficient grow lamps that generate more light and less heat” (Halleck, 2020). Seedlings often require intense light for about sixteen hours a day in order to germinate successfully (Halleck, 2020). If your indoor garden is next to a bright window you may only need to use the grow lights for fourteen hours a day (Halleck, 2020). If your space has little natural light lamps can be used for eighteen hours. Most grow lights cost between $50 to $300 (Home Depot, 2020). The more affordable lights are single units while more expensive units contain multiple lights and gardening structures.

- Cold Frame Systems:

  A cold frame system is a relatively simple structure, with a detachable clear dome lid. The clear dome allows the system to utilize solar energy to create a microclimate within your garden (Holcombe, 2019; Jabbour, n.d.). Cold frames look like a large box with a translucent top that is angled to ensure optimal sunlight reaches the plants within. Low-growing, cool season plants are the best suited to cold frames (Holcombe, 2019; Jabbour, n.d.). Although some leafy vegetables like lettuce can continue to grow in a cold frame, they are primarily used for storing dormant plants, giving seedlings an early start and extending the growing season past frost (Holcombe, 2019; Jabbour, n.d.). Within the cold frame the plants are insulated and protected. Cold frames are relatively inexpensive and can be bought anew or constructed from recycled materials, such as lumber and old windows or plastic sheets (Holcombe, 2019; Jabbour, n.d.).

Figure 7: A cold frame system can be a simple sheet of glass or plastic over a wooden box of plants (Vargo, n.d.)

- Côtière:

  A Côtière, also called an Ados bed, is a French growing structure that resembles a cold frame. However, a Côtière is usually more sophisticated than typical cold frames and allows you to grow longer into the winter months (Damrosch, 2015). Unlike the traditional cold frame systems that are commonly used in North America, a Côtière relies on a south facing slope and stone wall (Damrosch, 2015). A south facing slope is naturally tilted towards the sun's rays and ensures optimal heat and light reach the plant, while the stone wall at the back of the glass case absorbs and retains heat (Damrosch, 2015). To create a Côtière you must first create a sloped bed so that it tilts upwards at a 30-degree angle and surround the plants with a clear frame (Damrosch, 2015). The angled case usually backs onto a brick or stone wall that varies in length and height depending on the size of the garden beds. An industrious gardener names Shaun Scott who constructed a large Côtière reported that his food bill dropped over 18% in one year of using the Côtière (Damrosch, 2015).

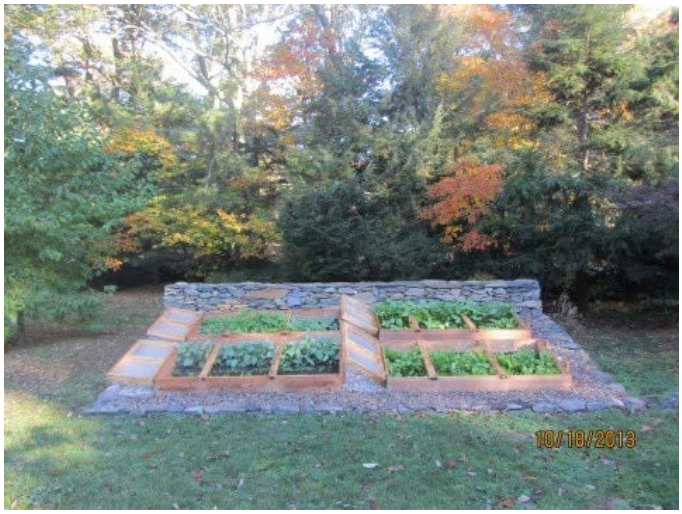


Figure 8: Unlike cold frames, a Côtière is angled and backs onto a stone wall (Damrosch, 2015).

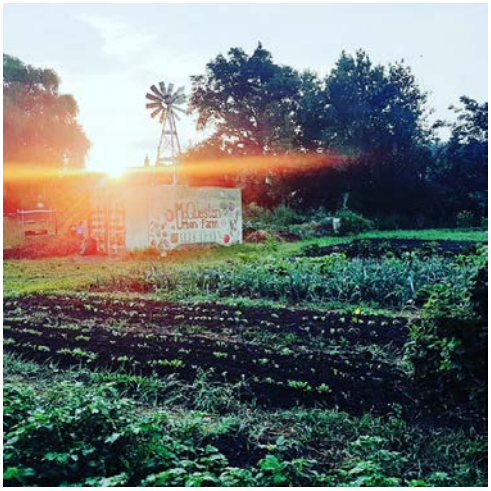
Gardening Initiatives in Hamilton

Over the past several years, a number of gardening initiatives have been established throughout Hamilton. Community gardens which provide fresh and healthy food to foodbanks and economically disenfranchised communities, have ultimately made the city more vibrant and healthy eating more accessible. One notable and well-established example of community gardens is the Hamilton Victory Gardens. The Hamilton Victory Gardens are part of a not-for-profit

program which is dedicated “alleviating hunger and food insecurity in Hamilton Ontario and local communities by using urban agriculture to provide fresh produce to local food banks and meal programs” (Hamilton Victory Gardens, 2017). By transforming vacant lots into gardens, Hamilton Victory Gardens creates spaces for education and growth, while simultaneously contributing to micro-localized food security (Hamilton Victory Gardens, 2017). The Hamilton Victory Gardens were established in 2011 and were inspired by the success of victory gardens during the first and second World Wars (Hamilton Victory Gardens, 2017). During the World Wars, Canada, Great Britain and other allied nations used public spaces and personal yards so that individuals could grow their own produce when faced with dangerous food shortages and contribute to a much-needed sense of community (Hamilton Victory Gardens, 2017). During the second World War, “it's estimated that 40% of the vegetables on the average American's table came from Victory Gardens” and this astonishing fact further illustrates the viability of eating home grown food (Allen, 2010). Since its creation, Hamilton Victory Gardens have produced 230,000 pounds of fresh food and created 12 garden sites and over 661 raised beds throughout the city (Hamilton Victory Gardens, 2017). Across the city, Hamilton Victory Gardens provide sustainable sources of nutritious food.

The number of community gardens across Hamilton continues to rise while their positive impacts on food security and health are becoming increasingly evident. In order to help people access resources and tools to participate in these community gardening programs, the Hamilton Community Garden Network (HCGN) program maintains a detailed record of community gardens in Hamilton. HCGN hopes to enhance the environment while simultaneously promoting wellness and accessibility to healthy food (Neighbour to Neighbour, n.d.). The McQuesten Urban Farm is one of the many community gardens in Hamilton and is located on a 3 acres plot of land behind the former St. Helen’s school (McQuesten Urban Farm, 2018). The urban farm addresses food insecurity, provides volunteer opportunities, enhances relationships within the community and adds economic value to the surrounding area (McQuesten Urban Farm, 2018). The McQuesten Urban Farm is dedicated to ensuring that all people, regardless of socio-economic status, have access to nutritious food (McQuesten Urban Farm, 2018). The McQuesten Urban Farm proves that we can create affordable solutions to food insecurity, within our own neighbourhoods and backyards. Additionally, to help individuals start their own gardens, Environment Hamilton, in partnership with Hamilton Ward 3, is offering a range of free plant seeds. By reaching out to local

organizations and community gardens, many of the upfront costs of creating a garden or purchasing nutritious food can be reduced.



Figures 9 and 10: McQuesten urban farm makes healthy food accessible and affordable, brightens the local neighbourhood and teaches community members about gardening.

Permaculture at McMaster

In light of the current climate crisis, there is an overwhelming need to move towards sustainable means of food production at the local and international levels. Unlike conventional practices within the agricultural industry, permaculture absorbs more carbon dioxide than it creates and has a minimal carbon footprint (Barth, 2016). Permaculture elevates traditional gardening practices to create a truly sustainable system. Permaculture was coined by Bill Mollison in 1978 who defined it as (Barth, 2016):

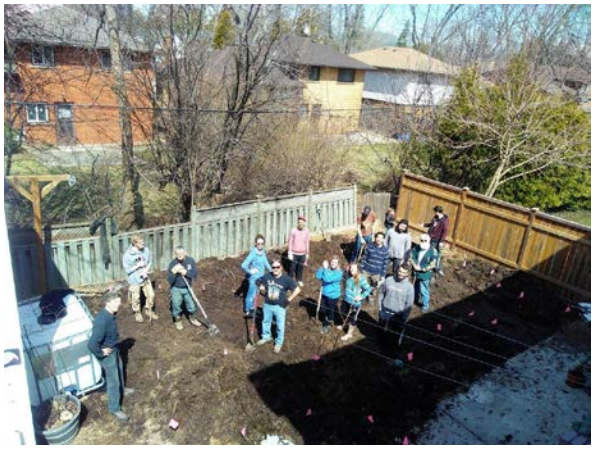
> The conscious design and maintenance of agriculturally productive systems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of the landscape with people, providing their food, energy, shelter and other material and non-material needs in a sustainable way.

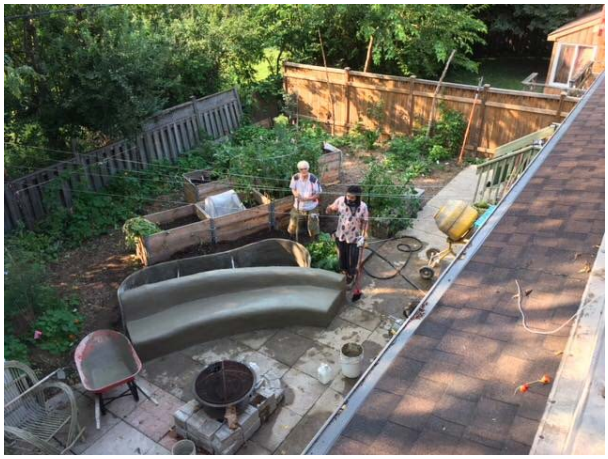
Permaculture primarily focusses on the creation of closed loop systems, meaning that the system in question “provides for its own energy needs and is inherently sustainable” (Barth, 2016). Rather than importing fertilizers, the permaculture system can be adapted to “provide for its own fertility needs” (Barth, 2016). In particular, perennials fit well within permaculture systems and can be beneficial for the soil. According to Mollison, permaculture systems allow us to “[work] with, rather than against, nature” (Barth, 2016).

The Community Permaculture Lab, developed in partnership with McMaster, was created in the Fall of 2017, when a local woman offered her backyard as a pilot project, to be used by McMaster students and community members (Academic Sustainability Programs Office, n.d.; Ekwuribe, Konig-Hession & Nilsson; 2019). The Community Permaculture Lab aims to establish outdoor learning facilities and develop community-based climate resiliency (Academic Sustainability Programs Office, n.d.; Ekwuribe, Konig-Hession & Nilsson; 2019). McMaster Permaculture initiatives focus on sustainability and strengthen campus connection to the broader Hamilton community. Within the McMaster Permaculture gardens there are native plant species, selected for their relation to each other and contributions to permaculture designs (Academic Sustainability Programs Office, n.d.; Ekwuribe, Konig-Hession & Nilsson; 2019). Permaculture principles do not have to be challenging or expensive to implement both at the large level, as illustrated by McMaster or at the micro-localized level, within your own home. Simple ways to develop a permaculture garden are:

- Catch rainwater in barrels or cisterns to use on your plants (Lyons, 2019);
- Compost garden and organic waste to create your own mulch. Try to protect the dirt and leave it relatively undisturbed (Lyons, 2019);
- Observe the sun and shade within your garden and plant accordingly (Hendry, 2019);
- Consider planting non-edible, flowering plants to attract pollinators to your garden (Hendry, 2019; Lyons, 2019);
- Research the connections between different plants and understand how they may compliment or deter each other's growth (Hendry, 2019; Lyons, 2019).

Currently, the Community Permaculture Lab meets every second Thursday and every fourth Saturday of the month. More information is available on their Facebook Page: https://www.facebook.com/CommunityPermacultureLab/. Additionally, McMaster students can become involved through the SUSTAIN 3S03 course, which publishes a report on all projects, including the Community Permaculture Lab, available at: https://asp.mcmaster.ca/wp-content/uploads/2019/12/3S03CourseReport2019.pdf.

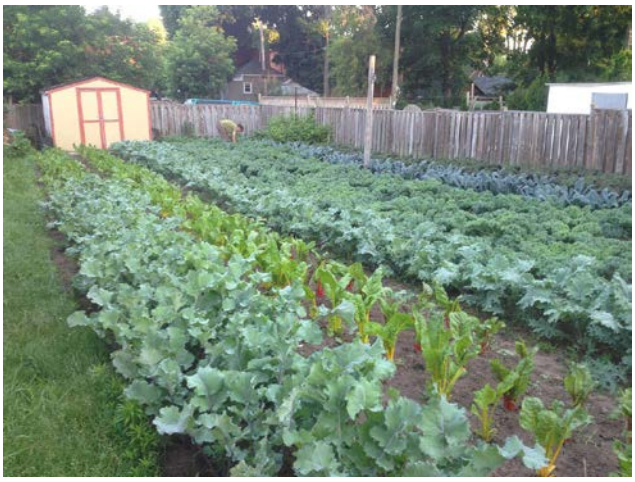




Figures 11 and 12: The McMaster Community Permaculture Lab is located in a backyard that was generously offered to the project team (Community Permaculture Lab—Posts, Facebook).

Russ Ohrt:

Russ Ohrt is an urban farmer and exemplifies that gardening can be accessible, even within the urban environment. Ohrt has championed the Community Supported Agriculture (CSA) program, which is a "formal relationship between individuals and a farmer" (Backyard Harvest, n.d.). Members of the Backyard Harvest CSA receive a food share that was locally grown. Every Tuesday during the growing season, share members receive their share of fresh produce (Backyard Harvest, n.d.). Currently Backyard Harvest grows within 11 backyards throughout the Strathcona, Kirkendall and North End neighbourhoods, and is currently accepting backyard contributions to the project (Backyard Harvest, n.d.). If you offer your backyard to the program, you are able to receive a portion of the harvested vegetables. By producing and selling food within Hamilton, Backyard Harvest is able to foster micro-localized food security while simultaneously combating climate change. Typically, every calorie of food that is purchased from a supermarket and produced on a factory farm, takes about twelve calories of fossil fuels to create (Allen, 2010). In light of the climate crisis "uber-local food that uses no pesticides, herbicides, diesel tractors or refrigerated transport trucks would seem to position Hamilton well for the changes to come" (Allen, 2010).



Figures 13 and 14: A Backyard before and after becoming part of the Russ Ohrt's Backyard Harvest.

Summary:

The ongoing climate crisis and COVID-19 pandemic have illustrated that the world is continually changing, often in dramatic and irreversible ways. As our goals and desires shift with the ever-changing world around us, there is one constant; the need for food. The need for nutritious and life-sustaining food largely impacts how we navigate through our surroundings and its availability is of the utmost importance to the whole human race. In addition to the changes impacting our social and environmental support systems, both climate change and the COVID-19 pandemic also worsen the divides in access to healthy and safe food. In light of the unwavering need for nutrition and the heightening call to create production systems that are not severely impacted by disruptions to our existing import-oriented, fossil fuel-dependent food chains, individuals and communities need to craft micro-localized food security strategies. Micro-localized food security can be relatively simple in both theory and application. By growing some or most of your own food, you eliminate the reliance on existing food systems that can be subject to severe change based upon interruptions to global systems, reduce your carbon footprint and save money on produce bills. By reaching out to community gardening organizations, using food scraps to help start a garden and extending the growing season, it is possible to have access to both affordable and healthy food. Gardens can be created in traditional plots of lands, raised beds, individual pots, trellises and recycled materials like pallets and plastic bottles. As long as there is access to sufficient light, almost any space can be used to garden. Growing small herbs is a great

way to begin if time, space and budget are restricted, but by using some of the tips outlined in this white paper and available online, growing more substantial foods like lettuce and tomatoes, can also be an affordable and relatively easy means of fostering food security. Although the size and appearance of a garden varies between individuals, one thing is constant: home gardening positively contributes to household food security and can transform our understanding of locally-grown food.

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