Region of Waterloo
PUBLIC HEALTH

Urban Agriculture Report




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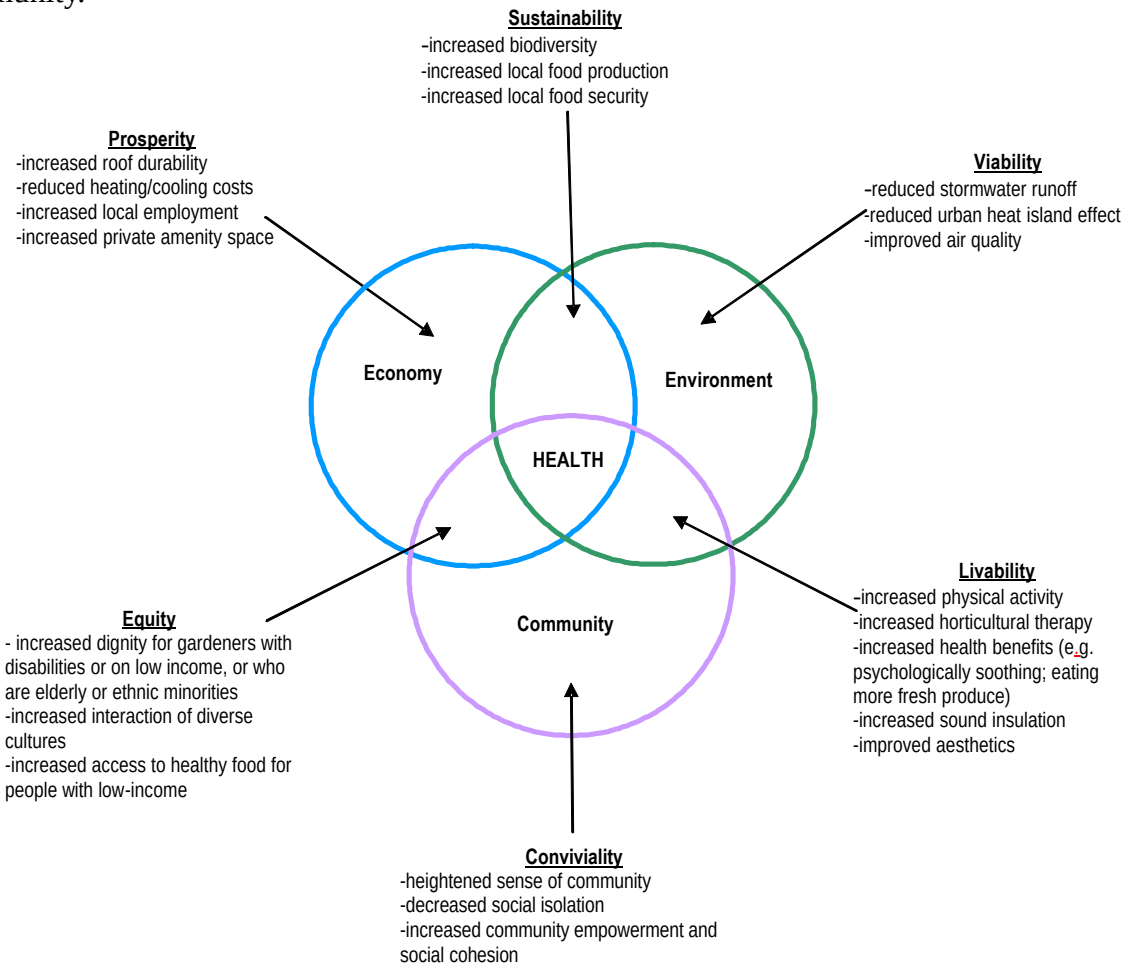
Executive Summary

Urban agriculture contributes to the quality of life and the health of individuals, families, and the community as a whole. This *Urban Agriculture* report, produced as part of the Regional Growth Management Strategy, explores the benefits of community gardens, rooftop gardens (and green roofs), and backyard gardens as found in a literature review and survey. Since urban agriculture has the potential to impact the social, economic, and environmental aspects of a community, the benefits are outlined in relation to a healthy community framework, represented by the 3-circle diagram below. An inventory of urban agriculture activity in Waterloo Region is also provided.

Community Health Benefits

Urban agriculture, whether it be in a backyard garden, rooftop garden, or community garden, has the potential to offset many of the negative effects of population growth and increased density. The benefits are numerous, and they pertain to many different areas of health such as community health (e.g. increased interracial interaction), economic health (e.g. increased local food production), and environmental health (e.g. improved air quality). The diagram below demonstrates the multiple benefits of urban agriculture as part of a model of a healthy community.



Future Population Growth

The need for urban agriculture in the form of community gardens, green roofs, and rooftop gardens, will increase with the anticipated population growth and increased urban density. Space for private gardens will decrease as lot sizes for homes or commercial buildings decrease. Therefore rooftop gardens would be a possible solution to allow for maximum building area and achievable economic potential.

Potential environmental benefits of urban agriculture can offset the consequences of population growth and urban density such as traffic congestion, energy waste, increasing air and noise pollution, increases in urban heat islands, loss of contact with nature, natural habitat loss, and loss of productive agricultural land.

With the potential for fuel prices to continue rising, the cost of transportation of food from distant sources will also rise and contribute to higher prices at the supermarkets. Growing more food locally is a good alternative, as it can reduce transportation costs and greenhouse gas emissions.

Inventory of Urban Agriculture in Waterloo Region

In Waterloo Region at the time of this report, there were approximately 31 community gardens offering at least 679 individual plots to community gardeners. In addition, there were at least 6 green roofs or rooftop gardens in Waterloo and Kitchener. In a recent survey commissioned by Region of Waterloo Public Health, 38% of urban residents stated that they grow some of their own food (i.e. vegetables, fruits, berries, nuts or herbs) and 90% of these residents used a backyard garden to grow the food. Seventy per cent (70%) also stated that it was important to them to be able to grow their own vegetables.

It is recommended that the Region of Waterloo continue to explore different avenues for expanding the amount of urban agriculture activity, especially in dense urban areas where population growth is expected.

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Introduction

"The city, suburbs, and the countryside must be viewed as a single, evolving system within nature, as must every individual park and building within that larger whole…
…Nature in the city must be cultivated, like a garden, rather than ignored or subdued."
-Anne Whiston Spirn, The Granite Garden, 1984

Urban agriculture is becoming a much studied practice in Canada, with the potential to mitigate several public health issues that result from highly urbanized communities. Links between urban agriculture projects and storm water retention, food insecurity, urban heat islanding, energy efficiency, air quality, climate change, habitat loss, social isolation and crime prevention have been documented.

The purpose of this report is to review the relevant literature that outlines the benefits of urban agriculture and take an inventory of the current urban agricultural activities in Waterloo Region.

Definition of Urban Agriculture

Urban agriculture can be defined in many different ways. This may be due to the fact that the concept of urban agriculture itself, is difficult to define [1]. Indeed, there has been at least one entire paper devoted to clearly defining it.[2] In general, however, urban agriculture is defined as the basic activity of growing food, whether it is fruit, vegetables, herbs or protein (fish or livestock) in or around the city environment.[3] It can also include activities associated with for-profit enterprises, social organizations, contributing to an individual's or family's food needs, or simply be an enjoyable pastime[4].

The scope of this report will further narrow the definition of urban agriculture to include:

- specific methods of urban agriculture: community gardens, rooftop gardens (and green roofs) and private gardens (eg. backyards, etc.)
- specific products of urban agriculture: fruits, vegetables and herbs (excludes fish, livestock and bees)

Rooftop Gardens vs. Green Roofs

The terms *rooftop gardens* and *green roofs* are often used interchangeably. Both mean that the flat top of a building has been modified to grow vegetation. This is usually done by covering part or the entire roof with layers that include a barrier to prevent root growth, a growing medium (usually soil), and then seed or plants. A green roof would consist of vegetation that does not require much soil depth or much maintenance (e.g. sedum which is a drought resistant perennial plant), and often a growing medium that is much lighter than soil. A rooftop garden, on the other hand, is focused on producing food or herbs (in addition to plants

and flowers), and therefore requires more attention and upkeep, and often a greater soil depth. Rooftop gardens are sometimes referred to as an "intensive" green roof [9], but for clarity in this report, it will be referred to as a rooftop garden.

Much of the research that has been done on the benefits (environmental and economical) of green roofs has not focused on rooftop gardens specifically. However, many of the benefits of green roofs are benefits that rooftop gardens provide as well. Therefore, this study will focus on rooftop gardens but will also refer to green roofs on occasion.

The Benefits of Urban Agriculture – Increasing the Health of a Community

Urban agriculture contributes to the quality of life and the health of individuals, families, and the community as a whole. To demonstrate this, a framework of community assets based on Hancock, Labonte, and Edwards' *Indicators that Count: Measuring Population Health at the Community Level*[5], as well as later work by Hancock[6] was used to structure this report. This structure was chosen because it provides a comprehensive vehicle for examining how urban agriculture can impact communities in numerous ways. Urban agriculture has the potential to impact the social, economic, environmental aspects of community, which in turn has important implications for people's health.

This framework uses three overlapping circles [see figure 1]. The circles represent economy, environment and community. The intersection of all three circles represents the health of the community. The circle of economy represents ***prosperity***, and considers financial aspects of a community as well as factors such as employment and unemployment. The circle of environment represents ***viability***, and considers community factors such as air quality, water quality, and the production and/or use of toxins. Finally, the third circle represents ***conviviality***, and considers community factors such as family safety and security, sense of neighbourhood/place, social support networks, and voluntarism/associational life. Together these three circles shape health status of the community.

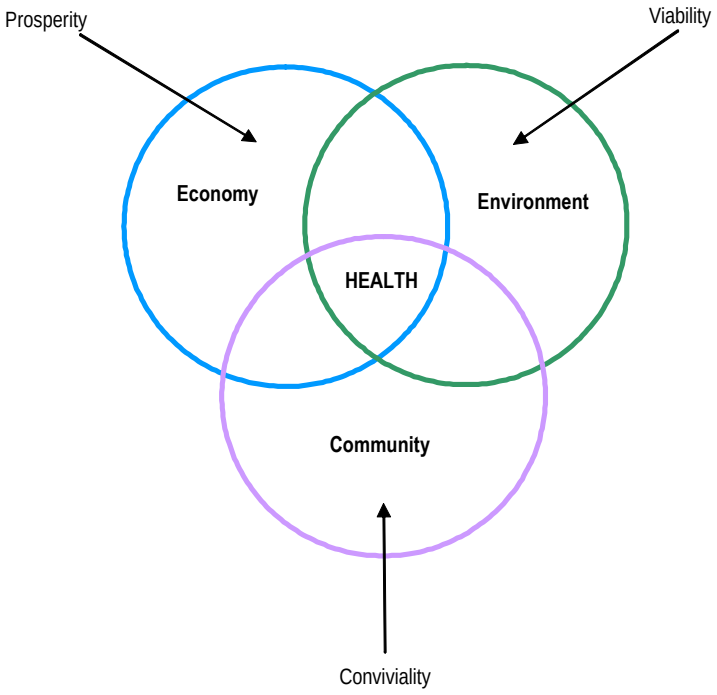


Figure 1.
Hancock's framework for representing community health.

The areas where the circles overlap represent other factors that contribute to community health [see Figure 2]. The combination of community and economy form the area referred to as ***equity***. Equity includes the issues of economic disparity, discrimination and inclusion, and access to power and control in a certain community. The combination of economy and environment together form the area referred to as ***sustainability***. Sustainability takes communities' water consumption, renewable resource use, waste production/reduction, local food production, land use, energy use, ecosystem health, and ecological footprint into account. Finally, the overlap between environment and community form the area of ***liveability***. Liveability concerns itself with density and land use, green space/open space, community safety and security, and noise pollution.

Many of the benefits of urban agriculture fit in the areas of liveability and sustainability.

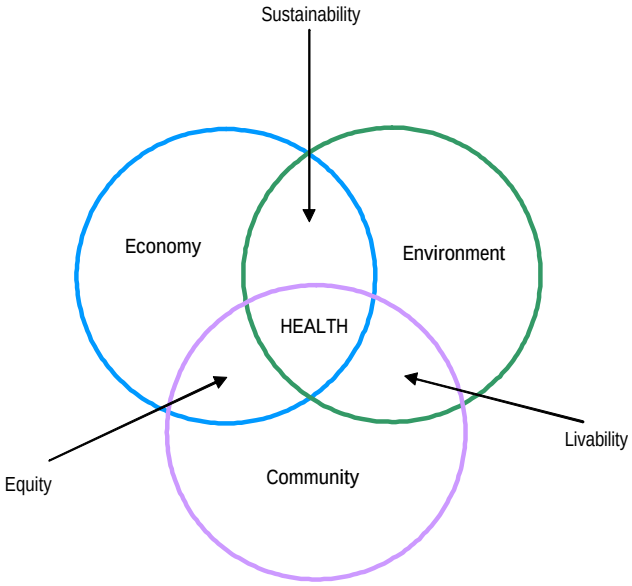
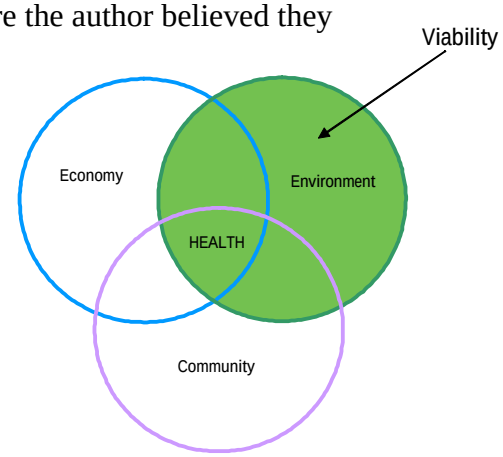


Figure 2. *Circles overlap to represent sustainability, liveability and equity.*

Hancock's framework provides a useful model to understand the various ways that urban agriculture contributes to the health of a community. Urban agriculture contributes to many of these different areas, but most of its benefits fit under sustainability and liveability. The following sections outline these benefits according to framework area. Because of the overlapping nature of these areas, some benefits could fit in more than one place in the framework. For the sake of simplicity, the benefits are situated where the author believed they were best represented.

Viability



The circle of environment represents ***viability***, and considers community factors such as air quality, water quality, and the production and/or use of toxins.

Highly urbanized communities often present environmental challenges. The environmental benefits of urban agriculture are therefore key advantages to managing such challenges[7 8 9] and are presented below.

Improved Urban Stormwater Management

Urban stormwater is the water that runs off surfaces such as rooftops, paved streets, highways, and parking lots during precipitation. In most cases, it represents water which would be absorbed into the soil if the area was not built up and paved over. Having numerous impervious surfaces in urban areas can cause many problems, both in water quantity and quality.[9] A city's infrastructure must take stormwater runoff into account, resulting in systems which can be expensive to construct and maintain. Left untreated, urban stormwater may contain toxic metals, organic compounds, and bacterial and viral pathogens. Untreated stormwater is not safe for people to drink and not recommended for swimming. Further, stormwater is one of the leading contributors to urban waterway pollution.[10]

Greenroofs are "the single most effective solution to combat urban runoff".

Green roofs are specific forms of urban agriculture which have been associated with improved urban stormwater management. Green roofs work to reduce stormwater by retaining a portion of the precipitation.[11,9] They have been noted as "the single most effective solution to combat urban runoff from impervious surfaces".[12] In fact, 70 to 100 % of urban stormwater that falls on a green roof can be retained by the green roof's growing medium in the summer season and 40 to 50% during the winter months.[13] With green roofs, any stormwater runoff that does occur would be stretched out over several hours, reducing the incidence of flash flooding.[13]

The benefits of improved urban stormwater management translate into cost savings for municipalities. One report has stated that, in Toronto[a], if only 6% of the rooftops were 'greened', the stormwater retention capability would be over 3.6 million cubic metres per year. As an illustration, a stormwater storage tank built to achieve similar results would cost 60 million dollars.[14]

Green roofs also reduce environmental pollution of local waterways because they help to improve the quality of stormwater runoff. This is because pollutants are retained in the green roof material.[9] Finally, reductions in stormwater associated with green roofs create reduced risk for sewer overflows and flooding and erosion at stormwater discharge areas.[9]

Urban Heat Island Reduction

Another environmental benefit associated with green roofs is the reduction of the urban heat island effect. The urban heat island effect is when a metropolitan area is significantly warmer than its surroundings— nearby rural areas or countryside. On hot summer days and nights, temperatures in urban centres can be anywhere from 2 to 6°C warmer than the surrounding countryside.[b] There are several causes of urban heat island, one of which is directly attributed to vegetation being replaced by asphalt and concrete for roads, buildings, and other

[a] Note that Toronto has many green roofs and rooftop gardens, and much of the local research in this report focuses on Toronto. Even though Waterloo Region is a smaller area with a less-concentrated downtown, the climate is similar and many of the benefits found in Toronto research would apply to Waterloo Region as well.

[b] The urban heat island effect should not be confused with global warming. Heat islands describe local-temperature differences between urban and rural areas. In contrast, global warming refers to a gradual rise of the earth's surface temperature. However, summertime heat islands may contribute to global warming by increasing demand for air conditioning, which results in additional power plant emissions of heat-trapping greenhouse gases. Strategies to reduce the urban heat island effect, therefore, can also reduce the emissions that contribute to global warming.

structures necessary to accommodate growing populations. The expanse of hard and reflective surfaces, such as roofs, absorbs solar radiation and re-radiates it as heat.[16]

A consequence of this urban heat island effect is increased energy requirements for cooling like air conditioning and refrigeration, especially in peak times. This, in turn, results in increased air pollution. Another consequence is increases in heat-related illness and mortality. Heat islands are considered a growing concern for urbanized centers.

Green roofs and rooftop gardens work to reduce the urban heat island effect by reducing the area of hard dark surfaces that tend to attract heat. Instead of such concrete building surfaces absorbing the sun's rays and converting it to thermal energy, green roofs or rooftop gardens allow for the majority of solar radiation to be absorbed by the vegetation and used for photosynthesis. Green roof or rooftop garden sun absorption therefore limits solar radiation release into the surrounding environment that would have contributed to temperature increases.[9] It has been suggested that in Toronto, covering only 6% of rooftops with vegetation would result in a 1 to 2°C (1.7 to 3.6°F) reduction of the heat island effect.[14]

Although it can be very difficult to calculate the energy cost saving derived from reducing the urban heat island effect[14], green roofs are considered to be a powerful way to counteract the urban heat island effect and achieve related environmental and energy-savings goals.

Greenroofs often result in reduced costs of meeting greenhouse gas reductions and adapting to climate change by reducing the "Urban Heat Island Effect" and the need for interior building insulation.

Air Quality Improvements

Since green roofs work to keep both outdoor and indoor temperatures cooler[c], they also provide indirect air quality benefits resulting from energy efficiency gains. Reduction in electrical demand can lead to power plants burning less coal which results in less chemical emissions in the air. This chemical emission reduction also can help to reduce smog.[9] One study found that, with 6% green roof coverage, the annual green house gas emission reductions were 1.56 Mega tonnes directly from buildings and 0.62 Mega tonnes indirectly from urban heat island reduction.[14]

Green roofs also improve air quality by removing air pollutants such as chemicals and allergens like pollen.[9] This improvement in air quality is linked to the reduction in heat island effect, as lower temperatures allow for low smog levels.[15] The study quoted above[14] also found that the 6% green roof coverage can reduce the incidence of smog advisories by 5 to 10% per year.

Since heat also makes poor air quality feel worse, lower temperatures would lead to improvements in perceived air quality. Benefits to the individual and the community related to better air quality are health related, as smog and other air pollutants makes air hard to breathe.[9]

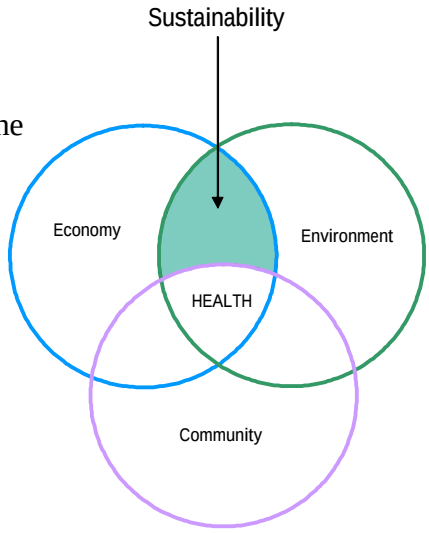
Urban agriculture has the potential to drastically improve air quality.

Any type of garden or vegetation (on land or on a rooftop) filters air that moves across it and improves air quality. For example, 1 m^2 (10.76 ft^2) of grass roof can remove between 0.2 kg of airborne particulates from the air every year. In addition to this filtering or air particulates, the vegetation's process of photosynthesis supplies animals and humans with oxygen and food (glucose). For example, 1.5 m^2 (10.76 ft^2) of uncut grass

[c] Green roofs keep indoor temperatures providing a layer of insulation that helps regulate indoor temperatures and protect from outdoor temperature fluctuations.

produces enough oxygen per year to supply 1 human with their yearly oxygen intake requirement.[16] *(See next section for air quality improvements resulting from local food production.)*

Sustainability



The combination of economy and environment together form the area referred to as *sustainability.* Sustainability takes communities' water consumption, renewable resource use, waste production/reduction, local food production, land use, energy use, ecosystem health, and ecological footprint into account.

Sustainability is a concern for urbanized communities. Urban agriculture has been associated with sustainability as food production is a major outcome of community gardens and rooftop gardens. The benefit of increased biodiversity has also been associated with urban agriculture.

Food Production

Citizens in a community can benefit from increased space for urban agriculture. Initiatives such as community or rooftop gardens contribute to urban food self-sufficiency and food security by helping to provide all citizens with increased access to nutritious foods.

Urban sprawl has contributed to a loss of productive agricultural land. Compounding this loss, a growing urban population contributes to increased food demand. Growing food in urban areas plays a role in local food security by providing much needed space to grow produce. The food produced in community gardens or rooftop gardens are local sources of food that require minimal travel distance to reach consumers. This reduction in food-travel to reach the consumer results in improved food quality, fewer greenhouse gas emissions, and often reduced costs. In terms of volume of food, one study estimated that if 6% of rooftops in Toronto were 'greened' and only 10% of these rooftops grew food, a yield of 4.7 million kilograms of produce per year would be generated.[14] It has also been documented that community gardeners consume more fruits and vegetables than non gardeners.[24] A diet high in fruits and vegetables has been linked to numerous health benefits.

Food produced in urban gardens can also benefit citizens who cannot afford fresh produce.

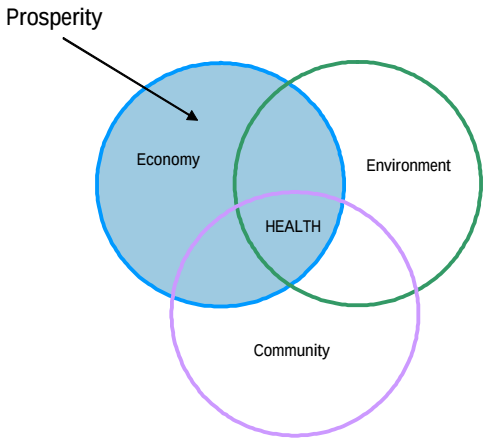
Food produced in urban gardens can also benefit citizens who cannot afford fresh produce. For instance, food produced can feed citizens who live on low income bracket or could supply local soup kitchens.

Rooftop gardens have also been used for commercial food production. Such commercial food production has the associated benefit of food cost savings that result in increased profit. For instance, the Fairmont Waterfront Hotel in Toronto saves an estimated $30, 000 annually in fresh vegetable and herb costs.[17]

Increasing Biodiversity

The current trend toward specialized food production in agriculture has contributed to great losses in biodiversity both within agriculture and on the surrounding wildlife. Restoration

of lost biodiversity, both within agriculture and on the surrounding wildlife, is therefore an important environmental benefit of urban agriculture. Urban agriculture can counteract specialized food production by growing a variety of produce. Further, urban agriculture has been associated with preserving rare and threatened varieties of fruit, vegetables, herbs, and flowers.[11] Additionally, urban gardens can provide suitable habitat and refuge for many invertebrates and bird species. [18]



Prosperity

The circle of ***prosperity*** considers economic and financial aspects of a community such as employment and unemployment.

Community gardens can boost economic development and tourism in a community.

Urban agricultural initiatives provide economic benefits to communities. Community gardens can boost economic development and tourism in a community. Gardens attract businesses and residents, thereby stimulating commercial growth and the promotion of inner-city revitalization.[19] In one study of community gardens, realtors and members of the Chamber of Commerce in the community attested that community gardens enhanced neighbourhood desirability for residents and businesses, which increased property values. The same study also found that community gardens likely contribute more to the upgrading of property values than they take away by not producing taxes.[7]

Local Employment

Urban agriculture can also create local employment [8,9] and generate income.[8] One study has estimated that covering 6% of the buildings in Toronto with green roofs would create jobs, both directly and indirectly, for 1, 350 people per year. Further, the market value of the food produced in these urban gardens would be 4 to 5.5 million dollars per year.[14] For green roofs in particular, jobs (and income) would be created in:

- manufacturing and selling materials designed specifically for green roof construction and maintenance
- selling specialized plants for green roofs (e.g. garden nurseries)
- designing and engineering of green roofs
- contracting and landscaping[16]

Private Amenity Space

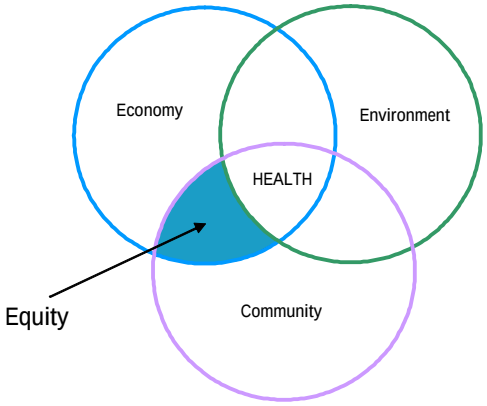
More greenspace is a good addition to any building or home.[9] The addition of private amenity space resulting from an addition of a rooftop garden or even a backyard garden could allow for increased financial benefit to building owners through increased rental income and

increased condominium fees. Hotels also could benefit financially by implementing rooftop gardens with higher hotel rates for rooms with garden views.[9]

Roof Durability and Reduced Costs

Ultraviolet rays and fluctuating temperatures can damage rooftops over time. This necessitates regular (and sometimes frequent) replacement of the roof membrane. Green roofs cover this membrane with soil and vegetation, and thus protect rooftops from ultraviolet rays as well as the stress caused by expansion and contraction. In this way, green roof reduce cracking and aging of roofs and enhance roof durability.[13] This enhanced durability results in rooftop life extension which contributes to cost savings and sustainability by reducing resource use.[9]

Green roofs insulate buildings by preventing heat from moving through the roof. Shading the external surface of the building envelope has been shown to be more effective than internal insulation. In fact, the Possman Cider Cooling and Storage Facility in Frankfurt, Germany yielded a 2-3 year payoff of their green roof system through savings in heating and cooling costs, as well as in equipment costs, since additional cooling towers had become unnecessary.[16]



Equity

The combination of community and economy form the area referred to as ***equity***. Equity represents the presence (or absence) of economic disparity, discrimination and inclusion, and access to power and control in a community.

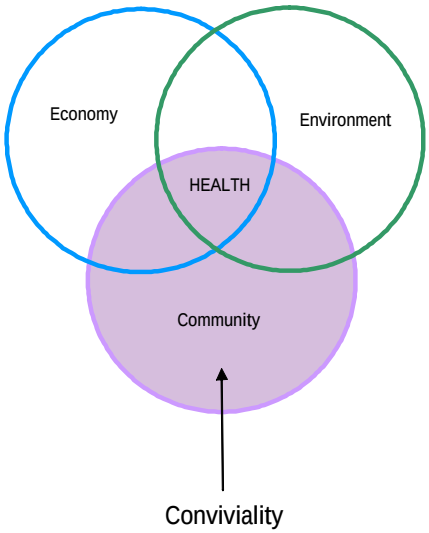
Growing food, whether on a rooftop or in a community or backyard garden, provides benefits to people from diverse backgrounds, languages, and cultures. "Food growing can be a way for ethnic minorities, the elderly, and people with disabilities to regain pride in their identity and to promote that positive self-image to others."[11] People from diverse ethnic backgrounds can grow food from their own culture as a way to maintain cultural traditions or reclaim and revalue their culture.[11,20] Community gardens are also considered spaces in which people from different backgrounds can successfully come together.[20] Gardening is an international activity that crosses cultural gaps. Food growing can serve as a way of breaking down barriers between people through a focus on the common interest of food.

Community gardens are considered spaces in which people from different cultures can successfully integrate.

Growing food can also increase access to healthy fruits and vegetables for people living on low-income. Growing food is a cost effective way of meeting or supplementing a family's nutritional needs. Often, working together in a community garden can lead to participation in other community supports such as collective kitchens. Such activities have the added benefit of providing a sense of dignity for people with low income; they are able to participate in the producing of their own food rather than simply receiving it. Often, they are eventually able to

use gardens and collective kitchens as a way to give something back to their community. Therefore, food produced in community or rooftop gardens can be used as a way of combating poverty in a community.[8]

Conviviality



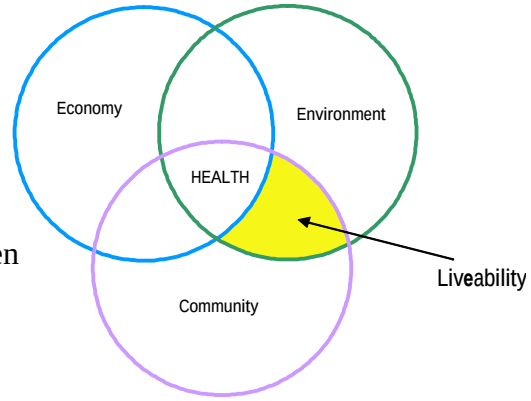
The community circle represents ***conviviality***, and considers community factors such as family safety and security, sense of neighbourhood/place, social support networks, and voluntarism/associational life.

Urban agriculture can give residents a sense of community, which is experienced as a sense of sharing or belonging as a member in a community. Community empowerment, attachment to locality, and the sense of ownership that can be generated from food projects can stimulate more involvement in local issues which can lead to effective action to defend and improve community amenities.[11] Social isolation is also reduced when people have a community garden in which to participate. Testimonies from community garden participants in Waterloo Region have shown that the garden provides a "welcome respite from city life" and a way to make new acquaintances when they have found themselves to be isolated by their circumstances.[21]

Community gardens are known for instilling a sense of community in an area; they are seen as one of a community's most participatory local civic institutions.[22] Citizens can be empowered by learning the horticultural, political, economic, and social skills involved in community gardening.[23] Finally, a comparison of gardeners and non gardeners indicated that gardeners were more likely than non gardeners to participate in their community and to have higher life satisfaction. This study also showed that community gardens were considered to be social centers and sources of pride; they provided social cohesion for gardeners[24].

These concepts of social cohesion and sense of neighbourhood are important to residents of Waterloo Region. The Reurbanization Market Analysis and Feasibility Study for Waterloo Region conducted focus groups where "participants were also clear to express the advantages they saw in living in reurbanization neighbourhoods, such as walkability, convenience, and a stronger sense of community. The last point was particularly interesting: participants felt that urban neighbourhoods, and well-designed higher density developments, could offer a strong sense of belonging or community, and that these characteristics would positively influence their housing choice."[25]

Liveability



The overlap between environment and community form the area of ***liveability***. Liveability concerns itself with community factors such as density and land use, green space/open space, community safety and security, and noise pollution.

Urban agriculture provides benefits which increase the liveability of a community. These benefits, outlined below, include increased physical activity, horticulture therapy, effective sound insulation, improved safety, enhanced community greenspace and aesthetic value.

Increased Physical Activity

In a society where obesity is an issue of concern, urban gardens create an opportunity for residents to increase their physical activity through gardening. Gardening is also a form of physical activity in which many people can take part, despite mobility restrictions. For instance, raised garden beds can be a form of gardening in which people with limited mobility, such as people in wheelchairs, can take part. Gardening is also enjoyed by people of all ages. The link between increased physical activity and community gardens has been well documented in the literature.[26]

Gardening is a form of physical activity in which almost all people can take part.

Horticulture Therapy and Health Benefits

Public or private vegetation has been shown to positively affect psychological and physical well-being. In fact, one study compared surgical patients in hospital who had a view of a landscaped courtyard versus those who had a view of a brick wall. Those with a view of the garden required shorter recovery times, less medication, and had fewer negative evaluation comments from the nurses.[27]

Psychological studies have shown that the restorative effect of a natural view holds the viewers' attention, diverts their awareness away from themselves and from worrisome thoughts thereby improving health. People living in high-density developments are known to be less susceptible to illness if they have a balcony or terrace garden. This is partly due to the additional oxygen, air filtration and humidity control supplied by plants but also from the therapeutic benefits that result from caring for plants. The variety of sounds, smells, colours and movement provided by plants, although not quantifiable, can add significantly to human health and well being.[16] Spiritual health is also nurtured through gardening since many people find that being close to the earth enhances their connection with their creator.

Health benefits associated with vegetation were also found in another study that associated reductions in stress and improved health with exposure to nature.[28] People with mental illness often find that a community garden is a place of acceptance for them and a respite from city life.[21] Finally, public vegetation could potentially result in a decrease of sick-days resulting in private employer benefit.[9]

Courtyard Garden atop Grand River Regional Cancer Centre, Kitchener

In Waterloo Region, Grand River Hospital has four rooftop gardens: the two described below are on the new Grand River Regional Cancer Centre (GRRCC) and there are two others in various wings of the hospital. The Healing Garden is located at the Chemotherapy and Outpatient Clinic level of the GRRCC. The

garden is accessed directly from the waiting area and has been designed to provide a welcoming and calming environment for patients, their families and staff. A wood trellis provides shade and a large, bronze-weired water pool provides the sound of falling water. The plants provide scent and colour.

The Terrace Green Roof located above the radiation treatment rooms is not accessible to the public due to safety requirements for radiation exposure; however, the garden provides a natural landscape view for the staff offices located on the top level of the Cancer Centre. This garden contributes to the overall radiation shielding strategy for the six radiation treatment rooms situated below. Any radioactivity in the soil will dissipate over time.[29]

Sound Insulation

Noise pollution is often associated with urban areas due to increased density, heavier traffic, and an abundance of hard surfaces. Both green roofs and rooftop gardens have been linked to decreases in noise pollution that is often associated with urban areas. This reduction in sound is accomplished through the absorption of sound waves by soil and plants.[9] At the Grand River Regional Cancer Centre, for example, the plantings on the green roof in the Courtyard Garden help to absorb nearby traffic and rooftop equipment noise so that the running water in the garden pool can be heard and enjoyed by patients.[29]

Safety

Reduced crime has been associated with communities that have community gardens.[30] The mere presence of people spending time outside in community gardens may discourage crime. In fact, widely-spaced vegetation,[d] such as a community garden, can deter crime by increasing surveillance and mitigating some of the psychological precursors to violence.[31] When people have invested in a community garden, they are present in it (providing surveillance) and they are more apt to want to protect it from crimes such as vandalism. Community gardens also provide safe places for residents in high-risk communities, including places for children to play and learn.[32]

Community Gardens have the locally-demonstrated potential to mitigate crime.

A local example of how community gardens can decrease crime is the Victoria Hills neighbourhood of Kitchener. After a community garden was established on a vacant lot in the centre of that community, police incidents decreased by 30% the first summer, and almost 56% by the end of the third summer. In addition to these statistics, people from the community have also indicated that they felt safer in their community after the establishment of the community garden. Reasons for this feeling of safety included "the physical presence of people in the garden late into the evening"; the fact that they "knew more people in their neighbourhood"; and the feeling that "neighbours were also watching out for them, their children and property".[33]

[d] Dense vegetation, such as forests, has been associated with higher fear of crime, as they are perceived as providing a cover for criminal activity. However, widely-spaced vegetation has been shown to have the opposite effect, reducing fear of crime.

Community Greenspace and Aesthetic Value

Urban agriculture initiatives can improve aesthetic value of a community and provide more outdoor space for residents and visitors. Rooftop gardens provide a pleasing and convenient space for residents.[9] Studies show that leisure activities in natural settings such as gardens and parks are important for helping people cope with stress and in meeting other non-stress-related needs.[16] Widespread implementation of rooftop gardens and community gardens could potentially provide more recreational and leisure space for urban residents.

Natural settings such as gardens and parks are important for helping people cope with stress.

Greenspace is also increasingly being recognized as a vital component to improved quality of life. In one study, low crime with safe streets and access to greenery and open space were the major elements cited as crucial for a satisfactory quality of life.[34] In fact, the *1995 New York Governor's Report on Open Space* recommended a minimum of 2.5 acres of open space per 1000 people. Other organizations, including the Council on the Environment, the Neighborhood Open Space Coalition, and Trust for Public Land, have asserted that open space is crucial to quality of life of city residents.[35] The Region of Waterloo has recognized the importance of greenspace and has responded by developing and implementing a Greenlands Strategy which seeks to balance anticipated population growth with environmental planning and stewardship.[36]

As demonstrated by using this healthy communities framework, urban agriculture has the potential to positively impact a community's health environmentally, socially, and economically.

Challenges to Urban Agriculture

While there are many benefits associated with urban agriculture, there are also several challenges mentioned in the literature. The main challenge is that some of the benefits described above are difficult to quantify because of their social nature. An effective cost-benefit analysis is difficult to outline.[9,7]

Many of the above listed tangible benefits to green roofs present some challenges. When constructing a new building with a green roof, many of the specifications for a green roof can be worked into the planning process. When retrofitting a building with a green roof, however, there is a need to determine whether the building can sustain the additional weight of a garden, water, etc. If the building cannot sustain the extra weight, provisions would need to be made to fortify the building.

Accessibility to rooftop gardens could also pose a problem for people with mobility issues. Provisions would need to be made so that people with such disabilities could access the garden (e.g. elevator lift or ramps directly to the rooftop).

One of the greatest barriers to installing a green roof or rooftop garden is cost. Even though the cost of installing a green roof is offset by savings incurred later on, the upfront payment for such a system can be a deterrent to installing a green roof.

The issue challenge associated with insurance extends to both rooftop gardens and community gardens. In the case of rooftop gardens, insurance may be difficult or expensive to obtain for building owners as there is considerable risk involved with people being on the rooftop in order to maintain the garden. As this is a relatively new issue to the insurance

industry in Canada, countries such as Germany and Japan could serve as models for how insurance is provided for rooftop gardens.

Community gardens in Waterloo Region continue to face a similar challenge – liability insurance. In most cases, property owners agree to provide land space to community gardens, but are either unwilling or unable to pay for additional liability insurance that would need to be added to their existing insurance policy. Some municipalities also require a group of community gardeners to provide their own liability insurance coverage before being permitted to use municipal land for gardening space (M. Hill, personal communication, July 7, 2005).

Future Population Growth

The need for urban agriculture in the form of community gardens, green roof, and rooftop gardens, will increase with the anticipated population growth and increased urban density. Space for private gardens will decrease as lot sizes for homes or commercial buildings decrease. Therefore rooftop gardens would be a possible solution to allow for maximum building area and achievable economic potential.[37]

Potential environmental benefits of urban agriculture offset the consequences of population growth and urban density such as traffic congestion, energy waste, increasing air and noise pollution, increases in urban heat islands, loss of contact with nature, natural habitat loss, and loss of productive agricultural land.

With the potential for fuel prices to continue rising, the cost of transportation of food from distant sources will also rise and contribute to higher prices at the supermarkets. Growing more food locally is a good alternative, as it can reduce transportation costs and greenhouse gas emissions.

Inventory of Urban Agriculture Activity in Waterloo Region

Community Gardens

A Community Garden Council exists in Waterloo Region. The purpose of this council is for citizens from different community gardens to come together and share information and resources. The Community Garden Council started with a handful of gardens and has since grown to approximately 31 gardens across the Region. This community group is currently supported by the Region of Waterloo Public Health. A listing of the community gardens for the 2005 growing season can be found below[e]. As can be seen from this listing, there is a minimum of approximately 679 individual plots available for community gardeners. This does not include gardens where the number of plots was not provided, or gardens where many gardeners

[e] Please note that there may be other community gardens not aware of or associated with the Community Gardens Council, and therefore not included in this listing.

contribute to one communal plot. If all plots are occupied and individual gardeners do not have more than one plot, it can be assumed that there are *at least* 679 people in Waterloo Region who participate in community gardening. Indeed, this figure is probably low, as one plot often involves more than one person (e.g. a family tends to a plot together), and not all gardens list number of plots.

Listing of Waterloo Region Community Gardens for 2005 Growing Season

Name of Garden	Location	Size of garden/ # of plots	Features and Details
Beaver Creek Community Garden	Beaver Creek Housing Co-op, Waterloo	20 plots, each 5' X 20' (size varies)	Members of co-op grow organic produce
Bridgeport Hispanic Agricultural Group	Bridge and Schweitzer Streets	41 plots of 100' X 100' for a total of 8-10 acres	
Brighton Yards Co-op Housing Community Garden	Brighton Yards Housing Co-op, Waterloo	12 plots, each 10' X 10'	Residents in co-op grow organic produce and flowers
Centreville-Chicopee Community Garden	141 Morgan Avenue, Kitchener	6 plots	
Chandler-Mowat Community Garden	Chandler Park, Kitchener	Approximately 25 plots	
Christ Lutheran Community Garden	Christ Lutheran Church, Waterloo	35 plots, some raised beds	Accessible location with a great diversity of gardeners and a wealth of garden information
City of Kitchener Allotment Garden Plots	1541 Westmount Road E, Kitchener (behind Williamsburg Cemetery)	219 plots, 20' X 20'	Land and services provided by City of Kitchener
Courtland-Shelley Community Garden	Vanier Park, Kitchener	20 plots, 10' X 10' each	Many English as a Second Language gardeners
Doon-Pioneer Park Community Garden	150 Doon Pioneer Drive, Kitchener	16 pie-shaped plots, each 22' long	
Forest Hill United Church Community Garden	Westmount Road, East, Kitchener	Plots are approximately 10' X 11'	
George Lippert Community Garden	Huron Park, Weber Street, Kitchener	10 plots, each 10' X 10'	
Kingsdale Community Garden	2361 Kingsway Drive, Kitchener	10 plots, each 10' X 10'	
May Place Community Garden	May Place, near Cedar and Weber Streets, Kitchener	8-10 plots, each 10' X 10'	
McDougall Road Garden	52 McDougall Road, Waterloo	60' X 80'	On private property, open to surrounding neighbours
Mount Zion Community Garden	Mount Zion Lutheran Church, Westmount Road, Waterloo	14 plots (?), each 10' X 10'	Have own water tank, composters and tool shed

Name of Garden	Location	Size of garden/ # of plots	Features and Details
Peace and Carrots Community Garden	St. James Rosemount Church, Kitchener	16 plots, each 5' X 20'	Labyrinth and garden promoting peace
Regal Acres Community Garden	Behind Regal Capital Planners, Union Street, Kitchener	30 plots, each 10' X 10'	
Rosemount Millennium Community Garden	Krug Street, Kitchener	14 plots, each 10' X 10'	One plot dedicated to producing food for charities
Steckle Gardens	J. Steckle Heritage Homestead, Kitchener	Varies	
Sunnydale Friendship Community Garden	Sunnydale Place, Waterloo	10 plots	Ethnically diverse group of gardeners overcoming language barriers by building community
The Good Earth Garden	St. John's Lutheran Church, Willow Street, Waterloo	90 plots, each 10' X 12'	Both sun and shade in organic garden
The Queen's Greens Community Garden	Across from Joseph Schneider Haus	22-25 plots, each 10' X 10' and one 10' X 20' raised bed	
The University of Waterloo Community Garden	University of Waterloo, Waterloo	10 plots	Available to staff or students
Trinity Village Community Garden	Catalpa Greenway in Trinity Village, Kitchener	10 plots	
Victoria Hills Multicultural Garden	Victoria Hills Community Centre, Kitchener	25 plots, 15' X 15'	Gardeners from many different backgrounds share common interest in gardening
Wilmot Community Garden	Private Property of member of Trinity United Church	12 plots	Sponsored by: New Hamburg Family Resource Centre
Woolwich Community Garden	South Street and Snider Avenue	8 plots, 20' X 20'	Sponsored by Woolwich Community Services
Woolwich Community Garden	First Street and Arthur Street	6 plots, 20' X 20'	Sponsored by Woolwich Community Services
Diversity Gardens	Notre Dame Drive, St. Agatha	2 acres	Training and workshop garden
Good Gardens Grow Good Foods	Guelph Street, Kitchener	No separate plots	Volunteers grow food here for people receiving Emergency Food Hampers
GROW Herbal Gardens	50 Kraft Drive The Working Centre, Kitchener	One communal garden	Grows culinary and medicinal herbs, seedlings and makes herbal products to sell (sponsored by The Working Centre)
The Kitchen Community Garden	50 Kraft Drive, Kitchener	One communal garden	Grows food for St. John's soup kitchen

Green Roofs and Rooftop Gardens

The green roofs and rooftop gardens existing to date in Waterloo Region have been created because the owners, organizers, developers and/or architects have seen the value in having them. They have not been connected by a shared vision or shared support.

The City of Waterloo completed a Green Roof Feasibility Study in January 2005 which outlined the numerous benefits of green roofs and recommended green roofs for certain areas and buildings within the City of Waterloo. This study also includes the proceedings from the Green Roof Waterloo strategy forum held in April 2003. This forum brought together various stakeholders to discuss benefits of green roofs and strategies to move forward with the creation of green roofs in the area.

In July 2005, staff from the Region of Waterloo and the City of Waterloo (and later joined by staff from the City of Kitchener) went on a tour of some green roof sites in the Region. It is hoped that by viewing the gardens and learning about the benefits, staff will be able to advocate for green roofs in their various capacities and even form a steering committee to implement additional green roofs in Waterloo Region.

Listing of Waterloo Region Green Roofs and Rooftop Gardens as of 2005

Name	Location	Notes
Waterloo City Hall	100 Regina Street South, Waterloo	Completed August 2005; extensive green roof with sedum plants
Perimeter Institute	31 Caroline Street North, Waterloo	
Accelerator Centre Research and Technology Park (University of Waterloo)	295 Hagey Blvd, Waterloo	Under construction as of August 2005; scheduled to be completed by September 2005
The Record Market Square	160 King Street East, Kitchener	
Grand River Hospital	835 King Street West, Kitchener	This site has multiple rooftop gardens and green roofs. The hospital has 3 as of July 2005 (with plans for more) and the Grand River Regional Cancer Centre (adjacent building) has 2.
Mary's Place	84 Frederick Street, Kitchener	Several intensive gardens separated by patio stones provide solace and space for residents at this women's shelter

Urban Agriculture in the Backyard

In June 2005, the Region of Waterloo commissioned a telephone survey to seven different neighbourhoods in the Region[f]. A few of the questions on this survey (see Appendix A) were designed to better understand the extent of urban agriculture on private, residential property (e.g. backyard gardens). This section outlines the findings from those questions on the survey.

In the neighbourhoods surveyed, 38% (*N=1029)* of respondents indicated that they grow their own food (i.e. vegetables, fruits, berries, nuts or herbs). The proportion of residents who grow food is the same in males and females, for all age groups, and income levels. Each of the three cities included in the study (Waterloo, Kitchener, and Cambridge) also had the same proportion of residents who grew their own food. However, length of residence in Canada is associated with food growing. Residents who had lived in Canada more than 10 years are more likely to grow their own food than those who had lived in Canada for less than 10 years ($p = .03$).

Generalized profile for those growing their own food in Waterloo Region:

- *Grow food in backyard*
- *Live in established suburb or near downtown*
- *Have lived in Canada for at least 10 years*

Interesting to note is that, of the 80 physically challenged[g] respondents surveyed, 22% (n = 18) grew their own food. This speaks to the fact that gardening is a form of physical activity in which some residents with physical challenges can participate.

Finally, respondents grow their food mostly in backyard gardens (90%). However, other places to grow food indicated by residents were: fruit trees or bushes (9%), on the balcony (5%), indoors (3%), in a greenhouse (2%) in a community garden (2%), or in a front yard garden (1%) [h].

Even though just over one third of respondents grow their own food, the majority of residents (70%) surveyed indicated that growing their own vegetables was important to them.

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[f] For the complete list of survey questions, as well as results from this study, please contact Pat Fisher at Region of Waterloo Public Health: fpat@region.waterloo.on.ca

[g] These respondents indicated on the survey that they could not walk for more than 10 minutes.

[h] Respondents could provide more than one response for this question.

Potential for Expansion of Urban Agriculture Activity in Waterloo Region

The City of Waterloo has shown leadership in one area of urban agriculture: green roofs. City of Waerloo staff there have recently completed a Green Roof Feasibility Study, and in 2003, they partnered with the Region of Waterloo to offer a workshop on green roofs for interested stakeholders. This workshop was well-attended, and attests to both the growing interest in green roofs as well as the potential for moving forward with strategies to incorporate more green roofs into building plans. This Feasibility Study scoped out areas of the City of Waterloo where green roofs would have the most environmental impact and listed potential sites for green roofs. The Region could consider leading by example with green roofs on Region-owned buildings and community gardens on Region-owned land.

One local study indicated that Uptown Waterloo[i] redevelopment in the future could incorporate green roofs in its design.[9] Much flat roof space for rooftop gardens exists in Uptown Waterloo. In fact, available flat roof space for rooftop gardens in Uptown Waterloo was estimated at 26,000 square meters. If 10% of such available roof space were to be utilized toward food production, nearly two-thirds of an acre of space would be available to provide Waterloo residents with fresh vegetables and produce.[9] Green roofs would allow for a more prestigious, desirable, and welcoming Region.

Some policy recommendations are in order to support urban agriculture initiatives. Several ideas exist for such recommendations, especially from other cities where urban agriculture has become not only highly valued, but entrenched in planning. In Germany, for example, over 10% of flat roofs have green roof infrastructure, the result of direct investment and/or regulatory requirements by local governments.[16] Policies to support urban agriculture should be created in consultation with various stakeholders throughout the Region of Waterloo. In particular, forming partnerships with leaders in this area such as the City of Waterloo (green roofs), the City of Kitchener (community gardens) and The Working Centre (urban agriculture) are encouraged.

[i] Currently, local research about feasibility of increasing the amount of green roofs has focused on the City of Waterloo rather than the entire Region

Conclusion

This report has given an inventory of urban agriculture activity in Waterloo Region and outlined the numerous benefits of incorporating urban agriculture into urban design. These benefits extend to various facets of community health. Greenspace, including that provided by urban agriculture, is an important inclusion in urban planning. Focus groups in the Reurbanization Market Analysis and Feasibility Study for Waterloo Region[25] stated that: "Greenery is very strongly desired – including trees, grass, landscaping, yards, and parks;" and gardens, community gardens, rooftop gardens, patios and greenspace were all mentioned as desirable in an urban dwelling. In addition to this, the Urban Environmental Accords: Green Cities Declaration was signed by mayors of large cities around the world on June 5, 2005. [38] Included in this declaration are 21 actions that cities can take to improve the environment and increase their own sustainability. Three of these actions could include urban agriculture as a strategy:

- **Action 7:** Adopt a policy that mandates a green building rating system standard that applies to all new municipal buildings.
- **Action 10:** Ensure that there is an accessible public park or recreational open space within half-a kilometer of every city resident by 2015.
- **Action 17:** Promote the public health and environmental benefits of supporting locally grown organic foods. Ensure that twenty per cent of all city facilities (including schools) serve locally grown and organic food within seven years.[38]

These things combined indicate quite strongly that community gardens, rooftop gardens and green roofs have a place in our communities, and that urban planning should strive to include urban agriculture in its design.

Appendix A

Three questions from neighbourhood survey which are applicable to urban agriculture report.

Question f10:
Do you, or does anyone in your household grow food in your yard, on your balcony or in a community garden? By food, we mean vegetables, fruit, berries, nuts or herbs.

Question f11:
And where do you grow that food?

Question f12:
For the following statement, please tell me whether you strongly agree, somewhat agree, somewhat disagree or strongly disagree. “It is important to me to grow my own vegetables.”

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