

# Greening Rooftops in the Garden City

**Abstract** This paper examines the potential for increased urban agriculture in Victoria, British Columbia, known as the "Garden City." Specifically, it discusses the potential for rooftop gardens as an important part of the solution to food security issues on Vancouver Island. The Island is heavily dependent on mainland food suppliers and transportation links, and is particularly vulnerable to food insecurity should these links be severed. Food security can be defined as, the physical and economic access to safe and nutritious food to meet dietary needs. Rooftops gardens are an untapped resource in Victoria and offer 'land' tenure and access, for residents who wish to produce their own fruits and vegetables. Green technologies in roofing systems are being developed across Europe and not only provide space for food production, but also yield environmental benefits such as building insulation, decreased energy costs, urban cooling and increased air quality. North America has not yet caught on to the benefits of promoting green roofs and actions must be taken to encourage governments at all levels to support these initiatives. There are a number of local organizations in Victoria that are working to promote the benefits of locally produced food and the potential for urban agriculture. Rooftop gardening is an integral part of this food production system and should be increased in Victoria.

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**Introduction** The world economic system is rapidly opening up markets with corporate profit as the end goal. Agribusiness in British Columbia is no exception and the food we eat has largely become commodified, escaping the notion that access to food is a basic human right. With the dominance of the agrifood sector, the increased mechanization of farming world-wide and the hidden costs of transportation associated with our food, Vancouver Island is more threatened by issues of food security, or access to food, than ever before. The Island's supermarkets are stocked with a limited amount of supplies and would be stretched to adequately serve residents should an earthquake or other disaster cut off our transportation links to the mainland. Victoria in particular has become reliant on importing food to feed its citizens. However increased efforts to change this situation are being made by various groups, such as Lifecycles and The Greater Victoria Compost Education Centre, who recognize that food production is not only a necessity, but a catalyst for tackling issues of social justice, poverty and environmental and human health (Moffet and Morgan 1998). One such effort that has not been adequately addressed in Victoria thus far is the potential for rooftop gardens as part of a larger urban agriculture system. Victoria has a moderate climate ideal for food production year-round. The potential for rooftop gardening in the Garden City is an important part of the solution to food security issues on Vancouver Island.

**Food Security** Food security is usually defined as "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (Pinstrup-Anderson and Pandya-Lorch 1998, 59). It may also be referred to as "household" or "community" food security; that is, access by groups of people to an adequate food supply (Phillips and Taylor 1998, CRD 1999). Not only should the food be safe and nutritious, but it must be culturally appropriate and environmentally and socially sustainable (CRD 1999). Access to food includes having a dependable income to purchase food or access to land for food production (BC's Action Plan 1998). Global food insecurity has its roots in poverty and a number of socio-economic factors. Our current agro-industrial food system undermines the needs of local communities, and it is likely that "prospects for a food-secure world will remain bleak if the global community continues with business as usual" (Pinstrup-Anderson and Pandya-Lorch 1998, 37).

**Local Agriculture** There are approximately 21 835 farms in British Columbia, 3900 of which are located on Vancouver Island and 1082 within the Victoria Capital Regional District (BC's Agri-Food Industry

1996, Junger 2000, CRD 1999). BC farms provide the equivalent of 60% of the province's total food requirements. However, on the Island only 10-20% of the food we consume is locally produced (Believe BC 2002, CRD 1999). Agriculture is BC's second largest primary industry, providing 61000 direct jobs and 3100 direct jobs for Vancouver Islanders (Believe BC 2002, Junger 2000). Although a large variety of fruits, vegetables and berries are grown on the Island, milk and eggs are our only self-sufficient commodities (CRD 1999). Despite a long growing season, mild winters and an increasingly aware consumer base, CRD farmers are still faced with adversity, particularly due to competition in agribusiness that lowers farm product values (CRD 1999).

Local Food Security In Victoria, those most vulnerable to food insecurity are First Nations, single mother households, the physically disabled, recent immigrants and those who have not completed high school education (BC's Action Plan 1998). In other words, Victoria's silenced and socially isolated are the most likely to face food insecurity. However, as previously stated, all of Vancouver Island is in a state of vulnerability due to its location and reliance on off-island food sources. "Community food security needs to be focused on the concept of food citizenship or food democracy, which requires that we move beyond the notions of food as a commodity and people as consumers" (Welsh and MacRae 1998,238). The community of Victoria needs to 'take back the city' and create access to food through urban stewardship. Rooftop gardening is just one measure that would enable Victorians to become 'food citizens' and limit their vulnerability to the fluctuations of the world market (Perkins 1996).

Greening Roofs Rooftops gardens can be as simple as free-standing containers that hold a few plants, to a technologically advanced layering system usually referred to as a "green roof" (peck et.al. 1999). Any type of roof is theoretically suitable for a rooftop garden, even sloped roofs that may still be able to hold a layer of sod (RGRG 2002). "Inaccessible" green roofs are vegetation covered, but not meant to be walked upon (Kuhn 1996). They are extensions of the roof, incorporating layers of a root repelling membrane, drainage system, and soil to grow grasses, mosses and wildflowers (GRHC 2002). A rooftop garden is typically on an "accessible" roof and adheres to safety regulations. Exits, railings and lighting are usually incorporated to encourage utility and comply with building codes. Plants may be grown in containers, raised beds or directly onto a layering system to accommodate drainage, protection of the roof from roots and waterproofing (Kuhn 1996). Various technologies may be used on green roofs such as hydroponics, aquaculture and vermiculture to deal with food wastes, for example (Wilson 1999).

The benefits of greening roofs are many. Green roofs use sustainable technologies and create jobs to produce roofing membranes, light weight growing mediums and filters (Kuhn 1996). In addition, jobs are created in research, design, construction, landscaping, urban farming and consulting (RGRG 2002). Green roofs reduce the "urban island" effect whereby cities absorb and produce excess heat Plants absorb CO2 emissions and improve the air quality, while also absorbing heat and causing a cooling effect Green roofs also insulate buildings and may reduce energy costs from 10-20%, lowering the usage of greenhouse gases in turn (Kwik 2002). They can retain storm water and generally use much less water for irrigation of plants. Green roofs may retain 50% of winter precipitation that falls on them, and up to 100% in the summer months (GRHC 2002). Due to their easy access and location within the city, pests and diseases may be more easily controlled in urban gardening, resulting in a decreased use of chemical pesticides (Wilson 1999). The lifespan of the roof may actually be lengthened with vegetative cover, as the roof membrane is protected from UV rays and temperature fluctuations. In addition, many social and community benefits result from greening roofs; improved gardening safety from vandals or pests, city beautification, community building through urban gardening, preservation of bird habitat and improved property values (GRHC 2002, RGRG 2002, Meletist and Webster 1999).

Food Production Reaches New Heights An important opportunity from greening rooftops is the potential for local food production. Rooftops provide accessible land tenure for urban farmers since the majority of other activities within the city do not compete for roof space (Meletist and Webster 1999). By growing food on rooftops, citizens have an opportunity to contribute to the local economy, increase their own food security, grow fresh organic produce and decrease the time and transportation costs between themselves and their food (GRHC 2002).

There are basically two types of roofing systems; extensive and intensive. Extensive systems have a low weight burden, low capital costs and low maintenance associated with them. Intensive systems add more weight, capital costs, maintenance and intensive planting, and are the most suitable for food production (Peck et.al. 1999). While container rooftop gardening may not require a very dramatic increase in load, there is still the consideration of more weight burden due to people, containers, decking, etc. (Kuhn 1996). However, weight may be strategically placed over bearing walls and columns, and while soil is heavy when wet (about 100 lbs/cubic foot- approximately 50 kg/0.06 m<sup>3</sup>), it is not the only growing medium available. Lighter material such as compost, fillers and gravel may be used, and not all plants require great depths of growing medium (Kuhn 1995). It is important to have a structural engineer assess the roof and its membrane to determine what kind of greening the roof can sustain. Some roof membranes may not be suitable for covering completely with vegetation; however they may be able to sustain container gardens with adequate water catchment (RGRG 2002). Additionally, food-producing roofs must meet safety measures to comply with building codes. For example, railings may be required and access to the roof may need to be improved for gardeners (Kuhn 1995). Each roof will require different adjustments to be suitable for food production, but it is important to note that almost any roof may be converted for this use. One estimate made by an Australian urban farmer suggested that a growing space of approximately 750 square metres could produce enough food to earn CND\$425 000 each year and could employ 7 or 8 people to tend it (Wilson 1999).

The Garden City? "It would be more accurate to call this the city of Pretty but Useless Shrubs and Inedible Ornamentals" according to a local food writer in Monday Magazine, and her words do have some truth to them (Saini 2002). More effort needs to be made to take advantage of the growing space that the city already has for the purposes of food production, not just beautification. Perhaps there are more rooftop gardens in the 'Garden City' than most people know of, but even if they are out there, not enough is known by the general public about the possibilities above their heads. One example of greening rooftops that has caused controversy recently is the Shoal Point development in downtown Victoria. The \$90 million project of developer David Butterfield made its goal the 'three-legged stool of sustainability:' economic development, social responsibility and ecological impact. Praised by developers and Natural Resources Canada, the monstrous condominium project, is known for its geothermal pump and energy efficient heating system (Down 2000, Energy Aware! BC 2002). James Bay residents are generally unhappy with the new complex because it doesn't fit with their Neighbourhood Plan. However, the project has brought more attention to the potential of greening rooftops. Whether Shoal Point's rooftop greenhouses will be used for food production is another question, but the public has been made aware that buildings can accommodate weight in the form of plants on their rooftops.

Green Roofs around the World As is the case with many other 'green' technologies, European nations are well ahead of the rest of the world when it comes to green roof technology. Germany leads the way with over 10, million square metres of green roofs constructed over the past six years (GRHC 2002). Government policies and financial incentives are the primary source of support for the industry in Germany and other countries (Kwik 2002, GRHC 2002). A multi-million dollar market for green roof products and services exists in France, Austria and Switzerland as well (GRHC 2002). For example, Switzerland has passed a new bylaw requiring that new buildings convert their rooftops to the equivalent area of greenspace lost to their footprint. All existing buildings must also convert a minimum of 20% of their roof space to green technology. Research and development has taken off and will hopefully spread its benefits to an immature North American market (RGRG 2002). St. Petersburg in Russia has also led the way in using green technology through its Ecohouse project. A sustainable urban community, the Ecohouse uses rooftop gardening to grow vegetables, fruit and grass in thin beds of soil for the use of residents. Excess produce is sold or exchanged for maintenance services for the buildings (Ecohouse 1999).

The United States has also begun to explore green rooftops in Chicago where city planners are looking to improve air quality and reduce heat absorption by the city's miles of pavement and dark buildings. The Environmental Protection Agency in the States has launched a program to cool cities and reduce smog. Chicago is one of five cities involved in the project but is the only city exploring the use of green roofs to achieve its goals (Webber 1999).

Canadian Roofs: Hurdles to Overcome Constraints facing the greening rooftops movement in Canada are based on a considerable lack of knowledge and awareness by the public, municipal officials and developers. Canadians do not have an understanding of the costs and benefits associated with green roofs, nor are many incentives offered by the government to increase this understanding or support those who wish to construct green roofs. There is a lack of products available in Canada for green roof construction and minimal technical or building standards to guide developers (Peck et.al. 1999).

Efforts are being made in Canada to catch up to European innovation and take advantage of advances in green roof research and development. The National Research Council of Canada is working with a Rooftop Garden Consortium on a 2-year study of green roof technologies. A Field Roofing Facility has been set up to monitor conditions and most attention is being given to the insulation and cooling benefits of green roofs (Baskaran and Liu 2002). The Council's Institute for Research in Construction held a workshop last year with professionals of the construction industry to discuss public policy and research directions. The workshop was sponsored by Environment Canada, the Canada Mortgage and Housing Corporation and Greening Roofs for Healthy Cities (GRHC) (IRC 2002). GRHC is a business coalition that works towards awareness and lobbies support for technology research and development of green roofing systems (Kwik 2002, GRHC 2002).

In a 1999 report for the Canada Mortgage and Housing Corporation entitled 'Greenbacks from Green Roofs: Forging a New Industry in Canada,' the authors propose a National Action Plan to support the development of a market for green roofs in Canada. The Plan includes the need to address the lack of knowledge and awareness about these technologies by gathering all information to date and making it accessible to the public via the internet for example. It suggests that governments at all levels must develop plans, policies and financial incentives to support this new industry. The Plan also advocates creating high profile demonstration sites in 6 major cities across the country to promote the benefits of green roofs to the public at large. The sites could be supported by a partnership between government and the Canada Mortgage and Housing Corporation (Peck et.al. 1999).

One group of entrepreneurs that has taken the matter of greening rooftops into their own hands is Annex Organics in Toronto. Not only is the group greening a warehouse roof in the downtown core, they are producing organic tomatoes to supply restaurants and merchants. The urban farmers are discovering that they are able to make a profit, but with intense competition from the agri-food industry, they must specialize in unusual and unique varieties of tomatoes to maintain their market niche. Annex Organics uses a semi-hydroponic system to grow their tomatoes which is protective of the roof membrane and keeps the plants out of the wind. The system reportedly weighs 9 kilograms per square foot, a weight load well under the requirements of the Ontario Building Code (Smith 1998).

Solutions Close to Home Locally here in BC, there are a number of concerned 'food citizens' that have formed alliances to promote initiatives for local food production and consumption. AgAware BC is a network within the agricultural sector that aims to raise awareness about where BC's food is coming from. They promote farm visits by the public and agritourism to reconnect consumers with farmers (Believe BC 2002). FarmFolk/CityFolk is a non-profit support system doing the same kind of work, while City Farmer in Vancouver is active in promoting urban food production (CityFarmer 2002). Also in Vancouver, the Public Library installed a green roof for the purposes of aesthetics and insulation. The roof is extensive and cost \$250 000 to construct the 2400 square metres of greenspace (Peck et.al. 1999). The Capital Region Food and Agriculture Initiative Roundtable is an example of a network of people in Victoria that acts as an advocate and supporter of local food projects (CRD 1999).

In Victoria, the primary issue behind the lack of rooftop gardens is awareness. An Environmental Planner for Saanich, Angela Evans says that while the municipality has expressed interest in green roofs for stormwater retention, many homeowners would be nervous about installing green roofs after the 'leaky condo' difficulties in BC. 'While Victorians seem fairly open to green technologies, there does not seem to be a lot of faith in housing construction. However, Evans also suggested that as long as an architect or civil engineer puts their stamp of approval on a roofing project, that building code officials will most likely approve the structure (Evans 2002). This was echoed by the Chief Building Inspector of

~e City of Victoria, Murray Sluggett; "Roof top gardens are fine from a building code point of view as long as you calculate the increased loading into your structural design" (Sluggett 2002). Mickey Lam, Head of the Urban Design Section of the City of Victoria's Planning Department, agrees; "As far as I know, there is no real restriction for proponents to introduce rooftop landscaping (including gardens) on buildings from zoning and development permit points of view. Actually, in many situations we encourage applicants to think along those lines if possible. The real constraint is the practicality of it from structural, cost and access availability points of view" (Lam 2002).

A current project that is challenging those constraints and raising awareness is a joint endeavour between the LifeCycles Project and Wild Fire Bread and Pastry. LifeCycles is a non-profit organization that runs a variety of projects to increase awareness about food issues in Victoria. They are assisting Wild Fire to construct a rooftop garden at their bakery. Currently, the building plans are being reviewed by a structural engineer to make sure the roof is able to load the extra load of the garden. Plans are also being drawn up to build a staircase access from the shop to the roof, where food will be grown for the bakery's use and patrons can enjoy a seat in the garden (Sutherland 2002). It is this type of project that will bring rooftop gardening further into public awareness and set an example for urban agriculture in Victoria.

Local Food Systems A locally produced food supply for local needs achieves a separation from unsustainable global trading and challenges the unequal power structures that determine our society's connection to natural ecosystems and to each other (Perkins 1996, Geggie and Fairholrn 1998). "...[W]hen basic necessities are no longer produced locally, people lose an important base for understanding how their everyday lives are connected with the environment and lose respect for the systems that sustain them" (Perkins 1996,70). Local individual community economic activity leads to strong communities that are empowered to health limit the growth of a globalized and exploitive market system (Perkins 1996, Geggie and Fairholrn 1998). When consumers purchase food ecosystem from the directly from the farmer, the power structure of producer, retailer and consumer is eliminated (Moffet and Morgan 1998). When communities have access to land and resources such as farmers, they may be more accountable for labour conditions, how the land is used and the state of the natural systems. This is turn will affect how food is produced, what quality of food is the result and who will be able to afford to purchase this food (Geggie and Fairholrn 1998). The health of communities is intricately linked to awareness, access and control of food supply. In particular, control of food is a hot topic and the rise of organic fruits and vegetables on the market is a response to consumer demand. Locally grown organic food eliminates exposure to pesticides and other chemicals, improving health and lowering the risk of cancer (Moffet and Morgan 1998).

A Consumer Report published in 1999 examined the United States food supply and concluded that although almost all tested produce contained chemical levels within the legal limit, most were at odds with what the government says is safe for young children (Consumer Reports 1999). Urban agriculture is one way to eliminate this risk by allowing consumers and growers access to fresh, organically grown produce right in the city.

Conclusions Rooftops provide an alternative venue for producing food locally; a reclamation of food citizenship. Corporate control, limited information to consumers, manipulation of consumers through supermarket hype and an emphasis on processed and convenience foods are all threats to food security in Victoria (Welsh and MacRae 1998). Urban agriculture addresses economic, poverty, health and environmental issues and is a social movement that allows for people to make important choices about the food they eat (Guberman 1998). Gardening is a favoured pastime for many residents of Victoria as a vehicle for relaxation, creative expression and beautification. Empowerment is another outcome of gardening that may be overlooked. Cultivating plants for local food production is powerful and important for the well-being of Vancouver Islanders. Those who do not garden may list time constraints, lack of access to land and lack of knowledge as reasons why they do not garden. It is vital that advocacy groups in Victoria continue to disseminate information to the public about ability to participate in urban agriculture and the benefits of eating locally produced foods. Government at all levels must also recognize the benefits of greening rooftops and support initiatives to encourage this activity across the country. Although Canadians have the technical knowledge to build parking garages, structures that hold massive amounts of weight, including landscaped courtyards, we have not applied this knowledge to constructing and altering roofs to bear the weight of food producing plants (Kuhn 1995). By supporting local farmers and expanding our control of food production through rooftop gardening, Victoria has the ability to greatly increase its food security.

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