

# **Rooftop Greenhouses and Gardens**

## **Working Session at the**

### **Cultivating Regional Food Security Conference**

#### **Seattle, December 4-5, 2010**



Notes by Michael Pilarski  
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[www.friendsofthetrees.net](http://www.friendsofthetrees.net)

First draft, seeking input, additions, clarifications from other participants. Most of this came out of the group discussion, but I did add a few opinions and extrapolations and a beginning resource list. Matt Maria also volunteered to do a one-page synopsis of this session.

Participants included:

Kate Clark, Transition Whatcom

Alyse Jenkins

Matt Maria, UW

Colin McCrate, Seattle Urban Farm Co.

Max Morange, Bellingham Food Bank

Janice Murphy, Seattle University

Jenny Pell, Wilder Institute

Michael Pilarski, Friends of the Trees Society

Sarah Reicherd, University of Washington Professor

W. Dean Smith, Transition Port Gardner

Del Webber

Affiliation is shown where known at this time. These names are from the prior sign-up sheet. Additional people joined the group whose names are not listed here. Who has the sign-up sheet we passed around? Matt?

A great conversation was had and many ideas put forth. The end product of the session evolved during the session but we did consider each of the questions posed on the Conference's briefing sheet.

Rooftop gardening is only one of a wide number of food production strategies to meet a goal of 20% of Seattle's food grown within the city and peri-urban area by 2020. (This goal was mentioned during our session, but I do not know the source). No one knows the percentage currently grown, but Jenny Pell ventured a guess at less than 1%. We chose to look at the larger issue of rooftop gardens as well as rooftop greenhouses. It also makes sense to include growing on walls as a closely-related gardening component.

Urban gardening is a fast-growing international movement, especially in the developing world where food is in shorter supply. There is much to learn from studying rooftop gardening internationally.

**Benefits:**

- Food production: healthier, fresh, unprocessed food. Increased food security.
- Job creation. It would employ architects, engineers, carpenters, gardeners and many others.
- Reduces city heat island effect
- Beauty. Softening of hard lines. Hanging gardens of Babylon.
- Creates additional living space, social and family spaces.
- Rainwater catchment. Reduces stormwater runoff and can reduce the need for irrigation water from city water.
- Building insulation (cooler in summer, warmer in winter)
- Habitat for insects, birds and wildlife. Native plants can be part of the mix.
- Production of oxygen, cleanses air, reduces pollutants.
- More exercise for people, time with nature and nurturing a garden is horticultural therapy, pleasant, makes people happier and has other intangible benefits.

**Practical issues:**

- Roof leakage.
- Pond liners. Currently 16-mill butyl rubber liners are available with a 50 year warranty.
- Some surfaces are damaged by walking on and boardwalks and decking must be built.
- Plants can be grown in containers of various sizes. Some of them can be on wheels. Raised beds and on wheels are useful in some situations, but also several benefits are not realized. The building is not so insulated. And the soil blocks are colder since they are not getting as much heat from the building.

**Sun rights/solar access:**

- What are the current city codes?
- What would the rooftop garden group suggest to change existing rules?

**Structural issues:**

- Age and condition of building?
- How much weight can the roof handle?
- Current roofing material.

**Considerations:**

Rooftop gardens can include a wide diversity of forms including:

(heaviest to lightest):

- Complete soil/media cover
- Raised beds, spaced across the roof.
- Containers spaced across the roof.
- Raised beds or containers only on the wall line where the structural weight can handle it.
- Pebble roof with sedums and similar plants
- Trellis constructed above the roof, e.g. for trellising grapes
- Netting hung on a sloping roof to grow vining crops on.

- Growing medium can be relatively light-weight using things like perlite, vermiculite, peat moss, poly-absorbent gels, compost, etc.
- Planting boxes can also be run alongside the roof line (with a catwalk) for plants to grow out onto a roof trellis. Tomatoes for instance.
- Pole trellises can extend upward from planters along the sides of flat roofs to provide a shady and private hang-out space (outdoor room) and to produce food.

**Wind issues:**

- Rooftops are windy places. Roof gardens (especially greenhouses) should be designed and built to withstand wind events.

**Types of crops, bees and livestock:**

- Because of the high costs of gardening on rooftops most people would grow high-value crops.
- Aquaponic gardens are sometimes put on rooftops (no soil needed).
- Vining crops are particularly suited to walls and roofs, Vining food plants include grapes, hardy kiwifruit, trailing cane fruits, Chinese magnolia vine, melons, squash, cucumbers, nasturtiums and others.
- Beekeeping. Apiaries on rooftops are used in many countries. Keeps bees flight paths away from people. One person remarked that a full honey super weighs 60 # and dealing with getting heavy objects off the roof is a concern.
- One participant remarked that Cuba had put a lot of energy into rooftop gardening, but abandoned it after some time in favor of animal husbandry on rooftops.
- Livestock particularly suited to rooftops are pigeons, rabbits and chickens.

**Social issues:**

- Ownership rights and benefits
- Renters
- Who pays for developing rooftop gardens in the case of renters? The building owner? The tenant? Tenant's rights?
- Mechanisms for tenants to offset rent by building improvements?
- Neighborhood acceptance or non-acceptance.
- Houses and building would be retrofitted as owners wish to. No stick, only carrots.
- From the grassroots perspective it would be a shame if the engineers, architects and bureaucrats made it virtually impossible for a poor person to make a rooftop garden. A more desirable outcome is for them to enable all economic sectors to be able to afford rooftop and wall gardens. Social equitability and democracy need to be balanced against safety and deterioration of buildings. Citizens' initiative needs to be encouraged rather than repressed. A number of the session's participants mentioned that it was important to make gardens assessable to lower income people.

**Costs:**

- Costs range from very little to very expensive.
- Do-it-yourself with scrounged materials can enable no cash expenditures. Some high tech proposals for large buildings and skyscrapers could run into the millions of dollars.
- In Seattle, hiring in a contractor to retrofit the roof to put in an outdoor living area on the roof combined with a large rooftop garden could cost tens of thousands of dollars. The rooftop garden on top of Chicago's new city hall building cost a lot of money, but is one of the nation's rooftop showpieces and Chicago touts itself as one the leading rooftop garden cities in the US.
- Seeing as how most city governments are in tough financial straits, volunteerism and self-funding is to be encouraged.
- A goal would be to enable homeowners and individuals to set up their own systems.

**Restaurants:**

Colin McCarty and Seattle Urban Farm Co. implemented a rooftop garden at the Bastille Restaurant in the Ballard neighborhood which grows food and spices for their restaurant. One participant mentioned a restaurant in some other city which grows \$30,000 worth of produce every year in their rooftop garden. The rooftop gardens are good publicity to the restaurant as well as providing produce.

Bastille Restaurant: See article in Seattle Times, November 15, 2009. At Seattle's Bastille, the garden goodies are on the roof.

[http://seattletimes.nwsourc.com/html/pacificnw/2010203442\\_pacificplife15.html](http://seattletimes.nwsourc.com/html/pacificnw/2010203442_pacificplife15.html)

**Recommendations:**

- Coalesce a group of experts and civil society to put together a list of guidelines and educational materials. Include architects, engineers, botanists, gardeners, community activists, etc.
- Develop building audits to analyze buildings for suitability for rooftop and wall gardening.
- Assemble/train teams of people who can do competent design and building assessments for rooftop gardens.
- Many trainings, workshops and conferences lie ahead.
- Establish mechanisms for subsidies for low-income people for building audits and design. Just as there are rebates or cost sharing for people to install insulation, double-pane windows and the like, can their be rebates or cost sharing for establishing rooftop gardens which meet certain criteria (filling beneficial functions and providing ecological services).
- Build knowledge and capacity.
- The long-term goal is to make Seattle a world leader in rooftop gardening in the temperate zone.

**Timed phases:**

- Locate current models in Seattle.
- Arrange field trips.
- Research rooftop gardening nationally and internationally. What organizations already exist? Assemble a library. Elizabeth C. Miller Library at the UW Botanic Gardens could possibly host the hard copy collection since they already have a lot of the pertinent info there.
- Establish a website to place information, proposals, discussions, links, etc.
- Identify barriers and problem solve.
- Design and encourage a number of new demonstration rooftop gardens. Solicit materials (in-kind donations) from companies.
- Write and update guidelines as experience shows what works and what doesn't. Regulations and guidelines for new building construction as well as existing buildings.
- Do cost benefit analysis.
- Establish an annual rooftop garden contest. An open house day for people to visit gardens and vote on the winner, including bike tours. Include a low-cost/low tech category.
- Build on the successes and scale up over time.

In Katie Murphy's presentation on "*Soil Study of Urban Planting Strips*" there was reference to 190 acres of parking strips (in Seattle? In NE Seattle?). How many acres of rooftops in Seattle are there? How many acres of walls are there in Seattle? House walls, building walls and retaining walls. The wall surface acreage will be higher than the rooftop acreage. How many acres of land in Seattle are in lawn? How many acres are in agriculture or food gardens currently? The acres of rooftop and wall space in Seattle will be a significant part of the total surface area in Seattle available for gardening.

**Funding:**

- Some grants should be written to fund green roof initiatives, study and design. Some grant sources mentioned at the conference wrap up were:
- Neighborhood matching grant funds
- UW Campus Sustainability Fund. \$600,000 in the current financial period. From a fee self-imposed by students.

**Resources:**

Some of these were mentioned in the session and some are included by Michael Pilarski.

A recent study by Seattle Public Utilities, Bansladen (sp?)

*Planting Green Roofs and Living Walls*. Nigel Dunnett and Noel Kingsbury. Timber Press, 2004.

*Rain Gardens: Managing Water Sustainably in the Garden and Designed Landscape*. Nigel Dunnett and Andy Clayden. Timber Press, 2007. Good information to go with

rooftop gardening as it covers rainwater roof catchment (which can be used for rooftop or wall gardening).

*Roof gardens: history, design, and construction*, Theodore Osmundson, W. W. Norton & Company, 1999, ISBN 0393730123.

The Rooftop Garden Resource Group

Mission: To create a rooftop gardening culture in Metropolitan Toronto.

Strategy: By linking community, professional and government interests, they actively promote rooftop gardens through education, community action, and the media. A number of pilot projects within the community are being created, including projects at city schools. The founding members of this group work for the Toronto Food Policy Council, Grow T.O.gether Community Gardeners, and the City of Toronto's Department of Housing, and they are urban planners, architects, and engineers. They are dedicated to making the Toronto urban environment a greener and healthier place to live and work through the creation of rooftop gardens which support urban food production, improve air quality and increase habitat for birds, promote community cultural diversity, and create job opportunities.

Contact: Monica E. Kuhn, Architect, 14 Sackville Place, Toronto, Ontario M4X 1A4; Phone (416) 923-9034. Kuhn is an architect and permaculture designer who has specialized in rooftop gardening for many years.

Source: (a report on urban agriculture from Canada's IDRC website:)

[www.idrc.ca/en/ev-2472-201-1-DO\\_TOPIC.html#Rooftop%20Gardening](http://www.idrc.ca/en/ev-2472-201-1-DO_TOPIC.html#Rooftop%20Gardening)

The following is from the IDRC report:

#### Rooftop Gardening

“Advocates of the greening of cities often lament the thousands of hectares of barren rooftops, which could otherwise be used as productive gardens. Indeed, in some parts of Europe, roof green space is a legal requirement. (36) In Canada, roof gardens are also starting to gain in popularity, with some specialists actively promoting them to the general public. (Case Study 3.2).(37)

Gardening on elevated structures is a logical consequence of the lack of affordable land in metropolitan areas. Roof garden proponents often claim that this farming method can be a part of the sustainable and healthy city solution. It does not consume land, can reduce air pollution and stormwater runoff, promote urban production and food self-sufficiency, reduce food transportation costs, and increase a building's economic value. It also promotes city beautification and is accessible for leisure activities.

Many obstacles, however, exist. No matter which planting techniques (i.e. container, hydroponics, greenhouses, coldframes) are used, transporting the required materials to the roof location is not as easy as for conventional ground gardens. (38) In addition, prospective gardeners must also consider the roof support capacity, which can limit the garden's design. Roof elevation, strong winds, high temperature, and suitable plant species also require serious consideration. For instance, strong wind, which can wipe out

leaves and vines, or high temperatures which necessitate more frequent watering, may discourage some gardeners.

Academic initiatives in rooftop gardening do not appear to be widespread, and those who support the idea do not necessarily research or practice it.(39) Some early attempts, however, were conducted in the mid-1970's by some faculty staff of the School of Architecture and Brace Research Institute, McGill University. The project was carried out in collaboration with the University Settlement Community Centre. The project published a detailed manual on rooftop gardening techniques, which became the basis for a Department of Agriculture pamphlet on this subject. This two-year, federally-funded demonstration project has long ceased, but a few faculty members are still available to provide public information on rooftop gardening.”

[http://www.yelp.com/search?find\\_desc=rooftop+gardens&find\\_loc=Seattle%2C+WA](http://www.yelp.com/search?find_desc=rooftop+gardens&find_loc=Seattle%2C+WA)  
for a list of some rooftop gardens in Seattle.

British Columbia Institute of Technology  
Centre for Architectural Ecology - Collaborations in Green Roofs and Living Walls  
NE3 - 3700 Willingdon Ave  
Burnaby, B.C., V5G 3H2

Green Roof Research Facility location:  
British Columbia Institute of Technology  
Great Northern Way Campus  
555 Great Northern Way  
Vancouver, BC, V5T 1E2  
604-456-1007

The mission of the BCIT Centre for Architectural Ecology - Collaborations in Green Roofs and Living Walls is to conduct world-class, innovative research on green roof and living wall systems and to provide research-based education across disciplines, to students and practitioners. The Centre is located within the School of Construction and the Environment at the BC Institute of Technology.

Centre for the Advancement of Green Roof Technology

Element Smart Roofing/Jones Boys Maintenance Co  
1813 130th Ave NE #110  
Bellevue, WA 98005

[www.elementsmartroofing.com/materials/green/  
info@elementsmartroofing.com](http://www.elementsmartroofing.com/materials/green/info@elementsmartroofing.com)

Designs and installs green roofs in the Seattle area  
Here are some specs from their website.

## Types of green roofs

Ecoroofs fall into two general categories:

- Extensive
  - Vegetation: generally accommodates groundcover species, succulents, and grasses
  - Substrate depth: one to 6 inches
  - Weight: building structure must be able to handle a load 12-50 pounds per square foot heavier than conventional roof structures
  - Access & maintenance: requires little maintenance (annual inspections) and therefore infrequent access
  - Drainage & irrigation: uses simple irrigation and drainage systems
- Intensive
  - Vegetation: larger species, including trees, shrubs, high-maintenance gardens
  - Substrate depth: one foot or greater
  - Weight: building structure must be able to handle a load 80-150 pounds per square foot heavier than conventional roof structures
  - Access & maintenance: frequent access required for higher levels of maintenance and should include railings, lighting, etc.
  - Drainage & irrigation: requires more complex irrigation and drainage systems

Element Smart Roofing has partnered with Duro-Last and IB to provide the perfect waterproofing membrane for your Seattle Green Roof or Roof Garden. The PVC used does not require any root barriers thus allowing a vast array of vegetative systems to be applied. Element Smart Roofing has partnered with expert landscaping companies who excel in installing both intensive and extensive Seattle green roof systems.

Rooftop Garden Resource Group

[www.interlog.com/~rooftop](http://www.interlog.com/~rooftop)

Wikipedia info and references

[http://en.wikipedia.org/wiki/Roof\\_garden](http://en.wikipedia.org/wiki/Roof_garden)

*Conservation* magazine. July-Sept 2010 issue has an article on gardening on large, high-rise buildings. There was some criticism of the high tech approach in our session.