Rooftop Gardens

Roofops are a city’s greatest untapped resource — acres and acres of empty space just waiting to be used! Imagine driving along an urban freeway and looking out over a sea of green instead of the sea of tar, asphalt, and gravel that we now have. Imagine looking out of a downtown office window and seeing meadows of indigenous wildflowers instead of air-handling units and roof vents. Imagine growing vegetables on top of that garage that takes up most of your backyard. This vision is not so far-fetched or so far-off as it may seem. In Europe, where sprawl is no longer possible and higher population densities have made the environmental crisis more immediate, roof greening has been adopted as much out of necessity as out of a wish to beautify the urban landscape. In fact, roof greening is now legislated for new industrial buildings in many northern European cities, and strongly recommended for others.

So how about a green roof on top of your school — a school garden that is safe from vandalism and receives full exposure to sunlight; an outdoor classroom where children can learn first-hand about weather, plants, and the benefits of integrating the natural with the human-made. Grow vegetables and you can supply food for the cafeteria; grow flowers and you can attract butterflies. Sloped or flat, large or small, rooftops offer limitless possibilities for urban greening, environmental education, community building, and the creation of safe outdoor spaces.

Cover any roof with plants and you have immediately achieved several things. Environmentally, by increasing the biomass in the city, you have increased oxygen levels and decreased carbon dioxide. Plants act as natural filters, so you have also cut down on dust and airborne particulates. Since plants absorb rather than reflect heat, you have had a hand in altering the local climate; and because plant roots hold and absorb water, your roof retains storm water, thereby decreasing the load on the city’s already overflowing storm sewage system.

The economic benefits are also substantial. Layers of soil and foliage have wonderful insulating qualities, keeping the building warmer in the winter and cooler in the summer, thereby reducing the energy bill. Since extreme temperature swings are moderated, the degree of expansion and contraction of the roof decreases; and because the roofing is covered, the membrane is protected from harmful ultraviolet rays and everyday wear and tear, which increases its life span and reduces replacement and repair costs.

On an educational and social level, an accessible rooftop green space can be used as a laboratory for experimentation, an outdoor place for play and performance, a school garden, or just a quiet area to read and write. Green roofs can also promote community activities. A common problem with school gardening is that the growing season is just getting started when the school year finishes and no one is there to take care of the garden through the summer. This can be turned into an opportunity to forge links with local community groups, seniors’ programs, children’s daycares or summer day camps who would love to have a place to garden. Spring planting and fall harvesting can become combined school and community events which extend the teaching and learning far beyond the classroom. Gaining support, funding, and donations of labor and materials is made easier if the garden is open to a larger community.
Green roofs can be divided into two distinct types: the vegetation-covered or “inaccessible” roof, and the roof garden or “accessible” roof. Inaccessible green roofs are those on which vegetation acts just like another layer of roofing material. They are meant to be looked at, not walked upon, can be installed on flat as well as sloped roofs, require little maintenance, and, depending on climate and rainfall, can support a variety of hardy grasses, wildflowers, mosses, and sedums in a soil layer as thin as 8 cm (3”). Accessible green roofs, on the other hand, are essentially outdoor rooms, and as such fall under the restrictions of building codes with respect to public safety features such as exits, guardrails, and lighting. They are usually installed on flat roofs, for obvious reasons, with the vegetation either as a “carpet” or in containers and raised beds, separated by areas of decking. The weight and carrying capacity of the roof structure often play a greater role in the design of an accessible green roof due to the added load of people, containers, decking, trees, and deeper soil; installation and maintenance costs increase accordingly.

If you are interested in growing a green roof on your school, there are several technical issues that you should be aware of.

Safety
The first consideration is safety.

h How will you and the students get to the roof: interior stairs, exterior stairs, ladder, elevator, ramp? Can everyone get down quickly and safely if they have to?

h Does your access already exist or will you have to install it? Will it meet the requirements of the building code?

h How will you get materials, plants, and water up to the roof: stairwell, elevator, exterior hoist, ladder, window?

h Can you install a hosebib? Can you collect rainwater?

h Who will be using the roof: teachers, students, staff, parents, community members, the handicapped? How many people will be on the roof at one time?

h Is there a railing and is it the correct height?

h Are you insured?

Bylaws and building codes have regulations governing structure, use, and safety. A call to the design department at your school board will help to get things started.

Loading
The second consideration is loading. The weight of soil, decking, people, and planters — and where they are placed — will all depend on the structural capacity of the roof and the rest of the building. Again, be sure to consult with your local board. They will probably need to have a structural engineer confirm the additional weight that the roof can accommodate. One cubic foot of wet “earth” weighs approximately 45 kilograms (100 pounds), so you can imagine the additional stresses that a garden can create. However, remember that earth is not soil: you will probably be adding compost, mulch, and other fillers which will decrease the weight. Nor do all of your planting beds have to be 30 cm (12”) deep; nor will you be covering the whole roof surface. Heavy planters can be placed strategically over bearing walls or columns; grasses do not need more than 8 cm (3”) of growing medium; some plants will grow in gravel.... You have a lot of options.

Roofing
The third consideration is roofing.

h What kind of roofing system do you have? Each has distinct characteristics: some are not made to be continuously wet, others are; some are made with organic
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Green rooftop on the Steiner Kindergarten in Wales.

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materials and are thus very attractive to plant roots; some may react chemically with materials in your garden; and some need to be protected from ultraviolet rays.

h What condition is your roof membrane in? If you have to replace or repair it within five years, can you do so without disrupting your established garden? Maybe your garden should be compartmentalized for easy access and repair.

h Can you walk on the roofing, or should it be protected with wood decking, pavers, rigid insulation, gravel, or grass?

h Will plant roots penetrate the membrane or should you plant in elevated planters?

h How and where does the roof drain? Filter cloth to keep the soil from eroding with the water is a must.

Again, talk to the board, landscapers, designers, or a roofing contractor. Although it may seem complex, there are as many solutions as there are restrictions or potential problems.

Roof micro-climate

Fourth, consider the micro-climate of the roof itself. Gardening up on a roof is quite different from gardening at ground level. It is very sunny, sometimes windy, and the temperatures are often extreme. This will have a direct effect on what will grow well, how often you have to water, and whether your plants can survive through the winter. Greenhouses and cold frames are life savers. You can also temper the effects of heat, cold, and dryness by using plastic containers that retain moisture instead of terra cotta; by insulating your planters; by using mulch; by mixing moisture-retaining additives into your soil; by layering or interplanting your plants; or by sticking to plants that thrive in these conditions. You can build trellises and shade structures; you can collect rainwater. This is likely to be an ongoing experiment!

Rooftop plants

Last, but not least, consider the plants. What you plant and what will prosper depend on how much time you are willing to dedicate to the garden. If you are looking for a maintenance-free installation, the climate and lack of water will often limit plant selection to hardier or indigenous varieties. Root size and depth are also important. Will the plant be able to stabilize and flourish in 10 cm (4") or does it need 60 cm (24") of soil? Are the conditions in which the plants were grown comparable to the conditions you will be subjecting them to? Typically, inaccessible roofs use a mixture of grasses, mosses, sedums, sempervivums, festucas, irises — plants that are native to drylands, tundra, and alpine slopes. On an accessible roof, with few exceptions, the choices are limitless. In Europe there are nurseries that specialize in providing plants specifically for green roof installations. Here we are still experimenting. Consult a landscape architect or horticulturist for advice.

Each roof is as different as the gardener who uses it or the building on which it is built. There are already many schools throughout the world that have been capped in green, with remarkable benefits to the students as well as to the surrounding communities. The next time you think about greening your city, look up towards the rooftops. You will be surprised at the hints of green and growing things that you can see. g

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