

## **From Garden City to City in a Garden** (Case Study: Shiraz City as a "Permaculture" Model in Iran)

Sara FATTABI, Apadana Institute of Art and Architecture, Iran  
Mojtaba BAZRKAR, MAF Hypermarkets, Iran

### **1. City Developing or Garden creating?**

Human face many challenges related to the health and well being. Many of these challenges arise as the direct consequence of dense urban environments. Industry, automobiles, and impermeable concrete and asphalt surfaces combine to negatively impact upon the air and water quality, while climate change serves to exacerbate the urban heat island effect through global warming.

To help alleviate the environmental problems encountered with dense urban habitation and to encourage sustainable development, governments and non-profit agencies worldwide are working toward creating laws, establishing standards, and funding incentives to promote best practices in development. Rooftop gardens are an excellent example of incorporating passive, eco-friendly technology into new or existing development. Rooftop gardens help mitigate the negative impacts of cities on the environment by: conserving energy and water, improving air and water quality, assisting in storm water management, absorbing solar radiation, becoming a source of local food production, providing habitat restoration, and creating natural retreats.

Many cities have a lot of 'lost', green space that can help them to communicate with nature. Good weather that can help them breeze better. At least, better life through developing the city. As our population grows, we will have to make a greater effort to ensure that we continue to make space for greenery and our natural heritage. "...[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).

### **2. Roof Gardening as one solution to Green**

The Green Movement in the 60's has rejuvenated much interest in the promotion of roof greening as the answer to the host of problems related to rapid urbanization (Michael Wong), Rooftop gardening is only one example of urban agriculture, but has an important place within a comprehensive urban agriculture strategy, as it takes advantage of underutilized urban spaces. Nowadays the creation of green roofs and rooftop gardens are becoming increasingly popular in so many cities. These practices reduce the city's environmental footprint, increase sustainability of urban areas and improve quality of life. At the same time, the many benefits of local food production, particularly increased food security, are becoming more apparent.

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).

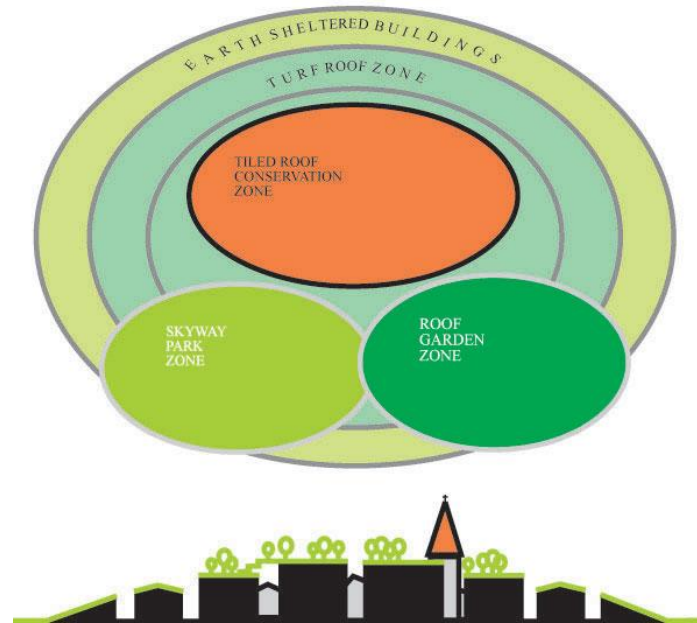


Figure 1: The diagram from a 1996 City as landscape essay on Eco-cities, suggests a citywide approach to the landscape treatment of roofs capes – and has a slight visual kinship with Michael Van Valkenburgh Associate’s design for the ASLA green roof.

## 2.1 Environmental Benefits of Roof Gardens

Exposure to green space reduces stress and increases a sense of wellness and belonging (Bremer et al, 2003, p. 55). “A ten percent increase in nearby green space was found to decrease a person’s health complaints in an amount equivalent to a five year reduction in that person’s age” (Sherer, 2006, p. 16). 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).

Conclusions Rooftops provide an alternative venue for producing food locally; 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. (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 favored pastime for many residents of Shiraz as a vehicle for relaxation, creative expression and beautification.

### 3. Roof gardening through “Permaculture”

Permaculture was developed in the early 1970's by Australian ecologists Bill Mollison and David Holmgren as a positive response to the energy crisis of the time and to ensuing environmental degradation and resource depletion. Permaculture was founded on the following assumptions: (Holmgren, 2002).

- 1) The environmental crisis is real and of a magnitude that will transform industrial society and threaten its existence,
- 2) Humans are subject to the same natural laws that govern the rest of the universe,



Figure 2: The diagram from a 1996 City as landscape essay on Eco-cities, suggests

Analysis of the roof top as an area for the development of permaculture design was chosen particularly as an investigation of how roof tops effectively become a building's fifth elevation. Roof tops often viewed from above in a city, with multilevel buildings, but rarely given the same amount of consideration as the other four conventional elevations. Roof tops in some cases are out of mind but not out of sight, becoming an unsightly and unlovely yet very dominant part of the city experience. The notion explored here is that these areas could become a very positive asset to a city if they were covered in vegetation. 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.

“Permaculture” is derived from the words permanent, agriculture and culture. It comes from the principle that a stable, sustainable culture cannot exist without an integrated relationship with a system of sustainable agriculture (Holmgren, 2002, Whitefield 2004). From its conception, permaculture has had a strong emphasis on developing relationships between communities and agriculture for the purpose of creating a stable, secure, localized food system. Permaculture systems seek to amend the vulnerability and destructiveness of the modern industrial food system which is heavily dependent on massive amounts of fossil fuel inputs (e.g. petroleum based pesticides and herbicides, fertilizer production and transportation) (Gever, 1991, Holmgren 2002). Permaculture food systems make efficient use of energy, labor and material resources and maximize synergistic relationships and yield. Along with this food system focus and partly because of it, the other principles of permaculture developed to facilitate the creation of sustainable communities.

‘Permaculture’ is about

an attitude to the land and living, which seeks to work with nature and natural systems to achieve a balanced harmonious ecosystem, within which humans exist as part of a larger network of co-operating life.

The four ideas investigated are:

- A garden for the production of food for humans: Helping to introduce the idea of urban food production to the city
- A garden for people sensitive to allergies: An environment where all can enjoy the benefits of the garden
- A garden for the well being of the human mind: A kind of sanctuary from the stress of inner city living
- A garden for the preservation and the regeneration of habitat: For native plant, bird and animal species, encouraging a more diverse and stable ecosystem for the inner city (Maibritt Pedersen 1999 / 2002)

permaculture is not the landscape, or even the skills of organic gardening, sustainable farming, energy efficient building or eco-village development as such, but it can be used to design, establish, manage and improve these and all other efforts made by individuals, households and communities towards a sustainable future. Because the focus of this report is on roof top gardens as a method of inner city permaculture, the specific benefits of roof top gardening have been considered.

a. International Reputation of Cities

- A city employing systems of roof top permaculture would gain the international reputation of being an environmentally leading city, and tourism could increase, due to the novelty factor involved with the idea of roof top gardening. Such a city could also be an example to other cities and become a centre for learning, and research into the area of roof top permaculture in an inner city context.

b. Human well being

- The psychological effects of more garden and nature zones are certainly very positive and a huge benefit for the citizens of the city.

c. Increased Life of the Roofing Membrane

- A layer of soil moderates extreme temperature swings experienced on the roof between day and night, and therefore the expansion and contraction of the roof will be moderated, and the life span of the roof will be increased. In England it has been recorded that:

'The effect of temperature regulation .... Can reduce roof temperatures by 40' C in summer, and raise winter temperatures from -20' C to -5' C.

- Because the roofing is covered, it is protected from harmful UV rays and conventional everyday wear and tear. Exposed flat roofs may require renewal after as little as ten years. There are documented examples of roofs under roof top gardens being in near perfect condition after fifty years and longer.

d. Energy Cycling

- By putting food or plant scraps that came from the garden, back into the same garden, all of the energy that it took to grow the food or plants is kept within the area to assist with the growing of the next generation of plants. The introduction of roof top permaculture creates a use for some of the city's organic waste through composting, thus reducing landfill loads.

e. Economics

- Economically, ‘any amenity such as a roof garden could easily add up to twenty percent value to a domestic property...’ which would also be true perhaps of commercial property.

f. Location and Tenure

- The relative nearness of roof gardens is a major advantage. Individuals or businesses cultivating their roof space do not have to make trips to and from allotments or other gardens, which saves time and energy (both human and transport).

- One of the problems associated with urban agriculture is the lack of tenure. Temporary garden plots are often displaced by what is viewed as more productive use of the land (such as car parks, bypasses, apartments etc.) Many gardens are labour intensive to set up and people may be reluctant to invest time in an area of which continued availability is not assured. Roof top gardens are not likely to face this dilemma and therefore offer greater security of tenure. (Maibritt Pedersen 1999 / 2002)

Permaculture strategies focus on the opportunities rather than the obstacles. In the context of helping the transition from ignorant consumption to responsible production, permaculture builds on the persistence of both a culture of self-reliance, community values, and the retention of a range of skills, both conceptual and practical, despite the ravages of affluence. The identification of these invisible resources is as important in any permaculture project as the evaluation of biophysical and material resources. While sustainable “production” (of food and other resources) remains the prime objective of permaculture strategies, it can be argued that permaculture has been more effective at pioneering what has come to be called “sustainable consumption”. Rather than weak strategies to encourage green consumer purchasing, permaculture addresses the issues by reintegrating and contracting the production/consumption cycle around the focal point of the active individual nested within a household and a local community. Although permaculture is a conceptual framework for sustainable development that has its roots in ecological science and systems thinking, its grassroots spread within many different cultures and contexts show its potential to contribute to the evolution of a popular culture of sustainability, through adoption of very practical and empowering solutions.( Holmgren)

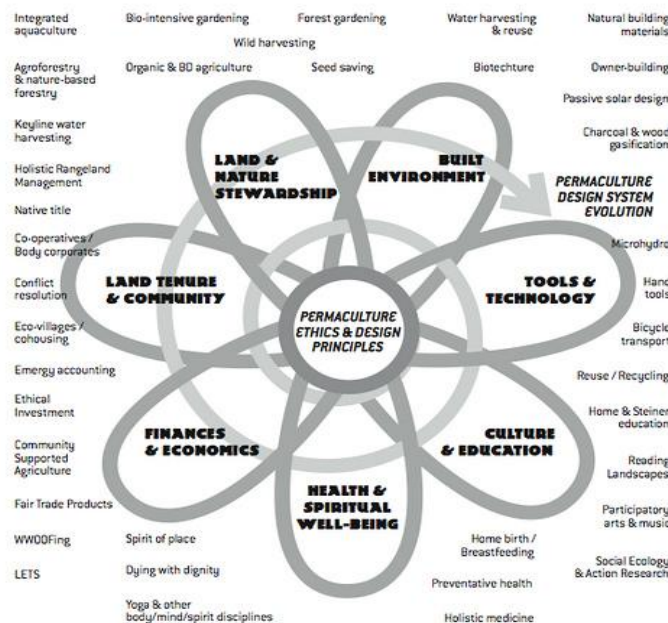


Figure 3: The Permaculture flower (Holmgren 2002)

### **3.1 Permaculture principles**

The idea behind permaculture principles is that generalized principles can be derived from the study of both the natural world and pre-industrial sustainable societies, and that these will be universally applicable to fast-track the development of sustainable use of land and resources, whether that would be in a context of ecological and material abundance or one of deprivation. These principles can be divided into ethics and design principles.

Ethics act as constraints on survival instincts and the other personal and social constructs of self-interest that tend to drive human behavior in any society. They are culturally evolved mechanisms for more enlightened self-interest, a more inclusive view of who and what constitutes “us”, and a longer-term understanding of good and bad outcomes.

#### **3.1.1 permaculture design principles**

The scientific foundation for permaculture design principles lies generally within the modern science of ecology, and more particularly within the branch of ecology called ‘systems ecology’. Other intellectual disciplines, most particularly landscape geography and ethno biology, have contributed concepts that have been adapted to design principles. Fundamentally, permaculture design principles arise from a way of perceiving the world that is often described as ‘systems thinking’ and ‘design thinking’ (Holmgren)

Observe and interact: Beauty is in the eye of the beholder (i.e. systems thinking).

Catch and store energy: Make hay while the sun shines.

Obtain a yield: You can't work on an empty stomach.

Apply self-regulation and accept feedback: The sins of the fathers are visited on the children unto the seventh generation.

Use and value renewable resources and services: Let nature take its course.

Produce no waste: Waste not, want not.

Design from patterns to details: Can't see the wood for the trees.

Integrate rather than segregate: Many hands make light work.

Use small and slow solutions: The bigger they are, the harder they fall. Slow and steady wins the race.

Use and value diversity: Don't put all your eggs in one basket.

Use edges and value the marginal: Don't think you are on the right path just because it is well traveled.

Creatively use and respond to change: Vision is not seeing things as they are but as they will be. (Tomczak, 2007)

To apply these principles in the real world requires understanding them in the context of all the elements in the system that is being manipulated. These elements fall into the categories of, site components (e.g. water, earth, landscape, climate, organisms), energy components (e.g. technologies, structures, sources, connections), social components (e.g. legal aids, people, culture, trade and finance), and abstract components (e.g. timing, data, ethics) (Mollison 1988).

Both of these systems are very similar, even though the terms come from different disciplines; permaculture and home gardens respectively. Ecological gardening applies permaculture design to create sustainable home landscapes.

#### 4. Permaculture Method Principle in Shiraz to become a Garden City

Iranian garden is the original output of Iranian life and mental interaction in their natural environment. On the other hand, Iranian garden is also the original output of Iranian life and mental interaction in their natural environment (Mansouri, 2005; Shahcheraghi, 2010). Especially in Shiraz that is known as Garden City.



*Figure 4: Shiraz south west view, central zone: old gardens, and new construction*

Shiraz is the sixth most populous city of Iran and the capital of Fars Province, with 1,455,073 inhabitants situated in southwestern Iran on the Roodkhaneye Khoshk (Dry River) seasonal river. It is found in the inland around 200 km from the Persian Gulf, at an elevation of 1,800 meters above sea level with a moderate climate and an active regional trade center for over a thousand years. Shiraz is the capital of Fars province, one of the most beautiful, historical cities in the world. Farsi (Persian or Parsi) the language of Ancient Fars (Pars), has become the official language of Iran (Persia). Different people have lived in the Fars province such as the Aryans, the Samis and the Turks, who worked together to form the Iranian culture. It is regarded as one of the oldest provinces of ancient Persia.

Shiraz is known as the city of poets, literature, wine and flowers. It is also considered by many Iranians to be the city of gardens, due to the many gardens and fruit trees that can be seen in the city. The economic base for Shiraz is commerce of products from the surrounding region, where grapes, citrus fruits, cotton and rice is produced. Of Shiraz own industries, cement, sugar, fertilizer, textile products, wood products, metalwork and rugs dominate.

Shiraz's climate has distinct seasons, and is overall classed as a semi-arid climate (Köppen BSh/BSk), though it is only a little short of a Mediterranean climate (Csa) summers are hot, with a July average high of 37.8 °C (100.0 °F). Winters are cool, with average low temperatures below freezing in December and January. Around 300 mm (12 in) of rain falls each year, almost entirely in the winter months, though in some cases as much as this has fallen in a single month (as in January 1965 and December 2004)[, whilst in the year from July 1965 to June 1966 as little as 82.9 millimeters (3.3 in) fell.

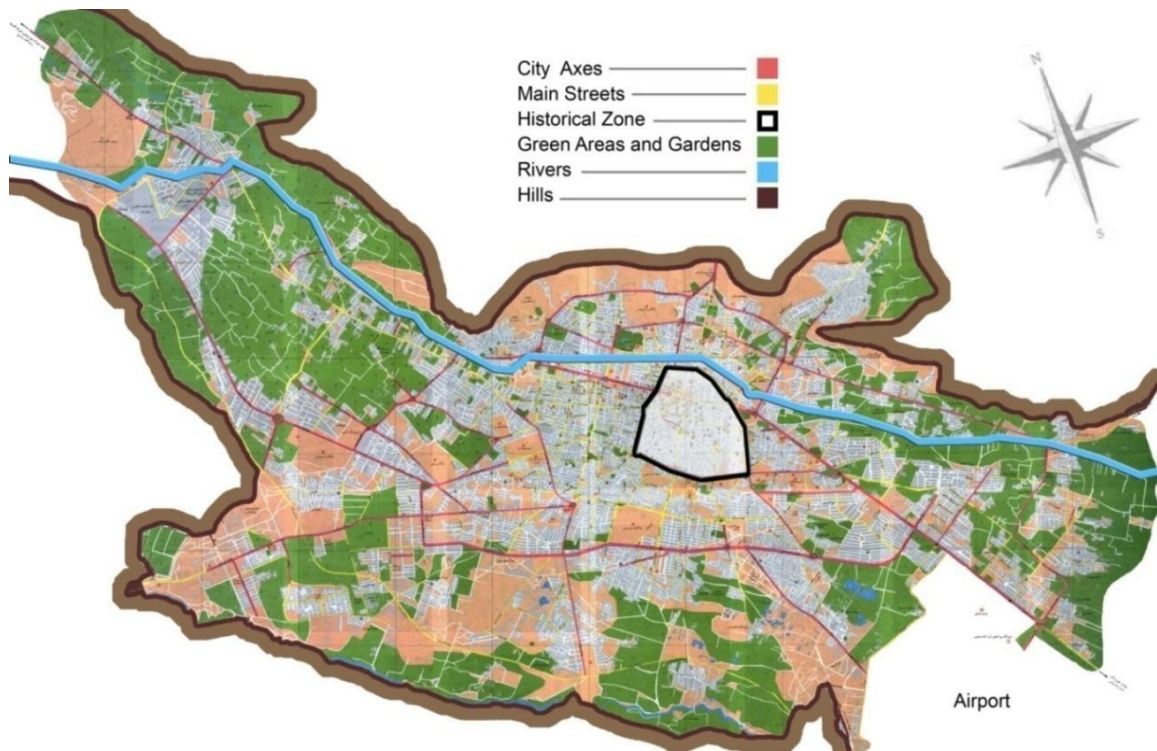


Figure 5: Shiraz Map

The wettest year has been 1955/1956 with as much as 857.2 millimeters (33.75 in), though since 1959 the highest has been around 590 millimeters (23.2 in) in each of 1995/1996 and 2004/2005. Shiraz contains a considerable number of gardens. Due to population growth in the city, many of these gardens may be lost to give way to new developments. Although some measures have been taken by the Municipality to preserve these gardens, many illegal developments still endanger them. As we can see because of its context and reputation of culture and long history, permaculture design can be done on it. Therefore we can renew and rebuild gardens through another way.



Figure 6: Shiraz north east view, near Dry River (Seasonal River)

Shiraz has some problems to serve daily transportation. This causes some urban projects to widen the streets in the central zone. In reality, the strategy has not been implemented in



many cases. Furthermore, the widespread patterns of physical growth have been acted So many gardens have been destroyed. In addition to opportunities for people to be connected to the identical built environment, Permaculture advantages can preserve human life from further damages. Roof gardening, greening open space, Pedestrian realm of the city is a great opportunity for citizens to reconnect to their history, environmental identity and cultural activities. It represents a different view of life to visitors which is safer, more beautiful and more convenient.



Figure 7: Green roof sample in Shiraz,

Environmental preservation, riverside and productive gardens Shiraz has over 400 hectares of fruit productive inner-city gardens inside its metropolitan area. Most of these gardens are located in North- West of the city in "Ghasr-Dasht" area. A few of these gardens have expensive buildings within them.

Lemon and orange trees are traditionally grown in private properties (e.g. Bagh-e- Eram) as well as public areas as. There are also local plantains trees grow up without any special care. The city river that is a seasonal waterway has a landscape which needs to be promoted as a linear recreational space for citizens. By some small changes in landscape design and safety promotion, it has potential to improve citizens' health.

There is a cultural event in each February (Bahman) when people plant trees one month before the spring, the so called "planting ceremony" (jashn-e-derakhtkari). Shiraz has fertilized soil and is one of agricultural centers of the country. It has numerous food production industries, as well as the potential to improve it further. It is suggested that the waste management system, food production and packaging industries must be taken into consideration in an integrated manner.

## 5. Conclusion

While the benefits of roof gardens are somewhat unquestionable from the environmental point of view, the cost effectiveness may need to be looked at in order for roof gardens to be widely adopted in our region. In conclusion 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. Government at all levels must recognize the benefits of greening rooftops and

support initiatives to encourage this activity across the country. Developers, policy makers, architects, and the public require performance information on the technology, benefits, and costs involved. Even when a city recognizes the benefits of rooftop gardens, there is still the need to encourage the construction of green roofs by making them a financially viable option.

Iran 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 Shiraz 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 Shiraz.

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