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ROOFTOP ORCHARDS AS URBAN REGENERATION DEVICES. ORTIALTI CASE STUDY

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Abstract: This paper explains how grown rooftop gardens can work as urban regeneration devices, by combining environmental and social benefits. In particular, it describes OrtiAlti project, a research project and a start-up, set up to boost up and to coordinate collaborative processes, involving profit sector, public institutions, third sector and citizens, aimed at building community rooftop gardens and connecting them in a supportive urban network. OrtiAlti is a metaphor, a way to demystify the old categories of spatial planning, a real new ontology that redefines the conflicting relationship between the public and private sectors in the use of resources such as the soil; that recognizes as multi-dimensional certain categories of urban spaces and activities; that includes new economic and social actors that operate as subjects able to produce values of collective interest to the community.

1. New challenges, new solutions

According to data compiled by the United Nations, in the incoming 10 years more than half of the world population will live in urban areas (UN HABITAT, 2010). Cities are in fact the places where environmental issues occur more evidently, due to gas emissions, energy consumption, waste production, heat islands and rainfall events; where the reduction of open spaces, the high demand for increasingly scarce resources such as water, energy and fresh food supply contribute to increase social conflicts and segregation. Nevertheless, cities are also the ideal spatial conditions for research and innovation and for active participation: by opening the field to new models of sociability, urban policies have been implemented, supported and informed by "bottom-up" urban communities' initiatives, often filling up the limits of a "top-down" politics. As a creative response to these dynamics, in 2013 in Turin was established OrtiAlti**,** a social innovation project, that aims to interlace environmental sustainability, with ethical food production and participation.

The idea at the core of OrtiAlti is to activate a collaborative methodology between the local communities, social enterprises (Zandonai, Venturi, 2014), private owners and profit organizations, by recovering abandoned flat roofs and converting them into productive community gardens. OrtiAlti combines in its approach two main urban problems, common to the most of contemporary European cities. The first concerns climate change impacts and the need for ensuring adaptation strategies for urban development and management; the second is related to the progressive increase of urban relicts: old factories, abandoned public facilities even private real estates, contended between a saturated market and the inability of public policies in promoting and investing on effective requalification processes (Saporito, 2015). The main goal of the project is then to facilitate and boost bottom-up practices of urban re-use and regeneration through urban farming, that can be certainly considered one of the main adaptation strategy for climate change (Dubbeling, 2014; World Bank, 2010), especially when integrated in architecture through green roofing solutions (Acherman & Al., 2014).

Food, in fact, appears as the ideal medium through which to design sustainable places and to contribute to the growth of the public city of tomorrow. In fact, next to the impact on the urban environment, due to the opportunity of greening the city and re-using abandoned lands or buildings,

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stands the opportunity of empowering urban inhabitants by allowing them to have direct access to food production and food procurement, which is increasingly seen as a matter of social justice (Mees & Stone, 2012), and to reclaim urban spaces for collective uses, like community gardens.
Urban farming is hence opening the way to a renewed urban landscape, levering on a growing and widespread culture of green and sustainable urban life styles. In a period of recession in which 7 families out 10 are forced to cut spending on food, urban gardens are becoming increasingly popular. In Italy there are about nine million city farmers (+ 9% compared to 2012)[2] who take care of a vegetable garden in the suburbs, for a total of 1.8 million hectares. The demand for these spaces is growing and not always administrations are able to satisfy it. In fact, for some cities, land availability constitutes a big challenge for urban food production: although there might be large resources of brownfields that could be made accessible and suitable for agricultural purposes, this would imply high decontamination costs, often not affordable for public administrations (Specht & Al., 2014). Moreover, in densely built-up areas, low-space technologies, from green roofing tech to vertical farming3, would offer tremendous opportunities for space-confined cultivation (Quesnel & Al., 2011).
In the light of ever more reduced public investments and of further impoverishment of weaker sections of urban societies, alternative approaches to urban development and food access, like the one proposed by OrtiAlti, appear necessary and more effective. The activation of local resources, the exploitation of the different identities, creating living spaces that facilitate collective social ties, foster new alliances, creating new job opportunities, make clear the link that necessarily exists between the processes of social innovation, urban regeneration and urban farming.
OrtiAlti has recently been awarded with the first prize of the national contest "WE-progetti delle donne", announced by WE-Women for Expo and Italian Pavillion for Expo Milano 2015.

2. The OrtiAlti case study

In the city of Turin, almost the 10%[4] of the territorial area is made of unused flat roofs – from garages, to residential buildings, supermarkets and industrial sheds-. To convert these parts of the city in roof gardens planted with vegetables, managed by citizens and connected in a supportive network represents a powerful tool for urban transformation and renewal, and cities environmental and social regeneration. As a first experimentation of that, in 2010 was realized the first community rooftop garden in Turin, known as "Oursecretgarden"[5](Fig. 1). This first installation was built over the roof of an architectural office (STUDIO999), located in the courtyard of a residential block in one of the most dense and populated neighborhoods of the city, San Salvario. Since then, the orchard has been cultivated and managed by the architects that work "under the garden" and by the inhabitants of the block, who have participated to the recovery process since the beginning. It was technically a simple project, but an innovative concept. This first experience received a lot of media attention, because it was able to intercept, in a more or less explicit and conscious way, many sensitive issues which are increasingly falling into common understandings and public policy-making practices: environmental sustainability and energy conservation, urban agriculture and the short chain, new forms of proximity and sharing practices, as well as sharing economy. The success of Oursecretgarden triggered an

[2] This data is drawn from CIA, the Italian Confederation of Farmers, from 2013.
[3] With the expression "Vertical Farming" is defined as the concept of cultivating plants or animal life within skyscrapers or on vertically inclined surfaces. For a deeper study, see Despommier, D. (2010), *The vertical farm: Feeding the world in the 21st Century*, Thomas Dunne Books, New York
[4] Source C.S.I. Piemonte (Informative System Consortium)
[5] Oursecretgarden has been awarded in 2010 with the Legambiente Prize "Innovazione Amica dell'Ambiente", and in 2011 was included among the Best Private Plots from an Austrian prize for gardening and design.

immediate reflection about the potential impact at the urban scale of similar actions. The flat roofs appear as unused resources available to urban inhabitants, and the roof garden as a device capable of integrating immediate environmental benefits, with important social effects, linking urban re-use, to collective green places, and promoting horticultural production as a practice of food security, solidarity, education and care. OrtiAlti was born in 2013, while working on the candidacy at the European competition LIFE+, thanks to a collaboration between the designers of Oursecretgarden, the Departments of Urban Planning, Environmental Engineering and Energy of the Polytechnic School of Turin and the company Harpo Trieste, producer and supplier of green roof technologies. A first application of the project was proposed for the City of Nichelino (Turin) and consisted in creating a network of rooftop community gardens on public buildings like schools and libraries, through the direct participation of local inhabitants and users.

Figure 1. Ousecretgarden, San Salvario, Turin. Ph. Lena Cagnotto

From this first confrontation of the project, OrtiAlti evolved into a social enterprise project, able to work on urban regeneration through virtuous collaborative processes between different subjects: profit and nonprofit, local and institutional actors, individuals and communities. The social innovation model proposed by the project consists in aggregating different functions and new opportunities for local actors, thanks to the installation of a farmed roof. In particular, the collaborative methodology developed consists of complementary steps: co-design the intervention with direct users, empowering them in taking care of the garden; involve local social enterprises employing disadvantaged people, or working in the health care service, as operative partners, both for roofing installation and gardens management; engage nonprofit associations working on food security to share the surplus produce; organize cultural and entertainment activities open to everybody on the recovered roofs. OrtiAlti thus induces social value and contributes to design and activate new

community spaces, overcoming the public-private dichotomy. Each ortoalto is a unique project, contingent in time and space. In fact, it grows from the coordination of a plurality of subjects with potentially different interests and values, whose action can be mediated only because it takes place around that specific project. The subjects coordinated by OrtiAlti are: Harpo, the company that produces its own technology for green roofs; The Cooperative and Social Enterprise Agridea, that thanks to OrtiAlti has certified its gardeners for the installation of green roofs, thus expanding its market and offering new opportunities of employment and training for its beneficiaries; the building owners, which benefits from the valorization of the property, because of the improvement of buinding energy performance and its aesthetical quality; the householders and users of the space reclaimed, who can benefit from fresh zero food miles every day.
The approach to urban re-use and farming proposed by OrtiAlti is easily scalable. It can be applied on different typologies of buildings, with different direct users, but still combing private and public rationalities: rooftop gardens can be placed on individual homes, institutional and office buildings, and roofs of restaurants and serve either home consumption, use of fresh produce in restaurants or institutional kitchens or commercial production.
Related to that, the OrtiAlti team is today working on two main prototypal interventions. The first involves a restaurant and a hostel in Turin, both run by a social enterprise that employs disadvantaged young and organizes cooking classes for its beneficiaries. Thanks to its new ortoalto, this cooperative will be able to refurbish the building where its activities are located –an old factory from early 30's, owed by the Municipality - ; to produce fresh vegetables for the restaurant; to extend their set of services, by adding gardening classes for its beneficiaries; to provide the neighborhood with a new and high quality community space, open for schools and several public activities. The other implementation is with Carrefour Italia: the project consists in a new ortoalto for educational activities in Carrefour new mall in the city of Nichelino – next to Turin -, as part of its corporate social responsibility. Carrefour has allocated 600 sqm for this new function and is working on a management plan, that will include the direct involvement of local inhabitants, associations and schools, in order to make this space publicly accessible.

3. An urban regeneration device: combining multiple impacts

OrtiAlti combines two innovations: a technological one and a social one. According to literature on green roofs and urban farming, a farmed green roof can at the same time value the real estate, and work as a new ecosystem (Oberndorfer, Lundholm, Bass, Coffman, 2007) and a climate change mitigation solution. The technology for green roofs, in fact, consists of the superposition on the flat surface of a series of insulating elements/layers: a root-resistant waterproofing PVC membrane; a water storage and mechanical protection felt; a drainage, aeration and water storage element; a filter sheet and the cultivation soil[6]. The latter is particularly important, since it needs to be composed in order to have enough nutrients for the cultivation, to be effective within no more than 20-25 cm of thickness, and to be lightweight. From an environmental point of view, green roofs improve air quality, by filtrating particulates and creating re-oxygenation zones. If put in a network, green roofs can create a real ecosystem, able to reactivate biodiversity in urban environments, to prevent "heat-island" effects and to ensure better management for rainfalls, reducing episodes of urban flooding. A green roof, in fact, imbibes and "stores" water and blocks instant flow. Furthermore, it allows the reintroduction and the re-use of sewage into the building-apparatus. In regards of energy

[6] The technology used by OrtiAlti is the one produced by HARPO Group, an Italian company from Trieste. For more informations, see www.harpogroup.it

consumption, green roofs improve buildings performances, by intensifying thermal insulation and improving indoor micro-climate of rooms in the floors below and thus contributing to reduce heating and cooling systems costs as well as C02 emissions. In addition, this solution absorbs sound waves and controls their diffusion, allowing to achieve better room acoustic insulation.

Table 1. Environmental benefits of a green roof in urban areas

	Improvements
Roof external temperature	- 20° C
Heat Island effect	- 2 °C
Air quality	> Oxygen
Building energy demand in winter	- 10/30 %
Building energy demand in summer	-75,00%
Noise pollution	- 5dB
Rain water contained in the drainage system	35,00%

[A]100 mq of leaves can filter up to 10/30 mg of pollute (Susca, Graffin, Dell'Osso, 2011)
Sources: (Tehodosius, 2003; Dunnett and Kingsbury 2004; Oberndorfer & al., 2011)

Since it is cultivated, a farmed green roof can satisfy fresh vegetables requirements of several families - for example, 100 sqm of tomatoes can produce 2 tonnes per year-, combining private benefits with collective ones. It can contribute to ensure food security and promote KM0 food supply chain (Bohn & Viljoen, 2011; Wilson, 2009). Moreover, it enables to recycle the biggest part of organic domestic waste of an entire residential building that, transformed in compost, can be used as natural fertilizers for the soil. The experience of *Ousecretgarden* has shown that even if 40 sqm of a grown garden are not sufficient to guarantee the yearly needs of the 6 families living in the overlooking condo, it can certainly integrate part of the vegetables required and offer them a new urban living experience. However, if one of the reason behind urban farming is the desire to reconnect production with consumption, roofs dimensions matter in case of soil-based farming. In response to similar limits, some of the most futuristic systems for roof farming propose to intensify production through multilevel urban structures or greenhouse systems, with very sophisticated growing methods, like hydroponic or aquaponics[7], so that to exploit as much as possible the available roof surface (Thomaier & Al., 20015) and still obtain relevant environmental effects (Delor, 2011).
From the social impact point of view, the innovation boosted by OrtiAlti approach is systemic: building owners -private or public-, which pay for the rooftop garden, can benefit from the risen value of their real estate property, the reduction of their expenditures, and the return of image –especially in case of investors like companies or G.D.O-, while they contribute to environmental sustainability and social cohesion; P.A. can leverage on these interventions integrating their public policies on green areas and food security, especially thanks to the potential involvement of local O.N.G. engaged in fighting urban poverty; local communities can satisfy part of their requirements for fresh vegetable, but, most of all, they can benefit of a new pleasant collective green area. A grown garden cultivated and looked after by citizens favours sociability between them, exchanges between generations -

[7] Hydroponics is a subset of hydroculture and is a method of **growing** plants using mineral nutrient solutions, in water, without soil. Aquaponics is even more sophisticated, since it integrates plant and fish production, in re-circulated closed system (water tank).

especially between elders and kids - and different cultures, and the pursuance of healthy and economical physical activity.

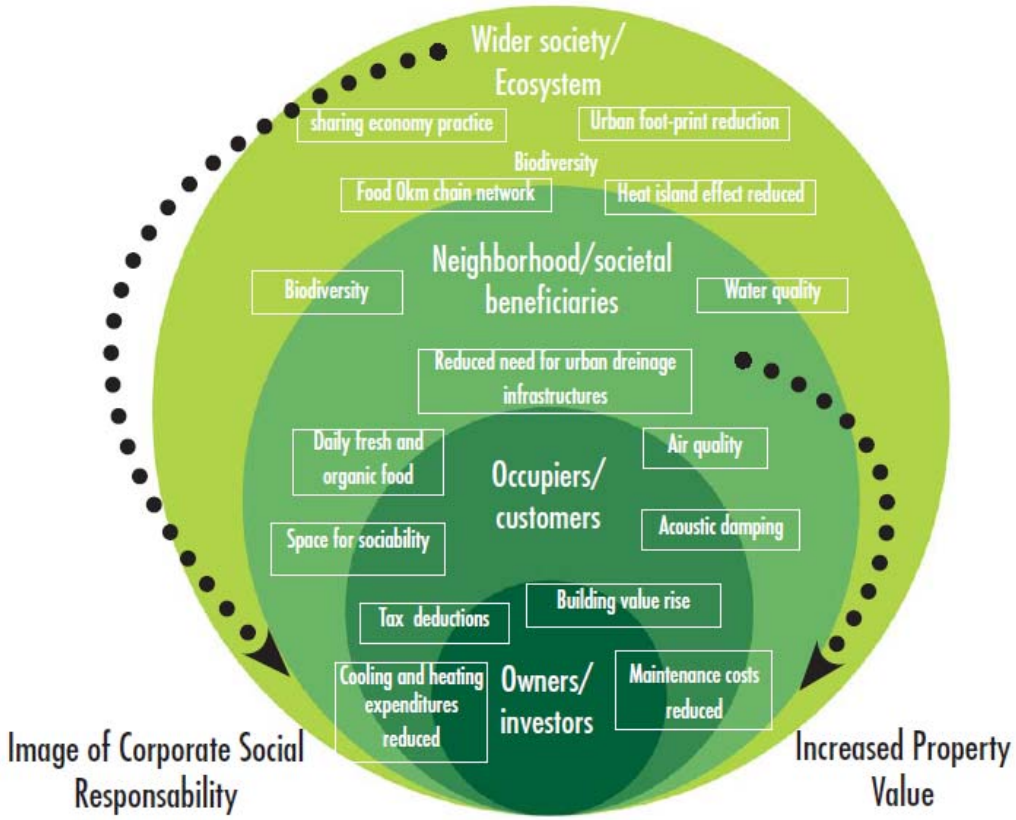

Figure 2. Multi-scalar positive impacts of OrtiAlti approach.

4. Towards a new ontology for urban planning

At the core of the OrtiAlti approach there was the idea that urban farming and urban regeneration could have been associated if framed within the concept of “urban resilience”, meaning the ability to adapt at changes without changing the systemic structure. In particular, this concept has recently migrated into the urban debate as umbrella for the planning and design strategies needed to support cities to develop the necessary capacity to meet the challenges of the future. Urban resilience is the degree to which cities are able to tolerate alteration before reorganizing around a new set of structures and processes. Hence, a resilient city is a settlement able to activate strategies to innovate its own internal equilibrium, according to the evolutions of contextual conditions; it is a city that adapts to climate change and that opts for the re-use and reconversion of its own urban fabric, rather than investing on no longer sustainable edification. Moreover, a city is resilient when it’s able to plan and implement permanent strategies for social homoeostasis, through mechanisms of smart collective governance.

According to this new paradigm for urban development, the ortoalto concept unveils the tangible opportunity to consider urban equipment – buildings, infrastructures, squares, green areas, ecc.. - as

dynamic resources, able to aggregate different communities of users, different public policies, different functions, hence different stakeholders. To reintroduce sustainable food infrastructures in the urban space becomes thus a "boundary strategy" to coordinate a wide range of functions, able to meet not-only production-oriented spaces, but many societal and ecological aims. According to Lovell (2010) the real challenge is hence to design multi-dimensional urban landscapes.
The ortoalto can work as a metaphor, a concept that demystify the old categories of spatial planning. A real new ontology that redefines the conflicting relationship between the public and private sectors in the use of resources such as the soil; that recognizes as multi-dimensional certain categories of urban spaces and activities; that includes new economic and social actors that operate as subjects able to produce values of collective interest to the community. The OrtiAlti case study, in fact, demonstrates the integrationist role of urban space, as at the same time prompter and recipient of different public policies: on the ortoalto meet welfare and educational policies, but also environmental and economic public initiatives. It also underlines the widespread commitment of private subjects – professionals, neighborhood organizations, social enterprises, inhabitants, ecc. – in taking care of the urban spaces and in designing new urban services through collaborative relationships.

We are facing an important paradigmatic change in urban planning, which implies some important reflections about meanings and methods:

- First, the overthrow of the traditional consideration of externalities produced by the phenomena of urban transformation and territorial policies. In Italy we are used to consider real estate initiatives and urban development projects as economical activity that involves generally positive externalities for the promoters, and as such subject to some form of direct payment of money in favor of the administration, by way of refreshment - in addition to the so-called burden of Urbanization -. This relationship between private parties - developers - and public - the municipalities - is regulated by laws from about half a century. Transformation initiatives of the city described in this note constitute a real reversal of the traditional public / private relationship: here is the public that is to take advantage of urban transformation made by private subjects. We are facing eventualities that require to update traditional assumptions on the redistributive aim of public action in urban planning.
- Second, the policy-maker is necessarily called to reconsider its decision-making process according to a renewed pragmatic rationality. This means to start and to learn from what already exists; from the "intelligence of democracy" (Lindblom, 1959) and from the social capital, the organizational capacity and the bottom-up initiatives spread all over the urban territory.

In particular, to build orchards on roofs matches with the tangible attempt to reconsider buildings in a renewed form and according to integrated uses, in the light of land consumption reduction and participatory practices. However, for being implemented correctly it still calls for innovations in urban policies and land use planning tools, particularly concerning the zoning codes. Major obstacles for constructing rooftop orchards and rooftop greenhouses are related to local building regulations and land-use laws: first, the change of the intended use of the surface – from not accessible, to accessible, for instance – implies procedures and precaution measures, which make the intervention too costly and time consuming. Rooftop greenhouse are even considered additional usable space, exceeding the floor-to-area ration in most cities. Interestingly enough, especially in Northern European countries like Austria, Germany and, across the Ocean, in Canada or United States, local regulatory bodies have started to adjust their urban planning tools in order to facilitate rooftop farming initiatives. This is the case for Monaco, Paris or Basilea, for instance, that have adopted specific policy tools to facilitate the

green roofs installations, as means for pursuing urban biodiversity, ecologic conservation and urban requalification. At the same time, the city of Vancouver or Toronto have developed specific urban food policies, according to which available flat roofs, especially those publicly owned, are included in their urban agriculture plans, as complementary spaces for food production. Other cities like New York and Boston have just started the revision of their zoning codes in order to introduce in their land-use urban agriculture, by including also rooftops as suitable spaces for farming.

5. Conclusions

This paper has been the occasion to reflect upon the OrtiAlti case study, as the exemplification of social innovation initiatives for urban re-use and urban farming. Differently from land based urban agriculture, the ortoalto has multiple functions and produces a wide range of non-food and non-market goods (Specht & Al., 2014), that contribute to create a new urban setting, sustainable and inclusive. It provides innovative architectural solutions for buildings reuse and urban regeneration, reducing food mile and improving resource and energy efficiency. In terms of social impacts, it contributes to improve community food security, to provide educational facilities, connecting consumers to food production, to empower urban inhabitants in taking care of the gardens. This has important effects also in economic terms, since it creates local circuits of produce exchange, and productive collaborations that can act as factors of local development.
Being rooftop farming a relatively unexplored field in urban planning discipline, especially in Italy, a lot of further research is still required.

6. References

Acherman K. & al. , (2014), "Sustainable Food Systems for Future Cities: The Potential of Urban Agriculture", *The Economic and Social Review*, Vol. 45, No. 2, pp. 189–206

Bohn K., Viljoen A., (2011), "The Edible City: Envisioning the Continous Productive Urban Landscape", *Field: a free journal for architecture*, Vol. 1, n.1, pp. 149-161.

Delor M., (2011), "Current State of Building-Integrated Agriculture, its Energy Benefits and Comparison with Green Roofs", University of Sheffield, Sheffield, UK.

Dubbeling M., (2014), "Urban agriculture as a climate change and a disaster risk reduction strategy", *UA Magazine*, n. 27, March, pp. 1-56

Dunnett N. Kingsbury N., (2004), *Planting green roofs and living walls*, Timber Press, Sheffield

Durhman A, Rowe DB, Ebert-May D, Rugh CL. (2004)., "Evaluation of crassulacean species on extensive green roofs.", Paper presented at the *Second Annual Greening Rooftops for Sustainable Communities Conference*, Awards and Trade Show; 2–4 June 2004, Portland, Oregon.

International Bank for Reconstruction and Development (2010), "Cities and Climate Change: An Urgent Agenda", in Urban Development Series - Knowledge Papers 10 (Washington DC: World Bank, 2010).

Lindblom C., (1959), "The Science of "Muddling Through", *Public Administration Review*, Vol. 19, No. 2

Lovell S.T., (2010), "Multifunctional Urban Agriculture for Sustainable Land Use Planning in the United States ", *Sustainability 2010, 2*,pp. 2499-2522 Open Access, available at www.mdpi.com/journal/sustainability

Mess C. & Stone E., (2012), "Zoned Out: The Potential of Urban Agriculture Planning to Turn Against its Roots", *Cities and the Environment*, Vol. 5, No. 1, Article 7.

Oberndorfer E., Lundholm J., Bass B., Coffman R., Doshi H., (2007). "Green Roofs as Urban Ecosystems: Ecological Structures, Functions, and Services", in *BioScience,* Vol 57, n. 10, pp. 823-833

Quesnel A., Foss J., Danielsson N., (2011), "Solutions from Above : Using Rooftop Agriculture to Move Cities Towards Sustainability", School of Engineering Blekinge Institute of Technology, Karlskrona, Sweden.

Saporito E., (2015), "Vuoti a Rendere", Editoriale *Labsus,* Rivista on-line, 21 Apile 2015.

Susca T., Gaffin S.R., Dell’Osso G.R. , (2011), ”Positive effects of vegetation: Urban heat island and green roofs”, *Environmental Pollution*, Vol 159, Issues 8/9, 2119-2126

Specht K. & Al., (2014), “Urban agriculture of the future: an overview of sustainability aspects of food production in and on buildings”, *Agric Hum Values*, 31, pp. 33–51

Theodosious, T.G, (2003), ”Summer Period Analysis of the Performance of a Planted Roof as a Passive Cooling Technique.”, *Energy and Buildings*, vol. 35, no. 9, pp. 909–917.

Thomaier S. & al., (2014), “Farming in and on urban buildings: Present practice and specific novelties of Zero-Acreage Farming (ZFarming)”, *Renewable Agriculture and Food Systems*.

Wilson, A., (2009), “Growing food locally: integrating agriculture into the built environment”, *Environmental Building News*, Vol. 18, No. 2, February 1. (available at www.buildinggreen.com).

Websites

www.ortialti.com
www.harpogroup.it
www.oursecregarden.biz