OrtiAlti as urban regeneration devices:
An action-research study on rooftop farming in Turin

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Key words	Abstract
	This paper discusses the role rooftop food gardens can play as urban regeneration devices, by combining environmental and social benefits and leveraging food production as a mediating function. In particular, this study focuses on the case of OrtiAlti, an action-research project based in Turin, set up to revitalize abandoned or under-utilized urban buildings through rooftop community gardens. The research is aimed at understanding the extent to which rooftop farming can contribute to urban regeneration processes if framed as a social innovation practice of place-making and urban resilience. OrtiAlti is indeed a metaphor, a way to demystify the old categories of spatial planning. It represents a new ontology that redefines the conflicting relationship between public and private sectors in the use of resources, such as land, that recognizes certain categories of urban spaces and activities as multi-dimensional, and that includes new economic and social actors as subjects able to produce values of collective interest for the community.

Introduction

According to data compiled by the United Nations, 54.5% of people live in urban areas (UN Habitat, 2016) and this number is due to increase exponentially in the next 30 years. Cities are the places where climate change effects occur more evidently, due to gas emissions, energy consumption, waste production, heat islands and rainfall events (Commission of the European Communities, 2007) and where the reduction of open spaces and the rising demand for resources such as water, energy and fresh food supply contribute to increase social conflicts and segregation (Istituto Superiore per la Protezione e la Ricerca Ambientale, 2009). Besides environmental challenges, cities are facing a deep economic crisis, which has affected post-industrial European cities (Bianchetti, 2015), threatening their stable social, productive and spatial organization. A new "urban issue" is emerging (Secchi, 2013) in cases where public action appears weaker than ever in combating social inequalities, urban deprivation and environmental emergencies (Pasqui, 2014).

However, cities are also the ideal spatial conditions for research and innovation. Cities, in fact, retain the economic and intellectual resources needed to develop creative solutions to emerging urban challenges: 1. Urban poverty, 2. Food insecurity and malnutrition; 3. Climate Change; 4. Natural resources scarcity and waste disposal (UN Habitat, 2016). The complexity and uncertainty of contemporary urban issues show once more the "weak, tricky and malignant" nature of urban planning problems (Rittel & Webber, 1973), which call for "out-of-the-box" thinking (Balducci, 2012), able to reconsider threats as opportunities. What seems to be required is the "negative capability" (Lanzara, 1993) of urban actors,

which is defined as the ability to deal with uncertainty and to react. This attitude implies that consolidated routines should be abandoned in favour of elaborating creative solutions to overcome the crisis. Contemporary literature on urban planning refers to this concept using the idea of "resilient cities" or "resilient communities". Resiliency is the capacity of territorial systems and their components to adapt and change over time (Davoudi et al., 2012), to bounce back quickly and emerge stronger from shocks and stresses (Rockfeller Foundation, 2009), and to exploit their environmental, economic, physical and social resources according to a reflexive, sustainable, inclusive and integrated approach.

In this sense, a real challenge for urban policy-makers, planners and designers is to design urban landscapes for a wide range of urban functions (Lovell, 2010) in order to deal with different urban issues at the same time. As an example of "out-of-the-box" solutions for resilient cities, green infrastructure (European Commission, 2013) and, in particular, urban agriculture (Dubbeling, 2014; World Bank, 2010), are considered kinds of new urban functions able to integrate spatial re-use with environmental rehabilitation and social mobilization through food production and community engagement (Tornaghi, 2014; Mess & Stone, 2012). Indeed, the concept of "green infrastructure" includes not only the natural resources of a territory (e.g. parks, ecological corridors, hydric basins, and forests), but also those artificial components which are able to increase the health of ecosystems and contribute to ecological networks. This is certainly the case for multifunctional green space, such as urban agricultural areas, but also for multifunctional green roofs, such as farmed roofs (Ackerman et al., 2014; Specht et al., 2014). The urban fabric, the buildings, or even just their roofs, can in fact become the urban infrastructure on which to redesign the resilient cities of tomorrow, by building a new "multi-functional landscape" (Lovell, 2010). It practically implies consideration of existing buildings as sites to be revitalized and re-used through strategies of "urban intensity", aimed at integrating conventional functions (e.g. residential, commercial, services, etc.), with unconventional ones (e.g. farming in buildings or on rooftops) and by pursuing social inclusion and community engagement. According to the paradigm of urban resilience, in fact, the role played by urban communities is crucial, as they can collaborate with the public administration in taking care of and regenerating urban goods (Ciaffi & Saporito, 2017) for the general interest.

In 2015, within this framework, OrtiAlti (i.e. gardens on top) was established in the city of Turin as an action-research and social innovation project (Phills et al., 2008). The idea at the core of OrtiAlti is to boost bottom-up urban regeneration processes, starting with the creation of rooftop community food gardens as urban regeneration devices. As a main research question, OrtiAlti is designed to study the extent to which rooftop farming can work as a solution for the resilient city: on the one hand, as a contribution to environmental rehabilitation, and on the other, as the trigger for innovative collaborations between different urban actors, who together can create solutions to many social problems related to food procurement, urban poverty, urban degradation, employment opportunities, and environmental education. The methodology for the inquiry has consisted of the creation and direct observation, as a participant observer, of a first experimental rooftop community garden in Turin: Ortoalto Le Fonderie Ozanam. There are two main hypotheses behind the Ortoalto Le Fonderie Ozanam (also called Ortoalto Ozanam) experiment. The first is that micro-actions of "urban acupuncture" (Lerner, 2014) and place-making (such as the repurposing of roofs as community gardens) can contribute to reactivating places quickly, by acting as catalysts driving the provision of local resources and creating community energy and public interest. The second is that food, because of its cultural and symbolic meaning, can act as a "common good" (Ciaffi et al., 2016) and a medium for social inclusion through which to create new civic bonds between urban actors and facilitate collaborations among them (Mela, 2016).

This paper, hence, starts with a literature review on rooftop gardening and farming, more specifically Zero acreage Farming (Specht et al., 2014, Thomaier et al., 2015), as a strategy for urban resilience and a practice of collective place-making (Houghton et al., 2015; Larsen, 2005). Next, the OrtiAlti methodology is presented as an action-research study aimed at testing community rooftop gardening at work. As a case study, the research discusses the implementation of Ortoalto Ozanam, the pilot project of the OrtiAlti methodology and the first roof-top community garden in the city of Turin. The last part of this article gives some ideas Justifying further research.

Rooftop farming as a solution for the resilient city
Forms of urban agriculture integrated with architecture are increasingly present in contemporary metropolises. Rooftop greenhouses, rooftop farms, vertical farms, and indoor farms are just some of the types of implementations which, from the US to China and Europe to Japan, are progressively replacing flat roofs, terraces, and even the entire vacant volume of various urban buildings, such as old factories, schools, headquarters, and residential buildings. These creations are mostly described as smart solutions for green building, sustainable food production and ethical consumption. However, if framed within the social innovation culture and the urban acu-

puncture perspective, rooftop farming could additionally contribute to social inclusion and urban regeneration.

Zero Acreage Farming: positive impacts and limits

Recent studies about these implementations have tried to give a comprehensive definition for this composite phenomenon using the concept of Zero acreage Farming (Specht et al., 2014; Thomaier et al., 2015; Sanyè-Mengual, 2015). According to its definition, Zero acreage Farming (ZFarming) includes "all types of urban agriculture characterized by non-use of farm land or open space" and "all types of urban agriculture in and on buildings, including installation of rooftop gardens, rooftop greenhouses, edible green walls as well as further innovative forms of indoor farms or vertical greenhouses" (Specht et al., 2014).

The number of ZFarming creations world-wide explains the perceived potential of such architectural solutions, such as new urban functions that generate a variety of benefits, going beyond simple food production and trade (Thomaier et al., 2015). Although the scientific literature on this topic is still rather limited , it is, however, possible to identify some recurring themes, which fall into 3 macro categories of impacts at the urban scale: (1) environmental, (2) social and (3) economic. In detail:

1. The literature on ZFarming puts a significant emphasis on the contribution it gives to the environmental quality of urban infrastructure and the territorial systems, especially because ZFarming pursues km 0 production, which is a strategy to drastically reduce CO_2 emissions to the atmosphere (Weber & Matthews, 2008; Aubry et al., 2008). Moreover, it limits energy consumption of buildings, by implementing synergistic solutions that recycle and ration energy and water. This is the case for rooftop greenhouses or rooftop farms, where technological solutions, such as the green roofing tech, for example, are implemented to thermally insulate the building below (Hui, 2011; Delor, 2011), reuse the building's grey water by discharging it to irrigate the vegetation (Specht et al., 2014), and transform organic waste into compost for the rooftop farm (Grard et al., 2015). Lastly, ZFarming contributes to a process of urban re-naturalization (Bohn & Viljioen, 2013). This is a process that, especially in the case of green roofing solutions, would contribute to restore urban ecological corridors and biodiversity (Orsini et al., 2014) and create new ecosystems (Oberndorfer et al., 2007).
2. From a social impact point of view, the literature highlights how most of these initiatives are based on the idea of pursuing more sustainable and ethical urban lifestyles, starting with more sustainable food procurement models for the city (Thomaier et al., 2015). Besides this, other social impacts are related to improving food access for urban inhabitants (Delor, 2011; Despommier, 2011; Hui, 2011), such as fostering education about ethical consumption and environmental sustainability and guarantying free access to high quality green spaces for socializing (Sanyé-Mengual, 2015; Lyson, 2004).
3. From an economical point of view, ZFarming can contribute to urban economy by intensifying food production and commercialization within the urban boundaries (Thomaier et al., 2015). Many of these projects entail intensive production, often using sophisticated technologies for cultivations which can be easily integrated into buildings, such as green-houses, hydroponics plants, and green roofing tech. But the economic impact on the urban system is not only due to their entrepreneurial nature (Santo et al., 2016), but also as triggers of real estate enhancement. In this way, initiatives integrated into existing buildings generate externalities extended to the neighbourhood, acting as a vector bringing urban regeneration (Robiglio, 2015).

Such studies demonstrate that ZFarming can, in fact, coincide with those "out-of-the-box" solutions for the resilient cities of tomorrow.

However, there are also some limits and critical aspects connected to similar initiatives, especially in the case of rooftop greenhouses and indoor farms. Both of these typologies imply the installation of very costly technologies, a precondition that tends to make such interventions inconvenient if they are not totally oriented to commercial purposes (Sanyé-Mengual, 2015).

Moreover, in western metropolises, the contribution ZFarming production gives to local food systems seems to be more related to the quality of food systems and the diversification of the produce distributed, rather than the real possibility to satisfy the urban demand for fresh food. In fact, even if it is true that building-integrated farming can be more sustainable in time than land-based urban agriculture, urban agriculture often occurs on urban lands waiting for future transformations and its contribution to guarantying fresh food access to the poorest sectors of the urban society still depends on the building location in the city. Some studies in the United States, where the "organic food" and "counter cuisine" movement is quite strong, show how ZFarming risks

even becoming exclusive when it emerges spontaneous-ly as a re-sponse to local instances of neighbourhoods where health-conscious movements are more common, which normally coincides with areas where the highly educated and high income population is concentrated (Ackerman, 2011).

Finally, although it seems largely acknowledged that rooftop farming, especially if realized with green roof-ing solution, can contribute to urban rehabilitation and work as a climate change adaptation strategy, especial-ly if put into a network of green infrastructure, it is less clear how rooftop farming can meet other social issues, such as urban poverty, food insecurity or even ethical food procurement.

The contribution of urban regeneration and social innovation literature

Literature and studies on ZFarming are helpful to struc-ture a taxonomy of building-integrated agriculture ty-pologies and relative impacts. However, most of these studies seem to be primarily focused on "food produc-tion", measuring the contribution of ZFarming to cities, reducing food systems ecological footprint or answering urban demand for food. However, there are, in fact, many other "non-food goods" that ZFarming produces (Specht et al., 2014), which frame this practice as a solution for the resilient city and which need more research.

First, recovering under-used or abandoned flat roofs and transforming them into productive green areas accessi-ble to the public is a practice of place-making that can improve the quality of life of the community. In particu-lar, community rooftop gardening and farming coincide with those "urban acupuncture" (Lerner, 2014) projects aimed at stimulating dynamic, transformative forces that re-create and re-activate places through co-crea-tion (Houghton et al., 2015). According to Urban Acu-puncture, it is possible to reduce stress in the urban en-viron-ment through small remedial interactions, just like "acupuncture" does to a human body suffering from cer-tain ailments. In practice, urban areas that are in need of repair receive certain specific physical projects (concern-ing the open space or the built space) that are meant to heal the stress or malfunction. This is the case with community rooftop farming projects, especially if these are intended and managed to generate environmental benefits and social impacts. According to scientific field literature (Tehodosius, 2003; Dunnett & Kingsbury, 2004; Oberndorfer et al., 2011; Hui, 2011), to convert a roof into a green roof is good for the urban environment, because it combines several ecosystem effects:

- improvement in outdoor thermal comfort, phys-ical-chemical features of rainwater and waste wa-

ter and air quality;
- reduction in the urban heat island effect of 2°C off the peak air temperature in the summer;
- reduction in the buildings' energy demand (10-30 % annually);
- decrease in noise pollution and improvement of the urban soundscape (5dB traffic noise level abatement);
- decrease in peak water flow to the drainage net-work (rivers, canals, etc.) by 50% and total volume of water conveyed to the drainage network by 35%;
- decrease in run-off time of urban test basin by up to 60%.

On top of that, a rooftop garden can perform as a device for community gathering and social inclusion (De Filip-pi, 2016; Mela, 2016), providing opportunities for urban inhabitants to interact and co-create a new urban space. In this context, a community rooftop garden can also be managed in order to produce several social benefits which go beyond food production: opportunities for social cohesion, mingling, networking, job training and support for vulnerable individuals (Tornaghi, 2014). In terms of urban public policies, a rooftop community gar-den project can intercept several public services: social services primarily, but also health care, as well as provid-ing opportunities for therapeutic gardening (Whatley et al 2015), job training support, educational services, etc.

From this perspective, a rooftop community garden or farming experience can be considered a social innova-tion solution (Murray, Caulier-Grice, & Mulgan, 2010), in-tended as a new idea (a product, a service and a model) that can satisfy different social needs at the same time in a more effective way than existing alternative ideas and simultaneously create new social bonds and collab-orations. In other words, these innovations are good for the society as a whole and can increase empowerment of society itself.

Methodology and objectives

The OrtiAlti project was conceived according to this cul-tural framework as a practical investigation of rooftop farming implementation and its effects as a solution for the resilient city. The research question behind the Or-tiAlti study was whether rooftop community farming, as a resilient practice, is able to improve the urban environ-ment and empower local inhabitants in taking care of the urban common good.

This action-research project was initiated in Turin in 2015. Given the experimental nature of the research top-

Figure 1: Ortoalto Le Fonderie Ozanam (Photo by Lorenzo Attardo)

ic, the inquiry methodology adopted required a certain ability of the researcher to work as an innovator, through reflection-in-action (Schön, 1983), working in cycles and recursive definition of hypotheses, tested by the action, then assessed, coming therefore to the reformulation of the hypothesis. That is why OrtiAlti was developed from the beginning as an action-research study, a process of "knowledge in action"(Argyris & Schön, 1978), to add up theoretical studies, stages of practice and reflection-in-action.

The idea behind the OrtiAlti methodology is to frame rooftop farming as a social innovation practice in order to design an implementation process aimed at meeting several social needs and generating social benefits at a larger scale. According to the definition given by a field study from Stanford University in 2008, a social innovation practice is "a novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals" (Phillis et al., 2008). Following this definition, the hypothesis behind the OrtiAlti research project is that by designing a collaborative methodology for implementation, which consists of engaging communities of urban inhabitants in the design and management phases of the rooftop gardens, integrating private sector and non-profit organizations (i.e. social cooperatives) as funders and operative partners, and facilitating support-

ive networks of food distribution and educational activities, rooftop farming could work as an innovative solution of community place-making and urban resilience.

To test the OrtiAlti hypothesis, Ortoalto Le Fonderie Ozanam (**Figure 1**) was created in 2016 as the first implementation of a community rooftop garden in the city of Turin and in Italy. This case study was used as a practical experiment, an urban laboratory, to test the implementation process in order to make it scalable and accessible to all and to observe and measure the effects (intended and not) of such an innovative practice for the Italian context.

A case study: implementing Ortoalto Ozanam in Turin

As a first experiment of the OrtiAlti approach, a pilot project was launched in February 2016 in Turin: Ortoalto Le Fonderie Ozanam (or Ortoalto Ozanam), a rooftop community garden, situated on the roof of a restaurant and a hostel, both run by a social cooperative that trains and employs disadvantaged young people in the activity of catering and hospitality. The building is an old factory located in the northern periphery of Turin, an urban sector that is characterized by a significant rate of urban poverty and a general lack of community services and green spaces. As a memory of the industrial past of the area, the former foundry built in late 1930s was reused

over time for different purposes. In the 1960s, with the name Casa Ozanam, it became a hospital for students and workers. Much later, in the 1980s, it became property of the Municipality of Turin, and then it was given to local NGOs (i.e. cultural associations and social cooperatives) who settled there to support the inhabitants of the neighbourhood by providing all kinds of social services.

Ortolalto was conceived from the beginning as an aggregator of interests and opportunities: first, as a step to refurbish the building and improve its energy efficiency; then as an opportunity for the restaurant below to produce fresh vegetables to be used in the kitchen and even for the social cooperative that runs the business to train its beneficiaries by adding gardening classes; lastly, as an opportunity to provide the neighbourhood with a new, high-quality community space, open to schools, workshops and other educational and recreational activities (**Figure 2**).

The implementation methodology has worked as follows:

- managers and employees of the social cooperatives have participated in the process since the design phase of the rooftop garden and have been trained for the rooftop garden maintenance;
- a social cooperative of gardeners was involved as an operative partner, which provided, for first time, the opportunity to learn how to install a green roof, thus opening up its business to a new market and offering new employment opportunities for its beneficiaries;
- a communication plan of the project was elaborated in order to attract private investors and engage the local community;
- an Italian roofing tech supplier, together with other enterprises, collaborated to work on and, in part, sponsor the project because of expected positive returns to their image for being involved in such an innovative solution;
- other social organizations located in the building became co-designers of a "shared management plan" for the garden, opening up new collaborations between them, thus integrating their social activities;
- lastly, the local public authority took part in the process by acknowledging the public utility of the intervention and including the Ortoalto Ozanam in the list of "local places of public interest".

Figure 2: Public initiatives at Ortoalto Ozanam (Photo by Lorenzo Attardo)

The construction lasted from February to April 2016 and by the end of May 2016, Ortoalto was officially open to the public. The rooftop garden covers an area of 150 m2 and is made of a green roofing tech, a light substrate, 18 cm deep, which is enough for cultivating a variety of vegetables (e.g. tomatoes, every kinds of salad greens, eggplants, green beans and peppers, etc.). Despite the relatively small dimensions of the project, the construction process lasted almost 3 months because of the regulatory procedures to be followed, which slowed down the process. The main problem concerned local regulations regarding building refurbishment and land-use, which, at first, didn't recognize the collective utility of the project and instead considered this implementation exclusively related to a commercial activity (even if it was not profit oriented), hence with limited access to the public.

The project is now in its second phase of implementation. Since the opening event in May 2016, Ortoalto Ozanam has been visited by many citizens, published in many reviews and newspapers, and has hosted classes, international workshops and public events on environmental education and ethical food production and consumption. Even just 6 months after its opening, there were already some measurable outcomes:

- the garden produced almost 30 kg of vegetables per square meter (1500 kg in 6 months), and most of the produce was used in the restaurant, while the rest was given to the volunteers who collaborated on the management;
- 3 employees from the restaurant were trained in gardening and 8 employees from the cooperative of gardeners were trained for implementing green roofs;
- 30 students from high schools and professional schools attended the construction phase;
- 7 workshops on environmental education and ethical consumption for children took place in the garden (involving almost 70 kids) and 2 conferences for university students and practitioners were organized at Ortoalto Ozanam to discuss urban sustainability and collaborative place-making culture;

Interestingly enough, some outcomes were not even intended when the project was initiated.

Many of these results can be considered outcomes of the social innovation approach adopted, which has generated unpredicted collaborations between several local and metropolitan actors concerned with different public sectors and social movements: social organizations working in education, health care and welfare sectors, but also the groups related to the Slow Food movement and artists organizations. As an example, the Local Department of Public Health Care, which deals with drug addiction issues, has undertaken a 1 year therapeutic gardening program at Ortoalto during which 10 patients have started taking care of the garden together with the cooperative located in the building.

Moreover, in June 2016, a social organization interested in bee-keeping, urban biodiversity and environmental education initiated a collaboration with the restaurant by installing two bee-hives next to the garden, which produced 18 kg of urban honey. Together with this new actor, the social cooperatives historically located in the building are now programming new training and educational activities together that are open to the city. Recently, a group of 20 Pakistani refugees moved to the hostel next to the restaurant. The presence of all these productive activities, and in particular, the presence of Ortoalto represents the perfect opportunity to program integration and work placement initiatives directly towards these people.

As a major result, the implementation process for the Ortoalto has worked as a practical laboratory to open up a discussion and a collaboration with the Local Municipality, aimed at evaluating the collective value generated by similar initiatives and, consequently, understanding the regulatory adjustments needed to make such an innovative solution easy to realize for any private inhabitant and building owner. Thanks to this confrontation, some barriers to the rooftop gardening implementation have been removed.

Firstly, before the implementation of Ortoalto Ozanam, according to local Building Regulation Code and Land-Use Planning Laws, changing the intended use of the roof surface from a space that is not accessible to people, to one that is, entailed adjusting the project to procedures and precautionary measures, which made the intervention more costly and time consuming than expected. Secondly, since it was recovered and transformed into a "terrace", according to the Local Land-Use Code, the roof surface becomes officially a "commercial surface" that can be used by the restaurant for making profit. This interpretation of the private initiative in urban development and building refurbishment is regulated by a direct payment of money to the administration for the positive externalities generated by the private developer. However, this regulation does not take into account the public benefits generated by an urban development solution like the one proposed with Ortoalto Ozanam, which, unlike a traditional private intervention in urban development, is actually contributing to the improvement of the public city.

As a consequence of such an evident conflict between procedures and meanings, the Municipality of Turin decided, after the Ortoalto Ozanam implementation, to acknowledge the public interest of similar initiatives in the city, even if promoted by private developers, and to support them by extinguishing the relative tax payment to the public administration. Thanks to this innovation, the potential for scaling up the project seems to be relevant.

As described in the case study, the impact generated by rooftop farming affects urban regeneration processes because it combines two innovations: a technological one (a farmed green roof that recovers unused urban surfaces, i.e. flat roofs, and improves the environment) and a processual one (a systemic model for stakeholder engagement in a place-making activity). Below, **Figure 3** shows how the implementation process tested with Ortoalto Ozanam generates multi-scalar positive impacts, not only for the first investor (the real estate owner, as a private individual, company or social enterprise), but also for the urban society as a whole, by combining environmental impacts with social effects.

In this way, a farmed roof is an opportunity, a spatial prefiguration, and a bearer of many values and expectations which can attract several urban actors because it is convenient for them in different ways:

- the building owners, private or public, who pay for the rooftop garden, can benefit from the rising value of their real estate, a reduction in heating and cooling expenditures, and a positive effect for their image, especially in the case of investors like companies or mass retailers, while contributing to environmental sustainability and social cohesion;
- the Public Administration can leverage these interventions, integrating their public policies on environment, social inclusion and food security, especially thanks to the potential involvement of local NGOs engaged in fighting urban poverty;
- local communities can satisfy part of their requirements for fresh vegetables, but, most of all, they benefit from a new pleasant collective green area. A garden cultivated and tended by citizens favours sociability between them, exchanges between
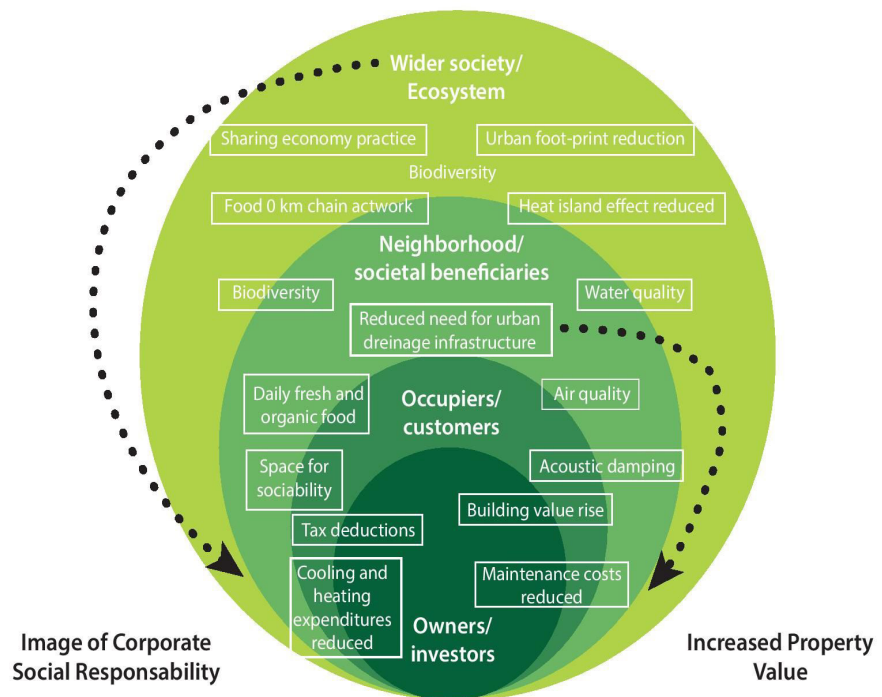

Figure 3: Multi-scalar positive impacts of OrtiAlti approach (Author's own elaboration)

generations (especially between elders and kids), multi-cultural integration, and the pursuance of healthy and economical physical activity.

Conclusions and open questions

This paper has been an occasion to reflect upon the OrtiAlti methodology as a practical exemplification of how rooftop farming can work as an urban regeneration device, if framed as a social innovation practice. Ortoalto has multiple functions and produces a wide range of non-food and non-market goods (Specht et al., 2014) that contribute to create a new urban setting, both sustainable and inclusive.

Urban rooftop gardening provides innovative architectural solutions for building reuse and urban rehabilitation, rationing resources and improving energy efficiency. In terms of social impacts, it contributes to providing educational spaces for citizens, connecting consumers to food production, empowering urban inhabitants in taking care of the common good, such as urban gardens and urban agriculture (Tornaghi, 2014), creating new employment opportunities and fostering virtuous collaborations between for-profit and non-profit businesses, citizens and institutional actors. In economic terms, it creates local circuits of produce exchange and new productive collaborations that can act as factors for local development. Hence, from the perspective of OrtiAlti, food production is a means to coordinate several urban

subjects locally which cooperate in regenerating the city while acting on the same design object (Saporito, 2016). Food, therefore, performs as a vehicle to spread the culture and practice of sustainable urban living.

The ortoalto can work as a metaphor, a concept that demystifies the old categories of spatial planning. The Ozanam case study, in fact, demonstrates the integrationist role of urban space, as, at the same time, a prompter and recipient of different public policies: around Ortoalto Ozanam, project welfare and educational policies meet, as well as environmental and economic public initiatives. It also underlines the widespread commitment of private subjects (e.g. professionals, neighbourhood organizations, social enterprises, and inhabitants) in taking care of urban spaces and designing new urban services through collaborative relationships. In particular, adding other multifunctional activities on building roofs, and building productive social gardens, especially, is a tangible attempt to reconsider abandoned or underutilized urban buildings not as a problem or a cost for the society, but as an opportunity to redesign a resilient city, thus fostering reduction of land consumption and participation of urban communities.

However, to be implemented correctly, rooftop farming still calls for innovations in urban policies and land-use planning tools, particularly concerning local regulations. Interestingly enough, especially in Northern European countries like Austria and Germany and across the Ocean in Canada and the United States, local regulatory bodies have started adjusting their urban planning tools in order to facilitate rooftop farming initiatives. This is the case for Monaco, Paris and Basilea, for instance, which have adopted specific policy tools to facilitate green roof installations as practical solutions for enhancing urban biodiversity, ecologic conservation and urban requalification. Particularly interesting is the Pariculteurs programme, launched in February 2016 by the Deputy Mayor for the Environment of Paris: a public initiative to facilitate the conversion of 47 rooftops of urban buildings (schools, research centers, offices, etc.) into community gardens and farms. At the same time, Vancouver and Toronto have developed specific urban food policies, according to which available flat roofs, especially those which are publicly owned, are included in specific 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 urban agriculture into their land-use as a new function, even adding rooftops as suitable spaces for farming.

After the creation of Ortoalto Ozanam, the city of Turin has opened an interlocution with the OrtiAlti research group to learn more about how to implement such a project and scale it up in the urban territory. In order to proceed in this direction, much research work is needed. First, a mapping of the available urban unused flat roofs (e.g. garages, residential buildings, supermarkets and industrial sheds) is needed. Secondly, a survey methodology must be designed to collect the data needed (from surface dimensions, to structural resistance, to accessibility level, etc.), combining quantitative and qualitative information, to allow creation of a detailed archive of potential rooftops suitable for a greening and farming interventions. As a rough estimate, more than 20% of the urban surface in Italian cities is covered with flat roofs. To convert these parts of the city into roof gardens planted with vegetables, managed by citizens and connected in a supportive network, represents a powerful tool for urban transformation and renewal, and environmental and social regeneration.

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Conflict of Interests

The author hereby declares that there are no conflicts of interests.

References

Ackerman, K. (2011). *The potential for urban agriculture in NewYorkCity: Growing capacity, food security, and green infrastructure*. New York, NY: Urban Design Lab at the Earth Institute, Columbia University.

Ackerman, K., Conrad, M., Culligan, P., Plunz, R., Sutto, M., & Whittinghill, L. (2014). Sustainable food systems for future cities: The potential of urban agriculture. *The Economic and Social Review*, (45)2, 189–206.

Argyris, C., & Schön, D. (1978). Organizational Learning: A theory of action perspective. Reading: Addison-Wesley.

Aubry, C., Ramamonjisoa, J., Dabat, M. H., Rakotoarisoa, J., Rakotondraibe, J. & L. Rabeharisoa (2008). L'agriculture à Antananarivo (Madagascar): Une approche interdisciplinaire. *Natures, Sciences, Sociétés*, 16(29): 3-35.

Balducci, A. (2012). Planning as the re-organization of

hopes. Disp, *The Planning Review*, 48(4), 4-5.

Bianchetti, C. (2015). Crumbling territories: Rules, rights and values. In C. Bianchetti, E. C. Lanza, A. E. Kercuku, A. Sampieri, A. Voghera (Eds.), *Territories in Crisis: Architecture and Urbanism Facing Changes in Europe*. Berlin: Jovis.

Bohn, K. & Viljoen, A. (2013). Urban agriculture: Designing the productive city. In CITIES trancity*valiz (Ed.), *Farming the city: Food as a tool for today's urbanism* (pp. 45-49). Amsterdam: Trancity valiz.

Ciaffi D., & Saporito, E. (2017). Shared administration of smart cities. In Riva Sanseverino, E. Riva Sanseverino, R., Vaccaro, V. (Eds.), *Smart cities atlas: Western and Eastern intelligent communities.* Cham: Springer Tracts in Civil Engineering,

Ciaffi, D., De Filippi, F., Saporito, E., & Marra, G. (Eds.) (2016). *Cibo, cittadini e spazi urbani. Verso un'amministrazione condivisa dell'Urban Food Policy di Torino*. Roma: Labsus.

Commission of the European Communities. (2007). Adapting to climate change in Europe –options for EU action (Green Paper COM/2007/0354). Retrieved from *http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex-:52007DC0354*

Davoudi, S. & Porter, L. (2012). Applying the resilience perspective to planning: Critical thoughts from theory to practice. *Planning Theory and Practice*, 13(2), 299-333.

De Filippi, F. (2016). La campagna va in città. L'agricoltura come opportunità di rigenerazione urbana. In D. Ciaffi, F. De Filippi, E. Saporito, & G. Marra (Eds.), *Cibo, cittadini e spazi urbani. Verso un'amministrazione condivisa dell'Urban Food Policy di Torino*. Roma: Labsus.

Delor, M. (2011). *Current state of building-integrated agriculture, its energy benefits and comparison with green roofs*. Sheffield: University of Sheffield.

Despommier, D. (2011). *Vertical farming: Feeding the world in the 21st century*. New York, NY: Picador.

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

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

Durhman, A., Rowe, D.B., Ebert-May, D., & Rugh, C. L.

(2004, June). Evaluation of species on extensive green roofs. Paper presented at the Second Annual Greening Rooftops for Sustainable Communities Conference, Awards and Trade Show, Portland, Oregon.

Grard, B. J. P.,Bel, N., Marchal, N., Madre, F., Castell, J. F., Cambier, P., Houot, S., Manouchehri, N., Besancon, S., Michel, J. C., Chenu, C., Frascaria-Lacoste, N., Aubry, C. (2015). Recycling urban waste as possible use for rooftop vegetable garden. *Future of Food: Journal of Food, Agriculture and Society*, 3(1), 21-34.

European Commission. (2013). *Building a Green Infrastructure for Europe*. Belgium: European Union.

Houghton, K., Choi, J. Z., Lugmayr, A. (2015). Urban acupuncture. *Journal of Urban Technology* 22(3), 1-2.

Hui, S. C. M. (2011, March). Green roof urban farming for buildings in high-density urban cities. Paper presented at World green roof conference, Hainan, China.

Istituto Superiore per la Protezione e la Ricerca Ambientale. (2009). *L'adattamento ai cambiamenti climatici: strategie e piani in Europa* (Rapporti 94/2009).

Lanzara, G. (1993). *Capacità Negativa. Capacità progettuale e modelli d'intervento nelle organizzazioni*. Bologna: Ed.il Mulino.

Lerner J. (2014). *Urban Acupuncture.* Washington, DC: Island Press.

Lyson T. A. (2004). *Civic agriculture: Reconnecting farm, food and community*. Medford, MA: Tufts University Press.

Lovell, S. T. (2010). Multifunctional urban agriculture for sustainable land use planning in the United States. *Sustainability*, 2(8), 2499-2522.

Mela, A. (2016). Città: centro di governo del territorio. In D. Ciaffi, F. De Filippi, E. Saporito, & G. Marra (Eds.), *Cibo, cittadini e spazi urbani. Verso un'amministrazione condivisa dell'Urban Food Policy di Torino*. Roma: Labsus.

Mess, C. & Stone, E. (2012). Zoned out: The potential of urban agriculture planning to turn against its roots. *Cities and the Environment*, 5(1).

Murray, R., Caulier-Grice, J., Mulgan, G. (2010). *The open book of social innovation*. The Young Foundation.

Oberndorfer, E., Lundholm, J., Bass, B., Coffman, R., Doshi, H. (2007). Green Roofs as Urban ecosystems:

Ecological structures, functions, and services. *BioScience* 57(10), 823-833.

Orsini, F., Gasperi, D., Marchetti,L., Piovene, C., Draghetti, S., Ramazzotti, S., Bazzocchi,G. ., and Gianquinto,G (2014). Exploring the production capacity of rooftop gardens (RTGs) in urban agriculture: The potential impact on food and nutrition security, biodiversity and other ecosystem services in the city of Bologna. *Food Security Journal*, 6(6), 781-792.

Pasqui, G. (2014). Prefazione. In Inti, I., Cantaluppi, G., & Persichino, M. (Eds.), *Temporiuso. Manuale per il riuso temporaneo di spazi in abbandono, in Italia*. Milan: AltraEconomia Edizioni.

Phills, J. A. Deiglmeier, K., & Miller, D. T. (2008). Rediscovering Social Innovation. *Stanford Social Innovation Review*, 6(4), 34-43.

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Science*, 4, 155-169.

Robiglio, M. (2015). *The unexpected ingredient of urban adaptive reuse*. Washington DC: The German Marshall Fund of the United States.

Rockefeller Foundation. (2009). Building climate change resilience (White Paper). Retrieved from *https://www.acccrn.net/sites/default/files/publication/attach/10_RF_WhitePaper_Resilience.pdf*.

Saporito, E. (2016). *Consensus building versus irreconcilable conflicts: Reframing participatory planning*. Springer Briefs in Applied Science and Technology.

Sanyé-Mengual, E. (2015). Sustainability assessment of urban rooftop farming using an interdisciplinary approach (Doctoral Thesis). Universitat Autònoma de Barcelona, Barcelona, Spain.

Saporito, E. (2015, April 21). Vuoti a Rendere. Labsus. Retrieved from *http://www.labsus.org/2015/04/vuoti-a-rendere-edifici-abbandonati/*

Specht, K., Siebert, R., Hartmann, I., Freisinger, U. B., Sawicka, M., Werner, A., & Dierich, A. (2014). Urban agriculture of the future: An overview of sustainability aspects of food production in and on buildings. *Agriculture and Human Values*, 31(1), 33-51.

Secchi, B. (2013). *La città dei ricchi e la città dei poveri*. Milan: Laterza.

Santo, R., Palmer, A., & Kim, B. (2016). *Vacant Lots to Vibrant Plots: A review of the benefits and limitations of urban agriculture*. Center for a Livable Future, John Hopkins University.

Theodosious, T. G. (2003). Summer period analysis of the performance of a planted roof as a passive cooling technique. *Energy and Buildings*, 35(9), 909–917.

Thomaier, S. Specht, K. Henckel, D., Dierich, A., Siebert, R., Freisinger, U. B., & Sawicka, Magdalena. (2015). Farming in and on urban buildings: Present practice and specific novelties of Zero-Acreage Farming (ZFarming). *Renewable Agriculture Food Systems,* 30(1), 43–54.

Tornaghi, C. (2014). Critical Geography of Urban Agriculture. *Progress in Human Geography*, 38(4), 551–567.

Weber, C. L. & Matthews, H. C. (2008). Food Miles and the Relevant Climate Impacts of Food Choices in the United States. *Environmental Science Technology*, 42(10), 3508–3513.

Whatley, E., Fortune, T., & Williams, A. E. (2015). *Enabling occupational participation and social inclusion for people recovering from mental ill-health through community gardening*. Aust Occup Ther J., 62(6).

World Bank. (2010). Cities and climate change: An urgent agenda. In Urban Development Series Knowledge Papers. Retrieved from *http://siteresources.worldbank.org/INTUWM/Resources/340232-1205330656272/CitiesandClimateChange.pdf*

UN Habitat. (2016). Urbanization and Development: Emerging Futures. World City Report. Retrieved from *http://wcr.unhabitat.org/wp-content/uploads/sites/16/2016/05/WCR-%20Full-Report-2016.pdf*