

# Introducing Rooftop Greenhouses to the City of Berlin

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**What solutions are available to connect food production and buildings? Policy makers, planners, activists, homeowners, architects and other relevant stakeholders were brought together in order to explore these options in a series of workshops held between 2011 and 2013.**

The aim was to identify possible farming models and describe their implementation in or on urban buildings for the metropolitan area of Berlin. This resulted in the development of a stakeholder network called “ZFarm – Urban agriculture of the future” ([www.zfarm.de](http://www.zfarm.de)) and a manual to enable the government, politicians, citizens and future operators to deal with rooftop greenhouses in Berlin.

## Food production in and on buildings in Berlin

The city of Berlin (Germany) has a long tradition of inner-city gardening. Family-home gardens, school gardens and garden plots (so-called *Schrebergärten*) can be found all over the city. These facilities have been used mainly to grow fruit and vegetables in wartime and in times of limited food availability. But in recent years a new momentum has developed,

and new types of urban food producers are focusing on urban farming activities that are taking place around, but also in and on urban buildings.

The term “Zero-acreage farming” (ZFarming) is used by the authors to describe all types of urban agriculture that do not use farmland or open spaces: rooftop gardens, rooftop greenhouses and edible green walls, as well as innovations such as indoor farms or vertical greenhouses (Specht et al. 2014). In recent years, ZFarming has become a topic of interest among a variety of local stakeholders in Berlin, even though it still faces several uncertainties.

As in many other cities worldwide, Berlin has seen an increase in recent years in rooftop gardens, rooftop greenhouses and indoor farms. These have been planned or set up by both activists and non-profit associations or private initiatives for social as well as commercial purposes. According to its proponents, ZFarming promises to fulfil multiple functions and produce a range of goods, all of which may have a positive impact on the urban setting. It promises environmental benefits, such as reducing the environmental impact of architecture, reducing food miles, and improving resource and energy efficiency. The social benefits include improving



*A photomontage of strawberries in a rooftop greenhouse overlooking the Potsdamer Platz in Berlin.* Credit: Jōichi Itō (Wikimedia commons), photomontage by Axel Dierich



Prototype of container farm tested by Efficient City Farming (ECF) with aquaculture in container and hydroponics in greenhouse.

Photo: ECF Farmsystems Berlin

community food security, providing educational facilities, linking consumers to food production, and serving as a design inspiration. In economic terms, it provides potential public benefits and commodity outputs (Specht et al. 2014).

At the same time, because this is a very new concept for food production and is thus at an early stage of research and development, it involves some limitations and difficulties. For some applications, the various individual technologies are known, but they have never been used together as required for ZFarming. Other applications require entirely new building materials or cultivation techniques (especially for indoor farming) that have not yet been developed. As well as technical constraints, other critical aspects pose problems, namely the high investment costs; the exclusionary effects (due to restricted accessibility, exclusive products and customers); and the lack of acceptance of soilless growing techniques (Specht et al. 2014, Thomaier et al. 2014).

### Designing urban innovations together

A participatory approach called “Regional Open Innovation Roadmapping” (ROIR) was chosen to investigate the potential and problems involved in implementing ZFarming projects in Berlin. ROIR is an instrument for participatory decision-making and the implementation of innovations. It depicts in advance the entire development, implementation

and launch of a project in detail, and includes from the outset the expertise and opinions of all relevant stakeholders (Phaal et al. 2004, Schwerdtner et al. 2010).

The ROIR process started with the identification of the relevant stakeholder groups. To achieve a balanced and comprehensive group, a variety of experts relevant to ZFarming were approached and invited to participate in the ROIR process. We invited stakeholders in each of the key expert groups:

- Activists & projects – NGOs, project groups and initiatives currently planning or actually setting up ZFarming-related projects
- Lobby groups, associations and unions – e.g., horticulture, real estate, landscape architecture, green roofs and farmers’ associations
- Planning and construction – e.g., architecture, recycling and greenhouse planning
- Politics and administration – e.g., departments of environment, health, consumer protection, urban development, climate
- Researchers from fields associated with ZFarming – e.g., energy and building, aquaponics, urban planning, plant physiology, agriculture
- Sales and distribution – stakeholders likely to grow, sell or distribute ZFarming produce, e.g., supermarkets, restaurants and university refectories.

Representatives of the various stakeholder groups met in a series of workshops held between 2011 and 2013. Initially, the stakeholders focused on all ZFarming types, including rooftop gardens, rooftop greenhouses, vertical fruit and vegetable gardens, and even technologically complex multistory indoor farms. But as early as the first phase, the participants decided to focus on rooftop greenhouses as the most promising type for the city of Berlin. First, the stakeholders defined a list of sustainability aims that any ZFarming project should fulfil (e.g. improvement of water efficiency, energy efficiency or employment). For indoor farms the stakeholders saw the required amount of energy as a major disadvantage, while for rooftop gardens the climatic conditions in Berlin only allow a very short growing season. Based on a comprehensive analysis of the expected economic, ecological and socio-cultural effects of the various innovative proposals, a joint decision was made by the stakeholders in the second workshop in favour of rooftop greenhouses as having the most development potential.

In the following steps and meetings, the topic of rooftop greenhouses was examined in detail. Due regard was paid to the technical, social, economic, environmental, administrative and political framework conditions required to ensure their successful implementation, and how these conditions can be established.

During the roadmapping workshops, the stakeholder network (of around 50 participants) called “ZFarming-urban agriculture of the future” ([www.zfarm.de](http://www.zfarm.de)) was established in Berlin; jointly, this network created a practical guide<sup>1</sup> to enable the government, politicians, citizens, and future



operators to deal with rooftop greenhouses in Berlin (Freisinger et al. 2013). The topics covered include all of the steps involved, from initial brainstorming to the finished rooftop greenhouse. Among other things, checklists for site analysis, production planning, financial planning, and public relations are provided.

### The way forward

As became evident during the ROIR process, rooftop greenhouses have some potential to contribute to the sustainable development of the city of Berlin. According to the members of the ZFarm network, rooftop greenhouses can help improve resource efficiency, increasing social capital and enhancing Berlin's economic strength in the medium to long term. The establishment of rooftop greenhouses offers opportunities for new partnerships and networks and requires interdisciplinary exchange among actors who have not cooperated before. Considering their aims, market orientation and transformative potential, rooftop greenhouses have been classified in five categories (Thomaier et al. 2014):

- 1.) Commercial: the main purpose of the greenhouse is to run an economically viable farming business;
- 2.) Image-oriented: the greenhouse is not the main source of revenue but serves as an add-on to another food business, such as a restaurant, that processes and sells the produce;
- 3.) Social and educational: the main purpose is to communicate social and educational values, such as greenhouses on schools, universities or hospitals;
- 4.) Urban living quality: the greenhouse serves as a recreational space on residential or commercial buildings, where residents or employees can grow their own food and enjoy a green oasis;
- 5.) Innovation incubator: the greenhouse serves the purpose of promoting new food-production concepts; these greenhouses are often pioneer or demonstration projects operated by NGOs or research institutions.

Most stakeholders specified that the main project's aims should be to educate people, create social interaction and demonstrate alternative forms of food production and resource recycling, and that they should explicitly but not solely focus on "profitability". Most of the stakeholders involved in Berlin emphasised that while projects should, of course, be economically self-sufficient, their real value lies in the production of non-market goods. In keeping with this notion, they therefore reject purely consumption-driven models. Some even see it as a risk that large companies could seize upon the idea of ZFarming and turn it into an exclusively profit-oriented and unsustainable business in which ZFarming would be reduced to an urban version of industrialised rural production. In the case of Berlin, the participants of the ZFarm network largely agreed that operators need to use the positive potential meaningfully, by focusing on local resources and energy-efficient production, building new market structures, and including social and educational aspects.

In order to successfully realise the sustainability of rooftop greenhouses, the various disciplines and stakeholders need



Front-page practical guide "Something is growing on the roof"

to continue to work hand-in-hand to establish pilot projects, whether on residential buildings, supermarkets or schools. From there, one can start to investigate the social, economic and environmental effects of the rooftop greenhouse and gain experience about what needs to be endorsed or adapted to enable rooftop greenhouses to make a valuable contribution to sustainable urban development.

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- 1) The manual "Es wächst etwas auf dem Dach. Dachgewächshäuser. Idee, Planung, Umsetzung" is available as a free download pdf at [www.zfarm.de](http://www.zfarm.de). The English version "Something is growing on the roof. Rooftop greenhouses. Idea, planning, implementation" will be available in January 2015.

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