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COST Action Urban Agriculture Europe: Freelance STSM: Stakeholders' acceptance, governance and power relations in innovative forms of urban agriculture

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COST-Action Urban Agriculture Europe

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Freelance STSM: Stakeholders' acceptance, governance and power relations in innovative forms of urban agriculture

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1. Introduction

The increase of world population and its concentration in urban areas is putting higher pressure on the global food supply. Urban expansion leads to the destruction of periurban farmland and increases the disconnection of consumption and production areas (Seto et al. 2011; Paül and McKenzie 2013). However, global food production is expected to face several challenges due to productivity limitations, scarce land availability and climate change effects (Godfray et al. 2010; Pelletier and Tyedmers 2010; Foley 2011; FAO 2013a). At the same time, the dependence of cities to external resources has pushed the global agenda to consider sustainable design practices, such as the "Thematic Strategy on the Urban Environment" of the European Commission (European Commission 2005).

In such sustainable design scheme, food is expected to be environmentally-friendly and with shorter food-miles, thereby decreasing the overall environmental impacts. Particularly in cities of developed countries, the environmental awareness of cities and the development of alternative food markets and supply-chains have promoted the creation of a local food sector (Weatherell et al. 2003). A growing demand of local and ecological food products has supported the creation of farmers' markets, community-supported agriculture (CSA) schemes or on-site retailing. Consumers attribute to local products a higher quality, freshness, nutrition and traceability (Lee 2001; La Trobe 2001; Boyle 2003; Seyfang 2004).

Within this local food movement, periurban and urban agricultural activities are increasing thereby providing citizens with local and fresh produce from vacant spaces in urban areas (Cohen et al. 2012; Grewal and Grewal 2012). Based on the discussion around UA conceptualizations of the Working group 1 of the COST Action "Urban Agriculture Europe" (Lohrberg and Timpe 2012), Urban Agriculture (UA) can be defined as (Sanyé-Mengual 2015):

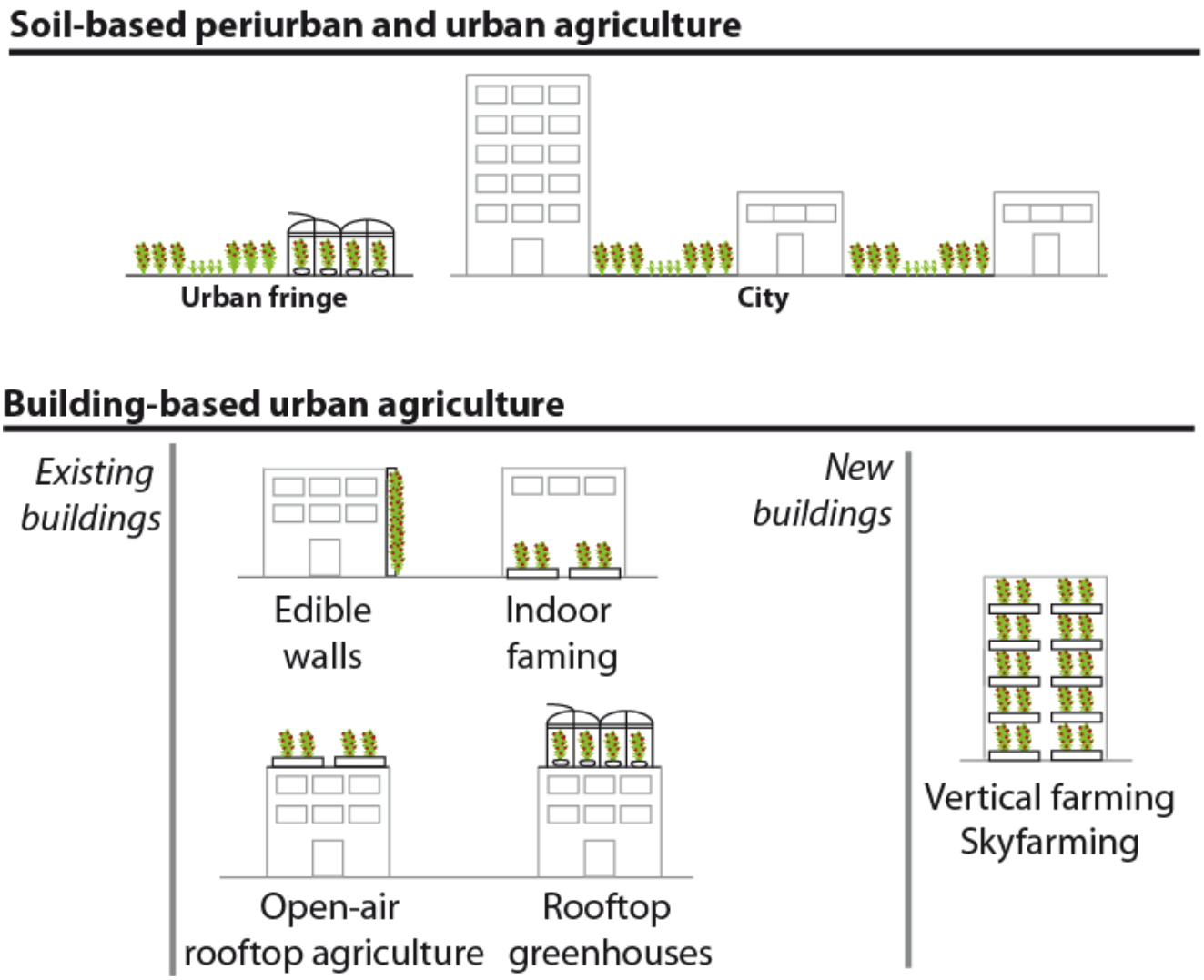
"farming operations taking place in and around the city that beyond food production provides environmental services (soil, water and climate protection; resource efficiency; biodiversity), social services (social inclusion, education, health, leisure, cultural heritage) and supports local economies by a significant direct urban market orientation"

UA projects address multiple needs in the urban environment beyond food security and environmental awareness. There are notable effects of UA initiatives at the community scale, such as social inclusion, self-organization and cohesion, which usually support community empowerment (Howe and Wheeler 1999; Armstrong 2000; Lyson 2004; Lawson 2005; Teig et al. 2009; Carney 2011; Block et al. 2011; Guitart et al. 2012). Furthermore, citizens employs urban agriculture as a tool to reach food sovereignty as a form of empowerment (Carney 2011; Kirwan and Maye 2012), in particular through a re-commoning process of urban land for producing food (Tornaghi 2014).

1.1. Innovative forms of urban agriculture

Beyond the traditional soil-based agriculture typologies, such as allotments in vacant lands, the large development of urban agriculture has led to the occupation of building spaces for the purpose of growing food (Specht et al. 2014; Thomaier et al. 2015).

The following figure illustrates the multiple typologies of urban agriculture, including soil-based and building-based.



Categorization of urban agriculture (Own ellaboration)

This STSM focuses on rooftop agriculture, which can be defined as (Sanyé-Mengual 2015):

"the development of farming activities on the top of buildings by taking advantage of the available spaces in roofs or terraces. Rooftop agriculture can be developed through open-air and protected technologies and used for multiple purposes."

Rooftop agriculture (RA) is the most common building-based type of urban agriculture (Thomaier et al. 2015). Open-air rooftop agriculture and rooftop greenhouses are the main typologies of RA, which can be also classified regarding the purpose of the project (e.g., commercial, image-oriented, educational, etc). Some initiatives here illustrate the rooftop agriculture movement.

The community rooftop garden of Via Gandusio in the city of Bologna (Italy) was set on the roof (10th floor) of a social housing towards social inclusion and community building. Organic soil production, hydroponic and floating cultivation techniques are employed by neighbours of the building to crop a diversity of vegetables, fruit and herbs for self-consumption. The open-air garden is now a meeting point for cultural exchange, hobby and empowerment.

Community rooftop garden of Via Gandusio, Bologna (Italy)

Gotham greens is a company that runs multiple rooftop greenhouses along the United States (New York City and Chicago). Their farms are rooftop greenhouses that have a controlled environment and employ re-circulating hydroponic production to boost resource efficiency in their production. Gotham Greens sells the produce to restaurants and to the general public through supermarkets under the label of "fresh local produce" (http:// gothamgreens.com).

Gotham Greens©

1.2. Research on rooftop agriculture

Current research on rooftop agriculture has approached four main areas of interest: theoretical background, agronomic and food security aspects, and environmental and economic burdens.

Theoretical background, opportunities and barriers:
Dickson Despommier paid attention to the occupation of buildings cept "Vertical Farming" (Despommier 2008; Despommier 2010; Despommier 2011), which focuses on the design and employment of skyscrapers for the production of food in high dense cities. This concept was also named as "skyfarming" by Germer et al. (2011). Thomaier et al. (2015) later focused on the practices of building-based agriculture, under the concept Zero-Acreage farming (ZFarming) and identified characteristics such as the common typologies and technologies.

The opportunities and barriers associated to rooftop agriculture were also identified by different authors. Cerón-Palma et al. (2012) determined the barriers and benefits of implementing rooftop greenhouses (RTGs) in the Mediterranean region based on the outputs of technical focus groups (e.g., architects, engineers). Specht et al. (2014) reviewed the available literature to compile the opportunities and limitations of ZFarm. Both authors highlighted the potential contribution of rooftop agriculture to sustainability, in terms of environment, economy and society. Also focusing on the barriers and opportunities, previous studies evaluated the stakeholder perceptions of rooftop agriculture in Berlin and Barcelona (Sanyé-Mengual et al. 2015a; Specht et al. 2015a).

Agronomy and food security:
The potential implementation of rooftop agriculture in cities has also been evaluated from an agronomic perspective. Particular attention has been paid to the contribution of rooftop agriculture to the domestic vegetable production, such as for Singapore (Astee and Kishnani 2010), Bologna (Orsini et al. 2014), and Barcelona (Sanyé-Mengual et al. 2015b). From an agronomic perspective, the use of different techniques and crops has been analysed as well as the seasonality variance (Whittinghill et al. 2013; Pennisi 2014; Orsini et al. 2014).

Environmental and economic burdens:
First studies have initiated the quantification of the environmental and economic balance of rooftop agriculture. Rooftop greenhouses (RTGs) have been evaluated as local food production systems by accounting for the environmental savings of substituting imported vegetables. The avoided environmental impact of substituting tomatoes from Almeria by producing local tomatoes through RTGs was quantified for the case study of Barcelona (Sanyé-Mengual et al. 2013). The quantification of both the environmental and economic balance of rooftop agriculture have been performed for rooftop greenhouses (RTGs) in Barcelona (Spain) (Sanyé-Mengual et al. 2015c) and for community rooftop gardens in Bologna (Italy) (Sanyé-Mengual et al. 2015d).

1.3. Purpose of the STSM

This research proposal aims to analyse the development of urban agriculture and innovative forms of rooftop agriculture in Europe by using a qualitative approach. Two previous studies on the stakeholders' perceptions of the potential implementation of rooftop agriculture in Berlin and Barcelona were already performed by the host institution and the researcher, respectively. Such studies (Sanyé-Mengual et al. 2015a; Specht et al. 2015b) pointed out for both cases that:

a) social acceptance is a risk for further development of urban agri culture and rooftop agriculture practices

b) regardless the support of stakeholders from the administration, inclusion of urban agriculture in policy is limited

c) stakeholders have multiple positions against urban agriculture and urban rooftop farming

However, both studies assessed the perceptions in general, thereby not deepening in the acceptance, governance and power relations that are created in the development of innovative forms of rooftop agriculture. These three topics are of great interest as:

a) the identification of the risks that stakeholders perceive can support the policy-making process as well as it can contribute to identify needed actions to better inform citizens

b) the evaluation of the policy discourses behind the inclusion of urban agriculture in policy can support the improvement of the governance of such strategies, particularly when comparing experiences of the administration and UA practitioners

c) the observation of the power relations between stakeholders and their position against urban agriculture and rooftop farming can shed light on the unbalances among stakeholders in policy and can help to identify recommendations for policymakers

1.4. Goal and research questions

In this context, this study focuses on evaluating the acceptance, governance and power relations in innovative forms of urban agriculture from a stakeholders' perspective. To do so, the research performed in this STSM aimed to answer the following research questions:

1) What are the risks that stakeholders perceive around rooftop agriculture? What are the main similarities and differences between regions of Europe (Berlin and Barcelona)?

2) What is the level of inclusion of urban agriculture and rooftop agriculture in policy?

3) Which power relations do exist between stakeholders related to urban agriculture?

2. Methods

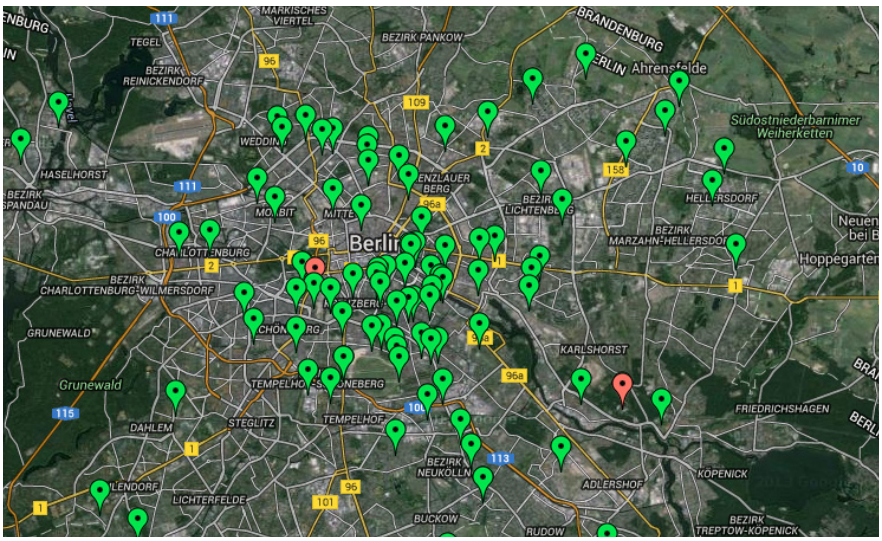
This section introduces the case studies used in this research and the methodological framework applied.

2.1. Case studies

Two case studies were evaluated in this assessment: Berlin and Barcelona. The selection of these cities was based on the current presence of urban agriculture and the growing interest on innovative forms of urban agriculture. Furthermore, the divergent origin of urban agriculture in the two cities and the different level of development of rooftop farming are interesting facts to evaluate potential similarities and differences among the two case studies.

Urban agriculture in Berlin

As our first case study, the city of Berlin (capital of Germany) was chosen. With a population of 3.5 million people, it is the second most populous city proper in the European Union (as defined by population within city limits). Generally, urban agricultural activities and inner-city food production has a long historic tradition in the city Berlin. Urban agriculture in Berlin is rooted in the time of industrialization and the rapid growth of the city of Berlin in the 19th century. Inner-city gardens were established, meant to improve the health and self- sufficiency of particularly working- class and poor inhabitants. Later on, the gardens helped to protect the general population during the two world wars and in times of economic crisis and limited food access. Nowadays, 3.000 ha (3% of the area of Berlin) are still covered by family home food gardens and garden plots. A total number of over 73.000 lots fall under the official urban planning code of an urban allotment garden, so-called “Schrebergarten” (allotments). The following figure shows a map of the urban agriculture initiatives in Berlin.



Map of UA initiatives in Berlin
Source: www.stadtacker.net
(Retrieved 10.11.2015)

In recent years, new types of urban agriculture have emerged and different groups of commercial or non-commercial project groups are planning and setting up projects all over the city. Their organisational form is not dedicated to individual consumption anymore (like the traditional types), but organized by communities or market settings, either as part of the social economy or new business models. Examples are social entrepreneurs like "Himmelbeet" (http://himmelbeet.com/) and "Prinzessinengarten" (http://prinzessinnengarten.net/) or business entrepreneurs like "Efficient City Farming (ECF)" (http://www.ecf-farmsystems.com/) or "topfarmers" (http://www.topfarmers.de/). The growing number of UA projects is accompanied by increasing interests of the media and constantly growing public and political awareness. Several pilot projects have recently been set-up as experimental cases in test stages for research and investigation of new applications to test or to showcase production in urban rooftop greenhouses, like "ECF Containerfarm" (see Figure), which tests options for rooftop farming in former shipping containers, "Tomatenfisch" (http://www.tomatenfisch.igb-berlin.de/), which explores hydroponic techniques, or "Watergy" (http://www.watergy.de/), which work on the integration of energy- and water- cycles between urban buildings and greenhouses. Those projects are supposed to lead the way to establishing further rooftop greenhouses in Berlin and beyond in the future.

Container aquaponics farm
©ECF Farming

The city of Berlin is surrounded by the federal state of Brandenburg. Brandenburg is a large producer of agricultural and horticultural products, which are marketed in the metropolitan area of Berlin. Regional agricultural products from Brandenburg are increasingly requested by the Berlin consumers. A recent study on consumer behaviour in Germany reveals that 92% of German consumers prefer to purchase regional products. The study further revealed a steadily increasing demand for regional products especially among the consumers from urban areas with higher education and income level (BMELV (Federal ministry of food and agriculture) 2013). Furthermore, consumers ask for more transparency of food production and better information about the origins of their food. This tendency leads to the assumption, that professional urban agricultural production could bring those appreciated values to Berlin's consumers.

With regard to the policy context, urban agriculture in Berlin is supported by the local political authorities and explicitly promoted as a strategy for the cities sustainable development. It has been connected to general urban planning strategies and is on the way to be implemented into larger urban programs. This accounts for all types of urban agriculture from ground-based community gardens to commercial rooftop greenhouses.

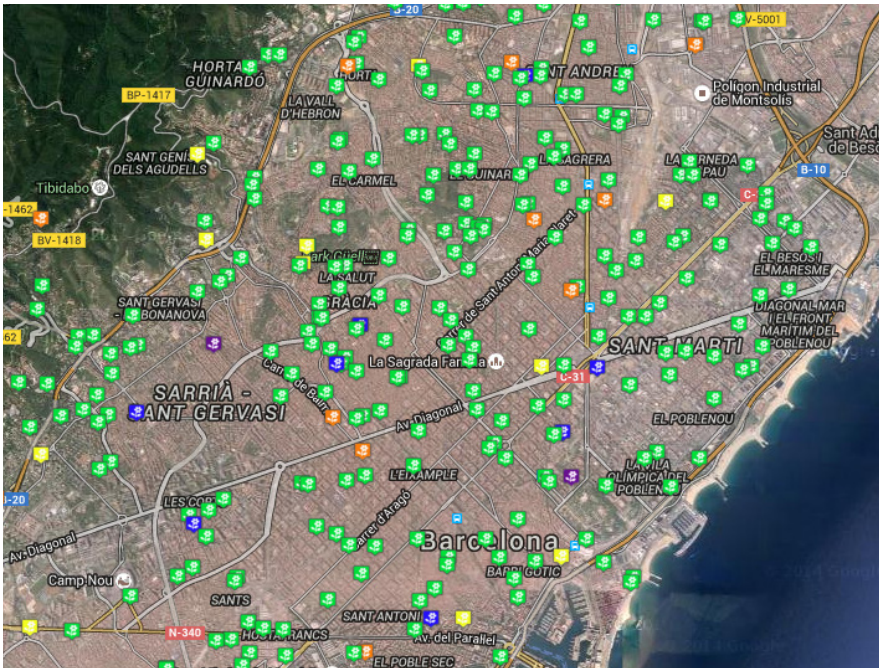
"Building integrated agriculture offers a chance for climate protection and a large variety of opportunities for self- development for big-city residents." (Andreas Geisel, Senator for Urban Development and the Environment, Foreword in (Freisinger et al. 2015))

One of Berlins stated goals is to test innovative concepts related to climate protection (Freisinger et al. 2015). According to Berlins planning authorities and policy makers the topic can easily be connected to general strategies like the "Urban Landscape Strategy" and the "Berlin Biological Diversity Strategy". These strategies formulate approaches to solving current urban problems and provide perspectives for the future. Within the framework of the "Berlin Urban Development Plan for the Area of Climate", innovative processes and technologies are described and promoted for the further development of urban buildings.

Urban agriculture in Barcelona

Barcelona (Spain) was selected as our second case study. With 1.5 million, Barcelona is the second most populated city in Spain and the capital of the region of Catalonia. Contrary to Berlin, UA activities in Barcelona began in the 1980s promoted by the municipal administration through the Barcelona Urban Gardens Network program. Prior to this, UA was limited to individual gardens in squatted vacant lands in the peri-urban areas (Ajuntament de Barcelona 2014).

Nowadays, 2.5 ha within the city centre are devoted to the 13 municipal gardens, which are individual plots that were created as a leisure option for elderly people (Giacchè and Tóth 2013). The last municipal garden (2013) also awarded some of the plots to socially-oriented entities that address community issues. 315 school gardens have been implemented through the Agenda 21 to promote sustainable and local development (Ajuntament de Barcelona 2002).



Map of UA initiatives in Barcelona
Source:
http://www.sostenibilitatbcn.cat/

Beyond municipality-supported projects, multiple squatting gardens have been developed around the city to claim for an increased access to land or to solve community issues, such as social inclusion. However, the municipality occasionally supports some of these initiatives, such as L'Hortet del Forat (Anguelovski 2013). The last municipality-driven UA action in Barcelona has resulted from the economic crisis. The Vacant Lands Plan (Pla Buits) offered to non-profit entities the management of spaces that became vacant due to the cancellation of urbanization projects, with the aim of revitalizing these areas with a community use. Most of the awarded projects were community garden projects (La Vanguardia 2013). The following figure displays the map of urban gardens in Barcelona.

Notwithstanding that UA in Barcelona is dominated by soil-based initiatives, some stakeholders have switched their interest to rooftop farming. Although research entities, architects and restaurant managers have initiated to plan rooftop greenhouses (RTGs) in Barcelona, this is still in the research and pilot stage (Sanyé-Mengual et al. 2015a), contrary to the Berlin case study where some companies are already running. The project Fertilecity (http://www.fertilecity.com) of the Universitat Autònoma de Barcelona (UAB) evaluates the potential integration of rooftop greenhouse with buildings in metabolic terms. The RTG-Lab exchanges the energy, water and CO2 flows with the building where it is placed on. The following figure shows the design of the RTG-Lab pilot project.

The growing interest in rooftop farming is enclosed in the expansion of the local food market in Barcelona, where the demand for local and sustainable food has recently increased (Generalitat de Catalunya 2012). Nowadays, around 16% of food distributed through MercaBarna (food distribution centre of Barcelona) is regionally produced (MercaBarna 2014). Thus, the deployment of RTGs can contribute to supply the demand of local food, although further policy efforts may be done to promote food production beyond the embryonic "Urban agriculture in Barcelona: global strategy" (Ajuntament de Barcelona 2014).

Tomato crop in the RTG-Lab

2.2. Methodological framework

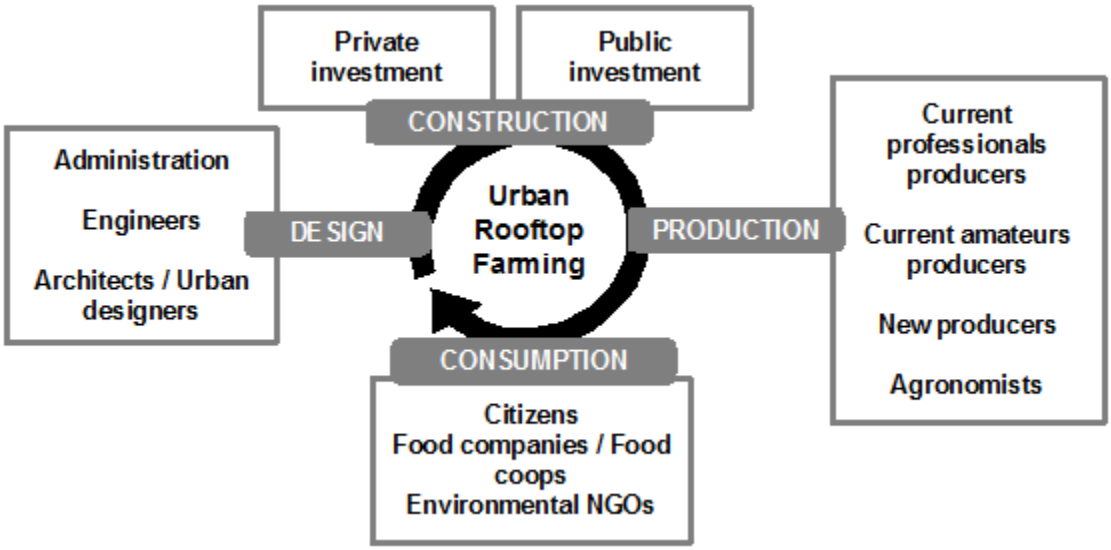
Qualitative methods were chosen for the assessment of the acceptance, governance and power relation in innovative forms of urban agriculture. Semi-structured interviews were used to approach the different stakeholders involved in the development of rooftop farming and to integrate their multiple perspectives and descriptions of the process (Weiss 1995). For the evaluation of the acceptance, an acceptance scale was defined to observe the different levels of rejection-acceptance.

Semi-structured interviews

Semi-structured interviews are a typology of interview that follows a prepared questionnaire for the conversation between the interviewee (i.e., informant) and the interviewer. Contrary to structured interviews, semi-structured interviews give the flexibility to the informant to address other issues beyond the questionnaire (Dunn 2005; Clifford et al. 2010). The interview process followed three main steps: Stakeholders identification and selection, Interviews and Discourse Analysis.

(a) Stakeholders identification and selection

The study aims to approach the multiple stakeholders involved in the development of rooftop agriculture. The following diagram is a simplified version of the stakeholders' map presented in Sanyé-Mengual et al. (2015) which is used as the basis for the selection of the stakeholders.



Stakeholders map of the development of rooftop farming, from the design to the consumption stage (based on Sanyé-Mengual et al., 2015).

For this research, a total of 56 stakeholders were interviewed: 31 stakeholders in Berlin and 25 stakeholders in Barcelona. The stakeholders represented 5 different groups in order to have a balances and comprehensive overview of the perceptions and opinions of the various experts involved in the development of rooftop farming.

The five groups are the following:

a) Activists, project groups and initiatives, who are planning to or actually setting up projects (like urban gardening initiatives, RTG project groups, NGOs in urban development, social urban agriculture enterprises,…)

b) Representatives from associations and unions (e.g. from agricultural or horticultural associations, real- estate, landscape architecture,…)

c) Stakeholders from planning and construction (like architects, landscape architects or greenhouse experts)

d) Representatives of different associated departments in policy and administration (e.g. from public departments of environment, urban development, sustainable development, consumer protection, health, landscape planning,…)

e) Stakeholders, who can potentially grow, sell or distribute products like supermarkets or university canteens (like food distributers, canteens, food co-ops, supermarkets,…)

(b) Interviews

The interviews were conducted between 2011 and 2013, lasting 1h on average. The qualitative data was, thus, collected before the performance of this STSM. The two research groups performed in parallel the interviews by approaching similar stakeholders and following a similar questionnaire for the semi-structured interviews. The two datasets are then comparable. The following table shows the parts and topics of the questionnaire and examples of the questions.Part

Part	Topics	Examples
Global opinion of urban agriculture and rooftop farming	Personal experiences, knowledge, engagement and opinion of urban agriculture and rooftop farming	Which types of ZFarming do you know? What is your opinion on the potential implementation of rooftop farming in your city?
Potential benefits	Perceived potential benefits of rooftop farming	What opportunities do you associate with rooftop farming?
Potential risks and barriers	Perceived potential risks and barriers of rooftop farming	What are the environmental, economic and social risks linked to rooftop farming systems?
Future development	Frame conditions and future challenges and actions	What actions do you think are necessary to overcome the identified limitations and challenges for these systems?

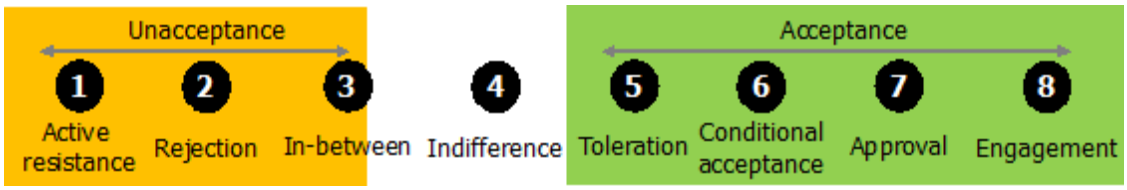
(c) Discourse analysis

The analysis of the discourses of the different stakeholders was performed by coding the transcripts and analysing these data. The 56 interviews were recorded (i.e., informed consent) and transcribed. Such texts were coded: the text was fragmented into small quotes with a specific code (i.e., related topic) and these textual data units were then categorized in global codes (e.g., potential benefits). After the coding, the principles of qualitative content analysis (Corbin and Strauss 1990; Kuckartz 2012) were applied in order to observe the global discourses behind the individual stakeholders' stories. The following table exemplifies the coding process.

Quote	Specific code	Global code
"A more liveable city, of higher quality. [With local food production] we can then save CO2 emissions and energy. If we increase the area of green rooftops the building has a better insulation, saving energy for cooling systems."	Environmental benefit	Potential benefits

Acceptance evaluation

Determining the acceptance of innovative forms of urban agriculture for the different stakeholders was performed by identifying the position of each stakeholder in an acceptance scale. The acceptance scale is based on Sauer et al. (2005), which determines 8 scales of acceptance from active resistance to engagement. The following diagram shows the levels of non-acceptance and acceptance of the eight scale scheme.



3. Stakeholders' acceptance of rooftop agriculture

The acceptance of rooftop agriculture was analyzed in global terms, for all the stakeholders interviewed. The perceived risks that can act as barriers for implementing innovative forms of urban agriculture were used to evaluate the acceptance.

At the global level, the perceived risks by the different stakeholders were identified, classified and compared for the two case studies. Four groups of risks were unraveled: risks related to the system, risks related to the food products, environmental risks and economic risks.

Risks of the system

Table 1 shows the perceived risks related to the system, which can be classified in three main groups.

Table 1. Perceived risks related to the system for the case studies of Berlin and Barcelona. Relevance is shown as high (dark red), medium (orange) and low (green). Not mentioned risks are marked as grey.

Risk	Berlin	Barcelona
a) System integration in the urban environment		
Conflicts with images of "agriculture"		
Conflicts with images of "urbanity"		
Conflicts with potential urban animal production		
Logistics and management constrains for food products		
b) Use, access and complexity		
Associated technology is perceived as too complex		
Risk that projects are overtaken by large enterprises		
Risk that the projects are set up too fast		
Projects are exclusive and act as a driver for gentrification		
c) Aesthetical		
Increase of noise and smell (due to production activity)		
Perceived little or no aesthetical benefits		

Some stakeholders are afraid the integration of food production on rooftops at the conceptual level, as urban agriculture can conflict with the current images of traditional agriculture and urban areas. In particular, the potential animal production in cities and the logistics and management requirements of a food production system are of great concern.

A second group of risks are related to the use, access and complexity of rooftop agriculture. Stakeholders perceive the technologies employed in rooftop agriculture as too complex. In particular for rooftop greenhouses, the required investment for the structure is seen as a risk for the dominance of rooftop agriculture projects taken by large

enterprises, which can perform huge investments for business-run initiatives. The rapid development of rooftop agriculture could be too fast for some stakeholders, who highlight the need to develop an implementation process that considers the specifications of the city. Furthermore, the implementation of exclusive rooftop agriculture projects could act as a driver for gentrification thereby increasing social inequalities among neighborhoods and citizens.

Finally, some stakeholders are concerned about the potential aesthetic impacts of rooftop agriculture. On the one hand, the potential increase of noise and smell from the production activity could decrease the livability of urban areas. On the other hand, some stakeholders outlined the potential aesthetical impact particularly for rooftop greenhouses.

Risks of food products

Table 2 compiles the risks that stakeholders perceived related to the food products from rooftop agriculture.

Table 2. Perceived risks related to the food products for the case studies of Berlin and Barcelona. Relevance is shown as high (dark red), medium (orange) and low (green). Not mentioned risks are marked as grey.

Risk	Berlin	Barcelona
Soil-less growing techniques are “unnatural”		
Quality of products expected to be low		
Health risks (due to air pollution)		
Health risks (due to contaminated waste water)		

First, some stakeholders have conflicts with the technology employed in rooftop agriculture projects. The use of greenhouses and soil-less techniques (substrate, hydroponics) is perceived as an “unnatural” way of producing food. Even more, these practices are linked with a low quality of the resulting food products since open-air and soil production is perceived as a higher quality crop environment.

Producing in the urban environment is associated with food safety problems by some stakeholders. The potential contamination of food products due to air or water contamination is perceived as a health risk. Such perception leads to a consumers’ low acceptance of rooftop agriculture. Stakeholders observe the same health risk for both open-air and greenhouse production, although this last type can offer a physical barrier to air contamination, for example.

Environmental risks

Table 3 compiles the risks that stakeholders perceived related to the environmental balance of rooftop agriculture and their products.

Table 3. Perceived risks related to the environmental dimension for the case studies of Berlin and Barcelona. Relevance is shown as high (dark red), medium (orange) and low (green). Not mentioned risks are marked as grey.

Risk	Berlin	Barcelona
Uncertainty about the overall environmental impact		
Risk of unsustainable management		
Soil-less techniques cannot be organic		

Local food production and urban agriculture initiatives also seek for the creation of short supply-chains that decrease the environmental impacts of food products. However, the situation on the roofs, the structure associated (in particular, for rooftop greenhouse) and the dependence to external resource (e.g., imported soil, water use, energy use) make the environmental balance unclear for some stakeholders. Furthermore, the smaller scale of urban production systems compared to rural crops highlighted a scale issue that could boost the environmental impacts per amount of food product. Finally, stakeholders preferred the use of organic techniques in urban agriculture seeking for sustainable food products free of fertilizers and pesticides. Such organic practices are limited with the employment of soil-less techniques, which usually provides the nutrients to the plants through fertigation, i.e., supplying chemical fertilizers through the irrigation.

Economic risks

Table 4 compiles the risks that stakeholders perceived related to the economic balance of rooftop agriculture and their products.

Table 4. Perceived risks related to economic dimension for the case studies of Berlin and Barcelona. Relevance is shown as high (dark red), medium (orange) and low (green). Not mentioned risks are marked as grey.

Risk	Berlin	Barcelona
Perceived little or no economic benefits		
Operators are not trained (professional) enough		
Competition to other rooftop uses		
Competition to peri-urban and rural farmers		

Regarding the economic risks, stakeholders perceive little or no economic benefits for rooftop agriculture due to mainly (a) the economy scale: the small size of roofs compared to rural agriculture can minimize the profit of business-run initiatives, and the (b) the required investment: in particular for rooftop greenhouses, the investment and fixed costs are expected to be large. Both aspects can lead to a high food price thereby reducing the competitiveness of rooftop food products, in particular when compared to conventional and industrialized vegetables.

When thinking on implementing rooftop farms (i.e., commercial initiatives), most of the stakeholders were aware of the lack of professional farmers in urban areas, where agriculture is not a common industry. As a result, commercial projects might find difficult to find professional and trained workers for managing agricultural production. Furthermore, an increasing demand of "urban farmers" would be limited by the lack of training programs in such topics.

Finally, competition to other activities was identified at two levels. First, rooftop agriculture can compete with other rooftop uses also linked to urban sustainability, like solar energy or rainwater harvesting. Furthermore, some stakeholders highlighted the recreational role of roofs and terraces in some case, where neighbors can use it as a meeting point. On the other hand, the urban production of food was pointed out as a potential competitor to peri-urban and rural farmers in the food market.

Comparing of the perceived risks in Berlin and Barcelona

In general, results were similar for the two European cities. Stakeholders highlighted multiple risks that were grouped in four main categories. In both case studies, the major number of risks was found for the category "Risks related to the system" (Table 1). Furthermore, both stakeholders' sets perceived that environmental risks were the least relevant (only low and medium level) (Table 3).

Differences between Berlin and Barcelona are found for the following risks:

- Risk that the projects are set up too fast
- Conflicts with potential urban animal production
- Increase of noise and smell (due to production activity)
- Health risks (due to contaminated waste water)

Such differences are related with the current development stage of rooftop agriculture in both cities and current practices. First, rooftop agriculture is more developed in Berlin, where there are already companies that have developed technologies for implementing rooftop agriculture at the city level and that have pilot projects to demonstrate the citizens the potentialities of rooftop agriculture and companies. This advanced stage leads to the perception of risks such as "Risk that the projects are set up too fast".

Second, companies also focus on implementing aquaponic systems, which combine the production of hydroponic vegetables with aquaculture in a re-circulation system. Thus, animal production is already embedded in the urban agriculture conceptualization of Berlin citizens, which have „Conflicts with potential urban animal production". Furthermore, such activities are more linked to "Increase of noise and smell" that are perceived as a negative impacts and risks for citizens.

Finally, the employment of hydroponic techniques and re-circulation methods is linked to the potential re-use of waste water from domestic uses. For example, the project Roof-Water Farm project (http://www.roofwaterfarm.com/) in Berlin focuses on the synergy between domestic buildings and aquaponics by re-using the wastewater. This practice is perceived as a "Health risks" by Berlin citizens.

4. Assessment inclusion of urban agriculture in current policy

The inclusion of urban agriculture in the current policy framework was evaluated for the case study of Barcelona based on the interviews with administrative offices and the analysis of policy documents. The case study of Barcelona included stakeholders from administration offices of two different geographical levels: regional (Catalunya) and local (county and municipality). The policy was evaluated also at these two levels.

The inclusion was evaluated by identifying:

Direct policy:	Indirect policy:
Policy documents that directly deal with the topic of urban agriculture	Policy documents that have a relation to the topic and could promote the development of direct policies

4.1. Direct policy

The following table summarizes the inclusion of urban agriculture in current policy documents.

Level [Office]	Document	Main features
Regional	No direct policy was found at this level	
Local [Environment agency]	Urban gardens network (1997)	This program from the Department of Environment is devoted to elderly citizens (>65 years) with the aim of incorporating them in an activity for improving the environmental through the organic production of vegetables (http://w110.bcn.cat/portal/site/MediAmbient/)
Local [Barcelona province]	Network of ci ties and towns towards sustai nability	The "Commission of urban gardens" of the network supports the creation of municipality-supported urban gardens in the towns of the Barcelona pro vince. They provide with organizational and knowledge support, such as defining the selective criteria (http://www.diba.cat/web/xarxasost/comissiohorts)
Local [Green areas and biodiversity]	Pla del Verd i la Biodiversitat (2014)	With the aim of promoting green areas and biodiversity, this program also supports urban gardens. Two of the actions are directly related to them: - To promote organic farming in peri-urban areas - To design and implement a program of community-managed gardens
Local [Urban habitat]	Vacant lands plan (2014)	This program aims to "revitalize vacant lands in the city of Barcelona, through activities of public interest managed by public or private non-profit organizations that seek the involvement of the civil society in the regenera tion and revitalization of urban fabric" (http://ajuntament.barcelona.cat/ecologiaurbana/ca/pla-buits). Community urban gardens are considered as an activity of these characte ristics. Around 65% of the awarded projects in the last edition were urban gardens (La Vanguardia 2013).
Local [Green areas and biodiversity]	Urban agriculture in Barcelona: global strategy (2014)	This document evaluates the current status of urban agriculture and six working areas for its promotion (Ajuntament de Barcelona 2014): "- Evaluation of the effects of environmental pollutants on crops and health risks - Progress in the practices of organic farming - Search for new spaces: public green areas, vacant public and private spaces, roofs, terraces and walls - Identification of beneficiaries of the practice of collective agriculture poli cies with social welfare and transverse districts - Exploitation of public-private cooperation - Municipal commitment in promoting urban agriculture through a govern ment measure"

Direct policy on urban agriculture can be only found at the local level. Regional concerns on agriculture are focused on rural agriculture and food supply, rather than on local and urban initiatives. At the local level (province and municipality), policy started with the "Urban gardens network" in 1997 where the municipality of Barcelona designed and implemented urban gardens for the elderly citizens.

During the last years, the global interest on urban agriculture has significantly grown as well as the related policy documents:

The growing interest of the different municipalities of the province of Barcelona on urban agriculture resulted in the creation of the "Commission of urban gardens" in the Network of cities and towns towards sustainability in order to offer administrative and technical support to the multiple initiatives.

Urban gardens are seen as an opportunity to renaturalize cities through new ecosystems. In this sense, urban agriculture is being promoted through policy documents related to urban biodiversity and green spaces.

As a response to the economic crisis of 2008, the local administration of Barcelona focused on using community initiatives such as urban gardens as a way to use vacant lands and improve the social quality of the city.

The rising participation of different offices of the city council of Barcelona in the promotion of urban agriculture (e.g., Green and Biodiversity, Urban habitat) urged the analysis and creation of a common framework for developing further urban agriculture programs and policy. This document evaluates the current presence of urban agriculture in Barcelona and defines further policy-making steps and good practices for supporting the development of urban agriculture.

4.2. Indirect policy

During the interviews, the different stakeholders highlighted the existence of policy documents that have a relation to the topic of rooftop agriculture.

The stakeholders involved in the administration offices identified some policy documents as indirect policy that could support the future promotion of urban agriculture and rooftop farming policies.

- Strategy for the Sustainable Development of Catalonia

- Strategy to Promote the green economy and circular economy

- Catalan strategy for energy renovation of buildings

- Food waste minimization (Catalan Waste Agency)

- Self-production of resources (currently focused on energy, though)

- Measure to promote "green roofs and living roofs" of Barcelona (2014) (NO food)

- Plan of energy, climate change and air quality of Barcelona 2011-2020 (2011)

At the regional level, particular attention is paid to the potential contribution of urban agriculture and rooftop agriculture as a way to rethink the current economic development model by making it more sustainable and towards the green economy.

> "Within the policy of the Sustainability department of the Generalitat de Catalunya (DTES) there are diverse aspects related to rooftop agriculture. There is a more broaden topic: the Strategy for the Sustainable Development of Catalonia (climate change, water, chemical products, GMOs)" (Sustainability department, Generalitat de Catalunya)

> "There is the traditional green economy, for example waste management or water treatment. And there is the new green economy: sustainable tourism and more innovative topics […] How to create new jobs in a way that does not enlarge the environmental impacts. […] From the DTES, the Strategy to Promote the green economy and circular economy and similar actions: local production, less impact, less transport" (Sustainability department, Generalitat de Catalunya)

Furthermore, the Catalan government highlights the potential contribution of urban agriculture to promote a new economic growth that could aid in solving the effects of the last economic crisis (e.g., unemployment):

> "One of the priorities is promoting the green economy and, particularly, in the current context: 900.000 unemployed citizens in Catalunya. […] Environmental issues are not an obstacle to growth rather an opportunity" (Sustainability department, Generalitat de Catalunya)

At the local level, the administration outlines the role of self-sufficiency in local policy and the potential inclusion of urban agriculture in similar policies:

> "From the city council there is the discourse on Monitor 2050 towards self-sufficiency not only for energy but also to try to reduce the consumption, become more efficient, shorten distance… the local production would be worth to defend" (Office of Urban Habitat, Barcelona city council)

In particular for rooftop agriculture, current green roof policies can be tools for the creation of rooftop agriculture policies as they share multiple benefits, such as the minimization of the energy consumption in buildings or the use of roofs for making the cities more livable and green.

5. Assessment of power relations and governance

The evaluation of the power relations and governance is based on the individual acceptance of the different stakeholders and their position in the development of innovative urban agriculture. Such evaluation aims to highlight recommendations for a democratic policy-making process. The assessment was applied to the case study of Barcelona.

5.1. The position of stakeholders with regard to urban agriculture

For the case study of Barcelona, we identified the position in the acceptance scale for each interviewed stakeholder. The acceptance was evaluated for urban agriculture (soil-based), rooftop agriculture and rooftop greenhouses in order to evaluate how the innovation affects the acceptance. The preliminary results are shown in the following diagram.

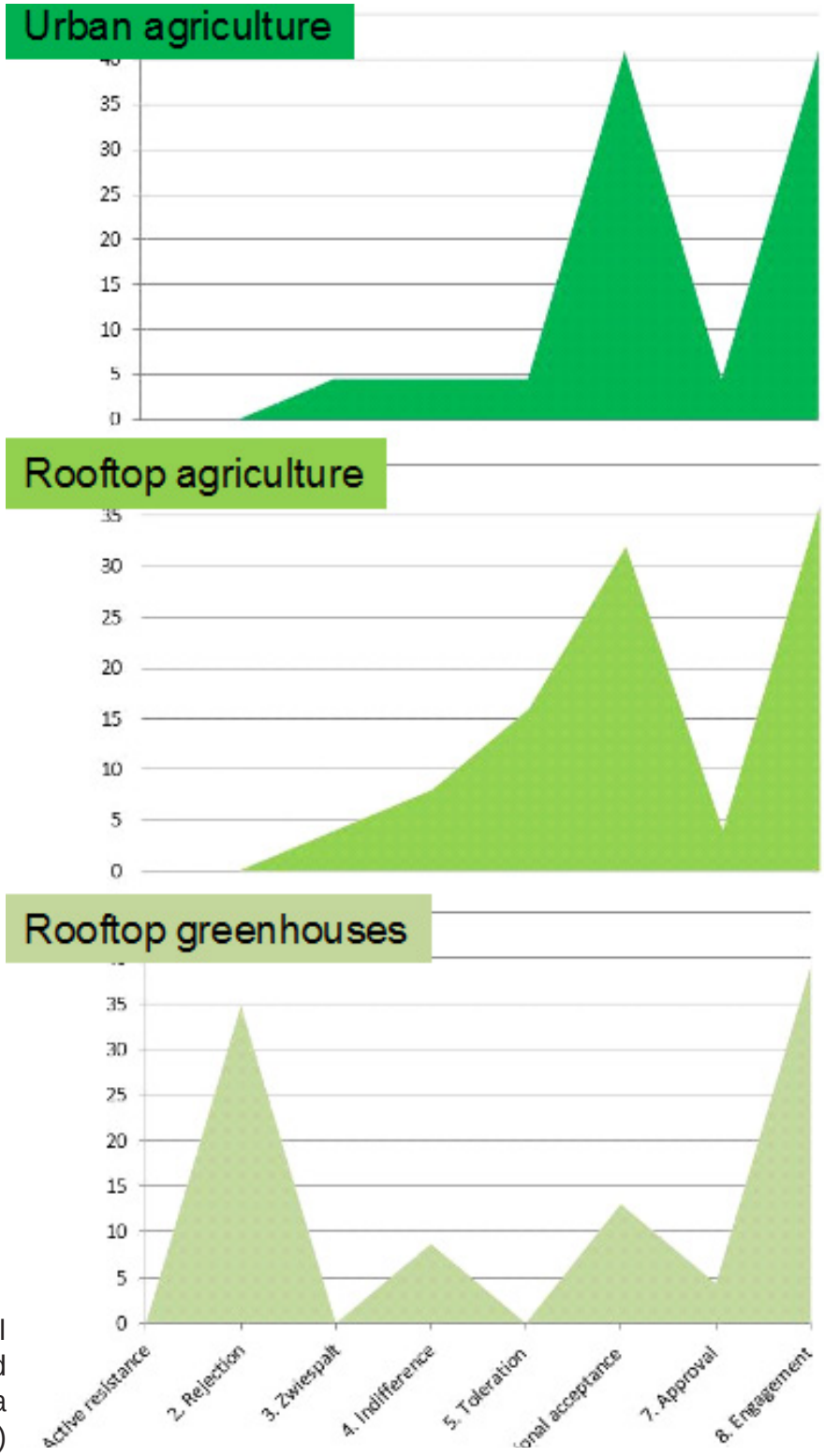
Some trends were observed:

-The stakeholders that accept urban agriculture without conditions tend to accept all the types of urban agriculture including rooftop agriculture and rooftop greenhouses.

-Most of the stakeholders accept only specific types of urban agriculture showing a conditional acceptance. Conditions are commonly related to the social sphere of urban gardens, such as socially-oriented gardens or gardens that ensure the sovereignty of citizens.

-Conditional acceptance of urban agriculture can lead to indifference or rejection of rooftop farming and, in particular, of rooftop greenhouses.

-Notwithstanding that the acceptance level of rooftop farming is high, the use of greenhouses and high-tech solutions boost the rejection among stakeholders.



Acceptance level of urban agricull ture, rooftop agriculture and rooftop greenhouses in Barcelona (Preliminary results)

5.2. Power relations and governance

The position of stakeholders' groups and their current involvement in policy-making determines the governance level in urban agriculture. Results can be used to identify needed actions towards more democratic urban agriculture policy-making. Main observations are the following:

There are some groups that show conditional acceptance or engagement of urban agriculture but that are not commonly involved in policy-making, such as urban gardeners, food-coop consumers, environmental NGOs and architects. The development of urban agriculture policy might involve these stakeholder groups to integrate their experiences, opinions and, particularly, their conditions. In particular, the involvement of future users of the gardens (urban gardeners) and future consumers (food-coop consumers) is of great interest to promote policies that are efficient in their implementation and demand of spaces and of products.

In the administration sphere, acceptance is multiple and varies from indifference to engagement. This fact can result in a different development of urban agriculture policy at difference geographical scales (from regional to local) and in the prioritization of specific types of urban agriculture. The creation of a comprehensive policy document to support urban agriculture and its multiple typologies might, thus, include the divergent opinions of administrative offices towards the achievement of a common acceptance of urban agriculture. Furthermore, urban agriculture policy must be multi-scale in order to incorporate the potential benefits that are approached at different geographical levels: from sustainable development (regional) to vacant lands (local).

There are some stakeholders that show indifference although they are key in the definition of priority policy areas, such as the local development office. The creation of multi-stakeholder teams for the definition of policy priorities and requirements can mitigate the individual power of certain stakeholders, such as specific administrative offices.

Finally, the development of specific policy for innovative forms of urban agriculture must consider the novelty of the topic and keep an open participation to new stakeholders, such as architects or engineers for rooftop agriculture.

In general, urban agriculture policy-making urges to:

- become more integrative by including all the stakehlders involved in the design and implementation of urban agriculture into the policy-making process

- consider the multi-functional nature of urban agriculture by involving the multiple administration offices related to urban agriculture

- evaluate the urban agriculture development in a comprehensive manner by evaluating all the typologies of urban agriculture (including the most innovative forms, such as rooftop agriculture) and observing urban agriculture effects at multiple scales

6. Conclusions and further work

a) Global acceptance: perceived risks around rooftop agriculture

Multiple risks around the implementation of rooftop agriculture are perceived by stakeholders in Barcelona and Berlin. Such risks can slow down the implementation of these innovative forms of urban agriculture and we here list some recommendations for a successful development of rooftop agriculture involving key stakeholders.

Policy-makers are responsible for improving current policy-making processes by:

- Promoting integrative policy-making processes that engage the different stakeholders involved
- Setting the urban integration standards (e.g., landscape and logistic regulations)
- Setting a quality standard scheme to ensure the food safety of urban products
- Running communication and education campaigns on rooftop agriculture and urban food systems to increase the awareness of citizens

Rooftop agriculture promoters and managers can reach a high level of acceptance while minimizing the perceived risks by designing projects that:

- Follows an inclusive, participatory and open planning process, which does not primarily target to an exclusive or elitist group of consumers
- Chooses unused or abandoned buildings and rooftops, thereby minimizing competition
- Uses discreet design (the less futuristic the design approach, the higher the acceptance)
- Uses energy from renewable and local resources and keeps the energy input low and establishes resource cycles with the house or neighbourhood (e.g., exploit local organic waste, waste heat and water resources)
- Employs soil-base technique or combines soil-less and soil techniques in the design
- Uses low-tech and soil-based growing techniques (or: for other forms, a high level of education would be necessary)
- Applies severe quality management and quality control of the products (quality must be assured and communicated)
- Includes educational programs, community building, art and creativity

Finally, researchers might participate in this process by:

- Generating, communicating and disseminating new data
- Demonstrating resource efficiency models of rooftop agriculture (e.g., metabolic integration between the greenhouse and the building)
- Increasing citizens awareness and knowledge through pilot and demonstrative projects
- Evaluating the gentrification effects

b) Current inclusion of urban agriculture and rooftop farming in policy

For the case study of Barcelona, various urban agriculture policy documents were found. Policy was initiated for top-down gardens devoted for elderly people. The recent expansion of urban agriculture in cities has been translated into new policy documents, which are related to the new forms of urban gardens: bottom-up, community, socially-oriented. On the other hand, the growing environmental awareness of local governments is also associated to some documents, which find in urban gardens an opportunity to improve urban biodiversity. However, each policy is related to a unique typology of urban agriculture and there is a need to create a policy document that encompasses the variety of urban gardens and initiatives. Furthermore, rooftop agriculture and other innovative forms are not considered in current policy.

Indirect policies can be identified as potential pathways for the short-term promotion of urban agriculture policy. Results highlight the potential significance of urban agriculture in sustainable development and green economy, as well as energy efficiency and urban livability. Urban agriculture affects multiple urban aspects becoming a transversal topic that can be approached from multiple specific policy documents or that needs a comprehensive policy document that includes the multifunctionality of urban agriculture (e.g., environmental benefits, economic development, social justice). Innovative forms of urban agriculture that are implemented on buildings can take advantage of the current green roof policy and further development might also enhance the potential contribution to improve the buildings (e.g., energy isolation).

c) Power relations and governance

Recommendations for improving the governance in urban agriculture and rooftop agriculture include:

- The inclusion of multiple stakeholders in the negotiations and creation of new policy documents to incorporate the various experiences and acceptance levels in the policy-making process

- In particular, this measure should focus for stakeholders' groups that are not commonly involved, such as urban gardeners, food-coops consumers, environmental NGOs and architects

- The multifunctional nature of urban agriculture affects various administrative offices which have different acceptance levels thereby policy-making processes have to deal with these divergences by involving all the administrative offices in the policy-making process

- The multi-scale nature of urban agriculture effects must be considered in the entire policy-making process

- The creation of multi-stakeholder teams for the definition of policy priorities and policy documents can deal with different levels of acceptance of urban agriculture and its innovative forms

d) Future work

Future steps will focus on the completion of the analysis for the two case studies and the publication of the results in peer-reviewed journals:

- The results from the section 3 will be published in a peer-reviewed journal article. Currently we are working on preparing a draft. Beyond the results shown in this report, the article displays quotations from the interviews and compares the perceived risks with current knowledge (literature, practices, market).

- The analysis conducted in sections 4 and 5 will be also applied to the Berlin case study.

- Results from the two case studies will be gathered in a short peer-reviewed journal paper as a Viewpoint on governance and policy-making.

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Whittinghill LJ, Rowe DB, Cregg BM (2013) Evaluation of Vegetable Production on Extensive Green Roofs. Agroecol Sustain Food Syst 37:465–484. doi: 10.1080/21683565.2012.756847Policy-makers are responsible for improving current policy-making processes by:

Weekly activities during the STSM

Week 1

Welcome:

- Introduction to the Institute of Socio-economics (ZALF)
- Meeting with Dr. Rose Marie Siebert: Planning and organization of the STSM period

Assessment of perceived risks:

- Identification of perceived risks for Barcelona and Berlin case studies
- Comparison of perceived risks for Barcelona and Berlin case studies: similarities and differences
- Joint assessment of perceived risks of rooftop greenhouses

Complementary activities:

- Attendance to the weekly meeting of the Institute of Socio-economics

Week 2

Assessment of perceived risks:

- Evaluation of the perceived risks to the existing literature and current practices

Complementary activities:

- Participation in the kick-off stakeholders meeting of the Future Food Commons (FuFoCo) project
- Attendance to the weekly meeting of the Institute of Socio-economics

Week 3

Assessment of perceived risks:

- Paper writing

Governance assessment:

- Design of the acceptance scale: Positioning of stakeholders for the two case studies

Complementary activities:

- Attendance to the weekly meeting of the Institute of Socio-economics
- Presentation of an overview of my research to the members of the Institute of Socio-economics

Week 4

Assessment of perceived risks:

- Paper writing

Governance assessment:

- Individual acceptance of rooftop farming: Supporting stakeholders
- Identification of inclusion of urban agriculture in current policies

Complementary activities:

- Attendance to the weekly meeting of the Institute of Socio-economics

Week 5

Assessment of perceived risks:

- Paper writing

Governance assessment:

- Analysis for the Barcelona case study
- Definition of the outline of the viewpoint paper

Complementary activities:

- Attendance to the weekly meeting of the Institute of Socio-economics
- Final meeting with Dr. Rose Marie Siebert:
  - Revision of paper on perceived risks,
  - Revision of methodological approach for the governance assessment

Confirmation by the host institution

Leibniz Centre for Agricultural Landscape Research
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December 4th, 2015

Object: Confirmation of the host institute of the conducted "Short term Scientific Mission" within the EU - COST Action "Urban agriculture Europe"

To whom it may concern,

I herewith confirm that Mrs. Esther Sanyé completed her short term scientific mission called: "Acceptance, governance and power relations in innovative forms of urban agriculture: addressing stakeholders perceptions of rooftop farming in Berlin and Barcelona" as part of the COST Action Urban Agriculture Europe.

With good wishes,

Yours sincerely,

Dr. Rosemarie Siebert
- Social scientist-
- Head of key research area -

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COST- the acronym for European **CO**operation in the field of **S**cientific and **T**echnical Research- is the oldest and widest European intergovernmental network for cooperation in research. Established by the Ministerial Conference in November 1971, COST is presently used by the scientific communities of 35 European countries to cooperate in common research projects supported by national funds.

The funds provided by COST - less than 1% of the total value of the projects - support the COST cooperation networks (COST Actions) through which, with EUR 30 million per year, more than 30.000 European scientists are involved in research having a total value which exceeds EUR 2 billion per year. This is the financial worth of the European added value which COST achieves.

A "bottom up approach" (the initiative of launching a COST Action comes from the European scientists themselves), "à la carte participation" (only countries interested in the Action participate), "equality of access" (participation is open also to the scientific communities of countries not belonging to the European Union) and "flexible structure" (easy implementation and light management of the research initiatives) are the main characteristics of COST.

As precursor of advanced multidisciplinary research COST has a very important role for the realisation of the European Research Area (ERA) anticipating and complementing the activities of the Framework Programmes, constituting a "bridge" towards the scientific communities of emerging countries, increasing the mobility of researchers across Europe and fostering the establishment of "Networks of Excellence" in many key scientific domains such as: Biomedicine and Molecular Biosciences; Food and Agriculture; Forests, their Products and Services; Materials, Physical and Nanosciences; Chemistry and Molecular Sciences and Technologies; Earth System Science and Environmental Management; Information and Communication Technologies; Transport and Urban Development; Individuals, Societies, Cultures and Health. It covers basic and more applied research and also addresses issues of pre-normative nature or of societal importance.