sustainability

MDPI

Article

Ecosystem Services of Urban Agriculture: Perceptions of Project Leaders, Stakeholders and the General Public

Esther Sanyé-Mengual [1,†], Kathrin Specht [2,3,*,†], Jan Vávra [4], Martina Artmann [5], Francesco Orsini [1] and Giorgio Gianquinto [1]

1 Research Centre in Urban Environment for Agriculture and Biodiversity (ResCUE-AB), Department of Agricultural and Food Sciences (Distal), University of Bologna, 40126 Bologna, Italy; esther.sanye@unibo.it (E.S.-M.); f.orsini@unibo.it (F.O.); giorgio.gianquinto@unibo.it (G.G.)
2 ILS—Research Institute for Regional and Urban Development, 44135 Dortmund, Germany
3 Department of Agricultural Economics, Humboldt-Universität zu Berlin, Unter den Linden 6, 10099 Berlin, Germany
4 Faculty of Social and Economic Studies, Jan Evangelista Purkyně University in Ústí nad Labem, 400 96 Ústí nad Labem, Czech Republic; jan.vavra@ujep.cz
5 Leibniz Institute of Ecological Urban and Regional Development, 01217 Dresden, Germany; m.artmann@ioer.de
* Correspondence: kathrin.specht@ils-forschung.de
† These authors equally contributed to this work.

Received: 30 October 2020; Accepted: 8 December 2020; Published: 14 December 2020

Abstract: Within the scholarly debate, Urban Agriculture (UA) has been widely acknowledged to provide diverse environmental and socio-cultural ecosystem services (ESs) for cities. However, the question of whether these potential benefits are also recognized as such by the involved societal groups on the ground has not yet been investigated. This paper aims at (1) assessing the perceived ESs of UA, comparing the views of different societal groups in the city of Bologna, Italy (namely: UA project leaders, stakeholders and the general public) and (2) to identify differences in the evaluation of specific UA types (indoor farming, high-tech greenhouses, peri-urban farms, community-supported agriculture, community rooftop garden and urban co-op). In total, 406 individuals evaluated 25 ESs via a standardized Likert-scale survey. The study unveiled similarities and divergences of perceptions among the different societal groups. The statistical analysis indicated that the general public and UA stakeholders agree on the high relevance of socio-cultural ESs, while provisioning ESs was considered as less significant. UA types focusing on social innovation were expected to provide higher socio-cultural ESs whereas peri-urban activities were more closely linked to habitat ESs. We assume that involvement and knowledge of UA are determining factors for valuing the provision of ESs through UA, which needs to be considered for ES valuation, particularly in a policymaking context.

Keywords: ES valuation; urban food system; urban sustainability; urban farm; urban food supply; multifunctionality; natural capital

1. Introduction

Worldwide, cities are confronted with pressing socio-ecological challenges such as climate change, social segregation and public health concerns [1,2]. For effectively addressing societal challenges related to urbanization, urban green spaces are widely accepted as a nature-based solution supporting, among others, climate change mitigation and adaption [3], social cohesion [4], and healthy living in cities [5]. However, in light of worldwide rapid urbanization, urban green spaces are under threat,

which leads to the call for compact and green cities to strengthen multifunctional green infrastructure [6]. Urban agriculture (UA) as part of the urban green infrastructure has been increasingly proposed as a multifunctional urban nature-based solution which provides a range of ecosystem services (ESs) [7–9]. By growing plant or animal-based products in urban systems such as on family food gardens, community-based farming and commercial flagship projects employing high-tech production processes [10], ESs of UA can potentially have large environmental as well as societal benefits for cities, such as water regulation, improved food security, or improved air quality [11,12]. Due to its multiple benefits, UA is gaining increasing attention in research and urban planning [7].

UA can be broadly defined as an activity "located within (intraurban) or on the fringe (peri-urban) of a town, city or metropolis, which grows or raises, processes, and distributes a diversity of food and non-food products" [13]. However, despite its multifunctionality, a recent comprehensive literature review suggests that current research has largely focused on the social benefits of UA (such as community-building and participation), calling for more comprehensive assessments of the further benefits UA can supply [7].

For instance, a lack of information on the environmental performance of urban food production can hinder the successful implementation of innovative forms of UA such as rooftop farming [14,15]. Additionally, competitions with other types of land-uses due to the limited space in cities can be a major constraint for implementing UA [7]. Unplanned urbanization is a major threat to farming land at the urban fringe [16]. Furthermore, within urban borders, some types of UA such as community gardens are vulnerable when it comes to land development and densification [17]. Therefore, a systematic assessment of UA is crucial for successfully integrating sustainable urban agricultural practices into urban planning [18]. In this regard, the ES approach can serve as an integrative assessment tool to make the socio-ecological benefits humans receive from UA visible, including provisioning (e.g., food supply), regulating (e.g., stormwater runoff reduction), supporting (e.g., biodiversity) and socio-cultural (e.g., recreation and well-being) ESs [8,18,19].

Besides lacking a consistent framework for assessing ESs provided by UA, it has recently been shown that most empirical studies from the Global North focus on the evaluation of ESs provided by community gardens, private/home gardens and allotments, while other urban farming approaches and rooftop UA are rarely analyzed [7]. In fact, a major characteristic of the green infrastructure approach as an important strategy for enhancing Europe's natural capital [20] is the consideration of various types of urban green spaces [21]. In the case of UA, an edible green infrastructure comprises a mosaic of various edible food components (e.g., community gardens, vertical gardens) [18]. In order to develop sustainable planning of UA as part of an edible green infrastructure, a systematic assessment of the ESs supplied by its various components is still needed, particularly by addressing the different kinds of actors involved in UA implementation and management [7].

For the sustainable management of urban green spaces, understanding the values that stakeholders subscribe to them is a valuable approach to gain insights into the drivers and constraints for engaging in the generation of ESs [22]. In this regard, the ES approach stands out for describing the flow of benefits provided by the ecosystem to humans, where these benefits describe humans' perception and values of ESs [23]. Aiming to understand pathways about how UA can contribute to urban policy challenges and the interlinked societal value towards UA, some studies assessed the perceived importance of ESs supplied by UA focusing on urban gardens [24,25]. However, these studies do not systematically compare the perceived importance of ESs supplied by various kinds of UAs. Furthermore, although studies show that the importance of ESs differs between various types of stakeholders [26], these studies often do not take into account the different types of actors relevant for UA such as residents, farmers and urban planners. In fact, the reviewed literature on the topic mainly focused on the views of urban green infrastructure (urban parks, UA) users [24,27,28] or experts from academia [24,29]. In the case of UA, assessing the perceived importance of ES may be influenced by the knowledge or motivation of the stakeholders. Thus, UA can be considered as a cross-cutting issue connecting actors with various interests in urban food production (e.g., aesthetics, social exchange) [30].

Contemporary assessments of ESs provided by UA show the need to define a common framework of ES valuation for UA. Firstly, existing studies largely focus on one single ES (e.g., food provision [31] or soil biodiversity [32]) and do not encompass the big picture of ESs. Secondly, the reviewed studies employ different classification systems of ESs, which highlights the need for a comprehensive framework for evaluating ESs in UA.

Taking into account the current state of UA as a multifunctional and multi-object nature-based solution, this paper aims at comparing the perceptions of different societal groups in the city of Bologna towards the provision of ESs through UA and to identify differences regarding specific UA types.

Towards this purpose, we investigate the following specific objectives:

(a) to define a framework that is suitable to evaluate the perceived ESs provided by UA;
(b) to analyze the ES valuation of UA as perceived by the general public and UA stakeholders;
(c) to analyze differences in the valuation and relevance of ES among the different societal groups (including project leaders of UA initiatives, stakeholders with a relation to UA networks and the general public);
(d) to evaluate differences in the valuation of ESs among different forms of UA (from a project leader perspective).

2. Materials and Methods

This section introduces the ES framework and the valuation method employed in this study, the description of the case study, the data collection and the data analysis.

2.1. Ecosystem Services Evaluation

2.1.1. Defining a Framework for Evaluating the Ecosystem Services of Urban Agriculture

To evaluate the perceived ESs resulting from UA, we performed a literature review to identify the list of ESs which have already been evaluated in case studies and in theoretical approaches. As a key reference, we employed the list of ESs defined by The Economics of Ecosystems and Biodiversity (TEEB) [23] and extended it further by adding what we considered as relevant from the literature. We divided the list of ESs into environmental and socio-cultural ESs. Encompassing the ESs evaluated in the literature, the comprehensive framework included 13 environmental ESs and 12 socio-cultural ESs (Table 1). In some cases, we further individuate the ES under evaluation for a more detailed assessment (e.g., while the TEEB evaluates "Local climate and air quality" as a single ES, we have separated them into "Local climate" and "Air quality"). While "local climate" was added to have further detail in the list of ESs under evaluation, we added "global biodiversity" to evaluate the perceived potential contribution of UA to prevent current trends of global biodiversity loss [33]. We also included five socio-cultural ESs due to the specific UA contributions as a nature-based solution for society and culture (e.g., education and learning [34], maintenance of traditional knowledge and cultural heritage [35], social cohesion [36], community building [37] and political fulfilment [25]). Furthermore, these socio-cultural ESs were listed in previous assessments of UA which were used to define the framework employed in this study (Table 1), including studies that followed a bottom-up approach to define the list of ESs by considering the perceptions and knowledge of UA stakeholders [28]. In the end, we extended the TEEB framework by seven additional ESs: Local climate, Global biodiversity, Education and learning, Maintenance of traditional knowledge and cultural heritage, Social cohesion, Community building and Political fulfilment.

Table 1. Definition of the ES framework and consideration of the different ESs in The Economics of Ecosystems and Biodiversity (TEEB) study and other previous ES studies. Literature documents are based on case studies (CS) or theoretical implementation (TI).

Reference	TEEB [23]	Langemeyer et al. [38]	Calvet-Mir et al. [24]	Berges et al. [29]	Camps-Calvet et al. [28]	McPhearson et al. [39]	Krasny et al. [40]	Lovell et al. [41]
Type of Urban Agriculture	**TEEB**	**Urban Parks**	**Home Gardens**	**Community Gardens**	**Urban Gardens**	**Urban Vacant Land**	**Community Garden**	**Multifunctional Green Infrastructure**
Method	**-**	**CS**	**CS**	**CS**	**CS**	**CS**	**TI**	**TI**
Environmental ecosystem services								
Provision								
Food	•		•	•	•	•	•	•
Other raw materials	•		•	•				
Medicinal and aromatic plants	•		•	•	•			
Regulating								
Erosion prevention and maintenance of soil fertility	•		•	•	•		•	
Pollination	•		•	•	•		•	
Regulation of urban metabolism	•		•	•				
Carbon sequestration and storage	•		•	•		•		•
Moderation of extreme events	•		•	•	•	•		
Air quality	•			•	•	•		
Local climate					•	•		•

Table 1. *Cont.*

Reference	TEEB [23]	Langemeyer et al. [38]	Calvet-Mir et al. [24]	Berges et al. [29]	Camps-Calvet et al. [28]	McPhearson et al. [39]	Krasny et al. [40]	Lovell et al. [41]
Habitat								
Habitat for species	•		•	•		•		
Maintenance of genetic diversity	•		•	•				•
Global biodiversity								
Socio-cultural ecosystem services								
Physical health					•			•
Mental health	•	•		•	•			
Recreation			•		•	•	•	
Tourism	•	•		•	-			
Aesthetical appreciation and inspiration for culture, art and design	•	•	•	•	•		•	•
Contact with nature and spiritual health	•	•	•	•	•		•	
Sense of place			•		•		•	
Education and learning		•	•		•		•	
Maintenance of traditional knowledge and cultural heritage			•		•			
Social cohesion			•		•		•	•
Community building								
Political fulfilment					•			

Note: Points refer to more than one ES for a given reference, when this reference address two or more ESs together (i.e., one point for more lines). The color code indicates the main ES categories (grey) and the single ESs (no color).

2.1.2. Valuation Method of Ecosystem Services

We evaluated the ESs based on a perception approach, thereby assessing how different societal groups consider that the system under evaluation is contributing to a specific ES. In UA literature, this approach has often been employed when considering the perception of garden users [28,38], researchers [29] or contrasting both perceptions [24]. We employed Likert scales, as a common method for evaluating perceived ESs, where the survey participants show agreement with a specific statement (i.e., the contribution of the system to a specific ES) on a numerical scale (e.g., 0 to 5) [24,28,38].

2.2. Case Study: Urban Agriculture in Bologna (Italy)

Bologna is the main province of the Emilia Romagna Region, which is situated in northcentral Italy and has an area of 3702 km^2 and a population of 1,014,619 inhabitants [42]. The city has 385,329 inhabitants in 140.73 km^2 [42,43]. The city structure, which dates back to the Medieval Age, includes a network of internal greened voids (enclosed parks and gardens that follows the structure of the hortus conclusus [44]. Beginning in the 1950s, urban gardens have spread in the peripheral and marginal areas of the city, primarily engaging workers and the immigrant population that find in the garden a way to relax and be in contact with nature, while also contributing to their household food needs [44]. The city of Bologna currently has 20 horticultural areas and around 3000 urban allotment gardens with prevalent social functions.

UA in Bologna has seen the emergence of business models encompassing both social and technological innovations [45] which can be categorized into six strategies: (a) cost reduction, (b) differentiation, (c) diversification, (d) share-economy, (e) experience and (f) experimental [46]. The UA sector in Bologna shows a dynamic scene, where technological innovation is spreading with a number of start-ups (mainly created by the community of university students) that collaborate with maker labs and incubators targeting the experimental business model. Student engagement in fostering technological innovation in urban agriculture is also connected with vibrant educational activity in the sector, which also includes international student competitions (e.g., UrbanFarm international student challenge [47]) and applied participatory research activity on innovative UA systems including rooftop agriculture [48], recreational aquaponics [49] and indoor vertical farming [50]. Within the city, a number of farmers' markets also exist. Urban gardening is further promoted as an educational tool among school pupils [51] as well as for job creation and the social inclusion of disadvantaged citizens [52]. Thus, Bologna emerges as a multifaceted innovation lab on UA, enclosed within a quite compact medium sized city, where activities assume the most diverse form, from low- to high-tech, integrating social as well as entrepreneurial goals. Such features make Bologna a valuable case study to evaluate the potential contribution to ES from multiple types of UAs.

While our study covers a period of two years, we followed the UA development in Bologna starting from an initial survey in 2016 [53] and updated the inventory in 2020 [54]. While a growth in UA was observed within the already existing cases (e.g., through business model upscaling), the increase in the overall number of projects within the city was very limited and thus the data collection conducted in different years had no effect on the replies.

2.3. Data Collection

We collected data from three diverse societal groups with different levels of involvement in UA initiatives in Bologna: project leaders with experience with UA (see Section 2.3.1), key stakeholders with a relation to UA networks (see Section 2.3.2) and the general public as potential consumers or participants in UA projects (see Section 2.3.3). We employed the same survey for the three societal groups, which included an individual evaluation of the contribution of UA to the 25 ESs of the framework (Section 2.1.1). The perceived contribution of UA to an ES was evaluated in a Likert scale from 0 (i.e., UA has no contribution to this ES) to 5 (i.e., UA has a high contribution to this ES). Two participants in the project leaders group also participated in the group of stakeholders

(among urban food-related for-profit companies). While this could be considered as part of the sample overlapping in two of the groups, the object of the survey was different. The stakeholders and the general public evaluated the ESs of UA considering it as a general activity in cities, thereby including the range of UA types from individual home gardens to high-tech rooftop greenhouses. These two societal groups assessed UA as a general activity as they were participating in data collection events tackling UA in general (i.e., a survey to address social acceptance and potential benefits and risks of UA in Bologna, and a stakeholders' workshop on the sustainability of UA, respectively). On the contrary, the UA project leaders reported the contribution to ESs for the specific UA activity they were representing, since we wanted to (a) collect specific knowledge of UA project leaders of their own experience in the specific UA type, and (b) gather information from different UA types towards comparing them (Table 2). Furthermore, the analysis did not compare the two groups of project leaders and stakeholders but assessed them separately.

Table 2. Data collection characteristics by societal group.

Characteristics	**Societal Groups**		
	Project Leaders of UA Initiatives	**Stakeholders of UA**	**General Public**
Sample size (n)	6	20	380
Respondents focus	Specific UA initiatives	UA in general	UA in general
Age range (years)	25–60	25–60	18 + (95% of sample within 18–64 group)
ES survey	The same ES survey (1–5 Likert scale) was employed for all groups.		
Data collection	January–March 2018	September 2016	October–November 2016
Data source	Primary data	Primary data	Primary data (previously published [8])

2.3.1. Project Leaders of Urban Agriculture Initiatives

We surveyed the project leaders of six UA initiatives in Bologna (Italy) between January and March 2018 during direct interviews. The six cases we used represent the cases focusing on technological innovations T1 and T2 (indoor LED farming, high-tech greenhouse with soil-less production) and cases S1–S4 focusing on social innovations (community-supported agriculture (CSA) peri-urban farms, peri-urban farms with direct selling, community rooftop gardens, urban social co-op with a social inclusion program) (Table 3). Further details and an analysis of the innovations in these case studies are reported by Sanyé-Mengual et al. (2019) [45]. We asked each project leader to respond to the survey considering the characteristics of the UA initiative that they manage. The total sample of UA activities in Bologna (n = 6) represents the distinct typologies of UA present in the city. In particular, the sample included all the professional UA initiatives in the area at the time of the data collection.

Table 3. Description of the cases included at the project leader level: urban agriculture form, urban space and innovation.

Case	UA Form	Urban Space	Case Description
T1	Indoor LED farming	Building (indoor cultivation)	This experimental farm aims at producing food with higher energy efficiency.
T2	High-tech greenhouse	Peri-urban (agricultural land)	This farm employs warm wastewater from the adjacent bio-energy plant to warm the greenhouse. Soil-less production is employed to boost resources efficiency.
S1	Peri-urban farm with direct selling	Peri-urban (agricultural land)	This peri-urban farm produces organic fruit and vegetables that are sold daily to customers via direct selling (social media and website).
S2	CSA peri-urban farm	Peri-urban (agricultural land)	This peri-urban farm recovered an agricultural space where production is performed without nutritional inputs as agricultural waste is used to restore soil conditions between crops. As a CSA activity, the members of the cooperative decide on the agricultural activity and the distribution of the produce in annual assemblies.
S3	Community rooftop garden	Building (rooftop)	This rooftop garden was the first community garden in Italy pursuing social inclusion among the inhabitants of a social housing block. Harvested produce is distributed and consumed among the neighbors.
S4	Urban co-op with social inclusion	Urban (agricultural land)	This urban farm recovered an agricultural area of a post-industrial neighborhood. The farm combines organic production with training opportunities and a restaurant to host events.

2.3.2. Stakeholders of Urban Agriculture

We collected data on the perception of ESs of UA from diverse stakeholders during a participatory workshop around the sustainability of UA in September 2016 in Bologna (Italy). Data collection included 20 stakeholders who represented four main groups:

- administration and associations (5), i.e., regional and local government, national agencies and local environmental associations;
- representatives of grassroots urban food systems (5), i.e., citizen driven food co-op, urban allotments and squatted gardens;
- urban food-related for-profit companies (4), i.e., association of local food producers, peri-urban food co-op managers, peri-urban farmers and SMEs supporting UA initiatives (e.g., resources and technology providers);
- researchers on food systems (6).

We collected data via the survey described in Section 3.3. The object of the assessment was UA as a general activity. Therefore, the two project leaders that joined the stakeholders' workshop within the for-profit activities group evaluated the perceived ESs of UA as a general activity.

2.3.3. General Public (as Potential Consumers or Participants in UA)

We retrieved data regarding the evaluation of ESs by the general public of Bologna from an existing dataset based on a sample consisting of 380 completed questionnaires as described by Sanyé-Mengual et al. [8]. The survey was performed in October and November 2016 and targeted citizens of Bologna who were adults and had lived in Bologna for at least two years. A two-stage cluster sampling for recruiting was used: (a) the data collection areas were randomly chosen out of 18 sub-neighborhoods and (b) the participants were randomly invited to join the study by addressing

every third passer-by in the recruitment spots [8]. Paper and pencil questionnaires were handed out to the interviewees by the interviewers. The participants were asked to rate their agreement level regarding the contribution of UA to specific environmental and socio-cultural ESs.

The sample was representative for sex structure (Sample: Male 49%, Female 51%; Bologna: Male 47.3%, Female 52.7%) and no significant difference ($p = 0.245$; binomial test) was found when compared to the Bologna population. However, the age structure of the sample was not representative of the Bologna population (one-sample chi-squared test: $p < 0.001$). The younger age groups were over-represented in the sample in detriment of older age groups, which were under-represented. More detailed descriptions and the original dataset have been published as a data publication [8].

2.4. Data Analysis

Data analysis included descriptive and analytical statistics:

- Firstly, the differences between the three groups were evaluated by means of ranking the contribution of the ES for each societal group by employing the average Likert-scale value within each group.
- Secondly, the statistical differences between the results for the groups of general public and stakeholders, which evaluated UA in general and had a larger sample size, were evaluated by performing an independent samples *t*-test of equality of means separately comparing the four ES categories (i.e., provisioning, regulating, habitat and socio-cultural) and paired sample *t*-test comparing assessment of the four ES categories within the two separated groups. IBM SPSS Statistics 19 software was employed for the statistical assessment. A previous study on UA and ESs conducted by Camps-Calvet et al. [28] was used as a point of comparison for two reasons. First, this study was among the pool of scientific literature analysis for the creation of our analytical framework. Second, the research of Camps-Calvet et al. was conducted in an alike South-European context in Barcelona. Both, Barcelona and Bologna are frontrunner cities establishing UA at the national level. Therefore, their study gives a good point of reference and comparison. The results of perceived ESs of UA in Barcelona from Camps-Calvet et al. (used as reference in Figure 2) [28] were not included in the statistical comparison.
- Finally, the results of the project leaders were evaluated separately towards observing differences at the UA initiative level. The analysis focused on the perceived contribution of each individual UA activity to the ES categories (i.e., provisioning, regulating, habitat and socio-cultural).

3. Results

This section reports the revealed differences among societal groups when valuing the ESs of UA. Firstly, the results from the three societal groups are compared in terms of ES ranking. Secondly, the statistical differences between the perception of the general public and the stakeholders are evaluated. Finally, the differences among different types of UA initiatives are assessed for the project leader group, focusing also on socially and technologically oriented cases.

3.1. How Do Different Societal Groups Rank the Contribution of Urban Agriculture to Different Ecosystem Services?

The evaluation of the ESs of UA by the different societal groups shows a diversified ranking (Table 4). This section explores the commonalities and divergences among the different societal groups in the resulting rankings, focusing on the different levels (UA in general vs. particular UA project) and the groups of stakeholders and general public. Due to the different sample size of the three societal groups, which is particularly limited for the project leader group, we are aware that overlaps might occur between ecosystem services in the ranking due to the lack of statistical difference. Therefore, we present indicative ranking of the ES types rather than a proper statistical analysis in Table 4. Means and standard errors are included in Table A1 in Appendix A.

Table 4. Ranking of the ESs according to the valuation by the project leaders, stakeholders and the general public. The table shows the 5 highest ranked (dark green) and 5 lowest ranked (pale green) ESs.

		Initiative Level	UA Level	
	Ecosystem Services	**ES Ranking by Project Leaders (n = 6)**	**ES Ranking by Stakeholders (n = 20)**	**ES Ranking by the General Public (n = 380)**
Provisioning	Food provision	4	15	8
	Provison of medicinal plants and herbs	22	21	5
	Provision of other raw materials (e.g., wool)	22	25	15
Regulating	Improvement of local micro-climate	13	14	20
	Improvement of air quality	12	19	19
	Enhancement of carbon sequestration	17	22	21
	Enhancement of pollination	1	7	12
	Limitation of extreme weather events	22	24	25
	Soil erosion prevention and maintenance	13	11	23
	Regulation of urban metabolism (e.g., organic waste)	22	6	22
Habitat	Provision of habitat for fauna	13	8	18
	Conservation of genetic variability	5	18	16
	Increase in global biodiversity	5	8	17
Socio-cultural	Contribution to training and education	2	2	2
	New forms of recreation	8	2	1
	Improvement of touristic attractions in the city	20	20	14
	Improvement of mental health	8	1	4
	Improvement of physical health	5	4	7
	Enhancement of the contact with nature and spirituality	3	12	3
	Improvement of urban aesthetics and art inspiration	8	4	6
	Preservation of cultural knowledge and heritage	8	15	13
	Improvement of community building	17	12	10
	Improvement of social cohesion	17	10	9
	Improvement of place attachment	13	15	11
	Contribution to political fulfilment	21	23	24

The color code indicates the 5 highest ranked (dark green) and 5 lowest ranked (pale green) ESs.

At the initiative level, socio-cultural ESs were ranked higher than environmental ESs. The highest ranked ESs were enhancement of pollination, contribution to training and education and the enhancement of the contact with nature and spirituality. Several environmental ESs attained the lowest rank (e.g., regulation of urban metabolism), while contribution to political fulfilment was the lowest ranked socio-cultural ES.

At the UA level, the two other societal groups (UA stakeholders and the general public) agreed about some aspects. In line with the UA project leaders, socio-cultural ESs were ranked higher than environmental ESs. Among socio-cultural ESs, the role of UA in relation to education and training, recreation and mental health was highlighted. The contribution of UA to enhance the contact with nature and spirituality revealed divergences between these two groups. Regarding environmental ESs, both groups agreed on the limited contribution of UA to the enhancement of carbon sequestration and the limitation of extreme weather events, thereby highlighting the perceived narrow role of UA in climate change mitigation and adaptation. The main counter perceptions arose regarding the provisioning ESs, more highly valued by the general public (showing statistical difference for all individual provisioning ESs, Table A1 in Appendix A), and socio-cultural ESs, which were on average more appreciated by UA stakeholders although statistical difference was found for only one of the twelve individual socio-cultural ESs (Table A1 in Appendix A). A summary of the five highest ranked ESs according to project leaders, stakeholders and the general public is displayed in Figure 1.

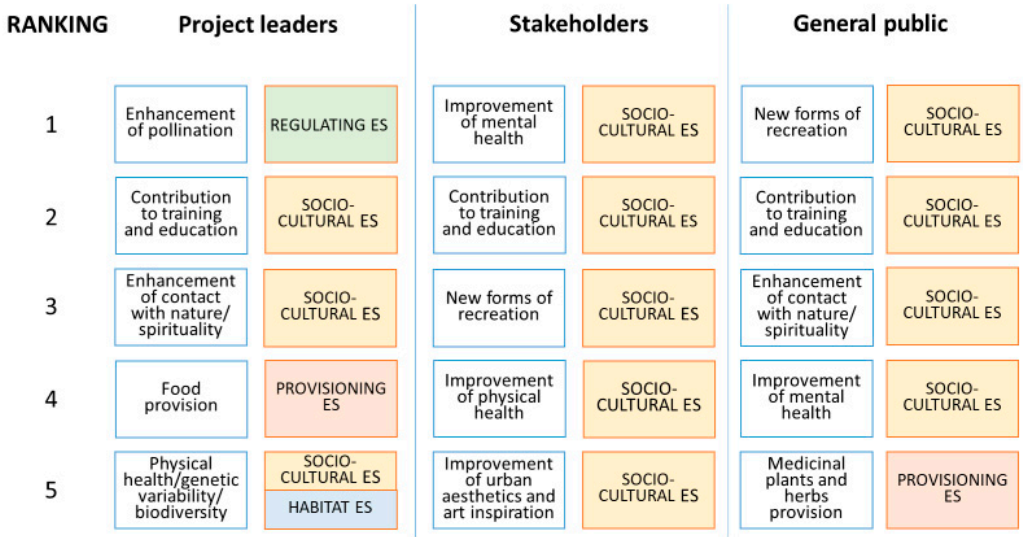

Figure 1. Summary of the five highest ranked ESs according to project leaders, stakeholders and the general public. In the project leader's valuation, three ESs shared the ranking number 5: improvement of physical health, conservation of genetic variability and increase in global biodiversity.

3.2. How Does the Level of Involvement in Urban Agriculture Initiatives Affect Ecosystem Services Valuation?

Towards understanding the potential differences in the perceived ESs of UA by different societal groups, the results for the general public and the stakeholders were assessed statistically (Figure 2, Table A1 in Appendix A). The perceived ESs of UA in Barcelona from Camps-Calvet et al. [28] were employed as a reference as the authors used a similar questionnaire as in our study.

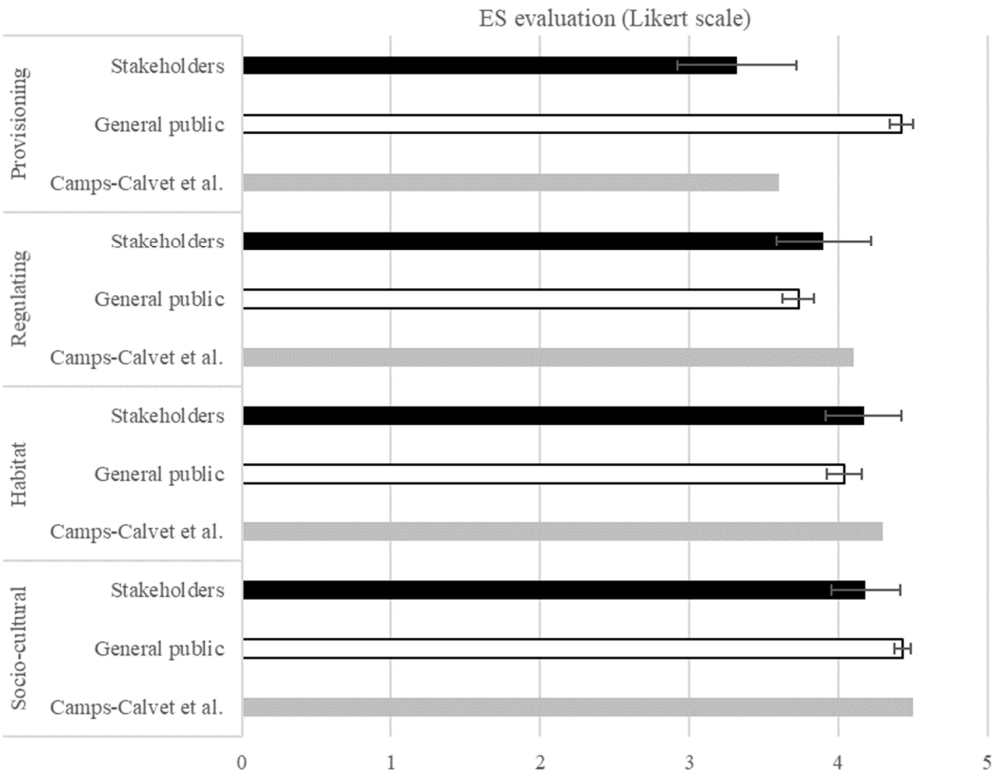

Figure 2. ES valuation per category and societal group: average evaluation by ES category (i.e., provisioning, regulating, habitat and socio-cultural) and societal group (i.e., stakeholders, general public), including a comparison with literature results from Camps-Calvet et al. (2016) [28]. Error bars indicate +/−2 standard errors (SE).

In general, both UA stakeholders and the general public perceived the contribution of UA to the different categories of ESs positively (higher than 3) (Figure 2). The statistical analysis revealed that the only ES category for which the assessed societal groups showed a clear significant difference was for provisioning ($t = -6.2$; $p = 0.000$). Consistently, the general public assessed the potential production capacity of UA more positively than stakeholders. The other two categories, regulating and habitat ESs, showed no statistical difference, thereby both stakeholders and the general public valued them similarly. A statistical comparison of socio-cultural ESs revealed some significant differences, though these were relatively weak ($t = -2.04$; $p = 0.042$). For comparison of all 25 ES types, see Table A1 in the Appendix A. Overall, the results were in line with the assessment of the perception of practitioners regarding UA in Barcelona by Camps-Calvet et al. [28].

Focusing on the way each individual group evaluates the different ES categories, some statistical differences can also be observed. Firstly, stakeholders valued three ES categories higher than provisioning: socio-cultural ($p = 0.000$), habitat ($p = 0.001$) and regulating ($p = 0.011$). Other differences were not statistically significant. Secondly, the general public valued provisioning ESs in a different way—i.e., higher than habitat and regulating ESs ($p = 0.000$ in both cases). With a similar average value, socio-cultural ESs are perceived more positively than regulating and habitat ESs ($p = 0.000$ in both cases). Regulating ESs were the lowest valued type of ES, showing a significant difference also to habitat ESs ($p = 0.000$). Comparing this to the literature, the stakeholders group showed a similar trend to Camps-Calvet et al. [28], who also focused on stakeholders rather than the general public.

3.3. Are the Different Urban Agriculture Types Perceived Differently Regarding the Delivery of Ecosystem Services?

At the project leader level, the data collected by case study allowed for the identification of differences related to different UA typologies. Additionally, the results revealed differences between initiatives based on either social or technological innovations (Figure 3).

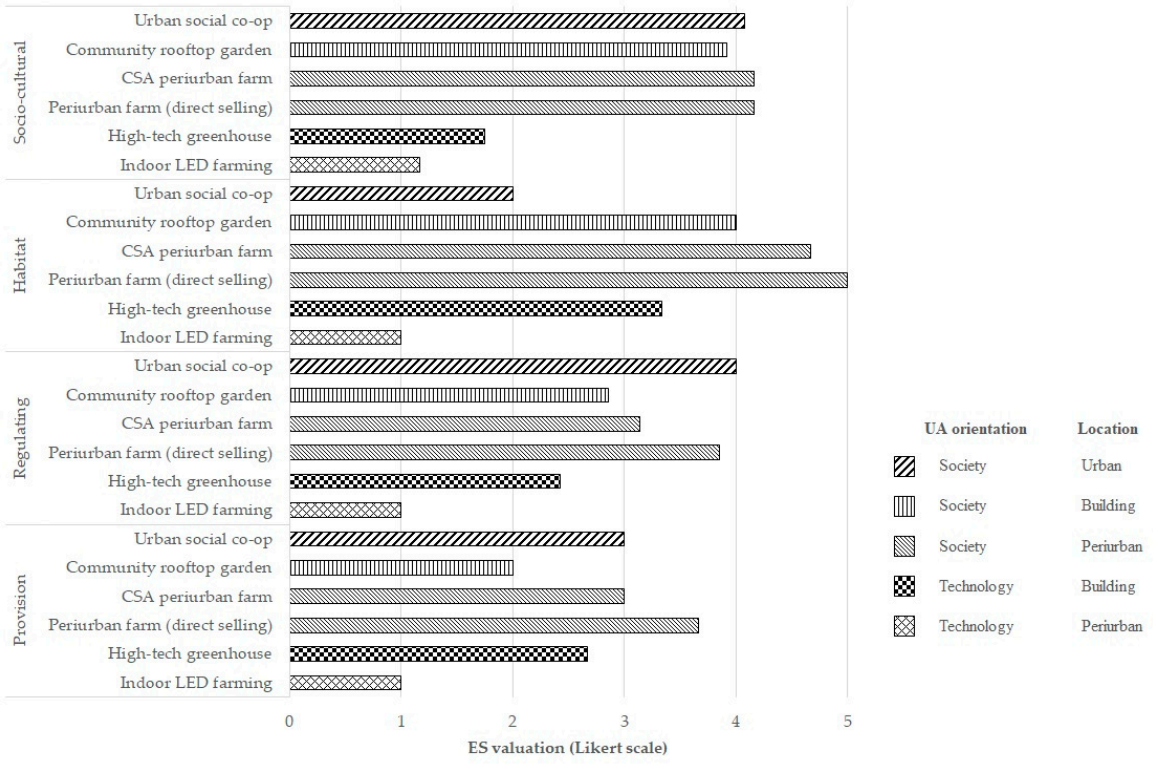

Figure 3. Average evaluation of the ESs of Urban Agriculture (UA) by individual case study and ES category. Likert scale from 0 (lowest) to 5 (highest) ES perceived.

Considering the four groups of ESs (Figure 3), habitat and socio-cultural ESs were valued with higher scores as compared with provisioning and regulating ESs. Regarding habitat services, the highest perceived contributions were associated with the assessed peri-urban initiatives (3.3 on average among case studies). Socio-cultural ESs were similarly evaluated by the socially oriented UA initiatives, the valuations of which were almost four times higher when compared to technologically oriented ones (Table A2 in Appendix A). From a case study perspective (Figure 3), social initiatives obtained the higher valuation of ESs, ranging from 3.4 to 4.1 on average. The peri-urban activities were the ones obtaining the highest valuation on average. These activities had the largest area of cultivation and, thus, a higher impact on the environment in absolute terms as could be perceived by the project leaders. On the contrary, the indoor LED farm was the one scoring as the lowest ES out of all the types (average of 1.1).

4. Discussion

4.1. The Perceived Contribution of Urban Agriculture to Ecosystem Services

In general, the different societal groups included in this study showed a very positive perception of UA and highlighted its positive contribution to multiple environmental and socio-cultural ESs. This means that not only the project leaders themselves, but also the general public as well as local stakeholders recognize the high potential that UA entails regarding the improvement of the quality of urban living and the environment. Previous studies revealed that there can be differences in the appreciation of UA depending on the different UA types. Recent surveys among the inhabitants of Bologna and Berlin exposed that the inhabitants of Bologna, for example, rejected animal-related landscapes and meadows within urban areas, whereas Berliners were highly critical towards the high-tech and intensive UA options (e.g., aquaponics) [8,55].

Our results imply a generally positive perception towards UA. This result suggests that there is a high level of acceptance and openness towards all types of UA and throughout all investigated groups, as the participants attach UA to the provision of high environmental and socio-cultural benefits for the city. This is in line with another recent survey conducted in the city of Bologna, in which citizens largely approved the implementation of UA and indicated a high willingness to engage in UA (98% of respondents), an appreciation of the contribution of UA to improve the urban image (95% of respondents), and the willingness to buy UA products (between 69% and 92%, depending on the product) [8]. We are aware that this high level of openness indicated in the survey does not necessarily means that all participants would in the end really engage in UA activities as active participants or consumers. Nevertheless, in terms of green space access, not everybody has access to private gardens calling for a just UA plan providing various forms of UA, which are accessible to a broad range of urban residents, given that there is such a large interest [56].

Overall, this positive conception of UA in our study paves the way for the future development of UA and opens the field for policy and planning interventions to strengthen the role of UA, as this is apparently supported by the society.

4.2. Perception of Urban Agriculture as a Contributor to "Multifunctional Services"

Our results revealed that environmental as well as socio-cultural ESs are generally highly valued, which underlines the potential of UA for delivering multifunctional services. Looking first at food as a provisioning ES, the different groups evaluated its benefits slightly differently. The capacity of UA to satisfy the needs of food provision for the urban population has always been a controversially discussed aspect in the scholarly debate and is likewise reflected in our study results: while the general public and project leaders valued the potential contribution to food production of UA as being very high, the urban stakeholders indicated a lower rank to this ES. This could be explained by the fact that the involved stakeholders generally valued other ESs than food provision more highly. At the initiative

level, for those UA types where food provision was one of the major goals, this environmental ES was highly valued by the project leaders accordingly.

We assume that the different valuations can be explained by the different levels of knowledge, based on the involvement of the interviewees in UA. We hereby assume that the general public usually has the lowest involvement, stakeholders have a medium level of involvement and UA managers a high involvement. This is aligned with results from a survey on social acceptance in Bologna [8] where only 47% of the respondents indicated to have heard about UA before the survey.

The existing literature widely discusses the overall role of UA for urban food self-sufficiency. A number of studies have evaluated the effectiveness of crop yields in UA compared to conventional agriculture, while considering the potential constraints of the urban environment (e.g., sunlight availability, crop area). On the one hand, studies have demonstrated that UA can obtain high crop yields and be competitive in the food market, although the actual efficiency and outputs mainly depend on their activity goals (for-profit vs. not-for-profit activities), location (peri-urban vs. urban, soil-based vs. building-based) and technology (e.g., soil-less techniques, protected cultivation) [57–60]. City-level assessments helped to quantify the production capacity of UA. In the case of Bologna, Orsini and colleagues [58] found that with a maximum implementation of rooftop gardens around the city, 77% of the requirements of Bologna citizens for leafy and fruit vegetables could be satisfied. Positive results were also proven for home gardening, where a high level of self-sufficiency has been previously quantified in a small-scale case study [61], a qualitative international comparison [62] and a large representative survey [63]. On the other hand, the capacity of UA to satisfy the food demand of citizens has been questioned. While some authors acknowledge that UA can serve as a complement to rural agriculture [64], others have pointed out the limitations that UA faces (e.g., in terms of space, resources or know-how) to fully compete with rural-sourced food [65–67].

Our study further revealed the high relevance of socio-cultural ESs compared to food production or other environmental ESs, such as the contribution to health, education or the generation of new forms of recreation. This is mainly related to the general conceptualization of UA, which is associated with a multifunctional social activity rather than a purely food production one [8]. The stakeholders ranked the improvement of mental health as the most valued ES. Indeed, benefits for mental health have been identified in the literature and studies reveal how working in or with nature can have a positive impact on mental health and overall well-being [68–70]. The establishment of allotment or community gardening activities has been proven to positively affect people and can be used as a tool to defeat loneliness or illnesses [71–74].

The educational function of UA has been described extensively in the literature [75]. Training has recently been identified as key for the success of UA initiatives, such as community gardens [76], and entertainment was indicated as the most preferred use for new UA spaces by the surveyed citizens of Bologna [8]. The multifunctionality of UA has also been central in the deployment of urban plans and programs to promote UA implementation. For example, the municipality of Barcelona implemented Pla Buits to boost the creation of social spaces in abandoned urban spots in reaction to the 2008 economic crisis, allocating several public spaces to the development of community gardens and UA-related associations that focus on community building and social cohesion [77].

4.3. Different Urban Agriculture Initiative Types and Their Contribution to Ecosystem Services

The assessment of UA at the initiative level revealed that the perceived contribution to ES is affected by the different intrinsic UA project characteristics (such as the project orientation, its interaction with the public and its location). The orientation of UA activities can lead to a different contribution to socio-cultural ESs. Delving into the case studies, the social UA initiatives had intense interactions with the public, aiming to become an open space to enhance the creation of bonds and networks with different societal agents and to strengthen consumer–producer relationships. On the contrary, the UA initiatives based on technological innovations tend to be rather isolated and develop in closed spaces,

which prevent free access and interaction with the society (e.g., located in buildings and thereby having physical barriers). This resulted in a low impact on the socio-cultural benefits for the society.

The available literature confirms that UA projects pursuing social innovations were correlated to a higher contribution to social sustainability benefits [45]. The dissemination of UA aims further contributes to a stronger relationship between consumers and producers [78]. In this study, the evaluated UA initiatives with direct selling and community-supported agriculture schemes also promoted activities with direct interaction with the society, such as training activities, open visits for the public and enhancing awareness of alternative forms of food production and consumption in cities [45]. Such provision of activities boosts the contribution of UA initiatives to socio-cultural ESs, such as training, recreation and social inclusion.

The differences at the UA initiative level also revealed the relevance of the location of UA initiatives for their provision of ESs. Peri-urban activities were perceived as larger contributors to habitat ESs, as these projects with larger areas contribute to the maintenance and protection of agricultural land through environmentally friendly activities (e.g., organic production, biodiversity conservation, polyculture farming). Contrarily, the community rooftop garden and the indoor LED farm showed the lowest evaluation for this ES. This may be explained by the fact that they are placed on or in buildings (rooftop and indoors, respectively) and the perception of supporting biodiversity habitats was weaker. Concerning the rooftop garden, this result contrasts with the theoretical projections evaluated by Orsini and colleagues [58], where a potential network of rooftop gardens around Bologna was identified as a planning scenario to strengthen the ecological corridors along the city. The relevance of the location of UA initiatives can also be appreciated regarding socio-cultural ESs. Building-based UA was perceived as a closed space with a limited relation to the public and therefore with little contribution of benefits to the society, while open and large spaces (e.g., peri-urban farms) were perceived as high contributors to socio-cultural ESs with a close connection with citizens.

4.4. Methodological Framework Extending the TEEB Assessment

Regarding the development of the methodological framework for the ES evaluation of UA, we decided to deviate from the original TEEB framework. We added seven individual ESs to the framework, which resulted in a total of 25 ESs to be evaluated. Overall, the addition of further ESs was required for the object of the study (i.e., UA as a nature-based solution) to embrace the plural contribution to social and environmental benefits. Our decision to add further ESs was based on previous literature findings, from which we selected those "services" useful and relevant as additions to the original TEEB framework. For example, regarding the local climate, a study of Gasperi [79] assessed the positive effects of urban rooftop gardens in micro-climate conditions and the resulting human comfort. The separation of local climate and air quality further allowed the stakeholders to evaluate the general local climate, compared to air quality, as two separate categories. Another ES that was added by us to the framework is the improvement of the "global biodiversity", which was also highly ranked by the UA managers and stakeholders. This highlights not only the contribution to biodiversity conservation through the provision of habitats in the UA project itself, but also its specific contributions to global biodiversity—e.g., through the recuperation of local and ancient crops (which were displaced by commercial varieties) or through the introduction of varieties that are introduced by migrants from their countries of origin (e.g., the project Semino recently started in Bologna—https://www.semino.org/). The other added ESs were on cultural knowledge, social cohesion and community building, which were similarly highly ranked by the different societal groups.

Finally, the additional ES related to place attachment and political fulfilment had a lower relevance in our assessment. As they have been added to the original framework, it could be questioned as to whether they should have been included into the assessment at all. For our purposes however, the identification of a socio-cultural ES—even with a lower appreciation—is still relevant to identify key aspects and central values of UA activities.

4.5. Limitations of the Study and Outlook on Future Research

Two aspects of the methodological approach entail some limitations. Mainly, the data collection was limited to one city (i.e., Bologna, Italy) to make the perspectives of different societal groups comparable. For this reason, only forms of UA present in the city were selected for the data collection at the project leader level, while other forms of UA were thereby excluded from the study. This fact is most relevant regarding technological innovations, where some UA types were missing (e.g., rooftop greenhouses, rooftop farms, aquaponics), rather than for the social initiatives. In order to extend the knowledge further, future research on this topic might focus on assessing the perceived ES in different geographical areas to explore the role of diverse local aspects. The assessment of diverse types and forms of UA (from high-tech solutions to social innovations) might shed further light on a comprehensive picture of the contribution of UA to urban ESs.

While this study included all of the professional UA activities in Bologna at the time of the data collection, the sample for UA project leaders with only six project leaders was comparably small, which makes it difficult to extract general conclusions. Furthermore, the differentiation between societal groups is not clear-cut—in particular, the boundaries between UA stakeholders and project leaders are blurred, since the leaders of UA projects are inherently also UA stakeholders at the same time. In our study, two project leaders even participated in both groups, although in each of them their role was specific to the object of the survey: they participated for their own UA activity (as project leaders) and for UA in general (as stakeholders). Still, this overlapping of the sample groups limited the comparison between these two societal groups. While a comparison of these two groups assessing the same object of study would provide further detail on differences between societal groups, it would require excluding the project leaders and managers from the stakeholders group to have a clear differentiation between the two sample groups. Methodologically, the setting of the interviews was different among the three groups of interviewees. While the stakeholders and project leaders were approached in a rather professional setting of a workshop or personal meeting, the interviewees of the general public were approached on the streets. We see the possibility that the different interview situation may have created a certain bias in their answers. Further research addressing the perception of ESs of UA from different societal groups might consider to ensure the same setting characteristics to prevent such potential bias.

However, when ESs are assessed from a perception approach, the variability among societal groups and UA typologies revealed in this study should be further addressed. Therefore, the following recommendations should be considered to prevent biased results. Firstly, perceived ESs should be evaluated in multi-stakeholder exercises that include all perspectives ranging from project leaders of UA initiatives (which have deep knowledge but narrowed to specific UA realities) to the general public (which can provide a broad but unspecialized perspective). Secondly, the diverging perceptions in our study revealed the need to integrate the perspectives from different societal groups in order to include different levels of knowledge and expectations on UA. Finally, the evaluation of perceived ESs should be complemented with expert evaluation, as in Calvet-Mir et al. [24], to integrate scientific knowledge as well. To deepen the knowledge about ES perceptions of various UA stakeholders, future research should also go beyond ES valuation by analyzing ES perception under the frame of relational values capturing values that are shared collectively and individually considering the role of care, responsibilities and justice [80]. In fact, these issues are also highly relevant for effective UA policies and their involved stakeholders from various backgrounds aiming at fostering food justice [56].

It should also be acknowledged, however, that only convergent messages among different societal groups and UA typologies might be easily translated into effective policymaking. On the contrary, the identification of divergent aspects among societal groups and UA typologies can reveal weak points for policy implementation that require further assessment to enable the implementation of effective policies. This work focused on the assessment of perceived contributions to ES. However, further studies quantifying the contribution of UA to the different ESs would allow comparing the perception of the society with quantitative data. The literature has already addressed some of these gaps,

such as the quantification of the potential nutrient production of urban UA as provisioning ESs [81], the assessment of species diversity as supporting ESs [82] or as stormwater runoff for regulating the ESs of community gardens [12]. The further quantification of the ESs provided by UA would help to define the relevance of UA not only as a type of urban land-use but also as an agricultural activity. Furthermore, the economic valuation of the ES could be the basis to set up financial instruments to promote and regulate UA activities, such as payment for ecosystem services (PESs) [83], incentives or green taxes (i.e., green financing).

5. Conclusions

This study evaluated the perceived ESs of UA and the variability among different societal groups (i.e., UA project leaders, stakeholders, general public) and UA types (including both social and technological innovations in UA). While the different societal groups shared a high appreciation of the contribution of UA to the different socio-cultural and environmental ESs, the level of involvement in UA activities and the knowledge on UA can lead to divergent perceptions on the benefits of UA. These perceptions can be addressed when ES valuation is considered in decision-making and policymaking contexts. Indeed, the services provided for ecosystems and biodiversity have become a relevant aspect in policymaking. For example, the EU Green Deal includes a priority for preserving and restoring the ecosystems and biodiversity due to the services they provide [84]. Therefore, the assessment of ES can be pivotal in policy design, such as for assessing policy priorities or policy impacts.

As our study revealed, food production was overall not the most valued ES by the different societal groups. The most relevant socio-cultural and environmental ESs were the contribution to health, pollination, education or the generation of new forms of recreation. These potential benefits should be further explored in policymaking to identify policies that could enhance the development of UA with wide social acceptance and to satisfy urban needs. Given its highly positive contribution, UA could be included and promoted in policies and programs on, e.g., training and education, pollination and biodiversity or mental and physical health.

Author Contributions: Conceptualization, E.S.-M. and K.S.; methodology, E.S.-M. and K.S.; validation, E.S.-M., K.S., J.V., M.A. and F.O.; formal analysis, E.S.-M., K.S. and J.V.; investigation, E.S.-M., K.S., M.A. and J.V.; resources, E.S.-M., F.O., J.V. and G.G.; data curation, E.S.-M. and J.V.; writing—original draft preparation, E.S.-M., K.S., M.A., J.V. and F.O.; writing—review and editing, E.S.-M., K.S., M.A., J.V., F.O. and G.G.; visualization, E.S.-M.; supervision, E.S.-M., F.O. and G.G.; project administration, E.S.-M., F.O. and G.G.; funding acquisition, E.S.-M., F.O. and G.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research has received funding from the European Union's Horizon 2020 research and innovation program under the Marie Sklodowska-Curie grant agreement No. 708672 (SustUrbanFoods) and the CE-SFS-24-2019 grant agreement No. 862663 (FoodE). The publication reflects the authors' views. The Research Executive Agency (REA) is not liable for any use that may be made of the information contained therein. Martina Artmann acknowledges funding support of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) (grant number: AR 1121/1-2). Jan Vávra acknowledges funding support of the Operational Programme Research, Development and Education of the Czech Republic (grant no. CZ.02.1.01/0.0/0.0/17_048/0007435).

Acknowledgments: The authors thank the stakeholders that took part in the participatory workshops and the project leaders of urban agriculture cases that contributed to the survey. The authors also thank Justin Calvin Schaefer (University of South Bohemia, Czechia) for the proofreading of this article.

Conflicts of Interest: The authors declare no conflict of interest.

Ethics Statement: The questionnaire addresses the fact that the activity and the respondents were representing the activity as representatives rather than themselves as individuals. Furthermore, results are displayed in an anonymous way. Either way, the respondents were informed about the scope of the study and about the possibility of finishing the questionnaire at any time.

Appendix A

Table A1. Perceived ecosystem services at the project leader, stakeholders and general public levels, including a comparison with the results from Camps-Calvet et al. [28] by ES type. Values display the averages of the Likert-scale evaluation from 0 (lowest) to 5 (highest) ES perceived, numbers in parentheses are standard errors. Difference between Stakeholders and General public was tested by independent sample *t*-test, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. For Project leaders $n = 6$; Stakeholders $n = 19$–20; general public $n = 252$–379.

Ecosystem Services		Project Leader	Stakeholders	GeneralPublic	Camps-Calvet [28]	Stakeholders—General Public Difference
Provision	Food provision	3.7 (0.67)	4.1 (0.19)	4.5 (0.04)	3.8	**
	Provision of medicinal plants and herbs	2.0 (0.36)	3.6 (0.26)	4.6 (0.04)	3.4	**
	Provision of other raw materials (e.g., wool)	2.0 (0.68)	2.4 (0.24)	4.1 (0.06)	n.a.	***
	Average provision	2.6 (0.38)	3.3 (0.20)	4.4 (0.04)	3.6	***
Regulating	Improvement of local micro-climate	3.0 (0.68)	4.1 (0.18)	3.8 (0.07)	4.0	
	Improvement of air quality	3.2 (0.70)	3.9 (0.25)	4.0 (0.07)	4.1	
	Enhancement of carbon sequestration	2.8 (0.48)	3.4 (0.22)	3.7 (0.09)	3.9	
	Enhancement of pollination	4.2 (0.65)	4.3 (0.16)	4.3 (0.05)	4.3	
	Limitation of extreme weather events	2.0 (0.68)	3.1 (0.25)	3.0 (1.0)	3.9	
	Soil erosion prevention and maintenance	3.0 (0.68)	4.2 (0.23)	3.4 (0.09)	4.4	**
	Regulation of urban metabolism (e.g., organic waste)	2.0 (0.52)	4.2 (0.21)	3.6 (0.09)	n.a.	**
	Average regulating	2.9 (0.45)	3.9 (0.16)	3.7 (0.05)	4.1	
Habitat	Provision of habitat for fauna	3.0 (0.63)	4.1 (0.17)	4.0 (0.07)	n.a.	
	Conservation of genetic variability	3.5 (0.81)	3.9 (0.18)	4.1 (0.06)	n.a.	
	Increase in global biodiversity	3.5 (0.72)	4.1 (0.17)	4.0 (0.07)	4.3	
	Average habitat ES	3.3 (0.63)	4.2 (0.13)	4.0 (0.06)	4.3	
Socio-cultural	Contribution to training and education	4.0 (0.26)	4.5 (0.14)	4.7 (0.03)	4.5	
	New forms of recreation	3.3 (0.76)	4.5 (0.14)	4.8 (0.02)	4.5	
	Improvement of touristic attractions in the city	2.7 (0.62)	3.8 (0.19)	4.2 (0.06)	n.a.	
	Improvement of mental health	3.3 (0.76)	4.7 (0.11)	4.7 (0.03)	4.6	
	Improvement of physical health	3.5 (0.67)	4.5 (0.17)	4.6 (0.04)	4.4	
	Enhancement of the contact with nature and spirituality	3.8 (0.60)	4.2 (0.20)	4.7 (0.03)	4.7	*
	Improvement of urban aesthetics and art inspiration	3.3 (0.76)	4.5 (0.14)	4.6 (0.04)	4.5	
	Preservation of cultural knowledge and heritage	3.3 (0.67)	4.1 (0.25)	4.2 (0.05)	4.6	
	Improvement of community building	2.8 (0.70)	4.2 (0.21)	4.4 (0.05)	4.4	
	Improvement of social cohesion	2.8 (0.70)	4.3 (0.19)	4.4 (0.05)	4.4	
	Improvement of place attachment	3.0 (0.78)	4.1 (0.19)	4.3 (0.05)	4.6	
	Contribution to political realization	2.5 (0.62)	3.3 (0.27)	3.4 (0.09)	4.1	
	Average socio-cultural	3.2 (0.56)	4.2 (0.12)	4.4 (0.03)	4.5	*
TOTAL AVERAGE		3.1 (0.48)	4.0 (0.11)	4.2 (0.03)	4.0	

Table A2. Perceived ecosystem services at the project leader level: Total average, average for socially oriented cases, average for technologically oriented cases and ratio social/technological, by ecosystem service type (provision, regulating, habitat, socio-cultural). Values display the averages of the Likert-scale evaluation from 0 (lowest) to 5 (highest) ES perceived. N = 6; for standard errors of total see Table A1.

	Ecosystem Services	Total	Social	Technological	RatioSoc/Tec
Provision	Food provision	3.7	4.0	3.0	1.3
	Provision of medicinal plants and herbs	2.0	2.3	1.5	1.5
	Provision of other raw materials (e.g., wool)	2.0	2.5	1.0	2.5
	Average provision	2.6	2.9	1.8	1.8
Regulating	Improvement of local micro-climate	3.0	4.0	1.0	4.0
	Improvement of air quality	3.2	4.3	1.0	4.3
	Enhancement of carbon sequestration	2.8	3.3	2.0	1.6
	Enhancement of pollination	4.2	4.8	3.0	1.6
	Limitation of extreme weather events	2.0	2.5	1.0	2.5
	Soil erosion prevention and maintenance	3.0	3.5	2.0	1.8
	Regulation of urban metabolism (e.g., organic waste)	2.0	2.0	2.0	1.0
	Average regulating	2.9	3.5	1.7	2.4
Habitat	Provision of habitat for fauna	3.0	3.3	2.5	1.3
	Conservation of genetic variability	3.5	4.0	2.5	1.6
	Increase in global biodiversity	3.5	4.5	1.5	3.0
	Average habitat ES	3.3	3.9	2.2	2.0
Socio-cultural	Contribution to training and education	4.0	4.0	4.0	1.0
	New forms of recreation	3.3	4.5	1.0	4.5
	Improvement of touristic attractions in the city	2.7	3.5	1.0	3.5
	Improvement of mental health	3.3	4.5	1.0	4.5
	Improvement of physical health	3.5	4.5	1.5	3.0
	Enhancement of the contact with nature and spirituality	3.8	4.5	2.5	1.8
	Improvement of urban aesthetics and art inspiration	3.3	4.5	1.0	4.5
	Preservation of cultural knowledge and heritage	3.3	4.3	1.5	2.8
	Improvement of community building	2.8	3.8	1.0	3.8
	Improvement of social cohesion	2.8	3.8	1.0	3.8
	Improvement of place attachment	3.0	4.0	1.0	4.0
	Contribution to political realization	2.5	3.3	1.0	3.3
	Average socio-cultural ES	3.2	4.1	1.5	3.4
	TOTAL AVERAGE	3.1	3.8	1.7	2.7

References

1. Elmqvist, T.; Bai, X.; Frantzeskaki, N.; Griffith, C.; Maddox, D.; McPhearson, T.; Parnell, S.; Romero-Lankao, P.; Simon, D.; Watkins, M. *Urban Planet: Knowledge Towards Sustainable Cities*; Cambridge University Press: Cambridge, UK, 2018.
2. Raymond, C.; Christopher, M.; Frantzeskaki, N.; Kabisch, N.; Berry, P.; Breil, M.; Nita, M.; Mihai, R.; Geneletti, D.; Calfapietra, C. A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. *Environ. Sci. Policy* **2017**, *77*, 15–24. [CrossRef]
3. Kabisch, N.; Frantzeskaki, N.; Pauleit, S.; Naumann, S.; Davis, M.; Artmann, M.; Haase, D.; Knapp, S.; Korn, H.; Stadler, J.; et al. Nature-based solutions to climate change mitigation and adaptation in urban areas: Perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *Ecol. Soc.* **2016**, *21*, 39. [CrossRef]

4. Peters, K.; Elands, B.; Buijs, A. Social interactions in urban parks: Stimulating social cohesion? *Urban For. Urban Green.* **2010**, *9*, 93–100. [CrossRef]
5. Van den Berg, M.; Wendel-Vos, W.; Van Poppel, M.; Kemper, H.; Van Mechelen, W.; Maas, J. Health benefits of green spaces in the living environment: A systematic review of epidemiological studies. *Urban For. Urban Green.* **2015**, *14*, 806–816. [CrossRef]
6. Artmann, M.; Kohler, M.; Meinel, G.; Gan, J.; Ioja, I.-C. How smart growth and green infrastructure can mutually support each other—A conceptual framework for compact and green cities. *Ecol. Indic.* **2019**, *96*, 10–22. [CrossRef]
7. Artmann, M.; Sartison, K. The Role of Urban Agriculture as a Nature-Based Solution: A Review for Developing a Systemic Assessment Framework. *Sustainability* **2018**, *10*, 1937. [CrossRef]
8. Sanyé-Mengual, E.; Specht, K.; Krikser, T.; Vanni, C.; Pennisi, G.; Orsini, F.; Gianquinto, G.P. Social acceptance and perceived ecosystem services of urban agriculture in Southern Europe: The case of Bologna, Italy. *PLoS ONE* **2018**, *13*, e0200993. [CrossRef] [PubMed]
9. Orsini, F.; Kahane, R.; Nono-Womdim, R.; Gianquinto, G. Urban agriculture in the developing world: A review. *Agron. Sustain. Dev.* **2013**, *33*, 695–720. [CrossRef]
10. Specht, K.; Zoll, F.; Siebert, R. Application and evaluation of a participatory "open innovation" approach (ROIR): The case of introducing zero-acreage farming in Berlin. *Landsc. Urban Plan.* **2016**, *151*, 45–54. [CrossRef]
11. Eigenbrod, C.; Gruda, N. Urban vegetable for food security in cities. A review. *Agron. Sustain. Dev.* **2015**, *35*, 483–498. [CrossRef]
12. Gittleman, M.; Farmer, C.J.Q.; Kremer, P.; McPhearson, T. Estimating stormwater runoff for community gardens in New York City. *Urban Ecosyst.* **2016**, *20*, 129–139. [CrossRef]
13. Mougeot, L.J.A. Urban agriculture: Definition, presence, potential and risks. In *Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda*; Bakker, N., Ed.; DSE: Feldafing, Germany, 2000; pp. 1–62.
14. Ackerman, K.; Conard, M.; Culligan, P.; Plunz, R.; Sutto, M.-P.; Whittinghill, L. Sustainable food systems for future cities: The potential of urban agriculture. *Econ. Soc. Rev.* **2014**, *45*, 189–206.
15. Specht, K.; Siebert, R.; Thomaier, S. Perception and acceptance of agricultural production in and on urban buildings (ZFarming): A qualitative study from Berlin, Germany. *Agric. Hum. Values* **2015**, *33*, 753–769. [CrossRef]
16. Martellozzo, F.; Amato, F.; Murgante, B.; Clarke, K.C. Modelling the impact of urban growth on agriculture and natural land in Italy to 2030. *Appl. Geogr.* **2018**, *91*, 156–167. [CrossRef]
17. Zammit, A.; Erjavec, I.Š.; Maksymiuk, G.; Theochari, D.; Fox-Kämper, R.; Good, R.; Sommariva, E. Allotment gardens as a challenge for an urban designer. In *Urban Allotment Gardens in Europe*; Routledge: London, UK, 2016; pp. 254–287.
18. Russo, A.; Escobedo, F.J.; Cirella, G.T.; Zerbe, S. Edible green infrastructure: An approach and review of provisioning ecosystem services and disservices in urban environments. *Agric. Ecosyst. Environ.* **2017**, *242*, 53–66. [CrossRef]
19. Lin, B.B.; Philpott, S.M.; Jha, S. The future of urban agriculture and biodiversity-ecosystem services: Challenges and next steps. *Basic Appl. Ecol.* **2015**, *16*, 189–201. [CrossRef]
20. European Commission. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions*; European Commission: Brussels, Belgium, 2015.
21. Hansen, R.; Pauleit, S. From Multifunctionality to Multiple Ecosystem Services? A Conceptual Framework for Multifunctionality in Green Infrastructure Planning for Urban Areas. *Ambio* **2014**, *43*, 516–529. [CrossRef]
22. Young, R.F. Managing municipal green space for ecosystem services. *Urban For. Urban Green.* **2010**, *9*, 313–321. [CrossRef]
23. The Economics of Ecosystems and Biodiversity (TEEB). *The Economics of Ecosystems and Biodiversity (TEEB): Ecological and Economic Foundations*; Kumar, P., Ed.; Routledge: London, UK, 2011.
24. Calvet-Mir, L.; Gómez-Baggethun, E.; Reyes-García, V. Beyond food production: Ecosystem services provided by home gardens. A case study in Vall Fosca, Catalan Pyrenees, Northeastern Spain. *Ecol. Econ.* **2012**, *74*, 153–160. [CrossRef]
25. Camps-Calvet, M.; Langemeyer, J.; Calvet-Mir, L.; Gómez-Baggethun, E.; March, H. Sowing Resilience and Contestation in Times of Crises: The Case of Urban Gardening Movements in Barcelona. *Int. J. Sustain. Dev.* **2015**, *8*, 417–442.
26. Smith, H.F.; Sullivan, C.A. Ecosystem services within agricultural landscapes—Farmers' perceptions. *Ecol. Econ.* **2014**, *98*, 72–80. [CrossRef]

27. Langemeyer, J.; Latkowska, M.; Gomez-Baggethun, E. Ecosystem services from urban gardens. In *Urban Allotments in Europe*; Routledge: London, UK, 2016; p. 384.
28. Camps-Calvet, M.; Langemeyer, J.; Calvet-Mir, L.; Gómez-Baggethun, E. Ecosystem services provided by urban gardens in Barcelona, Spain: Insights for policy and planning. *Environ. Sci. Policy* **2016**, *62*, 14–23. [CrossRef]
29. Berges, R.; Opitz, I.; Piorr, A.; Krikser, T.; Lange, A.; Bruszewska, K.; Specht, K.; Henneberg, C. *Urbane Landwirtschaft—Innovationsfelder für die nachhaltige Stadt*; Leibniz Centre for Agricultural Landscape Research (ZALF): Müncheberg, Germany, 2014.
30. Sartison, K.; Artmann, M. Edible cities—An innovative nature-based solution for urban sustainability transformation? An explorative study of urban food production in German cities. *Urban For. Urban Green.* **2020**, *49*, 126604. [CrossRef]
31. Nicholls, E.; Ely, A.; Birkin, L.; Basu, P.; Goulson, D. The contribution of small-scale food production in urban areas to the sustainable development goals: A review and case study. *Sustain. Sci.* **2020**, 1–15. [CrossRef]
32. Yadav, P.; Duckworth, K.; Grewal, P.S. Habitat structure influences below ground biocontrol services: A comparison between urban gardens and vacant lots. *Landsc. Urban Plan.* **2012**, *104*, 238–244. [CrossRef]
33. IPBES. Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services—Unedited Advance Version Key Messages. 2019. Available online: https://ipbes.net/sites/default/files/inline/files/ipbes_global_assessment_report_summary_for_policymakers.pdf (accessed on 10 December 2020).
34. Beery, M.; Adatia, R.; Segantin, O.; Skaer, C.-F. School food gardens: Fertile ground for education. *Health Educ.* **2014**, *114*, 281–292. [CrossRef]
35. Barthel, S.; Folke, C.; Colding, J. Social–ecological memory in urban gardens—Retaining the capacity for management of ecosystem services. *Glob. Environ. Chang.* **2010**, *20*, 255–265. [CrossRef]
36. Teig, E.; Amulya, J.; Bardwell, L.; Buchenau, M.; Marshall, J.A.; Litt, J. Collective efficacy in Denver, Colorado: Strengthening neighborhoods and health through community gardens. *Health Place* **2009**, *15*, 1115–1122. [CrossRef]
37. Anguelovski, I. Beyond a Livable and Green Neighborhood: Asserting Control, Sovereignty and Transgression in the Casc Antic of Barcelona. *Int. J. Urban Reg. Res.* **2013**, *37*, 1012–1034. [CrossRef]
38. Langemeyer, J.; Baró, F.; Roebeling, P.; Gomez-Baggethun, E. Contrasting values of cultural ecosystem services in urban areas: The case of park Montjuïc in Barcelona. *Ecosyst. Serv.* **2015**, *12*, 178–186. [CrossRef]
39. McPhearson, T.; Kremer, P.; Hamstead, Z. Mapping ecosystem services in New York City: Applying a social–ecological approach in urban vacant land. *Ecosyst. Serv.* **2013**, *5*, 11–26. [CrossRef]
40. Krasny, M.E.; Russ, A.; Tidball, K.G.; Elmqvist, T. Civic ecology practices: Participatory approaches to generating and measuring ecosystem services in cities. *Ecosyst. Serv.* **2014**, *7*, 177–186. [CrossRef]
41. Lovell, S.T.; Taylor, J.R. Supplying urban ecosystem services through multifunctional green infrastructure in the United States. *Landsc. Ecol.* **2013**, *28*, 1447–1463. [CrossRef]
42. USP-BO. Popolazione Residente al 31/12/2012 nei Comuni Della Provincia di Bologna per Sesso ed età. *Ufficio di Statistica Della Provincia di Bologna su Dati Delle Anagrafi Comunali*. 2013. Available online: http://dati.istat.it/Index.aspx?DataSetCode=DCIS_POPRES1 (accessed on 10 December 2020).
43. ISTAT. I Censimenti Nell'italia Unita. Available online: https://www.istat.it/it/files/2011/01/I_Censimenti_nellItalia_unita.pdf (accessed on 10 December 2020).
44. Gasperi, D.; Bazzocchi, G.; Bertocchi, I.; Ramazzotti, S.; Gianquinto, G. The multifunctional role of urban gardens through the XX century. The Bologna case study. In *XI International People Plant Symposium on Diversity: Towards a New Vision of Nature*; ISHS: Leuven, Belgium, 2012; pp. 91–98.
45. Sanyé-Mengual, E.; Specht, K.; Grapsa, E.; Orsini, F.; Gianquinto, G. How can innovation in urban agriculture contribute to sustainability? A characterization and evaluation study in Western Europe. *Sustainability* **2019**, *11*, 4221. [CrossRef]
46. Pölling, B.; Velasco, M.-J.P.; Torquati, B.M.; Giacchè, G.; Recasens, X.; Paffarini, C.; Alfranca, O.; Lorleberg, W. Business models in urban farming: A comparative analysis of case studies from Spain, Italy and Germany. *Morav. Geogr. Rep.* **2017**, *25*, 166–180. [CrossRef]
47. Orsini, F.; Pennisi, G.; D'Alessandro, A.; Kratochvilova, D.; Steffan, G.; Paoletti, M.; Sabbatini, G.; D'Ostuni, M.; Trombadore, A.; Gianquinto, G. Bridging interdisciplinary knowledge for sustainable urban landscapes: Results from the international student competition UrbanFarm2019. *Acta Hortic.* **2020**, *1298*, 97–106. [CrossRef]

48. Marchetti, L.; Piovene, C.; Cesarali, A.; Bertocchi, I.; Orsini, F.; Gianquinto, G. "Greenhousing": Integrating low-input simplified hydroponics for roof gardening in bologna's public housing. *Acta Hortic.* **2015**, *1093*, 99–106. [CrossRef]
49. Settanni, L.; Lombardo, F.; Tamborra, G.M.; Orsini, F. Design of an aquaponic system for integrated fish and plant production in Bologna (Italy). *Acta Hortic.* **2020**, *1298*, 129–134. [CrossRef]
50. Pennisi, G.; Sanyé-Mengual, E.; Orsini, F.; Crepaldi, A.; Nicola, S.; Ochoa, J.; Fernandez, J.A.; Gianquinto, G. Modelling Environmental Burdens of Indoor-Grown Vegetables and Herbs as Aff ected by Red and Blue LED Lighting. *Sustainability* **2019**, *11*, 4063. [CrossRef]
51. Piovene, C.; Marchetti, L.; Draghetti, S.; Cesarali, A.; Bazzocchi, G.; Gianquinto, G. Giardini in rete. a model for setting up didactic soilless gardens in schools. *Acta Hortic.* **2015**, *1093*, 83–90. [CrossRef]
52. Pennisi, G.; Magrefi, F.; Michelon, N.; Bazzocchi, G.; Maia, L.; Orsini, F.; Sanyé-Mengual, E.; Gianquinto, G. Promoting education and training in urban agriculture building on international projects at the Research Centre on Urban Environment for Agriculture and Biodiversity. *Acta Hortic.* **2020**, 45–52. [CrossRef]
53. Gasperi, D.; Pennisi, G.; Rizzati, N.; Magrefi, F.; Bazzocchi, G.; Mezzacapo, U.; Stefani, M.C.; Sanyé-Mengual, E.; Orsini, F.; Gianquinto, G. Towards Regenerated and Productive Vacant Areas through Urban Horticulture: Lessons from Bologna, Italy. *Sustainability* **2016**, *8*, 1347. [CrossRef]
54. Orsini, F.; Pennisi, G.; Michelon, N.; Minelli, A.; Bazzocchi, G.; Sanyé-Mengual, E.; Gianquinto, G. Features and Functions of Multifunctional Urban Agriculture in the Global North: A Review. *Front. Sustain. Food Syst.* **2020**, *4*, 562513. [CrossRef]
55. Specht, K.; Weith, T.; Swoboda, K.; Siebert, R. Socially acceptable urban agriculture businesses. *Agron. Sustain. Dev.* **2016**, *36*, 17. [CrossRef]
56. Horst, M.; McClintock, N.; Hoey, L. The Intersection of Planning, Urban Agriculture, and Food Justice: A Review of the Literature. *J. Am. Plan. Assoc.* **2017**, *83*, 277–295. [CrossRef]
57. McDougall, R.; Kristiansen, P.; Rader, R. Small-scale urban agriculture results in high yields but requires judicious management of inputs to achieve sustainability. *Proc. Natl. Acad. Sci. USA* **2019**, *116*, 129–134. [CrossRef]
58. Orsini, F.; Gasperi, D.; Marchetti, L.; Piovene, C.; Draghetti, S.; Ramazzotti, S.; Bazzocchi, G.; Gianquinto, G. 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 Secur.* **2014**, *6*, 781–792. [CrossRef]
59. Sanjuan-Delmás, D.; Llorach-Massana, P.; Nadal, A.; Ercilla-Montserrat, M.; Muñoz, P.; Montero, J.I.; Josa, A.; Gabarrell, X.; Rieradevall, J. Environmental assessment of an integrated rooftop greenhouse for food production in cities. *J. Clean. Prod.* **2018**, *177*, 326–337. [CrossRef]
60. Grard, B.J.-P.; Chenu, C.; Manouchehri, N.; Houot, S.; Frascaria-Lacoste, N.; Aubry, C. Rooftop farming on urban waste provides many ecosystem services. *Agron. Sustain. Dev.* **2017**, *38*, 2. [CrossRef]
61. Sanyé-Mengual, E.; Gasperi, D.; Michelon, N.; Orsini, F.; Ponchia, G.; Gianquinto, G. Eco-Efficiency Assessment and Food Security Potential of Home Gardening: A Case Study in Padua, Italy. *Sustainability* **2018**, *10*, 2124. [CrossRef]
62. Sovová, L.; Veen, E.J. Neither Poor nor Cool: Practising Food Self-Provisioning in Allotment Gardens in the Netherlands and Czechia. *Sustainability* **2020**, *12*, 5134. [CrossRef]
63. Vávra, J.; Daněk, P.; Jehlička, P. What is the contribution of food self-provisioning towards environmental sustainability? A case study of active gardeners. *J. Clean. Prod.* **2018**, *185*, 1015–1023. [CrossRef]
64. Sanyé-Mengual, E. Sustainability Assessment of Urban Rooftop Farming Using an Interdisciplinary Approach. Ph.D. Thesis, Universitat Autònoma de Barcelona, Bellaterra, Spain, 2015.
65. Martellozzo, F.; Landry, J.-S.; Plouffe, D.; Seufert, V.; Rowhani, P.; Ramankutty, N. Urban agriculture: A global analysis of the space constraint to meet urban vegetable demand. *Environ. Res. Lett.* **2014**, *9*, 064025. [CrossRef]
66. Badami, M.G.; Ramankutty, N. Urban agriculture and food security: A critique based on an assessment of urban land constraints. *Glob. Food Secur.* **2015**, *4*, 8–15. [CrossRef]
67. Specht, K.; Schimichowski, J.; Fox-Kämper, R. Multifunctional Urban Landscapes: The Potential Role of Urban Agriculture as an Element of Sustainable Land Management. In *Sustainable Land Management in a European Context*; Springer Science and Business Media LLC: Berlin/Heidelberg, Germany, 2020; pp. 291–303.
68. Armstrong, D. A survey of community gardens in upstate New York: Implications for health promotion and community development. *Health Place* **2000**, *6*, 319–327. [CrossRef]

69. Wakefield, S.; Yeudall, F.; Taron, C.; Reynolds, J.; Skinner, A. Growing urban health: Community gardening in South-East Toronto. *Health Promot. Int.* **2007**, *22*, 92–101. [CrossRef]
70. Triguero-Mas, M.; Anguelovski, I.; Cirac-Claveras, J.; Connolly, J.; Vazquez, A.; Barrera, J.; Urgell-Plaza, F.; Cardona-Giralt, N.; Sanyé-Mengual, E.; Alonso, J.; et al. Quality of life benefits of urban rooftops for gardeners with mental health and intellectual disabilities. *J. Epidemiol. Community Health* **2020**, *17*, 200087.
71. Dayson, C.; Bashir, N. *The Social and Economic Impact of the Rotherham Social Prescribing Pilot*; Sheffield: Kansas City, MO, USA, 2014.
72. Soga, M.; Cox, D.T.; Yamaura, Y.; Gaston, K.J.; Kurisu, K.; Hanaki, K. Health Benefits of Urban Allotment Gardening: Improved Physical and Psychological Well-Being and Social Integration. *Int. J. Environ. Res. Public Health* **2017**, *14*, 71. [CrossRef]
73. Litt, J.; Schmiege, S.; Hale, J.; Buchenau, M.; Sancar, F.H. Exploring ecological, emotional and social levers of self-rated health for urban gardeners and non-gardeners: A path analysis. *Soc. Sci. Med.* **2015**, *144*, 1–8. [CrossRef]
74. Nordh, H.; Wiklund, K.T.; Koppang, K.E. Norwegian allotment gardens—a study of motives and benefits. *Landsc. Res.* **2016**, *41*, 853–868. [CrossRef]
75. Rogers, M.A. Urban Agriculture as a Tool for Horticultural Education and Youth Development. In *Sustainable Development and Biodiversity*; Springer Science and Business Media LLC: Berlin/Heidelberg, Germany, 2018; pp. 211–232.
76. Ochoa, J.; Sanyé-Mengual, E.; Kappel, N.; Gianquinto, G.; Specht, K.; Fernandez, J.A.; Bañón, S.; Orsini, F.; Magrefi, F.; Bazzocchi, G.; et al. Sustainable Community Gardens Require Social Engagement and Training: A Users' Needs Analysis in Europe. *Sustainability* **2019**, *11*, 3978. [CrossRef]
77. La Vanguardia. *The "Vacant Lands Plan" Gives 14 Spaces to Various Entities*; La Vanguardia: Barcelona, Spain, 2013.
78. Zoll, F.; Specht, K.; Opitz, I.; Siebert, R.; Piorr, A.; Zasada, I. Individual choice or collective action? Exploring consumer motives for participating in alternative food networks. *Int. J. Consum. Stud.* **2017**, *42*, 101–110. [CrossRef]
79. Gasperi, D. Urban Horticulture: Reducing Food Miles to Improve Cities Microclimate and Environmental Sustainability. Ph.D. Thesis, Alma Mater Studiorum—University of Bologna, Bologna, Italy, 2017.
80. Jax, K.; Calestani, M.; Chan, K.M.A.; Eser, U.; Keune, H.; Muraca, B.; O'Brien, L.; Potthast, T.; Voget-Kleschin, L.; Wittmer, H. Caring for nature matters: A relational approach for understanding nature's contributions to human well-being. *Curr. Opin. Environ. Sustain.* **2018**, *35*, 22–29. [CrossRef]
81. Sioen, G.B.; Sekiyama, M.; Terada, T.; Yokohari, M. Post-Disaster Food and Nutrition from Urban Agriculture: A Self-Sufficiency Analysis of Nerima Ward, Tokyo. *Int. J. Environ. Res. Public Health* **2017**, *14*, 748. [CrossRef] [PubMed]
82. Cabral, I.; Keim, J.; Engelmann, R.; Kraemer, R.; Siebert, J.; Bonn, A. Ecosystem services of allotment and community gardens: A Leipzig, Germany case study. *Urban For. Urban Green.* **2017**, *23*, 44–53. [CrossRef]
83. Matzdorf, B.; Meyer, C. The relevance of the ecosystem services framework for developed countries' environmental policies: A comparative case study of the US and EU. *Land Use Policy* **2014**, *38*, 509–521. [CrossRef]
84. von der Leyen, U. *'A Union that Strives for More: My Agenda for Europe', Political Guidelines for the Next European Commission 2019–2024*; Publications Office of the EU: Luxembourg, 2019.