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EXECUTIVE SUMMARY

Urban Agriculture (UA) is rapidly evolving and changing and often entails more than the production of food. EFUA's Working Package 3 therefore aims to identify the types and benefits of UA in the European context. This report is an update of the typology as described in the COST Action UAE. As existing typologies are often based on subjective observation rather than on empirical data and are also one-dimensional, this study is based on a systematic literature review about characteristics and existing typologies of UA, interviews with sixteen experts in the field representing eleven European countries and a questionnaire about specific UA initiatives amongst 112 respondents.

The proposed renewed UA multidimensional typology is as follows:

- Urban farm: high acreage, outdoor production, urban or peri-urban, privately owned, production oriented, diverse produce (animal and plant based), additional services, production sold e.g. CSA farm
- Community park: low acreage, outdoor, urban or peri-urban, production for own consumption, diverse additional activities at site e.g. forest garden
- DIY garden/farm: medium acreage, outdoor production, urban or peri-urban, mostly vegetable production, a group of people or individuals responsible, for own consumption e.g. allotment garden or self-harvesting farm
- Zero Acreage farm: low acreage, build-in urban area, privately owned, out of soil production, production oriented, diverse (plant based) produce, production sold e.g. vertical farm
- Social farm: medium acreage, outdoor production, privately owned or part of an NGO, produce is sold, gifted or for own consumption, additional services e.g. health care farm
- Community garden: low acreage, outdoor, urban, production for own consumption, diverse additional activities at site e.g. educational garden

This renewed multi-dimensional typology is based upon the questionnaire, its findings backed up by the systematic literature review and interviews. Nevertheless, it is important to keep in mind that typologies are always a simplification of reality. The urban agriculture field is highly diverse, with various combinations of characteristics possible, and there is some overlap between the types suggested. However, the renewed typology does give insights into the diversity of urban agriculture in Europe and the different types of UA one may expect to find.

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1. INTRODUCTION

Urban Agriculture (UA) is not a new phenomenon: it has existed since the expansion of early human conurbations. For many centuries UA (and peri-urban agriculture)¹ was an essential element in the urban food system as a source of fresh food. In the 19th and 20th century UA gradually disappeared due to, among others, fast and long-distance transport and innovations in food conservation. In the context of the modern urban Global North, UA, however, goes beyond mere food production in urban space, as it can provide a wide range of social, economic, and environmental benefits. Van Veenhuizen and Danso (2007: 6) understand modern UA as “an integral part of the urban economic, social and ecological system”, which distinguishes this type of agriculture from conventional (globally oriented) agriculture (see also section 3.1.1 in this report). This definition exemplifies UA’s wide diversity in forms of appearance, production methods, business models and stakeholders involved, as well as the variety of benefits and services provided (e.g. Krikser et al, 2016; Van Veenhuizen, 2006). In the last two decades, UA’s potential to contribute to healthy and sustainable cities has increasingly been studied. UA is also progressively embraced by local policymakers as well as city dwellers. The members of the Milan Urban Food Policy Pact accepted UA as a tangible pathway to feed their urban populations healthily and sustainably and implemented it in their local urban policy plans (e.g. Blay-Palmer et al., 2018).

Although urban agriculture is no longer a new phenomenon and is embraced by both urban policymakers and urban populations, it still has not unfolded its potential due to (societal, political and spatial) barriers resulting from gaps in knowledge, expertise and advocacy. There is a need to address UA from a holistic perspective. The Cost Action report Urban Agriculture Europe (UAE) (Lohrberg et al., 2016) represents a pioneer in this direction and has offered UA a definition, typology and four one-dimensional fields of action: government, business, space, and metabolism. The report also reflects the geographic, political, and historic background of UA in Europe. In addition, its typology - based upon two main types (urban farming and urban food gardening) - has been adapted into various follow-up studies (Figure 1).



Figure 1. Typology of UA as presented in Cost Action report Urban Agriculture Europe (Lohrberg et al., 2016).

¹ If we refer to urban agriculture in this report, we include peri-urban agriculture unless otherwise specified.

However, since the publication of the Cost Action report, both UA and its urban context (and needs) have dramatically evolved. For example, in 2016 (the publication year of that report) innovative pathways in urban agriculture like vertical or rooftop farming and the production of edible insects or micro-algae were not yet fully systematically explored, and were not integrated in the typology (Specht et al., 2019). In addition, the fragility of the current global food system has become ever more apparent due to present disturbances like climate change or the outbreak of Covid-19, suggesting to explore new pathways that include urban agriculture (Langemeyer et al., 2021). Yet, inclusion of UA starts with a better understanding of the added value (at all policy levels) of urban agriculture, the multi-dimensionality and its multiple benefits. A comprehensive typology based on empirical data is supportive to a better understanding of UA and its multiple benefits.

Although in recent years several publications have been issued which extensively address (new) forms, functions and benefits of UA (e.g. Sanyé-Mengual et al., 2019; Specht et al., 2019; Orsini et al., 2020; Langemeyer et al., 2021), there is still a need to further conceptualise and structure this knowledge. The existing typologies are often one-dimensional and are targeting location, distribution, governance, etc. Furthermore, these typologies are often based on subjective observation rather than on empirical data. Also, UA typologies and its benefits need to be linked to the urban policy agendas of today and tomorrow (at different levels of decision making), such as climate, liveability, (peri-) urban planning, social cohesion, poverty and access to (fresh) food.

The European Forum on Urban Agriculture (EFUA) aims to “unlock Urban Agriculture’s potential through achieving better networking, better knowledge, better deployment, and better policies in the field” (EFUA proposal, p. 2). EFUA’s Working Package 3 aims to identify the types and benefits of UA in the European context based on a systematic literature review and empirical data. The specific aim of subtask 3.1 was to update and complement the typology as described in the COST Action UAE. This update of the UA typology was to be done using 1) a systematic literature review, 2) a consultation of R&I projects/ experts/practitioners in the field of UA and 3) an exchange and reflection with the UA Forum. The aim of the latter is to ensure that the updated typology will be recognized by local stakeholders (e.g. policy makers, UA practitioners), is multidimensional and is therefore transferable to policymakers.

The present report presents a UA typology update which commences with the preceding Cost Action. In the next chapters we describe our research methodology, consisting of three pillars, i.e. a literature review, expert interviews and a survey across Europe. Chapter 3 displays the results of these three pillars. In chapter 4 we integrate and discuss the results followed by conclusions and recommendations.

2. RESEARCH METHODOLOGY

In this chapter we discuss the methodology that we used to create an updated typology of urban agriculture in Europe. Figure 2 visualizes the three main methods used, which we discuss in more detail below.

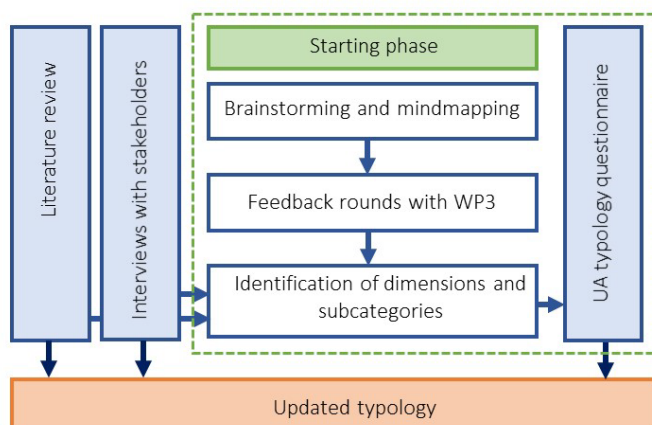


Figure 2. Visualization of the research methodology

2.1. LITERATURE REVIEW

We conducted a systematic literature review in order to get more insights into characteristics of UA, and existing typologies of UA, including their goals, benefits and drawbacks. This was a review involving the initial COST typology that we aimed to update as well academic papers discussing UA typologies. The search process was structured, relying on a search in Wageningen UR's digital library, and papers suggested to us by academics involved in UA. A selection of keywords like "urban agriculture", "types", "typology" and "forms" was used for the search.

The systematic literature analysis identified several approaches for classifying and categorizing urban agriculture projects. Existing typologies have been examined according to the criteria of categorization, identified types and limitations. The results of the literature analysis are presented here in table 1, in order to outline the starting point of the UA typology update. Additional explanations can be found in chapter 3.4. (Typology of UA based on literature and interviews). In-depth information about the highlighted characteristics is given in table 6.

Table 1. Overview of existing UA typologies

Study:	Criteria for Types:	Types:	Limitation:
Van Veenhuizen (2006)	Policy Dimensions	Three main types	Mainly for local authorities and one-dimensional
Thomaier et al., (2015).	Degree of market orientation; strategic orientation	Spectrum of types	Only about Zero-acreage
Vanni and Henke (2017)	Socio-economic qualities	Three main types	Only applicable for the specific Italian context
Krikser (2016)	Distribution level, interests, and actors	Nine ideal, subtypes, and mixed types	Very specific aim of transition processes between types
Goldstein et al. (2014).	Environmental performance	Five main types	Specific aim to highlight the material and resource needs of different types and to group systems that have similar needs
De Graaf (2011).	Crop management	Four types	Only applicable for specific geographical context (Netherlands)
Urban agriculture consortium (UAC).	Highlight the benefits of UA types	Six types	Focused on creating livelihoods and growing food at scale and less on allotment and community gardens
Dietl (2020).	Key characteristics, advantages, and disadvantages	Seven archetypes	The typology served as the basis for the multi-criteria sustainability assessment
Lohrberg et al. (2016).	General characteristics, multifunctional qualities	Two main categories, fifteen subtypes	Four one-dimensional fields of action
Verzone (2021).	Sites, growers, motivations, production entities, scale	Five main categories, several subtypes	Mostly focussed on food
McGlone et al. (1999).	Governance structures (Planning/Design, Implementation, Management)	Five, which got extended by a new type (Fox-Kämper et al. 2018)	Mostly targeting community gardens

The literature analysis underlined, that existing typologies vary greatly in their focus, scope, and representation. Typologies are therefore always a simplification of reality and do not include every possible site-specific manifestation of UA. Against the backdrop of the dynamic development of UA, some typologies appear already outdated and one dimensional. Furthermore, existing typologies seems often based on subjective observation rather than on robust empirical data.

2.2. SEMI STRUCTURED INTERVIEWS

Parallel to the literature review, semi-structured interviews were carried out with sixteen experts in the field, representing eleven European countries and found through the EFUA network. The objective of the interviews was to gather data on UA characteristics and types from the perspectives of experts with specific (and varying) professional and geographical backgrounds (see Figures 3 and 4). We asked interviewees to share their vision on how different forms of UA can be characterized, what dimensions are important when trying to distinguish different forms, and why. This was input for the mind maps and dimensions created to develop the questionnaire (see section 2.3). When answering these questions some interviewees focused on their city or region specifically, whereas others made more general statements on urban agriculture dimensions and types.

One of the researchers carried out the interviews in either Dutch, German, English, or Spanish. Two interviews were conducted in Italian, by an Italian member of the wider WP3 community. The interviews were recorded and transcribed ad verbatim. Informed consent was given, the interviews have been anonymised and they are saved in a secure place.

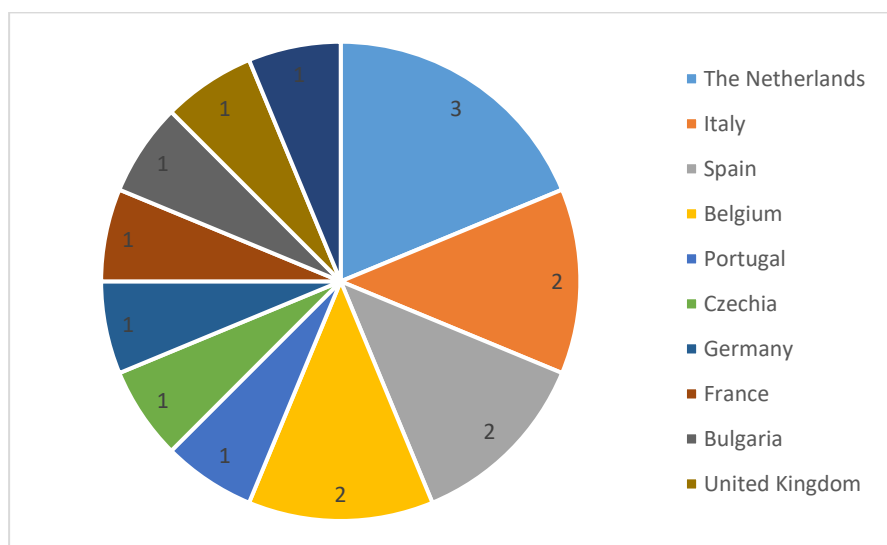


Figure 3. Country profile of interviewees

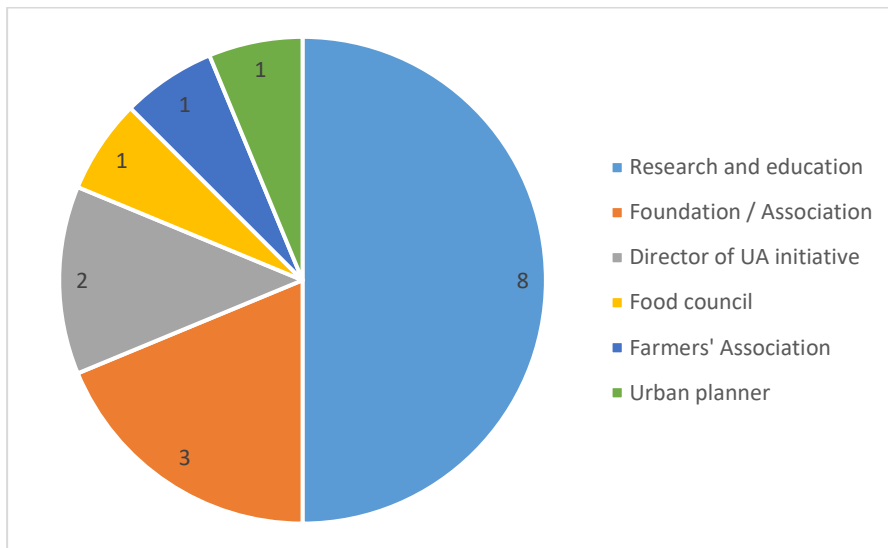


Figure 4. Professional background of interviewees

2.3. UA TYPOLOGY QUESTIONNAIRE

Our work on the questionnaire started with identifying ‘dimensions’ according to which UA initiatives can be differentiated and potentially grouped into types. Dimensions are those elements that distinguish certain forms of UA, such as size, location or what is being produced. We chose to start from these dimensions rather than from existing typologies in order to avoid being steered in a certain direction or reinforcing flaws in such an existing typology. Moreover, we aimed to avoid starting from a number of well-known labels that would identify certain types of UA (such as community garden or urban farm): although these labels are often used, they are also ill-defined and it is unclear whether they mean the same thing in different contexts.

A first step in the process was a brainstorming session within the smaller WP3 task 3.1 team. Starting from on our own knowledge of the field – mainly based on a Dutch context - we identified a preliminary set of 1) dimensions, 2) subcategories and 3) forms of UA. These were visualized in the form of mind maps (see Figure 5 below). An example of a dimension is ‘type of product’, with the subcategories of ‘food products’, ‘non-food products’, and ‘services’: in each of these subcategories we listed several options (for food products those are animal products and plant-based products, each again containing a number of options).

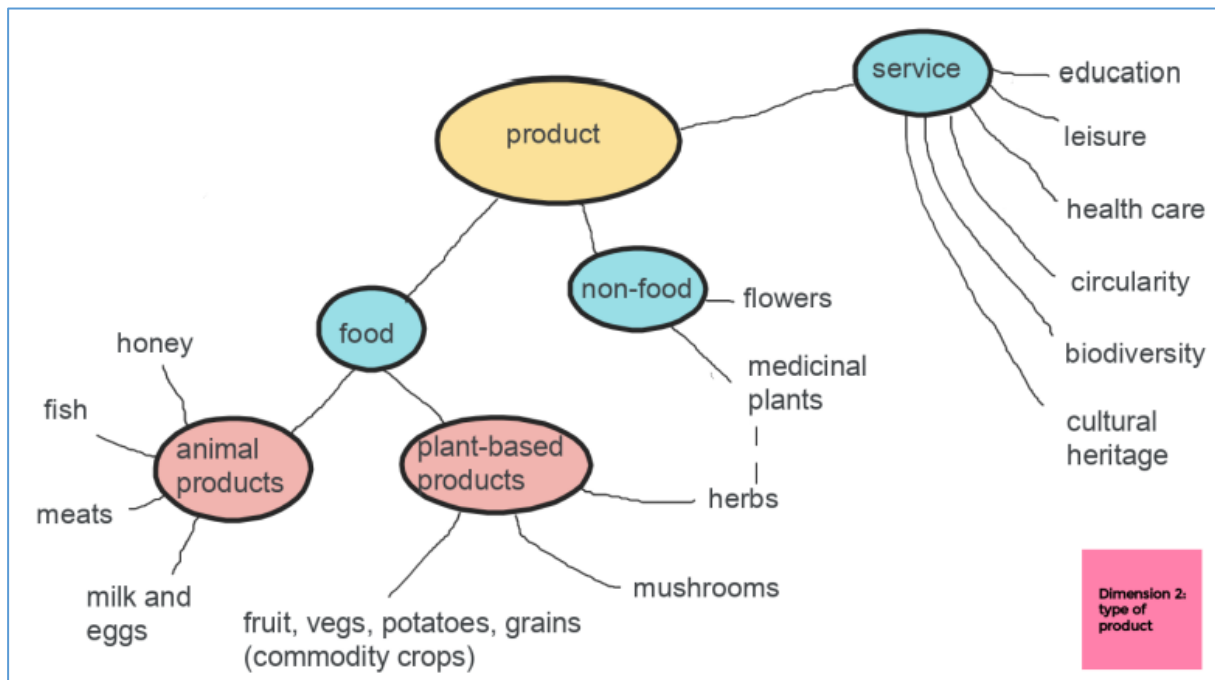


Figure 5. Mind map of dimensions, subcategories and forms of UA

After creating and logically rearranging mind maps for all dimensions identified, we gathered these into an excel file (see Table 2).

Table 2. Overview of preliminary dimensions, subcategories, and options

Dimensions	Subcategories		Options
Type of product	Food	Animal products	Meat, Milk and Eggs, Fish, Honey
		Plant-based products	Fruits/Vegetables/potatoes and grains, mushrooms, herbs
	Non-Food		Medicinal plants, flowers
	Services		Education, Leisure, Health care, Circularity, Social cohesion, Cultural heritage, biodiversity
Product destination	Own consumption		Family/Self, Group
	Gifting	Known	Family, friends
		Unknown	Foodbank
	Selling	Known	CSA, Box scheme
		Unknown	Retail, Restaurant, Direct sale (on-farm)
Location	Urban	In/on/at building	On the roof, on the balcony, inside, vertical wall
		Outside	Garden, wild/natural area, field, park, forest, farm
	Peri-urban	In/on/at building	On the roof, on the balcony, inside, vertical wall
		Outside	Garden, wild/natural area, field, park, forest, farm
Ownership	Defined	Private	Family/individual, company, group
		Semi-public	NGO, informal group
		Public	Public
	Undefined		Squatters
Production method	Indoor	Glasshouse	Soil, water, artificial
		Building	Soil, water, artificial
		Tunnel	Soil, water, artificial
	Outdoor		Container, raised bed, Open soil
Maintenance	Paid		Company, individual
	Middle-way		Public services, NGO
	Non-paid		Group, Individual

We then organized different feedback rounds with the larger WP3 community in which we shared first the mind maps and later the excel file with the preliminary set of dimensions. Input from the wider WP3 community was specifically important to include a wider variety of viewpoints and opinions and move beyond a Dutch perspective only. In various online meetings and subsequent written feedback requests, we discussed reflections, suggestions, and comments on what dimensions should be included when creating a typology. One of the ways in which this was arranged was by asking the partners to fill out the excel file with one specific UA example in mind, crossing the subcategories and options applicable for that initiative. This exercise aimed at stimulating reflection on whether dimensions and subcategories were missing or, on the other hand, redundant. All written and verbal feedback was compiled into one word document, which the smaller team then discussed in detail. For each suggestion a final decision was given in the original word document, which was again shared with the wider team. The challenge was to find a balance between enough detail to distil relevant types of UA and not too much detail in order to remain simple enough to work with. After these feedback rounds a second version of the excel file was created in which all feedback was taken into account (see Table 3).

Table 3. Overview of the final version of dimensions, subcategories, and options.

Dimensions	Subcategories		Options
Type of product	Food	Animal products	Meat, Milk, Eggs, Fish, Honey, other
		Plant-based products	Fruits, vegetables, arable crops, herbs, microgreens, other
		Mushrooms	
		On-site processing	Dairy products, jams, and marmalades, honey, meat products, juices, soup and meals, other
	Non-Food	Medicinal plants, flowers, other	
	Services		Food security/ poverty alleviation, Education, Leisure, Health care, Social cohesion, Cultural heritage, Creating Circularity, Soil conservation, water retention, Biodiversity, Providing renewable resources
Product destination	Own consumption		Family/Self, Group
	Gifting	Known	Family, friends
		Unknown	Foodbank
		Pick-your-own without paying	
	Selling	Directly to consumers	CSA, Box scheme, Direct sale (on-farm)
		Not directly to the consumer	Retail, Restaurant,
Location	City	In/on/at building	On the roof, on the balcony or facade, inside (includes cellar), vertical farming
	or	Outside	Garden, orchard, agricultural field, park, forest, other
	City-region (including peri-urban area)		
Production method	Indoor	Ship container	Soil, water, other
		Glasshouse/Greenhouse	
		Tunnel	
	Outdoor structure		
	Outdoor	Above ground structure, open soil, other	
	Organic	Organically certified	
		Organic but not certified	
		Not organic	
Renewable Resources	Energy, water, organic waste		
Ownership	Ownership		Full or partial ownership by initiative/company
	Lease/rent/use land legally from		Private party, public organization, association/NGO, other
	No ownership rights		No clear ownership rights, it uses the commons, other
Maintenance	Forms of maintenance		Individual own plot
			Group common plot
			Public institution/NGO
			Company or commercial organization
			Other
Time	Permanent		
	Non-permanent (pop-up, mobile, squatted)		
	No longer existing		
Estimated size	m2		
	Ha		

The final version of the excel file containing the different dimensions of urban agriculture served as input for a questionnaire that aimed to measure how different UA initiatives score on these various dimensions – so as to be able to differentiate between them. The excel file was transformed into an online questionnaire using Microsoft Forms (see Appendix Typology Survey), by shaping the dimensions into questions. Partners of the wider WP3 community gave feedback on a draft version of this questionnaire. The questionnaire also contained a number of questions as requested by WP3.2 and WP4.

The final questionnaire was sent out through the EFUA network, asking people either involved in or knowledgeable about a project to fill it out for a specific UA initiative. Respondents from any European country were eligible to do so. When responses started coming in, we kept track of the countries from which responses originated, and gave specific attention to sending out the questionnaire to people from those countries and/or European regions that were underrepresented. We aimed to persuade people to fill out the questionnaire by allotting a cheese for every fifty entrances. Our intention was to collect at least 100 responses. The questionnaire gained 124 responses. After deleting a number of incomplete responses, double responses (more than one entry for the same initiative) and a response from the United States, the final sample contains 112 complete entrances.

2.4. DATA ANALYSIS OF THE QUESTIONNAIRE

Microsoft Forms gathers the data in an excel file. We adjusted this file in the following way:

- First, we adjusted all questions into ‘yes/no’- answers: for instance, when we asked what services an initiative provides, we created columns for each of these services and manually included a ‘1’ when this service was mentioned by the respondent. In only a few questions this required any interpretation from our side, as most questions in the questionnaire were closed. (When the data was transferred into Genstat (Genstat for Windows 21st Edition), empty cells were filled with ‘0’).
- We then ‘labelled’ all initiatives under a preliminary type. One of the questions in the questionnaire asked the respondent to give such a label. Often given answers were community garden, allotment garden, or CSA. Others gave descriptions or used more than one such label. One of the researchers manually allocated a label to each initiative so that the total number of labels was restricted: practically this meant taking care of uniform spelling, but also to choose one label if more than one label were given, and to translate a description into a label. This manual labelling was checked by a second researcher, who made a number of adjustments.
- When the respondent gave the size of the initiative in hectares, we calculated this into square meters. The initiatives showed large diversity in terms of acreage: some initiatives are very small but in a few cases acreage was very large. These few very large ‘outliers’ distort the analysis, as a cluster analysis will then cluster all the smaller ones. In order to limit the influence of these very large initiatives, we did not use size in square meters but \log_{10} (size in square meters). This helps creating clusters of equal size. Figures 6a and 6b show that by using \log_{10} the initiatives are more normally distributed.

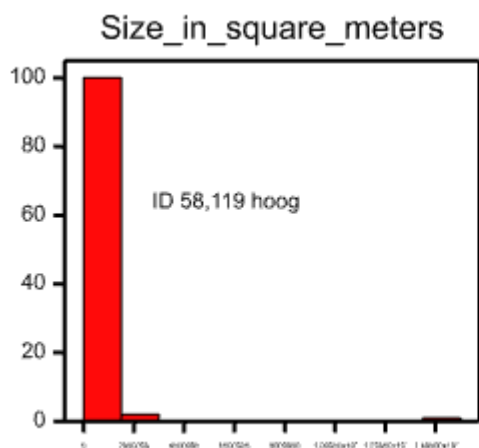


Figure 6a. Size in square meters

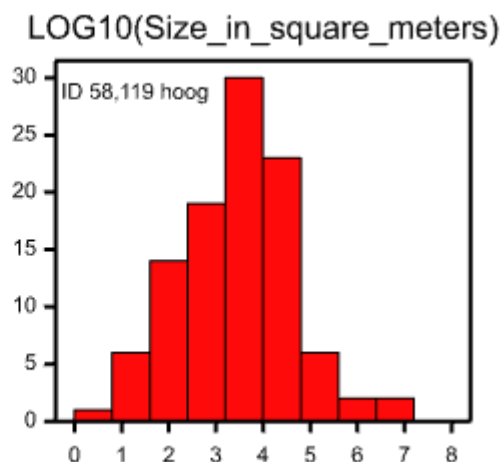


Figure 6b. Log10

In order to analyse the data, we involved a statistician to the team. Using Genstat for Windows 21st Edition (a programme for conducting statistical analyses) we first performed a cluster analysis based on the labels that respondents had given to their initiatives, such as 'community garden' or 'allotment garden'. This analysis did not result in clear clusters. Therefore, we performed a second cluster analysis based on other variables. This process and the reasoning behind it is further elaborated upon in chapter 3, results (section 3.5).

3. RESULTS

In this chapter we commence with a broader understanding of UA, i.e. with the characteristics (including the definition) and dimensions of UA which we found in the literature. We proceed with the characteristics (again including the definition) collected in the interviews. In paragraph 3.3 this information is synthesized and main distinctions are highlighted. In 3.4 we give an overview of types of UA found in the literature and mentioned by the interviewees. These different types have finally been synthesised in 4 (overarching) clusters. In 3.5 we describe the results of the questionnaire and the cluster analysis of the 112 entries of the questionnaire.

3.1. CHARACTERISTICS OF UA ACCORDING TO THE LITERATURE

3.1.1. DEFINITION OF URBAN AGRICULTURE

Urban agriculture exists in a variety of forms and can comprise of a diverse range of activities. UA is therefore a multi-dimensional concept (Van Tuijl et al., 2018). There have been numerous attempts to create a definition of UA, with scholars emphasizing certain aspects of UA over others, depending on their viewpoint (Dietl, 2020). Aspects underlined in most definitions are the production of food and non-food products, the location in the urban or peri-urban space, and its integration with the urban system, thus the exchange of resources between UA and the urban flows (Van Veenhuizen and Danso, 2006; Van der Schans and Wiskerke, 2012; Lohrberg, 2016). Others highlight the aspect of short supply chains and direct producer-consumer links (Krikser et al., 2016). The ambiguity of what peri-urban precisely entails and where the rural space starts is addressed in the COST Action Urban Agriculture Europe definition by stating that urban agriculture occurs “in a spatial context that, according to local opinions and standards, is categorized as ‘urban’” (Lohrberg, 2016: pp. 21). Along the same lines, Jansma and Wertheim-Heck (2021: pp. 2) argue that “‘urban’ in urban agriculture defines not so much its features or its location but rather its connection to the adjacent city through markets, resources, and services”. Taking that connection specifically into account, a definition widely accepted is that by Mougeot (2000: pp. 10), who states: “Urban agriculture here is understood as an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, (re-) using largely human and material resources, products, and services found in and around that urban area, and in turn supplying human and material resources, products, and services largely to that urban area”.

3.1.2. CHARACTERISTICS OF UA

Characteristics of UA described in the literature refer to product destination, organisation and focus, ownership, maintenance, production method, spatial aspects, products, financing, degree of permanence and size and scale. We now give a short description of each of these characteristics, followed by a summary in Table 4.

Product destination

Common distinctions of product destination are self-consumption, distribution within a community of friends by selling, barter or gifting, and selling at the market level (Thomaier et al., 2015; Krikser et al., 2016). Specific examples of product destination localities can be food banks, restaurants, supermarkets, school canteens, and selling to processors.

Organisation and focus

The goals of UA are diverse and can have a social, economic, and/or ecological focus. The aim of an UA project will influence its type or form (UNDP, 2001; Hodgson et al., 2011; Dietl, 2020; Simon-Rojo et al., 2016), and as McClintock (2014: pp. 151) states: “the function of a particular form of urban agriculture plays a large part in its role in the food system”. The purpose of a project influences what benefits are provided, and which target groups might benefit from UA. One initiative can have several purposes (Hodgson et al., 2011).

Ownership

A specific characteristic of UA is the form of tenure, such as leasing, usufruct rent or lease, farming under permit, informal agreements and unsanctioned farming (Mougeot, 2000).

Maintenance

The characteristic ‘maintenance’ concerns the actors who carry out the maintenance of the plot(s). McClintock (2014) makes the distinction between management and labor. The former is about the actor managing the initiative. This could be a household, a collective like an NGO or a business owner. An individual community garden member or institutional staff are examples of actors carrying out maintenance.

Production method

The production system is a characteristic that encompasses several factors such as soil-based or hydroponics production (Kampmeier, 2019), organic or non-organic fertilizer (Thomaier et al., 2015), and pest control (Goldstein et al., 2014), as well as the sources of water and energy sources (Schmidt and Eng, 2016; Dietl, 2020).

Spatial aspects

UA initiatives can develop within urban, suburban, and peri-urban areas (Hodgson et al., 2011). Mougeot (2000) mentions urban/intra-urban and peri-urban as location characteristics. Yet, where exactly the boundaries between intra-urban and peri-urban lie has been contested. There are different ways to define areas, ranging from ‘location respective to residence (on-plot or off-plot)’, developmental state of site ‘open-space or in-building, or depending on ‘modality of tenure’ (land leasing, authorized or unauthorized, personal agreement, or land sharing). The official land use category (residential, industrial or institutional) is another option (Mougeot, 2000).

The UNDP report on urban agriculture differentiates between four land zones, in which urban agriculture can be located. These are cores, corridors, wedges, and the periphery (UNDP, 2001). These four land zones are identified because they differ in “the intensity and type of land use” (pp.

21) which influences the form of UA that are established in these zones, in terms of which space is used or what products are produced for instance.

Products

For professional agriculture having a stable revenue model is key. Urban agriculture provides a variety of products. Additional activities or services, such as offering care, can play an important role as well. Different types of professional agriculture can be distinguished, depending on the services offered (Schmidt and Eng, 2016; Simon-Rojo et al., 2016).

Financing

There are different financing models possible, which also relates to ownership. Examples are private sponsorship, crowdfunding, grants and voluntary work (Thomaier et al., 2015).

Degree of permanence

Whether UA can use permanent space influences agricultural practices such the crops produced. We can differentiate between permanent, long-term, and short-term land use (UNDP, 2001).

Size and scale

Scale and size of UA can vary considerably, from small to large-scale land plots, or on/in spaces such as rooftops, walls, balconies or basements (Hodgson et al., 2011). Roemers (2014) considers scale and intensity of production, differing between ‘production for sustenance with possible surpluses’ and ‘production for a commercial scale’. He states that the scale and production method will influence the locational needs of the farmer.

Table 4. Overview of dimensions and characteristics of UA identified in the literature

Categories	Characteristic	What it entails	Reference
Product destination	Level of distribution	Micro (own consumption), Meso (friends, submarket), Macro (market)	Krikser et al., 2016
	Product destination	Self-consumption, Trade (sale, barter, gift), Market-oriented	Mougeot, 2000
	Market orientation	Private use, Local urban markets, On-site selling, CSA, Restaurants, and supermarkets	Thomaier et al., 2015
	Purpose of production	Home consumption, Market sale, Sale to the processor	UNDP, 2001
Organisation and Focus	Actors (related to distribution level)	Individuals, private households, Associations, start-ups, companies	Krikser et al., 2016
	Organizational model		UNDP, 2001
	Organizational form	Private, public and collective structures	Schmidt and Eng, 2016
	Number of actors involved		UNDP, 2001
	Organization and focus	Actors, Organisations, Goals	Dietl, 2020
	Primary functions or orientations	Food production, recreation, landscaping, informal surplus selling, edible landscape creation, community-building, education	McClintock, 2014
	Purpose (dimension)	Own-consumption, education or demonstration, therapeutic, economic development, etc.	Hodgson et al., 2011
Ownership	Ownership	Private, corporate, or public entities	Pearson et al., 2010
	Ownership	Leasing with different owner structures, Private ownership, collective ownership	Schmidt and Eng, 2016

	Form of tenure	Economic rent or lease, usufruct rent or lease, farming under permit, informal agreement, unsanctioned farming	UNDP, 2001
Maintenance	Management	Individual, household, collective, Institution or contracted organization, non-profit organization, Business owner	McClintock, 2014
	Labour	Self or family, Individual community garden member, Collective Institutional members, Staff, and volunteers, Employees	McClintock, 2014
Production method	Production methods	Earthbound, independent earthbound, hydroponic, aquaponics, vertical farming, indoor farming, rooftop, facade	Kampmeier, 2019
	Production system	Substrate, nutrient supply, pest control, water need, energy supply, resource and infrastructure needs, the potential of urban synergies	Dietl, 2020; Schmidt and Eng, 2016
	Production techniques	In soil or raised-bed, greenhouse, hydroponics, aquaponics, permaculture, vertical farming	Hodgson et al., 2011
	Farming methods	Soil-based (open or raised beds), Hydroponics, aquaponics, Seasonal and year-round production, Organic non-organic	Thomaier et al., 2015
	Farming system	Aquaculture, horticulture (container, soilless hydroponics)), Livestock (poultry, small and large livestock), Agroforestry, miscellaneous	UNDP, 2001
		Substrate, nutrient supply (artificial imported, self-supplied) pest control (low, high) Industrial symbiosis potential (low-high) Irrigation needs (rain-fed, low-recycling) Energy supply (passive solar, solar or grid-based, building supplied) Infrastructure inputs (low, medium, high) Cultivation period	Goldstein et al., 2014
Spatial aspects	Location	Urban, suburban, peri-urban, private, public land, building sites	Hodgson et al., 2011; Schmidt and Eng, 2016
	Location	City center (core), corridors, wedges, periphery	UNDP, 2001
	Location	Intra-urban, peri-urban	Mougeot, 2000
	Type of space used	Around the house, community spaces, surplus public, and private space, industrial areas	UNDP, 2001
	Type of area	Criteria for the typification varies: Residence (off plot, on plot) Development status (built up-open space) Modality of tenure (lease, sharing, authorized unauthorized) Official land use category (residential, industrial, institutional)	Mougeot, 2000; Schmidt and Eng, 2016
	Space used ZFarming	Rooftop, indoor,	Thomaier et al., 2015
	Spatial aspects	Type of area (field, vacant plot) Location (center to urban fringe)	Dietl, 2020
	Location, distance, and traffic	Transportation distance, short supply chain, long supply chain or distance in km	Schmidt and Eng, 2016
Products	End products	Plants, animals, ornamentals, compost	Hodgson et al., 2011; UNDP, 2001
	Products and Resources	Production period (all year, seasonal), harvest amount/m2, diversity of products, distribution level (micro, meso, macro)	Dietl, 2020; Schmidt and Eng, 2016
	Products and activities	Food, non-food, services, packaging, processing, and distribution	Thomaier et al., 2015

	Products	Food, cultivated (grain, root, vegetable, medicinal herbs, fruit, livestock), non-food, ornamental plants, other resources, and services	Mougeot, 2000
	Products and Resources	Leisure and activity, urban green space	Schmidt and Eng, 2016
	Functional dimension	Service functions; landscape features, recreation, education, and health	Simon-Rojo et al., 2016
Financing	Financing	Investors, crowdfunding donations, CSA, grants, voluntary work	Thomaier et al., 2015
	Financial sponsorship	Which actors take the financial risk (private or public actors or collective collaborations)	Schmidt and Eng, 2016
	Sponsorship (criteria)	Private, collective, companies	Kampmeier, 2019
Activities	Economic activities	Production, marketing, processing, (interrelated in time and space)	Mougeot, 2000
Permanence	Degree of permanence	Permanent, long-term, short term	UNDP, 2001; Schmidt and Eng, 2016
Size	Production end/scale	Micro (backyard), meso (allotments), macro (commercial farm)	Pearson et al., 2010
	Scale (of production systems)	Micro individual family Small medium enterprises Large companies	Mougeot, 2000
	Size and Scale	Small-large parcels of land Spaces: rooftop, balconies, porches, fences, basements	Hodgson et al., 2011; Schmidt and Eng, 2016

3.2. CHARACTERISTICS OF UA ACCORDING TO INTERVIEWEES

3.2.1. DEFINITION OF URBAN AGRICULTURE

Some interviewees shared reflections on what they perceived as UA. Interviewees had varying backgrounds and different relations to UA through their work. As one interviewee argues, how UA is defined “depends on the point of view from which one measures it” (respondent 13). Some had a broad perspective and regarded both urban gardening and urban farming as urban agriculture. In general “it can be any agricultural practice that is situated in the centre or peri-urban fringe of a city” (respondent 13). This can mean anything from household gardens in the backyard and balconies to community gardens, allotment gardens, and initiatives in public parks, as well as new trends such as vertical gardening, mushroom growing, animal husbandry, and urban farms that are more market-oriented in terms of food production and services (respondents 5, 6, and 13). Similar to what is mentioned in the literature, respondents stated that: “Urban agriculture is all agriculture that has an active relationship with the city. A relationship that is, above all, market-based, or even of goods and services that are not strictly market-based, such as environmental and social goods and services” (respondent 14). Another interviewee highlighted context-dependency: “Understanding what there is in urban agriculture apart from urban gardens depends from city to city, each territory, and I think each city, each urban context, has a different way of doing things, which also depends on the agronomic characteristics of the soil and traditions” (respondent 15). Furthermore, respondents distinguished between a broad and a narrow definition of UA. The broad one includes private gardens as a form of UA, as well as allotments, community gardens and school gardens. The narrow

perspective on UA focuses on entrepreneurs and organizations who start initiatives with a revenue model (respondent 4).

Characteristics of UA that stand out as defining it as such, are the producer-consumer link, direct selling, and short chains. The connection to the city is what makes it an urban farm (respondent 12). “I still call it urban agriculture because there is a direct relationship between the farmer and the buyer” (respondent 1). As suggested in the literature, this characteristic could be more significant for its definition than its exact location. An urban agriculture initiative can be located in a rural area but because of the many connections with the city, it is still considered UA. This also works the other way: agricultural land within the city that is cultivated in a very traditional way and is less interconnected with the city is not necessarily considered as urban farming (respondent 12). Besides the short supply chain, also an interconnection with urban flows can define UA. An example is an initiative using the residual heat of a building for its production (respondent 12). One interviewee established a definition of UA based on three criteria, being proximity to the city, functionalities, and metropolitan governance. The first includes intra-urban and peri-urban spaces. Functionalities mean that UA should provide urban functions related to for instance food production, short supply chains, or in terms of landscape, leisure, and energy provision. These functions can be delivered also from a large distance to the city. Therefore, the second criteria prevails over the first. “For example, a farmer can sell pigs directly, but the farm is 80 km away from the city. There, the farm will be urban by this function, supplying the city and not by the first criterion of proximity”. Lastly, metropolitan governance refers to the integration of urban agriculture in programs or regulations at the metropolitan scale, not regional nor national (respondent 8).

3.2.2. CHARACTERISTICS OF UA ACCORDING TO RESPONDENTS

Respondents were also asked to pinpoint characteristics, or defining features, of UA. Figure 7 visualizes clusters of categories (e.g. production method) identified by the interviewees. In some cases interviewees clearly identified main distinctions or ways to classify UA initiatives: in the word cloud we have marked these in bold letters (these were explicitly mentioned). Other distinctions - described but not clearly identified as a distinguishing feature - are shown in normal letters.

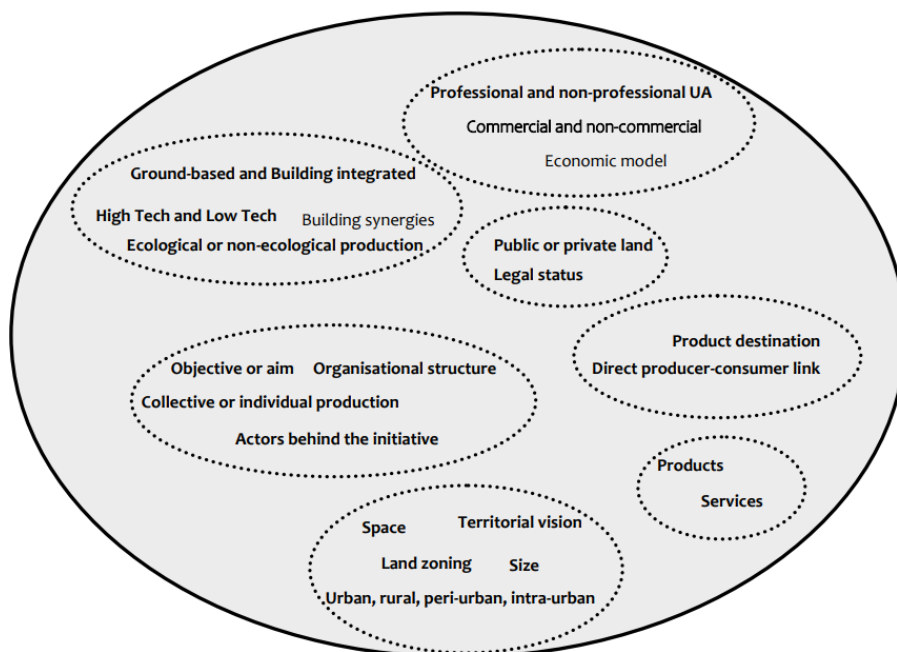


Figure 7. Word cloud visualizing characteristics of UA identified by interviewees

Below we give for each of the dimensions found in the literature (i.e. product destination, organisation and focus, ownership, maintenance, production method, spatial aspects, products, financing, degree of permanence and size and scale: see section 3.1.2) the input from the interviewees.

Product destination

“There are all kinds of [distribution] models imaginable”. Whether the production is private, shared, or market-oriented makes a difference, but combinations exist (respondent 5, 6).

Organisation and focus

Whether it is about environmental benefits and providing green space for leisure, about fostering strong producer-consumer links, about producing food as a professional business, or about making a new urban area attractive for the market, influences the needs of a project (respondent 7). As one interviewee mentions: “according to the aim you produce a different reality” (respondent 7). It is about “the aim, the public which they aim to address, and what they want to do, how they want to be defined” (respondent 7).

Different actors can be involved in the UA project: an initiative can be started by a few individuals for instance, by a voluntary group, an association, a company that can hire people (respondent 6), institutions, a municipality, or housing cooperatives (respondent 1).

Respondents mentioned levels, degree or forms of organization of the initiatives as a relevant distinction. The spectrum includes of a group of residents/neighbours getting together to start a vegetable garden as well as professional entrepreneurs producing food as a business (respondent 4). Furthermore, interviewees made a distinction between bottom-up and top-down initiatives, since these will have a different level of self-organization and institutional acceptance (respondent 5).

Ownership

Sometimes UA is done in places where it is not permitted (respondent 13). “Informal urban agriculture, illegal use of plots is also urban agriculture” (respondent 2). Whether land is public or private was identified as a distinctive characteristic (respondent 6). This makes a difference in terms of organization: “it can make things very complicated or easier” (respondent 4).

Production method

The distinction between high-tech and low-tech agriculture was mentioned as a key distinction (respondent 7). Building synergies is another characteristic identified in the interviews and can encompass a variety of forms, depending on the scale or perspective. For instance, heat reuse is a common function, but reusing abandoned buildings is also a way of building synergy, even if it is not about high-tech indoor agriculture (respondent 7).

Spatial aspects

According to respondents 5 and 13 UA can be located on the ground, on a terrace, on a balcony, on vertical structures, on the façade of a building, on rooftops, or in public space. In one interview land zones were mentioned as a characteristic. UA can be located on ground that is classified as agricultural, industrial, or residential, or on ground destined for sport or educational purposes. Oftentimes UA projects are located temporarily on ground that is not classified as agricultural land (respondent 13).

For initiatives in the city centre the social and environmental perspectives of UA often prevail, and civil society and public administration are more involved. In peri-urban areas, more private entrepreneurs are located, connecting peri-urban and urban space by the delivery of food boxes (respondent 2). One interviewee regarded ground-based and building-integrated UA as a key distinction because it significantly influences the economic and ecological implications (respondent 7). This is a spatial aspect but also influences agricultural practices and production methods.

Products – services

Examples of services mentioned were related to education and food production, but also consultancy and eco-grazing. Projects can be multifunctional and “each type can be mixed at different scales or levels” (respondent 12). For other initiatives, the aspect of food production is minor and small-scale, whereas the social services are highly significant: “The story they tell, the message of reconnecting residents to the food system, has a very big impact. So I think that’s interesting to see, that sometimes in terms of production something is very minimal, but the social context and the impact they can have is very large” (respondent 4). Urban agriculture provides a variety of products. It is not

only limited to vegetables but also includes animal husbandry, honey, as well as non-edible products such as flowers, textile, or compost (respondent 12).

Size and scale

The size of the initiatives influences “whether a lot is going on or not, whether there is a lot of access to the public or not” (respondent 6).

3.3. SYNTHESIS OF LITERATURE AND INTERVIEWS

The literature review showed a broad range of characteristics and dimensions of UA. Scholars support that UA characteristics and forms are highly diverse (Krikser et al., 2016; Dietl, 2020; Hodgson et al., 2011; UNDP, 2001; McClintock, 2014; Schmidt and Eng, 2016; Van Tuijl et al., 2018). In line with this, an aspect highlighted by several interviewees was the wide-ranging combination possibilities of UA characteristics. As one interviewee explains: “All these categories do not mean that they are exclusive of the previous ones but that they can be additive. It can be a legal, public, therapeutic, self-consumption UA. It does not mean that one is incompatible with the other” (respondent 13). This implies that UA forms cannot always be classified in single categories. Hence, there might be overlaps within one category (McClintock, 2014; Thomaier et al., 2015). For instance, an individual gardener’s produce can be destined for own consumption but possibly he sells his surplus at the market too (McClintock, 2014). Another example is a commercial UA enterprise that has a non-profit orientation as well (Thomaier et al., 2015). The precise form of UA will also depend on the local context (Schmidt and Eng, 2016). The variability of UA types also applies to several characteristics, such as location, size and scale, production methods, and end products (Hodgson et al., 2011). One interviewee emphasized that “urban agriculture is always a form of production, agricultural production, combined with activities and services. And that combination, that’s what makes urban agriculture, but the degree to which they are combined or how they are combined, that’s endlessly variable” (respondent 4).

Although the main takeaway of both the literature and the interviews is the diversity of UA characteristics and forms, literature and interviews highlight certain main distinctions. A key distinction of UA found in literature is urban gardening and urban farming. This can be related to whether UA is professional or not, or commercially or non-commercially oriented (Hodgson et al., 2011, interviews). There is a clear difference in the level of professionalization between neighborhood gardens and other types of UA such as CSAs. The main focus of the former is often social cohesion and greening the neighborhood, generally lacking a revenue model (respondent 4), even if growing food is also important. Urban farms on the other hand, have to determine, for instance, which size is necessary to be viable (respondent 7). Whether an initiative is professional is therefore a key distinguishing feature since it implies different choices to be made to achieve economic feasibility.

Another distinction concerns whether people produce individually or collectively. There is also a differentiation between UA that is mainly aimed to produce food, UA that is multifunctional and provides on-site services such as leisure, education and therapy, and UA that provides services in

terms of environmental and material flows (Simon-Rojo et al., 2017; Van Veenhuizen, 2006). Another relevant distinction is that between ground-based production and building-integrated production, since these types require essentially different preconditions (in terms of infrastructure, space requirement, and resources) and production methods. Additionally, ground-based production generally faces competition from other urban planning sectors (Dietl, 2020; Schmidt and Eng, 2016; respondent 7).

3.4. TYPOLOGY OF UA BASED ON LITERATURE AND INTERVIEWS

The literature shows that there is a wide variety of types of UA. Table 5 shows an overview of types found in the literature and types described by experts in the interviews.

Table 5. Summary of types of UA mentioned in literature and interviews

Types mentioned in literature or interviews	Authors and interviewees
Family gardens	Simon-Rojo et al. 2016
Private gardens	Hodgson et al. 2011; Barcelona development plan
Backyard urban farming	Roemers, 2014
Residential gardens	McClintock, 2014
Individual urban gardens	Interviews
Home gardens	Interviews
Neighborhood gardens	Municipality Freiburg, interviews
Private field/forest garden	Municipality Freiburg
Allotment gardens	Simon-Rojo et al. 2016; Orsini et al.; McClintock, 2014; Delgado, 2017; interviews
Association allotment gardens	Municipality Freiburg
Association small gardens	Municipality Freiburg
Pensioneer garden	Municipality Freiburg, Barcelona development
Ground-based non-conditioned	Goldstein et al., 2014
Community gardens	Simon-Rojo et al. 2016; Hodgson et al. 2011; Orsini et al.; Dietl, 2020; Roemers 2014; Schmidt and Eng, 2016; Municipality Freiburg; Ayuntamiento Barcelona; Kampmeier, 2019; Van der Schans and Wiskerke, 2012; Van Tuijl et al., 2018; Van der Schans et al., 2014; interviews;
Public urban community garden	Municipality Freiburg
Collective gardens	McClintock, 2014
Rooftop gardens	Van der Schans et al., 2014; Specht et al., 2014
Community rooftops	Dietl, 2020
Non-commercial rooftop	Roemers, 2014
Socially-oriented rooftop gardens	Mengual and Sola, 2015
Unregulated urban gardens	Barcelona development plan
Intercultural gardens	Kampmeier, 2019
Educational gardens	Simon-Rojo et al. 2016; Kampmeier, 2019; interviews,
School gardens	Ayuntamiento Barcelona, Van der Schans and Wiskerke, 2012; interviews,
Institutional gardens	Hodgson et al., 2011; Roemers 2014; Schmidt and Eng, 2016; McClintock, 2014; Van Tuijl et al., 2018
Demonstration gardens	Hodgson et al., 2011
Therapeutic gardens	Simon-Rojo et al. 2016
Social gardens	Ayuntamiento Barcelona
Foodbank production gardens	Van der Schans and Wiskerke, 2012
Squatter gardens	Simon-Rojo et al. 2016, Delgado, 2017
Guerrilla gardens	Hodgson et al., 2011; Roemers 2014; Schmidt and Eng, 2016; McClintock, 2014; Kampmeier 2019; Van Tuijl et al. 2018; interviews,
Urban livestock (beekeeping, chicken, sheep, worms, insects)	Van der Schans et al., 2014
Hobby beekeeping	Hodgson et al., 2011

Hobby poultry keeping	Hodgson et al., 2011
Market garden	Hodgson et al., 2011; Van der Schans et al., 2014
Urban farm	Hodgson et al., 2011; Delgado, 2017; municipality Freiburg; Van Tuijl et al., 2018
Market-oriented UA	Van Veenhuizen, 2006
Commercial Zfarming	Thomaier et al., 2015
Subsistence oriented UA	Van Veenhuizen, 2006
Open-space outdoor recreational farming	Roemers, 2014
Multifunctional urban farms	Interviews
Multifunctional UA	Van Veenhuizen, 2006
Urban farms only for food production	Interviews
Leisure and educational farms	Simon-Rojo et al. 2016
Educational farms	Interviews
Therapeutic farms	Simon-Rojo et al. 2016
Care farms	Van der Schans and Wiskerke, 2012; interviews
Social farms	Simon-Rojo et al., 2016
Cultural heritage farms	Simon-Rojo et al., 2016
Experimental farms	Simon-Rojo et al., 2016
Local food+ farms	Simon-Rojo et al., 2016
Environmental farms	Simon-Rojo et al., 2016
Social and educational Zfarming	Thomaier et al., 2015
Zfarming for urban living qualities	Thomaier et al., 2015
Image-oriented Zfarming	Thomaier et al., 2015
Zfarming as innovation incubator	Thomaier et al., 2015
Farm starts and incubator hubs	UA consortium
Peri-urban farm	Hodgson et al., 2011; Orsini et al., 2020
Peri-urban fringe farm	UA consortium; interviews
Peri-urban horticulture	Schmidt and Eng, 2016
Self-picking gardens/fields, self-harvesting business	Dietl, 2020; Schmidt and Eng, 2016; interviews
'Rent-a-field'	Dietl, 2020
Box scheme	Interviews
CSA	Dietl, 2020; Schmidt and Eng, 2016; interviews
Community-made agriculture	Dietl, 2020
Beekeeping	Hodgson et al., 2011
Ground-based conditioned	Goldstein et al., 2014
Building-integrated non-conditioned	Goldstein et al., 2014
Living machine	Goldstein et al., 2014
Non-commercial farming indoor controlled environment	Roemers, 2014
Commercial farming in an outdoor controlled environment	Roemers, 2014
Commercial Farming indoor controlled environment	Roemers, 2014
Rooftop Farms	Orsini et al. 2020; Schmidt and Eng, 2016; Mengual and Sola, 2015
Commercial Rooftops	Dietl, 2020; Roemers 2014
Rooftop Hydroponics	De Graaf, 2011
Rooftop Greenhouses	Specht et al., 2014; Mengual and Sola, 2015
Socially-oriented rooftop greenhouses	Mengual and Sola, 2015
Indoor Farms	Dietl, 2020; Schmidt and Eng, 2016; Specht et al., 2014
Vertical Farms (with artificial Lightning)	Orsini et al., Schmidt and Eng 2016; Specht et al., 2014; Van Tuijl et al., 2018; interviews
Vertical greenhouses	Specht et al., 2014
Greenhouse nursery	Van der Schans et al., 2014
Aquaponics	De Graaf, 2011; Van der Schans et al., 2014
Edible green walls	Specht et al., 2014
Agro-parks, agricultural parks	Schmidt and Eng, 2016; Van Tuijl et al., 2018
Agro-Tourism	Van Tuijl et al., 2018
Forest Gardening,	De Graaf, 2011; Van der Schans et al., 2014
Agroforestry	Van der Schans et al., 2014
Edible landscape	Hodgson et al., 2011; Roemers 2014

The possibilities of different combinations of characteristics (and thus: to create different types and typologies) of UA are substantial.

The typology (or representation of UA types) by Van Veenhuizen (2006) identifies three main types of urban farming related to policy dimensions; subsistence-oriented urban agriculture, market-oriented urban agriculture, and multifunctional urban agriculture. Examples mentioned for the first are home gardening, community gardening, institutional gardens, or micro-scale open-field farming. The second refers to commercial urban farms. Since it includes a policy perspective the target group is local authorities.

The Zfarming typology focuses on the UA subtype Zero-acreage farming referring to food production in urban buildings, rooftop farms, rooftop greenhouses, indoor farming, and productive facades (Thomaier et al., 2015). Two main criteria are used; the degree of market orientation (no market orientation, indirect market orientation, and direct market orientation) and their strategic orientation (urban qualities, education, and social commitment, sustainable food production).

The typology of Vanni and Henke (2017) focuses specifically on peri-urban farms in Italy. They concentrate on professional and market-oriented peri-urban agriculture aiming to contribute a more in-depth understanding of the local peri-urban farm reality. Their typology classification consists of three overarching types; traditional, adaptive, and reactive farms, each having two sub-typologies according to a highlighted feature. The authors take a socio-economic perspective to define these UA types.

This typology by Krikser (2016) uses three main criteria the distribution level, interests, and actors. The distribution level has the subcategory of micro, meso, and macro. The main interests identified are self-supply, socio-cultural, and commercial. Main actors considered are individuals, associations, and start-ups, as well as companies. They identified nine ideal, subtypes, and mixed types.

The typological framework of Goldstein has an environmental perspective stemming from the need to address the knowledge gap on the environmental performance of different UA types. The purpose is to highlight the material and resource needs of different types and to group systems that have similar needs. The variations between different UA systems are large. Furthermore, the potentials of types to stimulate circular resource flows with “urban material and energy flows” was included as well. They identified 5 types, the first being ground-based non-conditioned UA which has no energy input for instance, as examples community gardens and allotments are mentioned. Compared to building-integrated conditioned which will have a higher energy need, an example mentioned here is rooftop greenhouses (Goldstein et al., 2014).

Other typologies focus on the suitability for a specific geographical context. De Graaf (2011) identified four types of UA that could be suitable for the Dutch city context. These four types are forest gardening, small-plot soil cultivation, rooftop hydroponics, and indoor aquaponics. He organized them according to two criteria along two axes; control and self-organization as well as,

soil-bound and building-integrated. The keywords, labor-intensive, capital-intensive, and knowledge-intensive indicate the needs of the types.

The urban agriculture consortium (UAC) focused on creating livelihoods and growing food at scale and less on allotment and community gardens. A key aim to achieve with their typology is to clearly highlight the benefits of UA types and link them to nutrition, well-being, and climate policy targets for local authorities. They thought of the types they identified in the UK and grouped them in an intuitive way. They have a separate type for food forests and orchards and peri-urban fringe farming. Another type they identified is “Farm starts and incubator hubs” which are urban farms that specifically support newcomers in urban agriculture by providing knowledge, training, and other resources. The patchwork farm type refers to initiatives in which several producers cooperate, “across several small and medium sites in one locality”. Activities and resources such as branding, marketing, and infrastructure are frequently jointly pursued.

Mengual & Sola (2015) focus on urban rooftop farming typologies. The author took Zero-acreage farming and building-integrated agriculture as an overarching concept and starting point to define rooftop farming. For an urban rooftop farming typology and with the purpose of simplification, it was focused on two factors type of farming (protected and open-air) and objective (commercial and social activities). Based on this four types are formed. The author used this typology as a base for the subsequent sustainability assessment on rooftop urban farming implementation.

Dietl (2020) used a typology classification to first systematically compare key characteristics, advantages, and disadvantages of UA forms. The aim was to create an overview of the different existing production forms and systems in UA. Seven UA archetypes were identified with similar characteristics. The typology served as the basis for the multi-criteria sustainability assessment, of these seven archetypes. The author stresses that the typology serves as an overview of the most common UA, and is not a fixed structure, as there are overlaps and deviations. The characterization was based on 17 criteria in the categories of “organisation and focus, production system, spatial aspects, and products”. The 7 ideal types identified are Community gardens, Community made agriculture, Self-harvesting fields, Community-supported agriculture (CSA), rooftop gardens, rooftop farms, and indoor/vertical farming.

The COST Action UAE typology differentiates between types based on main distinctions such as urban farming and urban gardening, individual and collective production. This typology specifically highlights the multifunctional character of urban gardens and farms by providing benefits and services. For urban farms, these services can be provided through on-site experiences or material and environmental flows. The types identified are quite self-explanatory. Types that might stand out compared to other typologies are cultural heritage farms, meaning that the farm contributes to the maintenance of “traditional materials and architectural styles, buildings, crop and breed varieties, and techniques of cultivation” (p. 27). Experimental farms are mentioned as farms that stimulate innovation in different aspects of UA, such as technology, marketing, and distribution (p. 27). With Local Food+Farms the authors refer to farms that actively encourage short supply chains and strong consumer-producer links in the local market. Examples to achieve this are direct retail, consumer-

producer cooperatives, and CSA. Lastly, environmental farms can provide wide-ranging services such as biodiversity, agro-diversity conservation, and reusing urban resources, as well as providing green space (Simon-Rojo et al., 2016).

The above described typologies vary greatly in their focus, scope, and representation. Typologies are therefore always a simplification of reality and do not include every possible site-specific manifestation of UA. Also there is always some kind of overlap between types /clusters. As existing typologies are often based on subjective observation rather than on empirical data and are also one-dimensional we made an attempt to cluster the types of UA mentioned in table 5 in logical overarching groups. Table 6 shows the suggested overarching types related to those mentioned in interviews and literature, leaving out specific types that are repetitive. The goal was not to include all specific types, but rather to reflect on which distinguishing characteristic or feature is highlighted for the specific types. It stands out that UA types are most often identified according to their purpose or specific services that they provide or their production method and level of building integration. For instance, commercial Zfarming and multifunctional UA are types indicating the purpose, while leisure and educational farms, intercultural gardens, and Zfarming for urban living qualities are all identified as types according to their service provision. Rooftop hydroponics and vertical farms are highlighted as types because of their production method and being building-integrated. Furthermore, some types highlight two aspects, such as social and educational Zfarming: this type refers to the purpose as well as the fact that it is located in or at a building. Similarly, “non-commercial farming indoor controlled environment” refers to the production method and building integration, as well as whether it is commercial or not.

Table 6. Typologies according to their highlighted characteristic (literature and interviews)

Overarching	Specific	Distinguishing/highlighted characteristic
Individual urban gardens	Allotment gardens, family gardens, backyard urban gardens	Individual maintenance
Community Gardens/Collective Gardens	Educational gardens, therapeutic gardens, demonstration gardens, intercultural gardens, socially-oriented rooftop gardens	Services/function/purpose
	Public urban community garden, self-picking gardens	Harvest is public, way of distribution
	Guerrilla gardens, unregulated urban gardens	Legal status
	Community rooftop	Type of space
	Pensioner gardens, institutional gardens, intercultural gardens	Target group
Urban Farms	Multifunctional UA, leisure and education farms, therapeutic farms, social farms, environmental farms, social and educational Zfarming, Zfarming for urban living qualities	Services/function/purpose
	Peri-urban farms, peri-urban horticulture	Location

	Self-harvesting business, CSA, box scheme	Producer-consumer link, ways of distribution
	Bee-keeping, fruit farming, urban livestock	Product specialization
	Market-oriented UA, commercial Zfarming	professional UA
	Building-integrated non-conditioned, commercial farming indoor controlled environment, rooftop hydroponics, vertical farms, aquaponics	Production method/building-integrated
	Zfarming as innovation incubators, Farm starts as incubator hubs	Role of demonstration projects or support for newcomers
Landscape-integrated UA	Forest gardening, edible landscape, agroforestry, agricultural parks	Public access to food

3.5. RESULTS OF THE QUESTIONNAIRE

112 respondents representing 18 countries across Europe, from Portugal to Bulgaria and from Sweden to Italy, replied (and gave consent) to the online survey (Figure 8). Most represented cities in the survey were Sofia, Rome, Copenhagen and Antwerp. However, not only state capitals were represented in the survey, also representatives from initiatives in regional centres and smaller cities like Montpellier, Bremen, Almere, and Andernach filled out the questionnaire. Responses came from cities as well as from the city region.

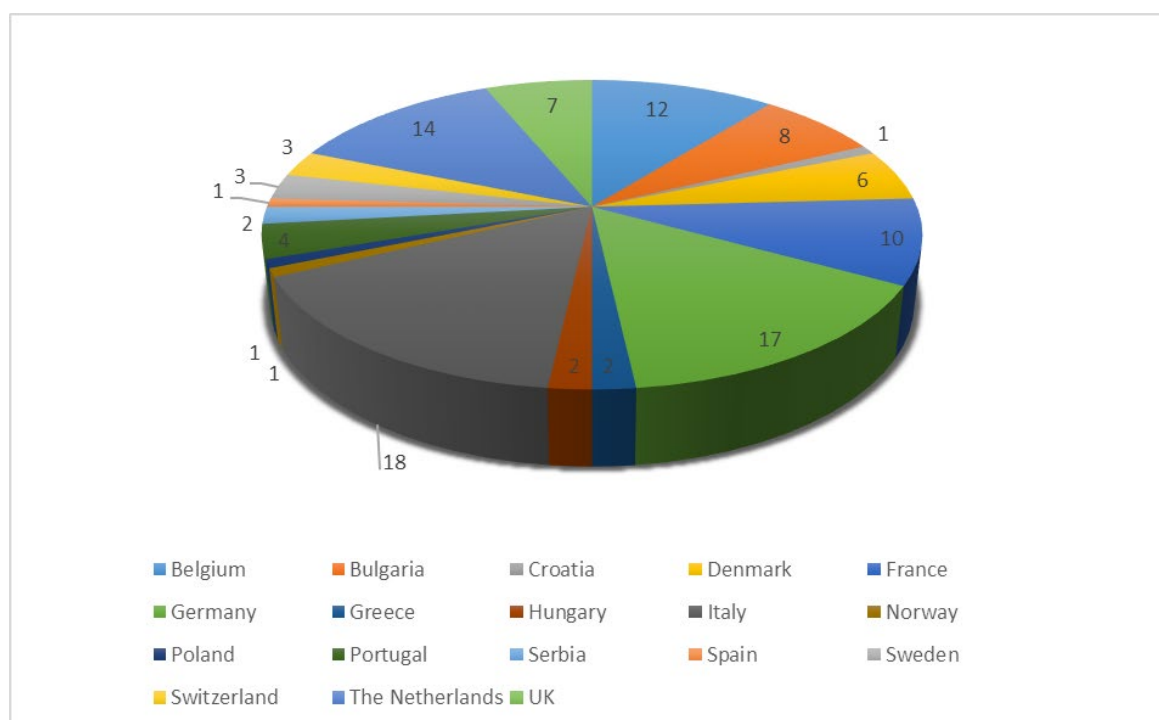


Figure 8. Respondents of the survey represent 18 countries in Europe (n=112)

3.5.1. CLUSTER ANALYSIS BASED ON PRELIMINARY LABELLING

Respondents of the questionnaire were asked to give their initiative a preliminary label such as community garden or allotment garden. This resulted in a number of labels, see table 7. We performed a cluster analysis of this original labelling. Assuming that a typology of urban agriculture exists of distinctly different types of UA – hence: initiatives with different characteristics – this cluster analysis showed that this preliminary labelling is not a good starting point for a typology. We explain this on the basis of figures 9a to 9c.

The bottom left corner of figure 9a shows that a number of labels is largely overlapping and difficult to distinguish. This means that respondents from initiatives with different labels answered the questionnaire in similar ways: recall that the questionnaire asked for characteristics of initiatives. In other words, initiatives with different labels have similar characteristics (or to be more precise: initiatives with the same label do not show more likeness in how they filled out the questionnaire than initiatives with other labels). Only cultural heritage and estate-farm as well as food cooperative and urban garden (urban garden) form separate clusters (both with different characteristics) but the number of initiatives in these clusters is very small.

Table 7. Preliminary labels given by questionnaire respondents

Preliminary label	Number of initiatives
Community garden	40
Urban farm	12
Allotment garden	11
Mentoring / training	9
Educational garden	8
CSA	8
Rooftop / vertical	7
A group of gardens	5
Cultural heritage	2
Food cooperative	2
Park	2
Estate-farm	1
Other	5

Figures 9b and 9c underline this observation. Both figures display that even with adding a large number of variables the error rate of the clusters based on the original labelling is high even with a rising number of variables, and even with a high number of variables the correct allocation of the clusters is relatively low (< 60%). Only food cooperatives are clearly distinguishable, but again this is a very small group. Hence, a preliminary label cannot predict the characteristics of an initiative.

In conclusion, the cluster analysis that starts from the original preliminary labelling is not able to create clusters that fit those labels. That implies that the labels that we often use to distinguish urban agriculture types are not very distinctive.

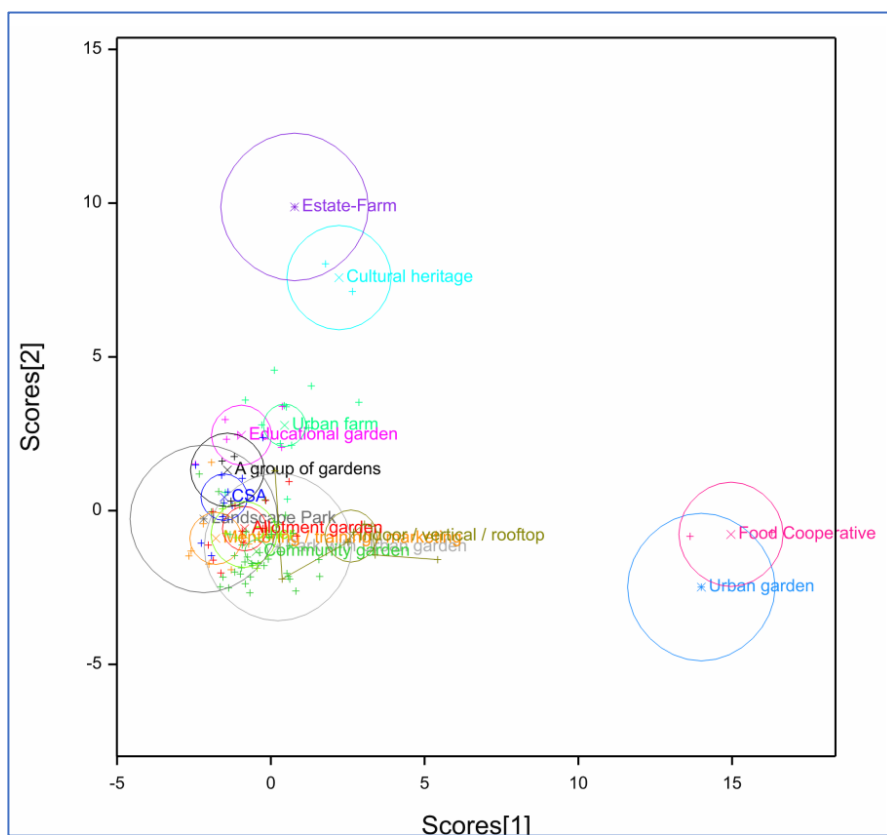


Figure 9a. Clusters based on preliminary labelling

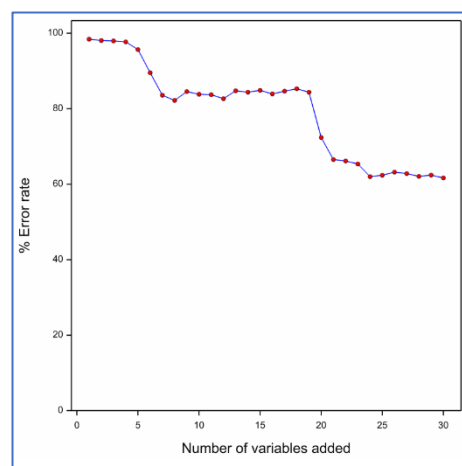


Figure 9b. Error rate versus number of initiatives added (based on preliminary labelling)

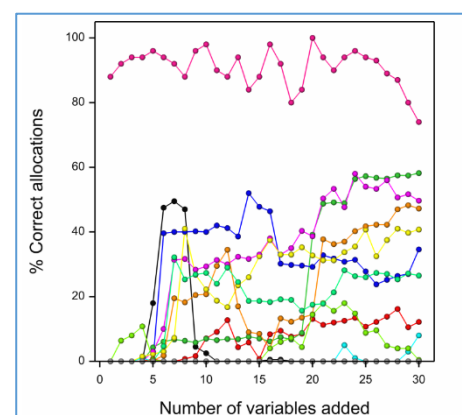


Figure 9c. Percentage of correct allocations versus number of variables added (based on preliminary labelling)

3.5.2. CLUSTER ANALYSIS BASED ON OTHER VARIABLES

A second step was to perform a non-hierarchical cluster analysis *not* based on the preliminary labelling. Genstat can be programmed to distinguish a number of clusters, starting from the variables in the survey which are most distinctive. We performed cluster analyses creating sets of 2, 3, 4, 5, or 6 clusters, using a maximum of 30 variables. These analyses showed that the 112 entries in the questionnaire are best divided over 6 clusters (types). This decision was based on the following information:

- The graphical distinctiveness of the individual clusters as exemplified in the distinction between figure 9a vs 10a²;

² Figures like 10a to 10c are also available for a situation with 2, 3, 4, or 5 clusters.

- The error rate versus the number of variables added (the percentage of initiatives placed in the wrong cluster, based on a certain number of variables) as exemplified in the distinction between Figure 9b vs figure 10b;
- The correct allocation of initiatives per cluster versus the number of variables added (similar to the error rate but shown per cluster), as exemplified in the distinction between figure 9c vs figure 10c;
- The list of most distinctive variables per set of clusters: a variable is supportive to create a clear typology when it clearly distinguishes between different clusters of a set. For example, the variable ‘whether produce is sold or not’ is not very helpful in creating a distinguishing typology if the produce of each of the clusters (in a set) is partly sold. If the produce in some of the clusters (in a set) is mostly sold and the produce in other clusters (in a set) is hardly sold, this variable is useful because it is distinctive.

As stated, the analysis producing 6 different clusters proved most useful: the 6 clusters are distinguishable (figure 10a), the error rate is lower than 20% (figure 10b) and goes down for all clusters when variables are added (figure 10c), and the specific variables on which the distinctions are made clearly discriminate between the clusters. In addition, 5 clusters deliver nearly the same results, while only condensing two clusters (of the 6 clusters) into one. We describe the six clusters below, but bear in mind that the distinction between the clusters is not absolute: in some cases values of variables partly overlap between clusters. Figure 10a underlines that some clusters (to be specific: 3, 5 and 6) are less distinctive and have a lower rate of correct allocations per number of variables than others. Differences between clusters have to be considered as relative rather than absolute.

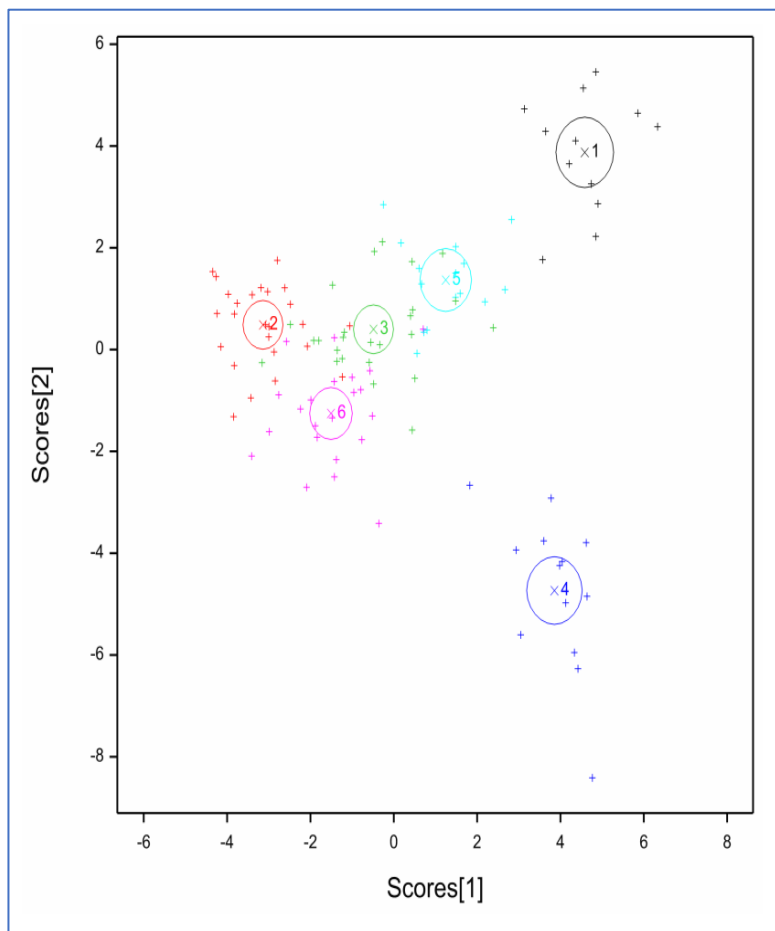


Figure 10a. Final clustering into 6 clusters

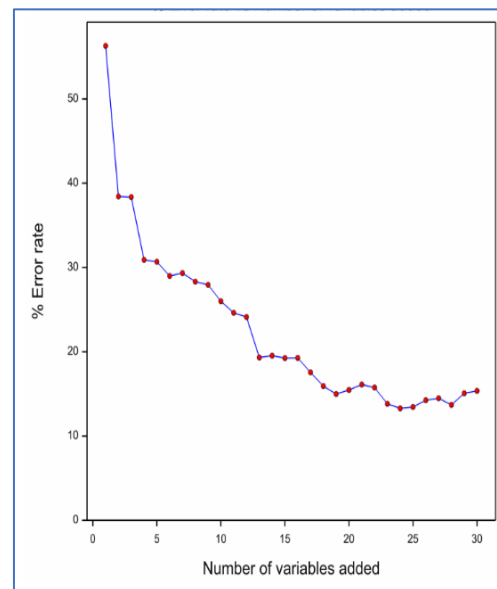
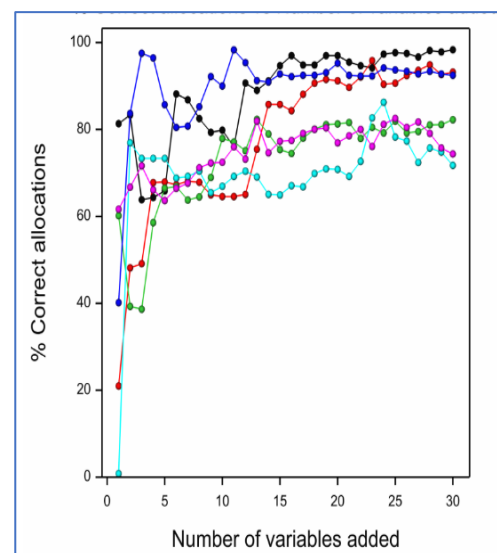


Figure 10b. Error rate versus number of variables added (6 clusters)

Figure 10c. Percentage of correct allocations versus number of variables added (6 clusters)



3.5.3. THE SIX IDENTIFIED CLUSTERS

In this section we describe the six clusters. In our description of the clusters we use the following indicators:

- Cluster number: the original number in the cluster analysis (as used in figure 10a)
- Name: based on the total set of variables a name is given to exemplify the cluster

- Number of urban agriculture initiatives (responses) in the survey linked to this cluster
- Dimensions: we recognise four groups of dimensions (which resonate with the perspectives used in Prior et al., 2018), each of which represents a number of variables from the survey. Because of the overlap of variables between the clusters, we present the variables not as an absolute value but rather as a position between two extremes:
 - *Spatial dimension*, variables:
 - Acreage: size of the initiative
 - In- or outdoor: where the agriculture mainly takes place
 - Location: city or city region (peri-urban area)
 - *Production dimension*, variables:
 - Vegetables: importance (share) of vegetables in total produce
 - Product groups: whether the initiative grows a diverse range of products, like vegetables, arable crops, flowers, and meat products. Each product group represents a variable in the survey
 - *Operational dimension*:
 - Selling: whether produce is being sold
 - Own consumption: whether produce is used for own consumption
 - Selling to consumer: whether production is directly sold to consumers (rather than to other parties)
 - *Community dimension*:
 - Responsibility: does the maintenance of the initiative lie with a group of people (for example an association, a foundation or NGO), or with (an) individual(s) (for instance a farmer, a farmer family or an entrepreneur)
 - Leisure: whether the initiative provides the service of leisure
- Example: we illustrate each cluster with an urban agriculture initiative from the survey that fits the cluster

CLUSTER 1: URBAN FARM

Number of initiatives linked to this cluster: 12

Dimensions (Figure 11):

- *Spatial*: urban and peri-urban, relatively high acreage (several hectares or more) and mostly outdoor production
- *Production*: a diverse groups of produce, i.e. not only vegetables
- *Operational*: most of the produce is directly sold to consumers or other customers (retail, restaurants or catering)
- *Community*: a farmer, a farmer family or an entrepreneur is responsible for the maintenance of the initiative; often leisure activities are part of the initiative

Example: *Plukboerderij Grondig* is a CSA (Community-supported Agriculture) farm of approximately 45 ha in the city region of Ghent (Belgium). The participants of the farm are involved in the farming business. They are given access to the accounts and are offered room to organise activities. The farm uses the principle of self-harvesting by participants, it offers vegetables, potatoes, fruits, eggs and meat. The farm also grows indoor (greenhouse).

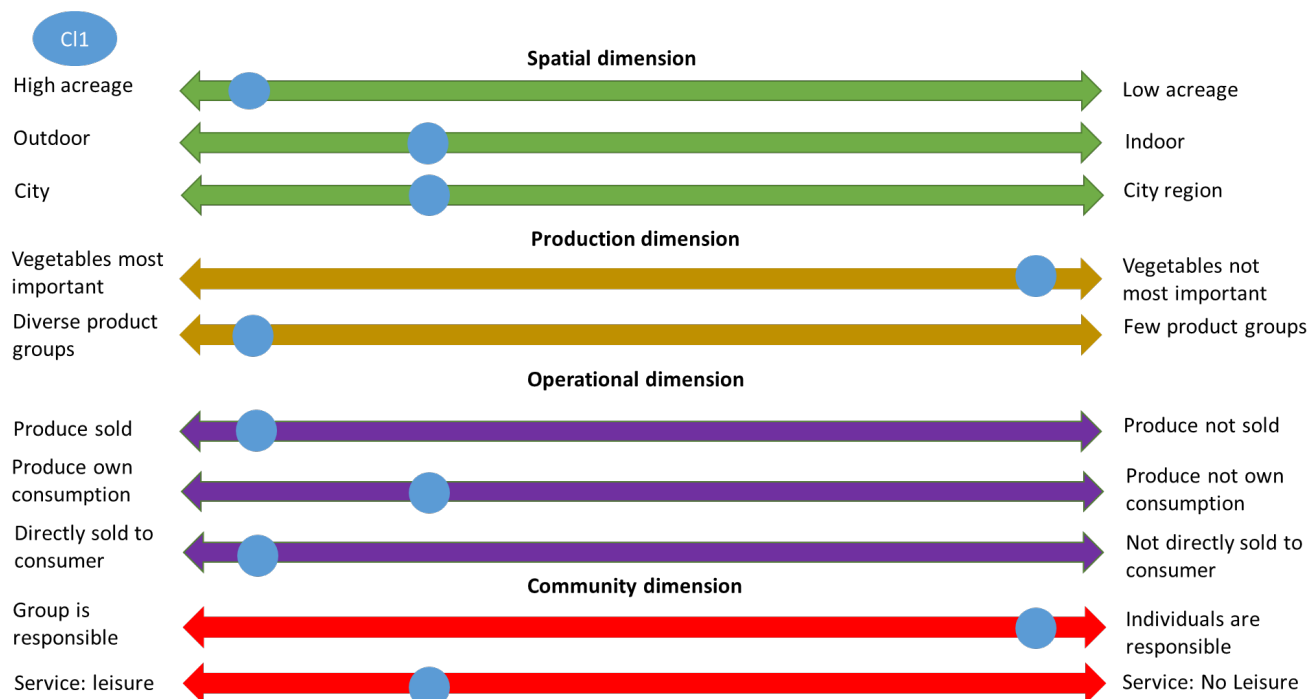


Figure 11. The dimensions of cluster type 1 'Urban Farm'

CLUSTER 2: COMMUNITY PARK

Number of initiatives linked to this cluster: 25

Dimensions (Figure 12):

- *Spatial*: mostly urban, medium to low acreage (mostly less than one hectare) and mostly outdoor production
- *Production*: a diverse group of produce, i.e. not only vegetables
- *Operational*: most of the produce grown is for own consumption, diverse additional activities at site
- *Community*: a group of people (this is an association, a foundation or an informal group) is responsible for the initiative; often leisure activities are part of the initiative

Example: *Parco Ort9* is a public park of approximately one hectare in the city (district 9) of Rome (Italy). The park offers room to (allotment) gardens, and cultural events and educational activities (for schools) are being organised in the park as well. The gardens in the park produce a variety of products, like vegetables, herbs, honey and flowers. It is maintained by a citizen association.

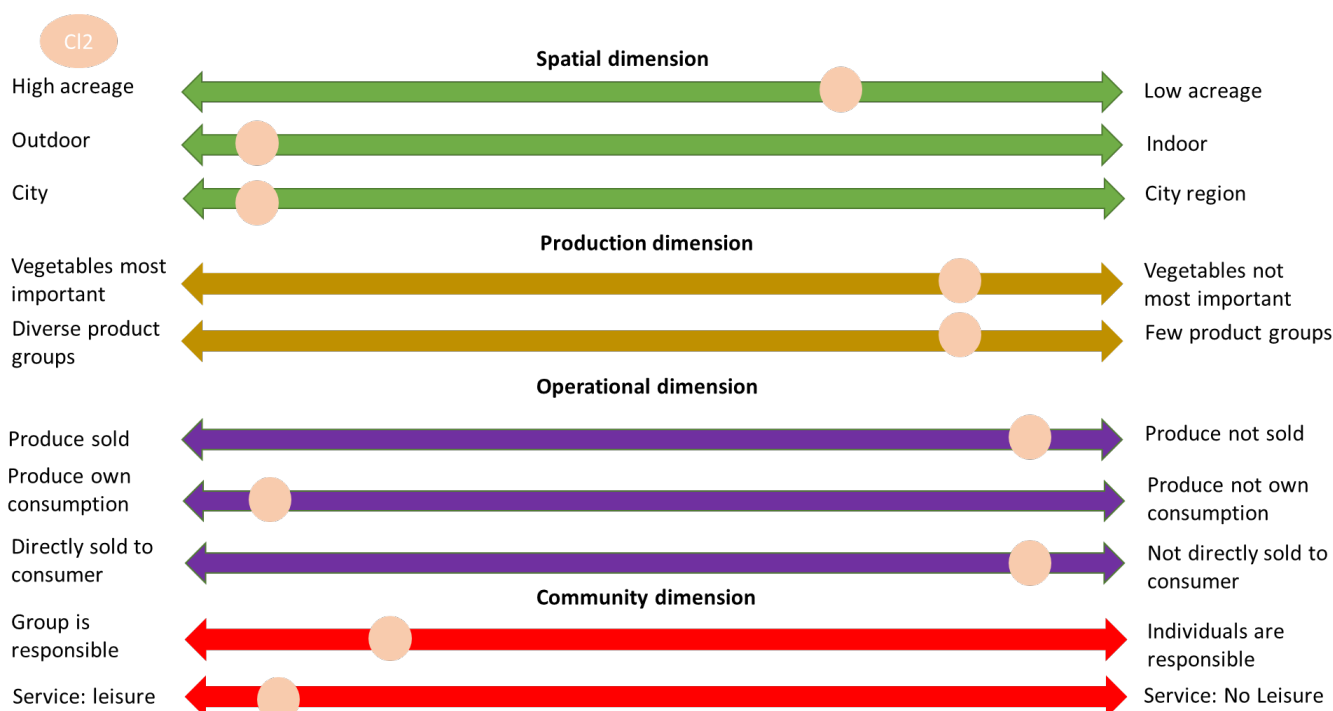


Figure 12. The dimensions of cluster type 2 'Community Park'

CLUSTER 3: DO-IT-YOURSELF GARDEN/FARM³

Number of initiatives linked to this cluster: 25

Dimensions (Figure 13):

- *Spatial:* mostly peri-urban, medium acreage (mostly less than two hectares) and mostly outdoor production
- *Production:* vegetables are the main product, but some other products are produced as well
- *Operational:* most of the produce is grown for own consumption
- *Community:* a group of people (like an association, a foundation or an informal group) is responsible for the maintenance of the initiative, however occasionally maintenance is performed by entrepreneurs/farmer; leisure activities are mostly not part of the initiative

Example: *ONZE volkstuinen onder glas* is an allotment garden complex in a greenhouse of approximately one and a half hectares in the outskirts of the city of Almere (The Netherlands). The individual gardeners produce a high diversity of (exotic) vegetables as well as (in some cases) flowers, fruits and herbs at their plots. The allotment garden complex in the greenhouse is initiated and maintained by a farmer family.

³ This cluster exemplifies the grey zone between clusters as it includes initiatives that resemble allotment and community gardens as well as some that have similarities with CSA farms.

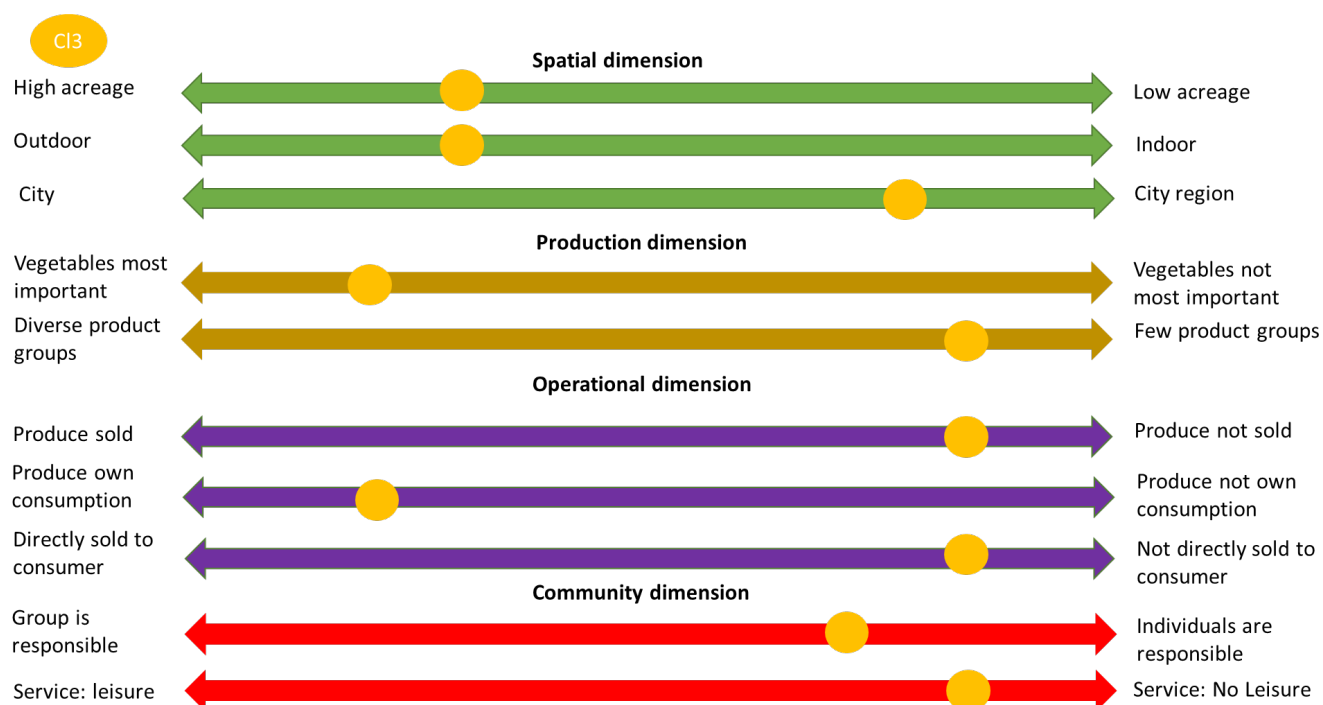


Figure 13. The dimensions of cluster type 3 'Do-It-Yourself garden/farm'

CLUSTER 4: ZERO ACREAGE FARM

Number of initiatives linked to this cluster: 13

Dimensions (Figure 14):

- **Spatial:** mostly urban, low acreage (mostly less than 1,000 square meters) and indoor production is dominant, however outdoor growing at a rooftop and/or out of soil (containers) is probable in this cluster as well
- **Production:** a diverse group of produce (such as herbs, microgreens and mushrooms), i.e. not only vegetables
- **Operational:** most of the produce is being sold, to consumers or other customers (retail, restaurants or catering)
- **Community:** a farmer, a farmer family, an entrepreneur or a non-profit enterprise is responsible for the maintenance of the initiative; in some cases leisure activities are part of the initiative

Example: *PLNT beyond bio* grows microgreens (salad leaves and herbs) in former ship containers in the port of Antwerp (Belgium). The produce of this (vertical) farm of 120 square meters is shipped to restaurants and other customer in the city. The farm is maintained by entrepreneurs.

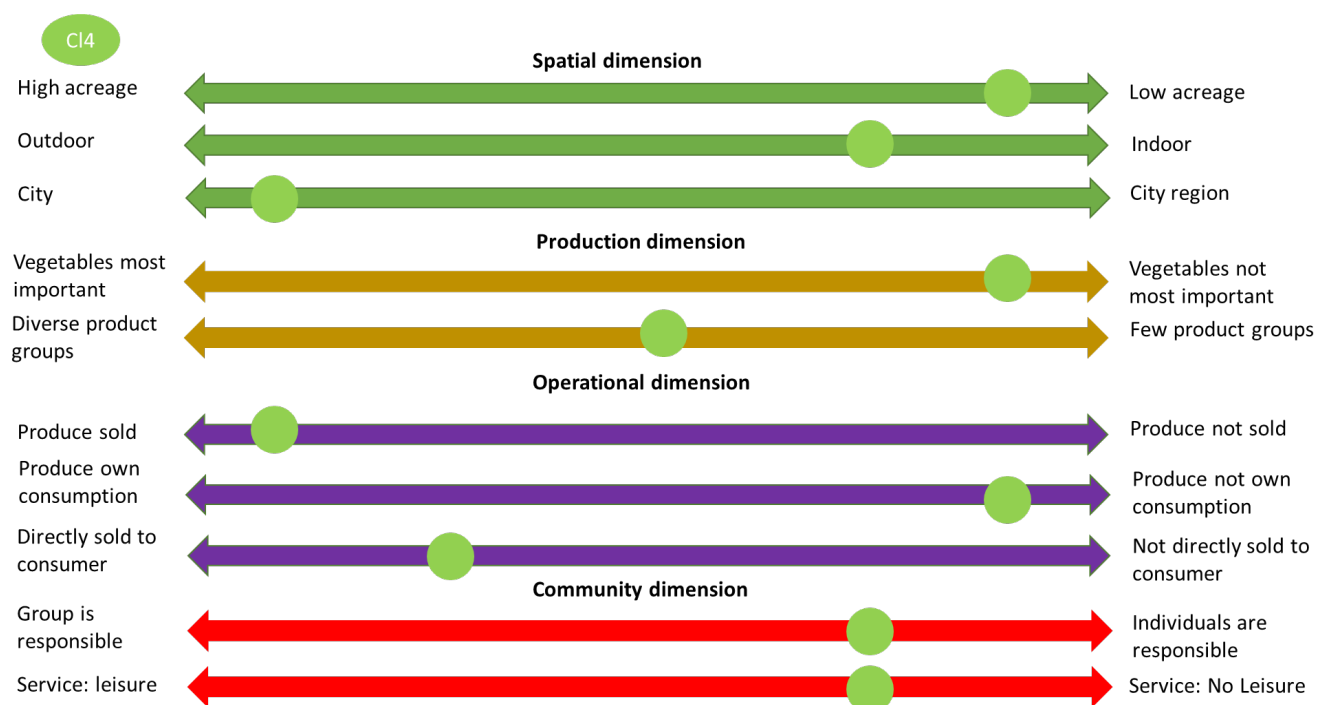


Figure 14. The dimensions of cluster type 4 'Zero acreage farm'

CLUSTER 5: SOCIAL FARM

Number of initiatives linked to this cluster: 15

Dimensions (Figure 15):

- **Spatial:** mostly urban, medium to small acreage (mostly less than one hectare) and mostly outdoor production
- **Production:** a diverse group of produce is grown, i.e. not only vegetables
- **Operational:** most of the produce is sold or gifted, mainly directly to consumers. However, some initiatives produce for own consumption
- **Community:** a farmer, a farmer family, an entrepreneur, an NGO or a non-profit enterprise is responsible for maintenance of the initiative; leisure activities are occasionally part of the initiative

Example: The 2,500 square meters *hope gardening* initiative in Northampton (UK) offers horticultural therapy for people in need. It produces vegetables, flowers and herbs for sale. Hope gardening is part of an NGO. This NGO offers training and work opportunities to a range of small businesses, and to people affected by homelessness, drugs, alcohol or poverty, people with mental health issues and people with other disadvantages.

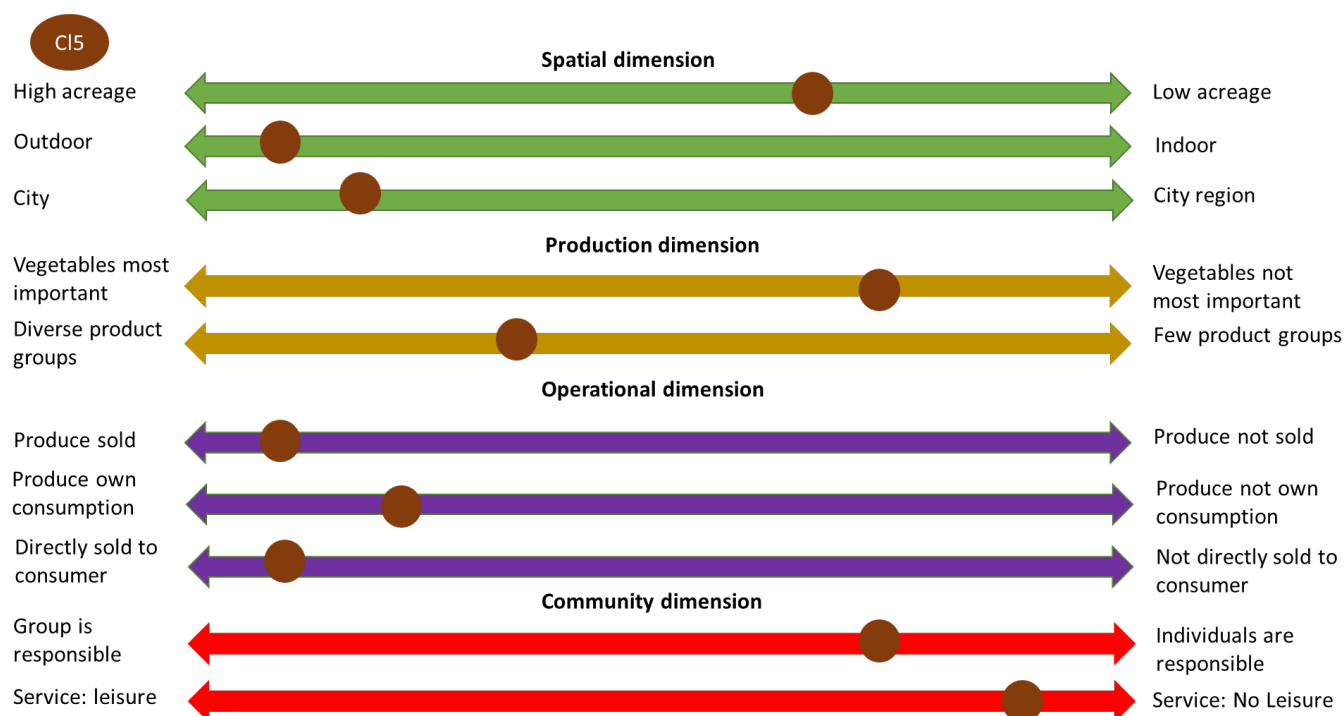


Figure 15. The dimensions of cluster type 5 'Social Farm'

CLUSTER 6: COMMUNITY GARDEN

Number of initiatives linked to this cluster: 22

Dimension (Figure 16):

- *Spatial*: mostly urban, small acreage (several 100 square meters at most) and mostly outdoor production
- *Production*: a diverse group of produce, i.e. not only vegetables
- *Operational*: initiatives produce for own consumption, diverse additional activities at site
- *Community*: individuals are responsible for the maintenance of the initiative; leisure activities are occasionally part of the initiative

Example: *Guldängen* is an approximately 2,500 square meters playground with an urban garden in the Swedish city of Malmö. Children are the target group of this garden. Classes, after-school groups, kindergarten groups and individuals come to the garden for programs with various educational outdoor themes like cultivation, ecology, nutrition and sustainability. During the growing season, children and their adults are also offered the opportunity to grow, build, barbecue and socialise together in the garden. The garden is part of a non-profit association that is dedicated to activate children in green learning environments and meeting places.

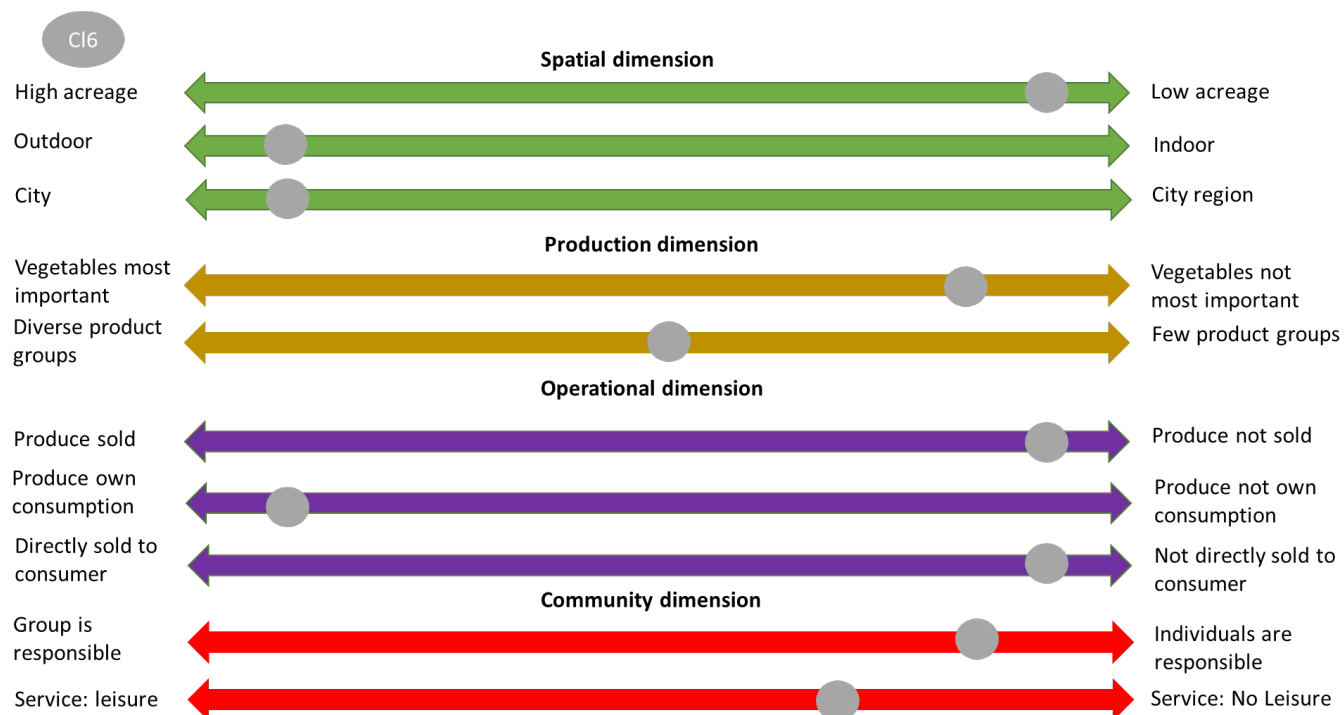


Figure 16. The dimensions of cluster type 6 'Community garden'

4. DISCUSSION AND CONCLUSIONS

The aim of task 3.1 of Working Package 3 was to update the typology of Urban Agriculture as created in the preceding Cost Action. In order to do so we used three main research methods: a systematic literature review, interviews with experts and a survey. Both the literature review and interviews as well as the clustering of the data of the survey gave input for an updated, or renewed multidimensional UA typology.

In table 8 we compare the Cost Action typology, our findings from the literature review and the interviews (as presented in table 6), and the findings from the cluster analysis based on the survey. It shows that the distinction made by the Cost Action into two main categories, i.e. urban farming and urban gardening⁴ is, although useful, not all-encompassing. The comparison in table 8 shows that the Cost Action typology overlooked the urban agriculture type ‘community park’ (or landscape-integrated UA), as this is neither gardening nor farming. The Cost Action typology partly positioned this type as a subcategory of urban farms, i.e. environmental farms. In addition, the DIY garden/farm stemming from the survey is a cluster that integrates gardening and farming – showing that the distinction between the two is not always so clear-cut as presented in the Cost Action typology. More-over, the zero acreage farm type was not mentioned in the Cost Action typology, perhaps because this type was not yet clearly present or visible. The table also shows that the clusters/types found in the literature and the interviews on the one hand and those found through the survey, are rather similar. Taken together these types extend the distinction between gardening and farming, giving more insight in the variety within both categories and adding a third one, while simultaneously showing that it is not always possible to make a clear-cut distinction in the typology.

Table 8. Comparing typologies of the Cost Action, the literature review and interviews, and the survey

Cost Action (2016)	Literature review and interviews (this report)	Survey (this report)
Urban farming	Urban farms	Urban farm
		Zero acreage farm
		Social farm
		DIY garden/farm
Urban gardening	Individual urban gardens	Community garden
	Community Gardens/ Collective Gardens	
	Landscape-integrated UA	Community park

The six types as shown in blue in table 8 – those defined by the survey and backed up by the other two research methods - make the initial distinction between gardening and farming more specific and do justice to the large variety of urban agriculture performances in Europe. We therefore

⁴ The Cost Action typology does involve a number of other types, but these are more illustrations of or subcategories of the main distinction of gardening and farming (recall Figure 1).

propose a typology as presented in blue in table 8 the six types as detailed in section 3.5.3). Succinctly presented⁵:

1. Urban farm: high acreage, outdoor production, urban or peri-urban, privately owned, production oriented, diverse produce (animal and plant based), additional services, production sold e.g. CSA farm
2. Community park: low acreage, outdoor, urban or peri-urban, production for own consumption, diverse additional activities at site e.g. forest garden
3. DIY garden/farm: medium acreage, outdoor production, urban or peri-urban, mostly vegetable production, a group of people or individuals responsible, for own consumption e.g. allotment garden or self-harvesting farm
4. Zero Acreage farm: low acreage, build-in urban area, privately owned, out of soil production, production oriented, diverse (plant based) produce, production sold e.g. vertical farm
5. Social farm: medium acreage, outdoor production, privately owned or part of an NGO, produce is sold, gifted or for own consumption, additional services e.g. health care farm
6. Community garden: low acreage, outdoor, urban, production for own consumption, diverse additional activities at site e.g. educational garden

We stress that this suggested typology is not absolute. Our typology clearly shows some overlap between the urban agriculture types 3, 5 and 6 (DIY garden/farm, Social farm and Community garden). As argued throughout the report, while the diversity between urban agriculture initiatives is large, this diversity cannot be easily 'caught' in mutually exclusive types. Although the literature review, interviews and survey data suggest clusters, creating these clusters required a relatively large number of characteristics, and initiatives within one cluster still differ on some of these characteristics. There are thus grey zones between types. For example, a community park sometimes offers allotment gardens and the example of the DIY cluster ONZE is an allotment garden for private consumption as well as a commercial business of a farmers family. Moreover, our survey data confirm a common theme which is underlined in the interviews and the literature review: the diversity within urban agriculture is so large that depending on one's perspective, different typologies can be created. In other words, depending on how one considers urban agriculture, different typologies emerge. The importance of perspective is also confirmed by the literature study: it is a matter of perspective how urban agriculture typologies are regarded.

To overcome these grey zones and deal with the matter different perspectives we suggest to use the four distinguishing dimensions that we used in section 3.5.3 rather than (or besides) the specific typologies as such. These four main dimensions – the spatial, production, operational and community dimensions - representing ten variables, possibly are more instrumental in understanding the diversity of UA than the typologies as such.

⁵ Please note that these numbers refer to the numbers used in section 3.5.3 and Figure 10a. In table 8 we used another order because there we matched the types to the gardening / farming distinction as used in the Cost Action.

For Krikser et al. (2017: pp.15), this diversity of UA is a reason to doubt the use of a typology: “Contrary to our assumption that the typology would be applicable in the context of policy intervention that seeks high effectiveness through clear profiles of UA types related to policy objectives, we learned that there is a large consensus in appreciating diversity and allowing for broad acknowledgement. We mainly see the typology as a contribution to theory on UA.” We do agree that for the participants themselves a typology is not specifically useful: while they may appreciate the ability to label their initiative as a certain type, they know that reality is not as black-and-white and as linear as a typology may suggest. However, seeing the typology as only a contribution to theory may be a bit too pessimistic. We believe that the typology as created in this project is useful for policy makers as it creates some understanding of the myriad of practices in urban agriculture, bringing this diversity back into six archetypes. Moreover, by showing that ten variables divided over four dimensions are most important in distinguishing urban agriculture types, the typology created highlights what characteristics are most relevant when trying to understand this diversity. Possibly, these variables and dimensions can assist policy makers in supporting specific types of urban agriculture in their areas.

The strength of our work is that we combined three research methods so that triangulation is possible. Moreover, we consulted experts from different European countries and in different positions, and the survey was filled out by respondents representing 112 initiatives spread over northern, southern, eastern and western Europe. That said, those 112 initiatives can only give a snapshot of what is happening in Europe, and the experts consulted were found through our own networks, which might have created bias. Our results are therefore not fully representative. Moreover, in our work we have omitted one appearance of urban agriculture: people gardening in their home gardens (or even within their homes). We have focused on the public initiatives – because they take place on public land, because they involve groups of people or because they intend to sell to others – however UA is also a private endeavour, like in backyard or balcony gardening (Veen et al., 2021). Indeed, gardening in private backyards can be substantial and can be a significant element of urban food systems (Darly et al., 2021, also see Kortright and Wakefield, 2011). However, backyard gardening could be positioned under the type of DIY gardening.

In sum, in this report we have proposed an updated typology of urban agriculture, presenting six archetypes. Our findings show that updating the previously created typology was useful: the field is constantly changing and developing. Zero acreage farming may not have been recognisable as a type when the previous typology was made, and we have been able to find recognisable types within (and beyond) the earlier distinction of farming and gardening. Moreover, our survey showed that the labels often used do not distinguish clearly between the different ways in which urban agriculture is performed. This also suggests that critically examining typologies and/or updating them after a certain number of years will be beneficial, especially in a dynamic field as urban agriculture.

REFERENCES

- Ayuntamiento de Barcelona (2019). Estrategia d'agricultura urbana al ciutat de Barcelona 2019-2030 (Policy document).
- Blay-Palmer A., Santini, G., Dubbeling, M., Renting, H., Taguchi M., & Giordano Th. (2018). Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems. *Sustainability* 2018, 10, 1680; doi:10.3390/su10051680.
- Darly, S., Feuillet, T., & Laforêt, C (2021). Home Gardening and the Social Divide of Suburban Space: Methodological Proposal for the Spatial Analysis of a Social Practice in the Greater Paris Urban Area. *Sustainability* 2021, 13, 3243. <https://doi.org/10.3390/su13063243>.
- Delgado, C. (2017). Mapping urban agriculture in Portugal. *Moravian Geographical Reports*, 25(3), 139-153.
- De Graaf, P. A., 2012. "Chapter 42 Room for urban agriculture in Rotterdam: defining the spatial opportunities for urban agriculture within the industrialised city." (533-546) In: *Sustainable food planning: evolving theory and practice*. Viljoen A. and S.C. Wiskerke (eds). Wageningen Academic Publishers, 2012.
- Dietl, A. (2020). Wie Städte von urbaner Landwirtschaft profitieren können: eine Typologie, Nachhaltigkeitsanalyse und Ökobilanzierung gängiger urbaner Anbauformen, mit Fallbeispielen aus Wien.
- Fox-Kämper, R., Wesener, A., Münderlein, D., Sondermann, M., McWilliam, W. & Kirk, N. (2018). Urban community gardens: An evaluation of governance approaches and related enablers and barriers at different development stages. *Landscape and Urban Planning* 170, 59–68. doi:10.1016/j.landurbplan.2017.06.023
- Groot, E. D., & Veen, E. (2017). Food forests: an upcoming phenomenon in the Netherlands. *Urban Agriculture Magazine*, (33), 34-36.
- Goldstein, B., Birkved, M., Hauschild, M., & Fernandez, J. (2014). Urban agricultural typologies and the need to quantify their potential to reduce a city's environmental "foodprint. *World SB14*, Barcelona, 24-31.
- Hespanhol, R. M. (2019). Agricultura urbana em Portugal: práticas espontaneas e institucionalizadas. *Confins. Revue franco-brésilienne de géographie/Revista franco-brasilera de eografia*, (43).
- Hodgson, K., Campbell, M. C., & Bailkey, M. (2011). Investing in healthy, sustainable places through urban agriculture (1-15). *Funders' Network for Smart Growth and Liveable Communities*.
- Jansma, J. E., & Wertheim-Heck, S. C. (2021). Thoughts for urban food: A social practice perspective on urban planning for agriculture in Almere, the Netherlands. *Landscape and Urban Planning*, 206, 103976.
- Kampmeier, L. (2019). Die Bedeutung von UrbanAgrar für die Subsistenz und Resilienz westlicher Metropolen. (Unpublished master's thesis). Alanus Hochschule für Kunst und Gesellschaft, Bonn.
- Krikser, T., Piorr, A., Berges, R., & Opitz, I. (2016). Urban agriculture oriented towards self-supply, social and commercial purpose: a typology. *Land*, 5(3), 28.

- Kortright, R., Wakefield, S. Edible backyards: a qualitative study of household food growing and its contributions to food security. *Agric Hum Values* **28**, 39–53 (2011). <https://doi.org/10.1007/s10460-009-9254-1>.
- Langemeyer, J., Madrid-Lopez, C., Mendoza Beltran, A., & Villalba Mendez, G. (2021). "Urban agriculture — A necessary pathway towards urban resilience and global sustainability?" *Landscape and Urban Planning* **210**. <https://doi.org/10.1016/j.landurbplan.2021.104055>
- Lohrberg, F., Lička, L., Scazzosi, L., & Timpe, A. (Eds.). (2016). *Urban agriculture Europe*. Berlin: Jovis Publishers
- McClintock, N. (2014). Radical, reformist, and garden-variety neoliberal: coming to terms with urban agriculture's contradictions. *Local Environment*, *19*(2), 147-171.
- McGlone, P., Dobson, B., Dowler, E. & Nelson, M. (1999). *Food projects and how they work*: New York: YPS & Joseph Rowntree Foundation.
- Mengual & Sola (2015). Sustainability assessment of urban rooftop farming using an interdisciplinary approach. Doctoral Thesis University of Barcelona
- Mougeot, L. J. (2000). Urban agriculture: definition, presence, potentials and risks. *Growing cities, growing food: Urban agriculture on the policy agenda*, *1*, 42.
- Municipality of Freiburg (no date). *Gärtnern in Freiburg. Konzept zur Entwicklung von Kleingarten und Flächen für andere gärtnerische Nutzungen*. Policy Document.
- Napawan, N. C. (2016). Complexity in urban agriculture: the role of landscape typologies in promoting urban agriculture's growth. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, *9*(1), 19-38.
- Orsini, F., Pennisi, G., Michelon, N., Minelli, A., Bazzocchi, G., Sanyé-Mengual, E., & Gianquinto, G. (2020). Features and Functions of Multifunctional Urban Agriculture in the Global North: A Review. *Frontiers in Sustainable Food Systems*, *4*, 228.
- Pearson, L. J., Pearson, L., & Pearson, C. J. (2010). Sustainable urban agriculture: stocktake and opportunities. *International journal of agricultural sustainability*, *8*(1-2), 7-19.
- Piorr, A., Zasada, .I, Doernberg, A., Zoll, F. & Ramme, W. (2018). Research for AGRI Committee – Urban and Peri-urban Agriculture in the EU, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels
- Roemers, G. (2014). Addressing Diversity in Urban Agriculture: How Picking the Right Policies and Choosing the Correct Locations Can Contribute to Viable Urban Food Systems (Master's thesis).
- Sanyé-Mengual, E., & Oliver i Solà, J. (2015). Sustainability assessment of urban rooftop farming using an interdisciplinary approach. Universitat Autònoma de Barcelona,.

Sanyé-Mengual, E., Specht, K., Grapsa, E., Orsini, F., & Gianquinto, G. (2019). How can innovation in urban agriculture contribute to sustainability? A characterization and evaluation study from five Western European cities. *Sustainability*, 11(15), 4221.

Schmidt, D., & Eng, B. (2016). Die Rolle der urbanen Landwirtschaft in der Stadtentwicklung. Übersicht und Umgang mit neuen Formen anhand von Fallbeispielen. Masterarbeit: Technische Universität Dresden-Raumentwicklung und Naturressourcenmanagement.

Simon-Rojo, M., Recanes, X., Cllau, S., Duzi, B., Eiter, S., Hernández-Jiménez, V., ... & Vejre, H. (2016). From urban food gardening to urban farming. In: Lohrberg, F., Lička, L., Scazzosi, L., & Timpe, A. (Eds.). *Urban agriculture Europe*. Berlin: Jovis Publishers, 22-28.

Specht, K., Siebert, R., Hartmann, I., Freisinger, U. B., Sawicka, M., Werner, A., Thomaier, S., Henckel, D., Walk, H. & Dierich, A., (2014). Urban agriculture of the future: an overview of sustainability aspects of food production in and on buildings. *Agriculture and human values*, 31(1), 33-51.

Specht, K., Zoll, F., Schümann, H., Bela, J., Kachel, J., Robischon, M., (2019). How Will We Eat and Produce in the Cities of the Future? From Edible Insects to Vertical Farming—A Study on the Perception and Acceptability of New Approaches. *Sustainability*. 2019; 11(16):4315.

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

UNDP (2001). *Urban Agriculture: Food, Jobs and Sustainable Cities*.

Van Veenhuizen, R. (2006). Cities farming for the future. Cities farming for future, *Urban Agriculture for green and productive cities*, (p 2-17). RUAF Foundation, IDRC and IIRP, ETC-Urban agriculture, Leusden, The Netherlands.

Van Veenhuizen, R., & Danso, G.K. (2007). Profitability and sustainability of urban and peri-urban agriculture. *Agricultural management, marketing and finance occasional paper 19*. Rome: Food and Agriculture Organization of the United Nation.

Van der Schans, J. W., Renting, H., & Van Veenhuizen, R. (2014). Innovations in urban agriculture. *Urban Agriculture Magazine*, (28), 3-12.

Van der Schans, J. W., & Wiskerke, J. S. (2012). Urban agriculture in developed economies. In *Sustainable food planning: Evolving theory and practice* (pp. 245-258). Wageningen Academic Publishers.

Van Tuijl, E., Hospers, G. J., & Van Den Berg, L. (2018). Opportunities and challenges of urban agriculture for sustainable city development. *European Spatial Research and Policy*, 25(2), 5-22.

Vasquez-Moreno, L & Cordova, A. (2013). A conceptual framework to assess urban agriculture's potential contributions to urban sustainability: an application to San Cristobal de Las Casas, Mexico
<http://dx.doi.org/10.1080/19463138.2013.780174>

Vanni, F., & Henke, R. (2017). Peri-urban agriculture: an analysis of farm typologies in Italy. *New Medit : Mediterranean Journal of Economics, Agriculture and Environment= Revue Méditerranéenne d'Economie Agriculture et Environnement*, 16(3), 11.

Veen, E.J, Dagevos, D. & Jansma, J.E. (2021). Pragmatic Prosumption: Searching for Food Prosumers in the Netherlands. *Sociologia Ruralis* , 61 (1), <https://doi.org/10.1111/soru.12323>.

Verzone, C. (2021). *Food Urbanism. Typologies, Strategies, Case Studies*. Basel/Berlin/Boston: Walter de Gruyter GmbH.

APPENDIX I. TYPOLOGY SURVEY



Urban agriculture typology survey

Welcome to this survey!

This survey supports the EFUA (European Forum for a Comprehensive Vision on Urban Agriculture) project (<https://efua.eu/> (<https://efua.eu/>)), focused on enhancing knowledge on urban agriculture and understanding how its potentials can be better supported through policies.

This survey aims to gain a more in-depth understanding of the different types of urban agriculture initiatives/projects in the European context. Therefore, we ask you to fill in this survey about the urban agriculture initiative of your choice.

The data collected will be analyzed to identify similarities and differences between urban agriculture initiatives in Europe. Your contribution to answering these questions will help to develop a typology of urban agricultural initiatives.

The survey is divided into several main sections: general information, products and services, people and organizations, product destination, location, production methods, ownership and maintenance, and relation with city governance. Please fill in the survey based on one specific initiative. If you would like to include several initiatives, please start a new survey for each. It will take about 15 minutes to complete this survey.

Thank you for your help!

Esther Veen, Daniela Müller, Lenneke Vaandrager and Jan Eelco Jansma (Wageningen University and Research)

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* This form will record your name, please fill your name.

General information on the UA initiative

1. What is the name of the UA initiative?

2. How would you characterize the UA initiative? (Examples are a community garden, an allotment garden, an urban farm, etc.)

3. Is the UA initiative permanent, non-permanent, or no longer existing?

Permanent

Non-permanent (pop-up, squatted)

No longer existing

4. When did the initiative start?

10 years ago or more

Less than 10 years ago, but more than 5

5 years ago or less

5. In which unit do you want to estimate the productive land/area of the initiative?

6. What is the estimated size of the productive land/area of the initiative?

Products and services

7. What animal products are produced at the UA initiative? (Tick one or more boxes)

☐ Meat

☐ Milk

☐ Eggs

☐ Fish

☐ Honey

☐

8. What plant-based products are produced at the UA initiative?

☐ Fruits

☐ Vegetables

☐ Arable crops

☐ Herbs

☐ Microgreens

☐

9. Are mushrooms produced at the UA initiative?

10. Is produce processed on-site?

11. If yes, what kind of processing activity is carried out on-site?

- ☐ Dairy products
- ☐ Jams and marmelades
- ☐ Honey
- ☐ Meat products
- ☐ Juices
- ☐ Soups and meals
- ☐

12. Does the initiative produce non-food products? If yes, which ?

- ☐ Medicinal plants
- ☐ Flowers
- ☐ None
- ☐

13. Which of all above mentioned products (in the categories of animal produce, plantbased produce, mushrooms, and non-food products) are most relevant for the UA initiative (for instance in terms of volume or turn-over)?

14. Which services - other than food production - does the initiative supply? Please refer only to those services that are specifically aimed for by the initiative.

Explanations:

Food security / poverty alleviation: all initiatives provide food, but here we refer to food supply specifically for food security and poverty alleviation as a key objective

Education: dissemination of knowledge, workshops, trainings and tours

Leisure: the UA initiative offers recreational activities such as agro-tourism, visiting opportunities, equestrian opportunities and other physical activities

Health care: the UA initiative provides health care services to specific target groups (such as the elderly, or people with physical or mental disability)

Social cohesion: fostering networking and social cohesion of participants, social bonds in neighbourhoods, integration aims for specific target groups, etc.

Cultural heritage: examples are maintaining traditional practices, diversity in plant species, or using traditional crops

Creating circularity: organic waste reuse (compost, fertilizer, substrate, biogas production, manure) or building synergies (heat reuse, wastewater reuse)

Soil conservation: practices that enhance soil fertility are carried out, improving soil biodiversity

Water retention: practices that enhance water retention are carried out

Providing renewable resources: providing renewable resources (energy) as a surplus from the UA initiative

Biodiversity: creating a habitat for a variety of animals and plants

15. Please name up to three of the above services which are key objectives of the initiative or to which the initiative contributes most?

16. What do you consider the main benefits of the initiative?

- ☐ Social
- ☐ Environmental and climate
- ☐ Economic
- ☐ Cultural
- ☐ Health and well being
- ☐ Food resilience
- ☐

17. If known, has this initiative produced some negative effects? If yes, please specify. (This can be from an environmental, social, economic, health-related perspective, for instance)

People and organisations

18. Who initiated the practice?

Here we refer to where the idea came from. So, if a garden was officially started by the municipality after pressure/lobbying from a NGO, then the NGO is the initiator.

- ☐ The state
- ☐ The municipality
- ☐ A public institution (such as a school or hospital)
- ☐ A private company
- ☐ A NGO or cooperative
- ☐ Citizen association
- ☐ A public private-partnership
- ☐ An informal group
- ☐ Individual/s, including farmer families
- ☐

19. What types of organisations are involved in the initiative?

By involved, we mean an organisation or individuals have participated in some way in the initiative's life and/or has stakes in the practice/initiative (funding, regulating, supporting, gardening, buying/receiving produce from etc.)

- ☐ The state
- ☐ The municipality
- ☐ A public institution such as a school or hospital
- ☐ A private company
- ☐ A NGO or cooperative
- ☐ Citizen association
- ☐ A public-private partnerships
- ☐ An informal group
- ☐ Individual/s, including farmer-families
- ☐

20. What is the main goal of the people who practice UA within the initiative? Here we want to identify the motivations of the practitioners, as distinct from the motivations of the initiators and leaders, which could be different. When you answer this question, please take into account only the day-to-day motivations of those who execute the gardening/farming activities.

To produce food (commercially or not)

Another, non-food related, goal (such as charity, eco-services, socialising, recreation)

I don't know

21. Are there specific urban problems that the initiative tries to mitigate?

- ☐ Poverty
- ☐ Food deserts
- ☐ Social exclusion
- ☐ Spatial segregation
- ☐ Waste recycling
- ☐ Soil and biodiversity preservation
- ☐ The initiative does not aim to solve any specific urban issues
- ☐

Ownership and maintenance

22. Does the initiative/project/company have ownership of the land and property?

- Yes
- No
- Partial ownership
- I don't know

23. Does the initiative lease/rent or legally use land in another way, from another party?

- No
- Yes, from a public organisation
- Yes, from a private party
- Yes, from an association/NGO
- Yes, from another party

24. If the initiative does not have ownership rights and does not lease land from another entity, how can the ownership best be described?

- ☐ It has no ownership rights

- ☐ It uses the commons



25. Who is responsible for the maintenance of the plot/land?

☐ An individual is responsible for maintaining his/her own plot

☐ A group is responsible for maintaining a common plot

☐ A public institution/NGO

☐ A company or commercial organisation

☐

Product destination

26. Is the produce for own consumption?

Yes

No

Part of it

27. Is the produce gifted?

Yes

No

Part of it

28. If the produce is gifted, to whom is it gifted?

☐ Known (such as family or friends)

☐ Unknown (such as the foodbank)

☐ It is a pick-your-own initiative that people do not have to pay for

☐

29. Is the produce sold?

Yes

No

Part of it

30. If produce is sold, to whom is it sold? (If both categories apply, you can tick both)

☐ Directly to consumers, such as through a CSA, a box scheme, or direct sales on the farm

☐ Not directly to the consumer, such as to restaurants or retail

☐

Location

31. In which country is the UA initiative located?

32. In or near which city or town is the UA initiative located?

33. What type of settlement is that (according to the national classification)?

State capital

Regional centre

City (not a state capital or regional centre)

Small city

Village

34. Is the initiative located in the city, or rather the city-region? (With city-region we mean the urban hinterland, which includes the peri-urban area).

In the city

In the city-region

35. Does the production take place indoor or outside?

Indoor

Outside

A combination of both

36. If the production is indoor, in which structure?

In/on/at a building

Ship container

Glasshouse/Greenhouse

Tunnel

37. If the production is in/on/at a building, where exactly? (Skip this question if not applicable)

On the roof

On the balcony or on a
facade Inside (includes
cellar) vertical farming

38. If the production is outside, where exactly? (Skip this question if not applicable)

☐ Garden

☐ Orchard

☐ (Agricultural) field

☐ Park

☐ Forest

☐

39. Does this outside production include the following structures?

☐ Glasshouse/Greenhouse

☐ Tunnel

☐ Container

☐

Production method

40. If production is indoor, on which growing medium does it take place?

☐ On soil

☐ On water

☐

41. If production is outdoor, where?

In an above-ground-structure (no contact between the construction in which the plants grow

☐

and the open soil)

☐ In open soil

☐

42. Is the production organic?

☐ Yes, it is organically certified

☐ Yes, but it is not certified as such

☐ No

☐

43. Does the initiative use renewable resources? If yes, from which source?

Energy: refers to renewable energy sources (solar cells, wind energy), residual energy, or the re-usage of heat waste.

Water: refers to wastewater reuse (from buildings or in a aquaponics system).

Organic waste: refers to biogas from waste digestion, using green waste (like food scraps or mowed grass) as animal feed (pigs, insects or worms) or for composting.

Energy

Water

Organic waste

None

Relation with city governance


44. Was the initiative started in the frame and/or with the support of a local, national or EU policy approach, such as:
- State or City Strategy/vision
 - Program (with funds, resources, incentives)
 - Project (a once-off initiative within a local, national or EU policy)
 - Land-use zoning instrument
 - Sectoral policy (for example in the fields of agriculture, environment, transport, housing etc).
 - A specific UA regulation
 - It is not the result of public policy
 - I am not sure
45. Does the city have a specific urban agriculture development plan/policy/strategy, and/or a regulation at the municipal or at any other level?
- Yes
 - No
 - It did in the past but does not anymore
 - No specific plan/policy and/or regulation but integral part of related plan/policies and/or regulations (e.g. for climate change, biodiversity, social cohesion etc.)

46. If yes, please specify:

Final questions

47. Considering your knowledge of the initiative and the actors/stakeholders involved in it, how would you assess the accessibility of data about the initiative in case we select the case for in-depth analysis?
- Data will be easy to access
 - Some data will be easy to access but not all
 - Data will be difficult to get access to
 - I am not sure
48. Would you be willing to share the website of the UA initiative? If yes please fill it in below.
49. Would you be willing to share more data about the UA initiative? If yes, please provide us with an email or another working contact or representative of the initiative, if they are open to give us more information and participate in our indepth study.
50. Do you have any comments or feedback on this survey?

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