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**RESEARCH ARTICLE**

# Institutions for Collective Gardening: A Comparative Analysis of 51 Urban Community Gardens in Anglophone and German-Speaking Countries

Ida Göttl and Marianne Penker

University of Natural Resources and Life Sciences, Vienna (BOKU), AT

Corresponding author: Marianne Penker ([penker@boku.ac.at](mailto:penker@boku.ac.at))

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Groups of urban gardeners collectively grow vegetables, fruits and flowers in an increasing number of community gardens all over the world. Despite a growing body of literature on community gardens, there is a particular gap for a transcontinental bigger N-study on the organisation of community gardening, which we want to fill with a comparative document analysis of 51 urban community gardens in six anglophone and German-speaking countries. Specifically, we want to understand how community gardens are organised as spaces for long-term collective action. We systematically collected and analysed documents such as membership rules, handouts to new members, formal statutes, or blog entries. A cluster analysis helped to identify three types of community garden organisations, which vary in terms of organisational form, membership and exclusion rules, individual versus collective cultivation of the garden area, and the degree of regulation, fees, and waiting lists. Our findings show that there is no single blueprint for a long-term community garden organisation, but that self-organisation or nested forms of organisation and more or less open social boundaries result in distinct places of collective gardening. Comparing organisational types across geographical contexts, the European gardens analysed showed bigger organisational diversity, more open social boundaries and more collectively used areas compared to North American gardens.

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**Keywords:** urban gardening; organisation; collective action; Germany; Switzerland; Austria; USA; Canada; UK

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## 1. Introduction

### 1.1. Knowledge gap and research questions

The community garden movement started in the United States of America (USA) a century ago (Lawson 2005) and has also developed in many European cities since then. These collectively organised community gardens are often seen as new forms of gardening opposing the idea of traditional allotments (“Kleingärten” in Germany and Austria, “Familiengärten” in Switzerland). Despite a growing body of international literature, we still know little about the communalities and differences in the organisation of community gardens across countries.

Considering the rising number of scientific publications on community gardens, Guitart et al. (2012) analysed the English language literature and came to the following conclusion: Most research on community gardens has been carried out on socio-political themes like social capital, gender roles and quality of life (52%). Guitart et al. (2012) recommended to geographically enlarge the research area to be able to contrast different conditions, challenges and potentials of gardens in the USA with those in other countries.

Regarding the organisation of community gardens, publications are often about planning processes (e.g. Lawson 2004; Rosol 2006; Hou 2018), design (e.g. Hou et al. 2009) and political conditions (e.g. Cohen and Reynolds 2014); and less about self-organisational structures in the garden group. Based on Holling (2001) we see the self-organisation of institutional patterns as establishing the arena for evolutionary change. For this article, we define self-organisation as the garden group’s ability to purposefully govern the gardeners

and their interaction with the biophysical garden elements and processes, allowing for adaptation also without the support of an external agency.

Jamison (1985) published an early work on the organisation of community gardens in the USA in the 1970s and showed how bureaucratic cultures emphasised the individualistic cultivation of plots and stricter regulations, whereas collectivist cultures rather referred to jointly cultivated gardens. Other studies on US community gardens generating basic information about their organisation include Armstrong (2000), Birky and Strom (2013), Kurtz (2001) and Ferris et al. (2001). Drake and Lawson (2015a, b) – for the first time – made an extensive comparative cross-country research. In a survey of 445 community gardens in the USA and Canada, Drake (2014) identified shared challenges and differentiated three types of community garden organisations depending on the number of gardens they manage.

Although most publications refer to US community gardens (Guitart et al. 2012, 369), literature on community gardens has also been rising in the German-speaking area; but cross-country and comparative studies are still scarce. Exceptions are e.g. Jackisch (2012), Mok et al. (2014), Colding et al. (2013) and Larson (2006), who however did not analyse the organisation of community gardens. Pourias et al. (2016) compared community gardens in Paris (France) and Montreal (Canada) focussing on gardeners' motivations. Spilková (2017) analysed community gardens in Prague (Czech Republic) and compared them with "Western" community garden literature. More recent comparative publications can be found in the research field of urban agriculture and governance (van der Jagt et al. 2017; Fox-Kämper et al. 2018; Schwab et al. 2018).

Community gardens have seldomly been researched from the perspective of collective action (Nettle 2014, 8). Nettle (2014) analysed collective action of gardeners in more than 60 Australian community gardens based on the social movement theory. Only recently, research has increasingly focused on community gardens as 'new' commons. Eizenberg (2012) considered community gardens in New York City (USA) as counter-hegemonic spaces in a neoliberal city. Follmann and Viehoff (2015) following Eizenberg (2012) characterised a community garden in Cologne (Germany) as "unperfected common in the making" (Eizenberg 2012, 1159), where gardeners fight challenges like land speculation and the amalgamation of the private and the public to stand up for a more social and sustainable city (Eizenberg 2012, 1168). Foster (2011), Colding and Barthel (2013) as well as Colding et al. (2013) described community gardens as forms of "Urban (Green) Commons". Rogge and Theesfeld (2018) emphasised the necessity to analyse community gardens as spaces for collective action and defined classification criteria for urban gardens as commons. With the help of an online survey, Rogge et al. (2018) analysed 123 community gardens located in Germany regarding social interaction and social sustainability. Exner and Schützenberger analysed eight respective six Viennese community gardens regarding the influence of local government and its homogenising effect on the gardens' organisation (Exner and Schützenberger 2015) and differentiated them from allotment gardens (Exner and Schützenberger 2018). Ginn and Ascensão (2018) illustrated the divergence of Portuguese urban gardens from an abstract ideal of the commons. Engel-Di Mauro (2018) provided a critical perspective on community gardens' contributions to a post-capitalist future.

Filling the gap on cross-country and more specifically cross-continental comparisons of community garden organisation, this paper explores how community gardens in six anglophone and German-speaking countries are organised as spaces for long-term collective action. Research on renewable energy production and housing has shown that self-organisation and decentral collective choice plays a bigger role in Germany than in anglophone countries. Gipe (2007) discussed the relevance of community-owned and community-governed wind, solar or biogas plants in Germany and their virtual absence in anglophone Canada (Gipe 2007). Kohl (2015) sees the different institutional legacies resulting in higher shares of tenant-dominated housing owned and governed by housing associations in Germany than in the USA. We want to see if different institutional legacies also play out in diverging garden organisations in German and anglophone countries.

Specifically, we want to provide answers to the following research questions:

- Do garden-organisation differ in anglophone and German-speaking countries and if yes, how?
- Are community gardens organised along consistent principles, or are there several approaches for the long-term self-organisation of collectively used gardens?

We identified community gardens in urban areas based on the definition of "communal urban gardening" (Birky and Strom 2013), i.e. gardens in urban areas with a form of collective organisation. The core criterion for the case selection was a certain degree of collective organisation and collective gardening, which differentiates community gardens from private ones but also from allotments aiming at individual gardening even if paths and other facilities are collectively used.

## **1.2. Collective action theory and hypotheses on design principles, group size and group heterogeneity**

In the middle of the 20<sup>th</sup> century, interest in a theory of collective action rose as Hardin's (1968) "The Tragedy of the Commons" and Olson's (1965) "The Logic of Collective Action: Public Goods and the Theory of Groups" came to the same conclusion: Collective use would result in over-use of common resources. However, empirical evidence confirms that users of commons – and more precisely common-pool resources – are quite capable of making organisational agreements to equitably share benefits among each other (Agrawal 2001, 1649f). The Institutional Analysis and Development Framework (Ostrom 2005) and the social-ecological system framework (Ostrom 2009) provide a conceptual language for the comparative analysis of the action situations, where individuals interact and collectively manage common-pool resources.

Ostrom (1990), jointly with her colleagues, investigated numerous common-pool resource cases. She tried to reveal patterns and similarities to figure out how such systems work. This resulted in the eight design principles which characterise examples of long-term common-pool resource management (Ostrom 1990, Cox et al. 2010):

1. clearly defined boundaries,
2. congruence between appropriation and provision rules and local conditions,
3. collective-choice arrangements,
4. monitoring,
5. graduated sanctions,
6. conflict-resolution mechanisms,
7. minimal recognition of rights to organise,
8. nested enterprises.

We assume that these design principles, which were formulated for common-pool resources, will also apply for community gardens, which provide several types of goods: common-pool resources (produce extracted from collectively managed plots), but also public goods (recreational amenities for members and non-members) or private goods (harvest from individually used plots, from which others can be excluded). While the design principles have been broadly confirmed for different resource management settings, group heterogeneity (e.g. ethnic, educational or income differences) seems to be a factor that may both enable and hinder collective action (Poteete and Ostrom 2004). A group of heterogeneous preferences can impede trust-building, self-organization and decision-making (Andersson and Agrawal 2011; Doss and Meinzen-Dick 2015). In contrast, scholars have also concluded that high levels of heterogeneity can be associated with successful collective action (Baland and Platteau 1999) or that both low and high levels of heterogeneity can be associated with lower levels of collective action, and medium levels of heterogeneity are associated with higher levels of collective action (Naidu 2009). Being aware of the ambiguous evidence on group size and group heterogeneity (Poteete and Ostrom 2004; Sandler 2015), we assume that it is easier to organise smaller and less heterogenous garden groups.

## **2. Comparative case study and mixed-methods approach**

### **2.1. Selection of cases**

In order to understand communalities and differences in German- and English-speaking contexts, we selected community gardens in the USA, Canada, the UK, Germany, Switzerland and Austria. Our aim was to choose a variety of different community gardens to be able to display the diverse forms of self-organisation. In Germany the database of the foundation "anstiftung", where 598 community garden initiatives have been listed by 17 April 2017, served as selection catalogue. The Austrian community gardens were picked from the website of the association "gartenpolylog" (140 listed gardens). As there is no cross-municipal register of community gardens in Switzerland, cases were chosen based on an internet research. We identified community gardens in the USA and Canada on the website of the ACGA (American Community Gardening Association, which estimates that there are about 18,000 gardens) and in an additional internet research. Due to the great number of gardens in the USA, the selection was oriented on the 15 cities with the largest number of gardens according to an ACGA study (ACGA 1998, 9). For selecting gardens in the UK, the website "Federation of City Farms and Community Gardens" with about 1,000 gardens was used, as well as a broader web search. For better comparability, we chose community gardens in cities of the six countries based on the following criteria:

- The garden is located in a city with a minimum number of inhabitants of 40,000.
- Information on the garden is available.
- The garden has been existing for at least 3 years.
- Relevant information on self-organisation is available.
- Diversity of urban contexts.

Based on these criteria, we randomly selected 60 gardens (10 per country), since this number was manageable for the time resources available. Because of missing information and lack of response via e-mail/phone, nine of the 60 gardens had to be excluded. Finally, 51 gardens were analysed; 27 gardens are located in the German-speaking and 24 in the English-speaking countries (see **Table 1**).

## 2.2. Mixed-methods approach

We obtained the data presented in this paper largely from the community gardens' web profiles (e.g. published guidelines, protocols and statutes of the gardens). Further information was gained from blogs, articles and books. Despite a wide range of information, in some cases where data was uncertain, we contacted the gardens by e-mail to clarify specific questions.

The document analysis of websites, journal articles (e.g., Follman and Viehhoff 2015, Hou et al. 2009 and Müller 2011), blogs, protocols and statutes yielded a large amount of data on the selected community gardens. For the comparative analysis of this data across countries, we opted for a multi-methods approach. A hierarchical cluster analysis helped to identify distinct types of community gardens (Gower distance with a simple-matching-coefficient for symmetric binary data). Differences between the two language areas were analysed with t-tests, the Mann-Whitney-U-test and cross tabulations. Based on Elinor Ostrom's design principles (deductive coding) and group heterogeneity (inductive coding), we coded the documents for a qualitative content analysis in German language. Finally, we qualitatively analysed the cases' accordance to the design principles.

**Table 2** shows the variables for the cluster analysis, **Table 3** the variables to compare the gardens across language contexts and types of gardens. Three variables were measured in discrete numbers, the number of years since the establishment of the community gardens, the number of members and the garden area size in square metres. Regarding the mode of self-organisation, four categories were identified from the material:

1. single non-governmental organisation,
2. non-governmental nested organisation,
3. governmental nested organisation,
4. no formal structure.

The first category comprises numerous forms of single organisations, which were specifically established for the community gardens (e.g., associations, non-profit organisations and charities, non-profit limited companies). Non-governmental nested organisations may also take various forms, they can be responsible for several community gardens simultaneously, manage additional projects besides the garden, or consist of more than one organisation managing the same garden. The governmental organisation is another specific form of a nested organisation. In these cases, several gardens are supervised by a governmental organisation, e.g. by a municipal department, or in North America by the Parks and Recreation Department. The fourth mode is a loose network of people without any formal organisation.

**Table 1:** Gardens by country (n = 51).

Country	Number of gardens (n = 51)	Years of existence (mean)	Area size in m <sup>2</sup> (mean)	Share of gardens with waiting list
Germany	10	9	6,920	20%
Austria	9	6	2,856	67%
Switzerland	8	5	3,315	0%
USA	10	33	8,129	100%
Canada	8	11	4,558	88%
UK	6	10	3,258	33%

**Table 2:** Variables for the cluster analysis (n = 51).

Variables for cluster analysis	Sample (n = 51)			
<b>Garden group size</b>	up to 40 members (n = 10)	41–80 members (n = 9)	more than 80 members (n = 18)	no fixed number of members (n = 14)
<b>Form of organisation</b>	single non-governmental organisation (n = 34 gardens)	non-governmental nested organisation (n = 10)	governmental nested organisation (n = 4)	no formal structure (n = 3)
<b>Garden area</b>	mostly common area (n = 13)	individual plots and common areas (n = 34)	mostly individual plots (n = 4)	
<b>Options for participation</b>	membership agreement necessary (n = 29)	membership necessary for own plot, moreover participation also possible without own plot or membership (n = 10)	participation without own plot or membership (n = 12)	
<b>Fees</b>	yes (n = 43)		no (n = 8)	
<b>Rules</b>	codified regulations (n = 44)		only informal guidelines (n = 7)	

**Table 3:** Variables for the cross-analysis of different garden types (n = 51).

Variables	Sample (n = 51 gardens allocated to three types)	
<b>Garden age until 2017</b>	range from 3 to 74 years	
<b>Garden size in m<sup>2</sup></b>	range from 300 m <sup>2</sup> to 28,300 m <sup>2</sup>	
<b>Garden access</b>	garden separated from the surrounding area (n = 29)	open access to the garden (n = 22)
<b>Waiting list</b>	yes (n = 28)	no (n = 23)
<b>Anglophone and German-speaking countries</b>	CA, UK, USA (n = 24)	AT, CH, DE (n = 27)

CA = Canada, UK = United Kingdom, USA = United States of America, AT = Austria, CH = Switzerland, DE = Germany.

Regarding the size of the garden group, four categories have been defined based on the number of members represented in the garden sample. The category “no fixed number of members” was used for gardens with an unspecified number of participants (e.g., some gardens work with both formal members and an open number of additional volunteers). Community gardens show different combinations of individually used plots and common areas that are collectively cultivated. In addition, the access to the garden is regulated in different ways, e.g. gardens separated from their surrounding by fences or walls and gardens with open access. Furthermore, many gardens control access with membership agreements. Others however offer the possibility to use the garden without a membership agreement. A further distinguishing feature were membership fees and the existence of a waiting list. Whereas many gardens publish clear rules, others emphasise the absence of rules and the freedom of gardening.

In a next step, the garden types identified in the cluster analysis were evaluated to understand if they significantly differ regarding the gardens' age and size (Kruskal-Wallis rank sum test for comparing three types) or the categorical variables of garden access, waiting list and geographical context (Pearson's Chi-squared test, cross tabulations) (see **Table 3**).

### 3. Results of the comparative analysis

#### 3.1. Three types of garden organisations

Based on the cluster analysis, we identified three types of garden organisations (**Table 4**).

Due to their open-door policy, the first group of community gardens can easily be interpreted as “participation gardens”. Participants do not have to sign a membership agreement or to join an association at any of these gardens. Although some also have an option for formal membership, it is no prerequisite for participation in the garden. Thus, for instance, the Abbey Gardens in London (the UK) state on their website: “Welcome to a garden where anyone may learn about, grow and harvest organic vegetables, fruit and flowers.

**Table 4:** Three garden types and their main characteristics (n = 51).

		Type 1 "participation gardens"	Type 2 "closed garden groups"	Type 3 "gardens with volunteers' option"
<b>Number of gardens</b>		n = 12	n = 27	n = 12
<b>Options for participation</b>	membership agreement (for own plot) necessary	0	27	2
	membership necessary for own plot, moreover participation also possible without own plot or membership	0	0	10
	participation without own plot or membership	12	0	0
<b>Garden area</b>	mostly common area	8	5	0
	individual plots and common areas	4	21	9
	mostly individual plots	0	1	3
<b>Rules</b>	codified regulations	7	25	12
	only informal guidelines	5	2	0
<b>Form of organisation</b>	single non-governmental organisation	8	17	9
	non-governmental nested organisation	2	6	2
	governmental nested organisation	0	4	0
	no formal structure	2	0	1
<b>Fees</b>	yes	5	27	11
	no	7	0	1
<b>Garden group size</b>	up to 40	0	9	1
	41–80	0	7	2
	more than 80	0	11	7
	no fixed number	12	0	2

You can give as much or as little time and energy as you can spare or just come and visit. There are plenty of events" (Friends of Abbey Gardens n.d.). The open-door policy is also emphasised on the website of NeuLand in Cologne (Germany): "Participate at NeuLand? Anybody, who wants to participate can do it. We are looking forward to welcoming you! Preferably, you come to one of our community days (see events), there someone can explain how everything works and you can directly pitch in" (Kölner NeuLand e.V. 2017). None of the gardens in this type is restricted to individually used plots, most areas are commonly used. The majority of gardens is accessible free of charge; some gardens ask for voluntary donations.

The biggest cluster "closed garden groups" (type 2) is characterised by an obligatory formal membership. The documents analysed do not refer to any participation options for non-members. Thus, the community gardens are organised by closed garden groups with a distinct number of garden members. Looking at the cultivation of the garden area, most of the gardens have individually as well as collectively used areas. However, a sub-group of five gardens manages the whole garden collectively. Type 2 comprises the biggest share of nested organisations. Nevertheless, the majority of type 2 gardens are governed by single organisations. All gardens of this type are based on membership fees.

The majority of type 3 "gardens with volunteers' option" offers garden use to both members and volunteers, who can participate without formal membership (10 out of 12). This however is restricted to special volunteer days or joint working sessions. A formal membership is required to obtain an individual plot. Thus, gardens of type 3 represent a hybrid form between the type 1 and 2. Nine out of twelve gardens have individually as well as collectively used areas, three gardens have mainly individually used plots. Almost all type 3 gardens (9 out of 12) are single organisations.

**Table 5:** Evaluation of garden types' differences (means and frequencies) (n = 51).

Variables	Participation gardens (type 1, n = 12)	Closed garden groups (type 2, n = 27)	Gardens with volunteers' option (type 3, n = 12)	Significant difference
Garden size* (in m <sup>2</sup> )	4,025	4,442	7,541	no
Garden age until 2017* (in years)	6	12	22	no
Waiting list**	no: 12 yes: 0	no: 10 yes: 17	no: 2 yes: 10	yes (p > 0.001)
Garden access**	no: 6 yes: 6	no: 15 yes: 12	no: 3 yes: 9	no
Anglophone and German speaking countries**	(2 AT, 2 CH, 5 DE), (3 UK)	(7 AT, 6 CH, 4 DE), (6 CA, 4 USA)	(1 DE), (2 CA, 3 UK, 6 USA)	no

\* Kruskal-Wallis rank sum test.

\*\* Cross tabulations – Pearson's Chi-squared test.

### 3.2. Cross-analysis of types

Comparing the types (see **Table 5**), we see significant differences regarding the existence of a waiting list (none of type 1 gardens has a waiting list), but no significant difference regarding age or size of the gardens, garden access or the gardens' location in anglophone and German contexts. It is striking, however, that all the twelve type 1 gardens are located in Europe. All US and Canadian community gardens are either allocated to type 2 or 3, which have some commonly used area but are dominated by individually used plots. In these two types, the membership to the gardens is associated with costs, and the majority of gardens have documented rules.

Whereas above we have cross-analysed the tree types, we also looked into the differences between gardens in German- and English-speaking countries. Gardens in anglophone countries are significantly older ( $p < 0.001$ ; Mann-Whitney U) and are more likely to have a waiting list ( $p < 0.001$ ; Chi-Square; 8 out of 27 gardens in German-speaking countries, compared to 19 of 24 anglophone gardens). Gardens are more often used collectively in German-speaking countries (11 out of 16) than in anglophone countries (2 out of 24). Regarding area size, access, and the number of members, no significant difference can be observed in the two language areas.

### 3.3. Ostrom's design principles, group size and group heterogeneity

Community gardens are quite diverse. Nevertheless, their organisation broadly corresponds with the design principles. Based on the deductively coded material, we assessed the accordance as high, middle or low, depending on the number of cases supporting or not supporting the principle as described in **Table 6**. Whereas some principles apply for most community gardens, others require a more differentiated consideration (see **Table 6**).

Concerning community gardens, the first design principle is certainly complex. While some gardens clearly distinguish between resource users and non-users, social boundaries seem to be a lot more open in gardens of type 1 and type 3. Here, we find different mechanisms for regulating access. While some open access gardens (type 1) have no rules concerning the harvest, others set physical boundaries when it comes to garden access or have strict withdrawal rules.

For the congruence between appropriation and provision rules and local conditions (principle 2), we find high accordance. The multitude of our cases has defined context-specific rules, only some community gardens emphasise freedom and the absence of rules. If there is information on rules, they seem to be stricter if the demand for plots is high and waiting lists are long. The level of collective choice opportunities (principles 3) varies among the cases. While 14 out of 51 gardens are part of nested organisations and have to follow regulations prescribed by higher-level organisations, most gardens highlight the importance of self-organisation and local decision-making. We find grassroot direct democratic decision-making as well as groups that elect representatives.

Referring to design principle 4, monitoring mechanisms in community gardens are not always as clearly described as other organisational aspects. Based on the information available, we find external monitors, monitoring carried out by elected boards or more informal collective monitoring among the gardeners.

In the case of misconduct (principle 5), we identify graduated sanctions starting from warnings and ending with plot withdrawal and the exclusion from the garden group. Concerning principle 6, conflict resolution approaches range from informal communication arrangements to highly formal arbitration mechanisms.

**Table 6:** Ostrom's design principles in community gardens.

<b>Design principles</b>	<b>Community garden organisations</b>	<b>Accordance</b>
<b>1a. clearly defined social boundaries: resource access</b>	<p>types of access rules:</p> <ol style="list-style-type: none"> <li>1. membership agreement necessary for gardeners</li> <li>2. membership agreement necessary for own plot, but additional opportunities for volunteers</li> <li>3. no membership necessary, open access to the garden</li> </ol> <p>fees</p> <p>waiting list if all plots are taken</p> <p>regulations concerning residency for gardeners</p> <p>harvesting regulations in case of open access:</p> <ol style="list-style-type: none"> <li>1. everybody may harvest (with consideration for others)</li> <li>2. collectively organised harvest</li> <li>3. produce is sold, even to gardeners</li> </ol>	<p>high accordance for type 1, middle accordance for type 2, low accordance for type 3</p> <p>context-specific accordance (e.g., high demand for gardens)</p>
<b>1b. clearly defined physical boundaries: garden entrance</b>	garden boundaries: fences, walls, locks	high accordance in about 50% of the selected community gardens
<b>2. congruence between appropriation, provision rules and local conditions</b>	<p>strict rules in case of a high demand for plots</p> <p>harvesting rights depending on the amount of work, more rights for official garden members</p>	<p>high accordance</p> <p>high accordance</p>
<b>3. collective-choice arrangements</b>	<p>level of collective choice arrangements:</p> <ol style="list-style-type: none"> <li>1. few collective choice arrangements due to externally prescribed regulations</li> <li>2. elected garden members responsible for decision-making</li> <li>3. collective choices by the garden group</li> </ol>	low accordance for type 1, middle accordance for type 2, high accordance for type 3
<b>4. monitoring</b>	<p>forms of monitoring:</p> <ol style="list-style-type: none"> <li>1. monitored by external person</li> <li>2. monitored by selected members of the garden group</li> <li>3. collectively monitored by garden group</li> </ol>	high accordance is assumed (however lack of data on several cases)
<b>5. graduated sanctions</b>	<p>warning</p> <p>plot withdrawal</p> <p>exclusion from the garden</p>	high accordance for most community gardens
<b>6. conflict-resolution mechanisms</b>	<p>regular meetings (opportunity for discussion and problem solving)</p> <p>contact persons responsible in case of conflict</p> <p>codes of conduct, guiding principles</p> <p>formalised arbitration</p> <p>targeted communication and mediation</p>	high accordance
<b>7. minimal recognition of rights to organize</b>	<p>land use agreement on public land</p> <p>public subsidisation</p> <p>tolerance from public agencies</p>	high accordance
<b>8. nested enterprises</b>	<p>governmental organisation overseeing several gardens</p> <p>single gardens within a bigger nested organisation (diverse forms, but no governmental organisation)</p>	high accordance for some community gardens; however, the majority of gardens is fully self-organised and not part of a nested organisation

Public authorities not only accept, but often directly support community gardens (principle 7). Besides supplying the garden area (42 of 51 gardens are on public land), public agencies provide grants and assist garden groups in the initiation phase. Leasing the garden area from public agencies might be tied to certain conditions and rules. As already presented in the quantitative analysis, the majority of community gardens is fully self-organised, so design principle 8 “nested enterprises” only applies for a minority of the gardens analysed.

Concerning the hypothesised positive effect of small group size and low group heterogeneity on the garden organisation, we identified both smaller and larger garden groups. Nearly all community gardens are characterised by heterogeneity, concerning the participants’ demographic and cultural backgrounds. Many community gardens explicitly emphasise the diversity of gardeners. “Stadtacker Wagenhallen” (Germany) describes itself as follows: “We are a colourful mix of students, young families, immigrants and workers with different backgrounds like China, Turkey, Italy and various other parts of Germany” (Stadtacker Wagenhallen e.V. n.d.). Community gardens often aim at promoting the exchange between generations and cultures. The “Stadtteilgarten Itzling” group (Austria) even allocates available plots according to a “diversity principle”. Some community gardens, especially in Canada and the USA, are only accessible for nearby residents. However, even these gardens aim at connecting diverse age groups and cultural backgrounds. A homogeneous garden group is to be expected in the “Roger’s Community Garden” located on the campus of the University of California San Diego (USA). Access to plots is restricted to students, graduates or employees of the university. We could not identify a link between heterogeneity and the age of the gardens, which could show different heterogeneity levels between younger and older gardens, however several gardens pointed at the benefits of heterogeneity for broadening expertise and learning.

## 4. Discussion

The analysis of 51 community gardens adds a cross-continental comparison of six anglophone and German-speaking countries to previous research on the organisation of community gardens located in the same city or country (e.g. Jamison 1985; Exner and Schützenberger 2018; Rogge et al. 2018). The analysis is limited regarding several aspects. We have only analysed 51 of tens of thousands of community gardens. Despite our thorough selection process, we have to expect selection biases (e.g., possible exclusion of gardens with missing internet presence or underrepresentation of gardens located in smaller cities). As data on community gardens is scarce, we can not assess our sample regarding its representativeness in terms of garden size, garden age or number of members. Furthermore, the analysis is limited to the information available and/or complemented by e-mail communication of garden board members. Hence, we assume that we have restricted insight into conflicts, problems or failure. The analysis cannot give clear indications, which organisational forms are more adaptable and robust than others, although some organisations are already older and have proven self-organisation going much beyond the three-year minimum age that we defined as selection criterion.

### 4.1. Types and principles of community garden organisation

Our analysis of 51 gardens in six German speaking and anglophone countries identified three different types of community gardening organisations, which vary in terms of participation options and number of participants (restricted number of members only or broader access), organisational form (single or nested organisation), the use of the garden area (different shares of collectively versus individually used plots), and fees. Evaluating the three types, they show significant differences regarding waiting lists, however not regarding age, which would have allowed to differentiate between more mature organisation forms and younger gardens, which are still experimenting with diverse approaches.

When examining type 1 “participation gardens” and the sub-group of five collectively used gardens of type 2 “closed garden groups”, one might argue, that they can be identified as gardens with a collectivist culture in Jamison’s (1984) understanding, since in these gardens most of the area is jointly cultivated. However, there are certain differences when it comes to participation options and garden access, which clearly distinguish these two types. Whereas “participation gardens” (type 1) are characterized by an open-door policy and participation opportunities for gardeners without obligatory membership and waiting list, “closed garden groups” (type 2) require a formal membership. In many cases, type 2 and 3 have waiting lists and correspond to the more bureaucratic cultures described by Jamison (1985).

While most of the cases are fully self-organised, 14 out of 51 community gardens are part of a nested organisation. Some of them with strong governmental organisations restricting collective-choice arrangements of the individual garden group members and external monitoring. Nested organisations benefit from templates for membership contracts, databases, office infrastructure and monitoring provided for several

gardens, which might reduce the efforts of individual garden group members (see also Olson 1965). New community gardens will form more easily if they can build on existing knowledge and structures. Van der Jagt et al. (2017) and Fox-Kämper et al. (2018) also stressed the importance of support mechanisms for the long-term management of community gardens. Notwithstanding these advantages of nested organisations, the majority of the garden groups opted for decentral autonomous decision making in independent and flexible organisations. Future research could have a closer look how the existence of a nested organisations plays out in terms of long-term garden adaptability.

#### **4.2. Differences and commonalities in community gardening organisation in the German-speaking and the anglophone context**

Different from literature-based expectations, we could not identify a significant difference between garden types in German-speaking and anglophone countries. This distinction rather arises between Europe and North America, as none of the US and Canadian gardens was fully cultivated collectively or belonged to the participation garden type, where gardens are open to a flexible number of non-members. We identified a higher diversity of community garden organisations in the European gardens, many of them putting a particular focus on the inclusion of the bigger community. Community gardens in German-speaking countries have been described as “new (urban) gardens” (Appel et al. 2011; Müller 2011) or “post-Fordist spaces” (Exner and Schützenberger 2018), which are characterised by diversity, creativity, self-organisation, ecology and the presence of political messages, which distinguishes them from allotments. The diversity of garden organisations and garden groups, already identified for German gardens by Rogge et al. (2018), could also be confirmed for the Swiss and Austrian gardens in our sample, whereas Spilkova (2017) assessed Prague’s community garden groups as ethnically less diverse as in anglophone countries. The future will show, if this diversity of European community garden groups and organisations will persist in the long run, or if it rather characterises young, “immature” gardens that are still experimenting with a diversity of approaches, not all of them possibly fit for the long-term garden management. Or if maturing gardens would become bureaucratic and over-organized as feared by Colding et al (2013).

Although we distinguished lower shares of nested organisations in US and Canadian community garden as the 61% identified by Drake and Lawson (2015a), nested organisations were more common for our North American sub-sample. These gardens were also established earlier and more often confronted with a greater demand for plots and waiting lists. The longer North American tradition of community gardens and the waiting lists may be explained with the lack of allotments in North America in distinct contrast to Europe (Drake and Lawson 2015a, Rosol 2006).

#### **4.3. Design principles, group size and heterogeneity**

While most design principles were broadly confirmed, Ostrom’s first design principle “clearly defined social boundaries” deserves closer attention. In the case of community gardens, we have to distinguish between users and non-users of different types of collectively used resources (Rogge and Theesfeld 2018). The resource system of the garden itself might be in danger of overuse or congestion in the case of unrestricted access. The withdrawal of produce as well as the work time was regulated in some of our cases.

While several gardens of type 2 can be accessed by members only, type 1 community gardens emphasise the fundamental openness of the garden. Several gardens form the type 3 “gardens with volunteer options” also offered participation possibilities to non-members on specific volunteer days. Open social boundaries have also been identified by Rogge et al. (2018) for 123 German community gardens: 72% had no access rules, 78% no community size rules. On the one hand, this openness can be discussed as interesting deviation from Ostrom’s design principles characterising rather immature gardens in Europe, whereas the older gardens in North America have much clearer social boundaries. On the other hand, open access promises broader social learning, which is considered as an important key element for adaptive and long-term community garden management. According to Bendt et al. (2013), public access community gardens in Berlin show broader and more heterogeneous learning about social–ecological conditions compared to allotment gardens or other closed garden forms. A broader community of practice can more effectively share and maintain the “social or collective memory in relation to management practice that sustains ecosystem services” (Barthel et al. 2010) or learn on how to transform cities towards more socially and ecologically benign environments (Colding et al. 2013). Opening social boundaries may be an important factor for broadening learning (a key aspect of adaptability in contexts of uncertainty), political support and labour beyond the narrow group of formal members, particularly as most groups do not own the

gardens, some of them even working with mobile beds. In view of tenure insecurity, it might be beneficial to mobilise sufficient interested parties who would be willing to advocate for the extension of lease contracts. The German “Prinzessinnengarten” in Berlin, “NeuLand” in Cologne, “Stadtacker Wagenhallen” in Stuttgart, the Austrian “LoBauerInnen” in Vienna and the Swiss “Stadiongarten” in Zurich were all established with the help and advocacy of numerous volunteers. The larger the neighbourhood enjoying the amenities of a community garden, the higher might be the chances for the long-term survival of the garden. Werner (2011) or Ghose and Pettygrove (2014) emphasised the relevance of social networks for the development and long-term organisation of community gardens.

The question that arises from this finding is how to find organisational structures that work for constantly changing open-access garden groups and have to continuously deal with new-comers. One possible approach practised by type 3 gardens is to differentiate between different groups of garden participants. Long-term commitment and extra working hours may be combined with privileges of collective choice or extra withdrawal rights. This would also correspond to Ostrom’s second design principle “congruence between appropriation and provision rules and local conditions”. However, our cases also indicate that while opening boundaries for community gardens may be appropriate in some cases, binding membership and continuity might make more sense in other initiatives, such as those with high demand and long waiting lists. The decision whether or not to open social boundaries seems to be one that strongly depends on local conditions and circumstances, such as tenure security and demand for participation.

Our findings for community gardens in six countries show that both smaller and bigger garden groups can organise community gardens as collective spaces. It was noticeable that almost all community garden groups were characterised by high heterogeneity, which was often a clear objective of the community gardens in our sample and argumentatively linked to learning (see above), but negatively correlated with social interaction and cooperation in 123 German community gardens (Rogge et al. 2018). Going beyond the quantitative notion of group size and heterogeneity, future research might have a closer look at the quality of different garden networks and how they provide access to power, knowledge, work time or money.

## 5. Conclusions

In this paper, we present a comparative analysis of 51 community gardens in three German-speaking and three English-speaking countries. We identified three different types of community garden organisations, with a bigger diversity in European than North-American gardens regarding membership and exclusion rules. In contrast to previous research on self-organised natural resource management, our findings on urban community gardens suggest that open social boundaries can be beneficial for learning, but also for the mobilisation of supportive networks and resources, particularly for those gardens confronted with tenure insecurity. For open-access gardens, a differentiation of participation modes with graduated responsibilities, withdrawal and collective choice rights could be helpful.

## Competing Interests

The authors have no competing interests to declare.

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