Defining edible landscapes: a multilingual systematic review

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Abstract

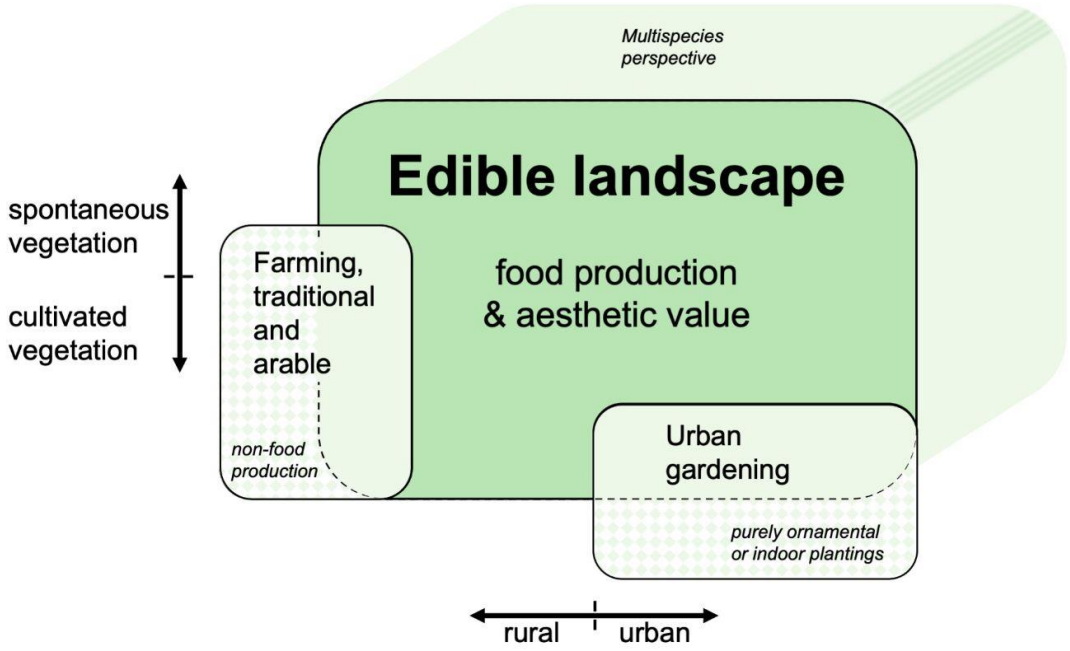
The concept of edible landscapes seeks to combine a participatory approach to food production with wider concerns about well-designed, sustainable human-landscape relationships. Despite its decade-long history and seeming potential for holistically addressing multiple intertwined socio-ecological crises, the concept has received much less attention than related ideas such as green infrastructure or nature-based solutions. We conducted a systematic, multilingual review of 79 studies to understand how edible landscapes are defined, what their characteristics are, what trends exist in the literature, and how edible landscapes can be situated in the broader context of food production. Findings suggest that no clear definition of the term ‘edible landscape’ currently exists, although the implicit consensus is that edible landscapes feature food production as well as an aesthetic contribution. The literature holds high expectations but provides only limited empirical evidence for benefits. Edible landscape frames a unique conceptual space, which we visualize by placing it in relation with related concepts. We then propose two concise, genus-differentia definitions as a basis for academic debate, one of which expands the concept to include multispecies agency in designing landscapes. We conclude with a call for more empirical as well as theory-focused research to facilitate edible landscapes’ contributions to more sustainable human-nature relationships.

Keywords
Food system
Sustainability
Urban agriculture
Rurban
Commons
Landscape planning

Highlights

- Analyzed 79 publications in a multilingual, systematic review
- Edible landscape concept offers to bridge binary divisions
- Proposing the missing concise definition of the edible landscape concept
- Illustrating the boundaries between edible landscape and related concepts

Graphical abstract



1. Introduction

What landscape might a radical transformation of agrifood systems towards sustainability produce? A broad coalition of scientists and stakeholders call for holistic approaches to address rapidly deepening socio-ecological crises. In this context, researchers working on agrifood systems increasingly scrutinize how widely applied concepts such as green infrastructure and commons can be applied to rethink food production and consumption. In this paper we re-examine edible landscapes (EL) – a central concept that predates green infrastructure and was proposed as a holistic solution to the human need for healthy food, encompassing both cultural and environmental aspects of human-landscape interactions. Through a systematic, multilingual review we analyze the term's definition (or lack thereof), what we might learn from trends in the literature, and how EL is situated in relation to related terms. We conclude by discussing geographical differences in EL research and propose a preliminary new definition from which new avenues for EL research arise, positioning the concept again as central to rapidly changing global landscapes of food production.

A broad scientific consensus urges the transformation of global food systems (FAO et al., 2021; Intergovernmental Panel on Climate Change, 2022). Industrial agriculture in particular drives climate change, biodiversity loss through habitat destruction and poor health outcomes, while being linked to the emergence of new diseases and heightened risk of pandemics (Horrigan et al., 2002; Rohr et al., 2019). A systems perspective emphasizes just how complex and intertwined food and agriculture related knowledge, institutions, infrastructures and practices are, linking consumption and production in ways that inhibit systemic change (McGreevy et al., 2022). These effects are even visible in the way consumers struggle to imagine how different food futures and personal relationships with food production and consumption might look like (McGreevy, forthcoming). In regard to cities, ecological footprint analysis suggests economic decentralization alongside localizing food production to alleviate the outsized per-capita environmental impact of urbanized areas (Tsuchiya et al., 2021). At the same time, research reveals how ongoing traditional and newly emerging practices of small-scale food production point toward how more sustainable food systems might function (McGreevy et al., 2022).

Alternative approaches to food production form a group with eclectic underlying philosophies yet similar in their affinity with what McGreevy and colleagues (2022) call principles of a post-growth metabolism (Figure 1). Examples include agroecology (Altieri, 1995), peasant farming (van der Ploeg, 2013), permaculture (Roux-Rosier et al., 2018), urban gardening (Jehlička et al., 2019), urban agriculture (McClintock, 2010), urban foraging (R. J. McLain et al., 2014; Shackleton et al., 2017), edible green infrastructure (Russo et al., 2017), agroforestry (Saha et al., 2011), edible commons (Sardeshpande et al., 2020), edible cities and edible landscapes (Artmann et al., 2020; R. McLain et al., 2012). All of these concepts are receiving increased attention as potential solutions for a wide range of problems from sustainability to ecosystems and conservation, health, food systems and planning. As such, all concepts can be seen as spanning not only disciplines but also different levels of discourse from local to regional, national and global. Considerable differences exist both in the degree to which the concepts have been

clearly defined and whether they have been analyzed through academic or even systematic reviews (Table 1). More than just an academic exercise, defining and situating the diversity of overlapping yet subtly different concepts is vital to understand how they might contribute to sustainability transformations.

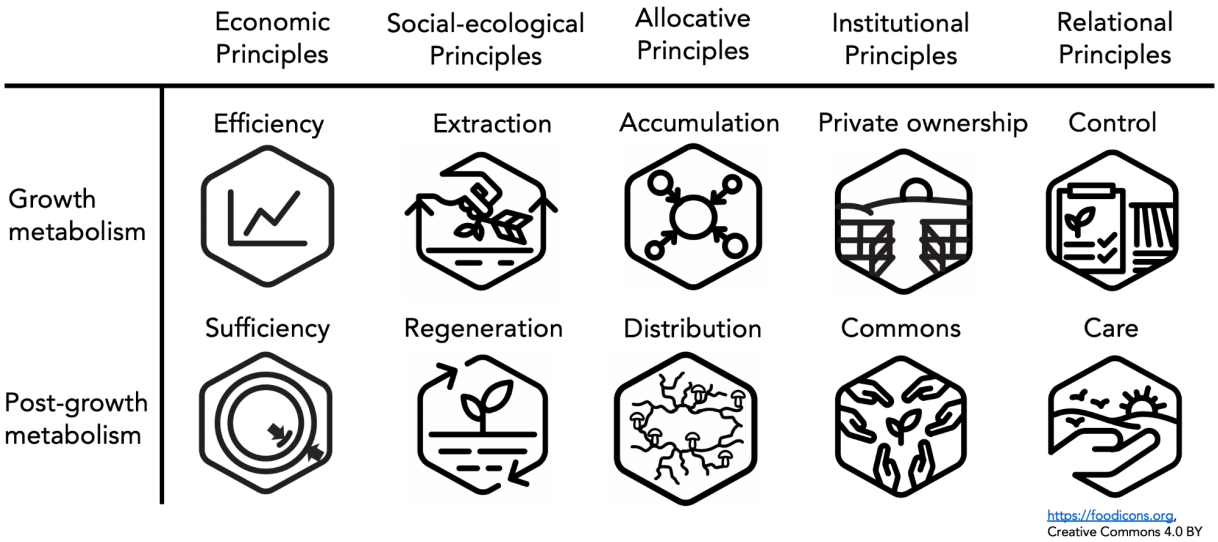


Figure 1 Comparison of principles of growth and post-growth metabolisms (after (McGreevy et al., 2022)).

Table 1. Definitions and reviews of alternative approaches to food production

Term	**Definition**	**Literature reviews**
Agroecology	Integration of research, education, action and change that brings sustainability to all parts of the food system: ecological, economic, and social. It's transdisciplinary in that it values all forms of knowledge and experience in food system change. It's participatory in that it requires the involvement of all stakeholders from the farm to the table and everyone in between. And it is action-oriented because it confronts the economic and political power structures of the current industrial food system with alternative social structures and policy action. The approach is grounded in ecological thinking where a holistic, systems-level understanding of food system sustainability is required. (Gliessman, 2018)	Multiple reviews examining specific aspects, e.g. (Sachet et al., 2021)
Community gardening	Open spaces which are managed and operated by members of the local community in which food or flowers are cultivated. (D. Guitart et al., 2012)	(D. Guitart et al., 2012)
Edible city	No clear definition in the literature	none known
Edible forest (related: food forests, forest gardens)	Multistorey, perennial, polycultural food systems (Park et al., 2018); perennial polyculture that mimics a forest ecosystem (Jacke & Toensmeier, 2005)	(Park et al., 2018)
Edible green infrastructure	A sustainable planned network of edible food components and structures within the urban ecosystem which are managed and designed to provide primarily provisioning – as opposed to highly studied urban "cultural" (e.g. recreation, increased property premiums, and aesthetics) and "regulating" (e.g. air and water pollution removal, temperature regulation, and flood regulation) – Ecosystem Services. (Russo et al., 2017)	(Russo et al., 2017)
Edible landscape	No consensus definition; Creasy 1982 paraphrased by (Kinoshita et al., 1998): A landscape which brings healthy things to the table, reduces water, soil and energy use, and uses edible plants for aesthetics and good planning.	none known

Edible urban commons	Unit of an edible green infrastructure which includes any common space, natural or modified, within city and peri-urban limits, that contains naturally growing edible plants and mushrooms. (Sardeshpande et al., 2020)	none known
Permaculture	Conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy, shelter, and other material and non-material needs in a sustainable way. (Mollison, 1990)	(Ferguson & Lovell, 2014)
Socioecological production landscapes	Dynamic mosaics of habitats and land and sea uses where the harmonious human-nature interaction maintains both biodiversity and human well-being. (Nishi & Yamazaki, 2020)	Partly (Kelsch et al., 2020)
Urban agriculture, urban farming	An industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city, or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crops and livestock. (United Nations Development Programme, 1996) -------- An industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city or a metropolis, which grows and 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. (Mougeot, 2005)	(Clucas et al., 2018; Poulsen et al., 2015)
Urban foraging	The practice of harvesting or gathering raw biological resources (fungi, plants, parts of plants, invertebrate and vertebrate animals, and fish) within urban and peri-urban settings primarily for direct consumption, decoration, crafts, barter, or small-scale sale. (Shackleton et al., 2017)	(Sardeshpande & Shackleton, 2019; Shackleton et al., 2017)
Urban gardening	No clear definition; variations based on language (Ernwein, 2014)	E.g. (Garcia et al., 2018)

Among these, the concept of EL stands out for several reasons. EL potentially transcends the strict divide between city and countryside through the notion of land use gradients and relations (rather than objects) that landscape as a perspective entails. A landscape approach and its focus on the land, its form, its inhabitants and their interactions, can look beyond the power of abstractions such as administrative borders to stay grounded in physical and bioregional reality. Perhaps it is this feature that allows residents to imagine and create intriguing spaces otherwise absent in the urban matrix with edible plants, fungi and animals. But perhaps it is also why such spaces tend to suffer from friction with regulations and administrative powers, often causing them to be forcefully destroyed (“Council Chops down Fruit Trees in Urban Food Street Precinct,” 2017; Rupprecht & Byrne, 2017). EL thus may hold not only the potential for challenging existing notions of organizing urban space, but could also represent a concept and technique to facilitate transformations of the urban fabric to incorporate generative elements in local food systems. Moreover, in light of recent research reexamining cities as home to more-than-human inhabitants (Houston et al., 2017; Maller, 2021) as well as calls to acknowledge the interdependence of human and nonhuman well-being in sustainability transformations (Rupprecht et al., 2020), questions arise around how urban landscapes can be made ‘edible’ and habitable for other species such as pollinators.

Decades after the idea was first proposed in the literature (Haag, 1980), EL remains without a shared definition. Despite increasing attention for ELs and their potential among researchers and practitioners alike, the term is frequently used with the implication that readers will have an image of what the term means. Beyond an early and somewhat influential description by Rosalind Creasy of EL as “landscape which brings healthy things to the table, reduces water,

soil and energy use, and uses edible plants for aesthetics and good planning" (Creasy 1982 in (Kinoshita et al., 1998), the core commonality among definitions assessed here is tied to the term itself, namely that EL should be edible while featuring landscaping. Moreover, the scholarly literature appears scattered, and to the best of our knowledge we currently lack a review of what characterizes EL. To provide an overview of the literature as well as propose a preliminary definition of EL to further future study, we take up this task and examine the following research questions:

1. What trends are visible in the EL literature (temporal, spatial, linguistic)?
2. How does the literature situate EL in relation to relevant fields of study (sustainability, ecosystems and conservation, health, food systems, planning, multispecies)?
3. How is the term edible landscape defined in the literature?
4. How can EL be situated in the context of related concepts?

2. Methods

We conducted a four-step literature review to identify, classify and summarize scholarly journal articles and book chapters on EL and to delimit 'edible landscape' from related terms. As past systematic reviews have revealed that relevant studies are often published in many languages (Rupprecht & Byrne, 2014, 2014), we designed this study to include five languages (English, Japanese, Chinese, Korean and German). Beyond the obvious need to explore literature on EL in English, Japan, China, Korea, and Germany are active sites for urban agriculture and urban greening both historically and in recent years. In the initial step, we conducted a scoping overview of publications on EL and related terms in the study languages, collecting synonyms, generalizations or specializations of 'edible landscape', such as 'urban gardening' or 'edible cities'. The scoping overview was conducted via Google Scholar due to its extensive search space and inclusion of non-peer-reviewed publications. We performed a set of queries on Google scholar and captured the number of publications per term in English and German as exemplary languages to compile a quantitative overview of publication mass. For each Google scholar query we applied filters to restrict the results to one study language at a time. We applied the 'allintitle' query predicate to constrain the search term presence to the publication title, in either singular or plural form of the respective search language.

The second step was a systematic review of peer-reviewed publications on EL in English. For this step, the abstract and citation database Scopus was used to generate a set of peer-reviewed papers for analysis. Scopus was selected over Google Scholar due to the latter's inclusion of irrelevant hits and issues around replicability of searches (Jacsó, 2008; Pieper et al., 2021). Scopus search was restricted to academic articles containing the search term 'edible landscape' in the title, the abstract or keywords with the intention to identify the maximum set of papers containing the search term while omitting papers that contain the search term only as part of the references. Every publication from the results list was then assessed individually, selecting papers for full analysis that substantially engaged with EL beyond throwaway references or single mentions, and excluding all others. For each selected paper, the definition

and main findings related to EL were recorded along with the geographical location of the study and the indicator whether the study was in an urban or rural setting. Papers were also screened for whether the overall work addressed sustainability, ecosystem, health, food system, planning or multispecies aspects. These themes were selected to understand how the academic literature situated EL within the academic fields most relevant to the topic. Sustainability refers to ecological, social, and economic aspects of EL as used in sustainability science. Ecosystem represents ecological and biological considerations including conservation and biodiversity. Health includes physical and mental aspects of health including well-being and contributions to diet and nutrition. The food system theme indicates the role EL might play in overall food production and consumption from a systems perspective. Planning encompasses urban and regional planning as well as governance. The term multispecies refers to an emerging paradigm of analysis focusing specifically on the relations between living beings (Locke & Muenster, 2015), and for the purpose of screening articles was interpreted widely to cover aspects from bird or pollinator services to environmental education benefits such as children-insect interactions.

In step three, systematic reviews were performed on peer-reviewed publications for both the English term and the closest translations of ‘edible landscape' into Japanese (‘エディブル・ランドスケープ’), Chinese (‘可食景观’), Korean (‘식용경관/에더블 랜드스케이프’) and German (‘Essbare Landschaft’). For Japanese, we searched J-STAGE and CiNii databases. For Chinese, we searched CNKI, and KoreaScience for the literature in Korean. The search was deliberately limited to EL rather than incorporating adjacent concepts (see Table 1) to identify a core body of literature. However, for this reason historical or traditional terms in Japanese, Chinese, Korean, and German that may be closely related in meaning with EL are beyond the scope of this study.

The fourth and final step of the systematic review consisted of a delimitation analysis of related terms. Based on the results of the previous steps, a catalog of potential differentiation criteria was collected. For each related term of ‘edible landscape' a search for review papers was performed to capture the state of definition of the respective term as well as the values of the differentiation criteria. The different concepts and their characteristics were then reviewed by the interdisciplinary team of authors until consensus was reached. Based on this term review, a core set of concepts related to landscape and EL was visualized, and concrete examples were mapped onto the conceptual diagram. For the quantitative analysis and visualization of results, we used the R programming language and in particular the package 'ComplexUpset' (Michał Krassowski et al., 2021).

3. Results

3.1 Systematic review: quantitative overview

A total of 144 publications were considered for the systematic review. Out of these, 79 publications were included in the set for detailed assessment. While the earliest publication in the set dates back to 1998, half of the assessed publications were published between 2019 and 2022 (Figure2). Of those, 40 articles were published in English, 28 in Chinese, and 11 in Japanese. No publications in German or Korean qualified for detailed assessment (see Figure 3). Regarding the geographical context in which the topic of edible landscape is discussed, a clear majority (77.8%) related to case studies in Asia, followed by the Americas (11.1%) and Europe (9.7%). Publications referred to case studies and the context of 21 distinct countries. The countries with the highest representation are China (31 publications) and Japan (10 publications). Out of the 79 publications, 49 named a geographical reference to a particular city or area whereas 30 publications discuss EL independent of specific locations. The cities referenced in the individual case studies are depicted in Figure 4.

For the studied community settings, 77.2% of the publications related to an urban setting, but only 6.3% relate to a rural setting. The remainder of publications relate to both urban and rural contexts or to peri-urban contexts or do not specify the setting.

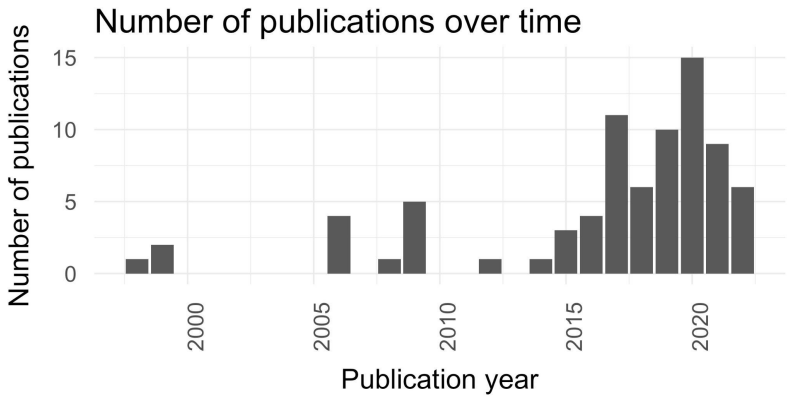


Figure 2. Number of publications (N=144) on 'Edible landscape' throughout years 1998-2022

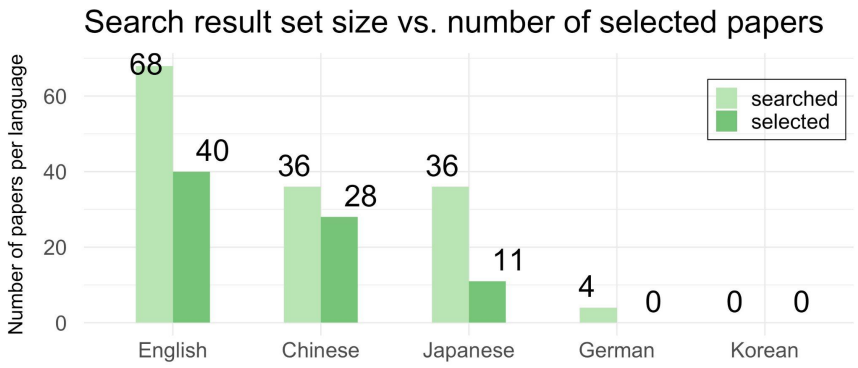


Figure 3. Search result set size (N=145) and number of selected papers (n=79) per language

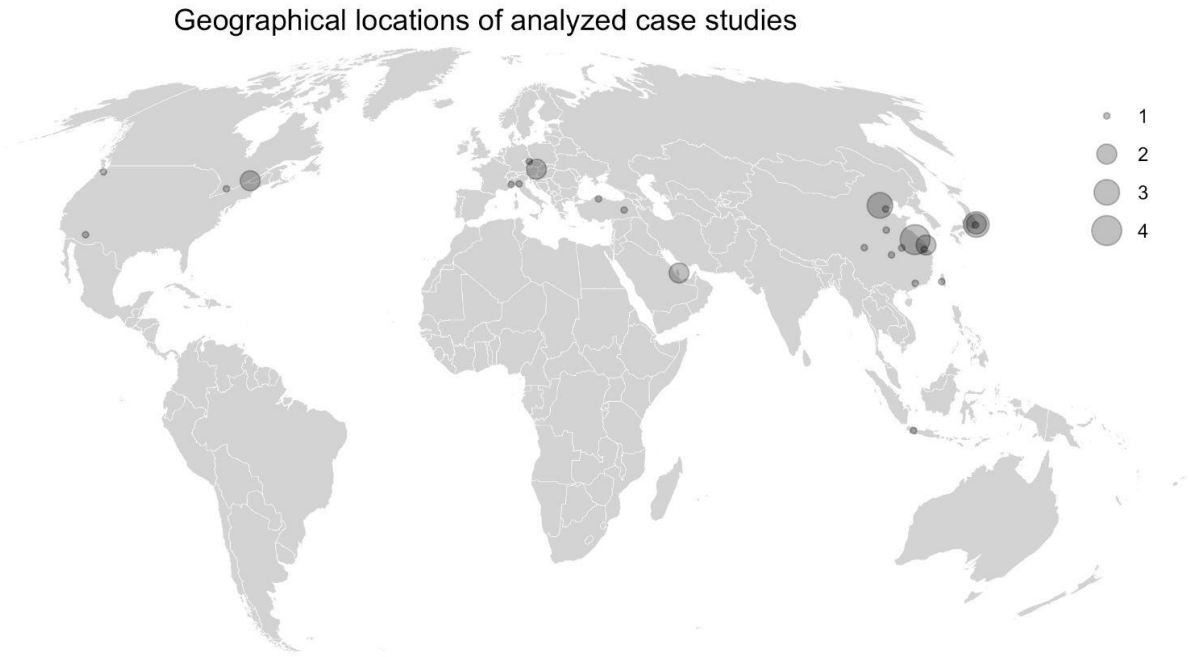


Figure 4. World map with cities represented in the analyzed case studies (n=49). Circle diameters represent the number of case studies per location.

The classification of publications with respect to topic indicators shows a spreaded distribution. Out of the 128 possible combinations of topic indicators, 49 were actually observed in the set of studied publications (see Figure 5). On average, each publication relates to 3.3 of the assessed topics. Of the assessed topics, ‘food systems’ was most widely addressed with 46 publications, followed by ‘planning’ with 45, ‘ecosystem’ with 42 and ‘sustainability’ with 39 references. The topics ‘health’ and ‘multispecies’ are referred to in less than half of the assessed publications. For 34 publications an ‘other’ topic was observed than the predefined topics. The most common

other topics were community (8 publications), economic value (4 publications) and agri-tourism (3 publications).

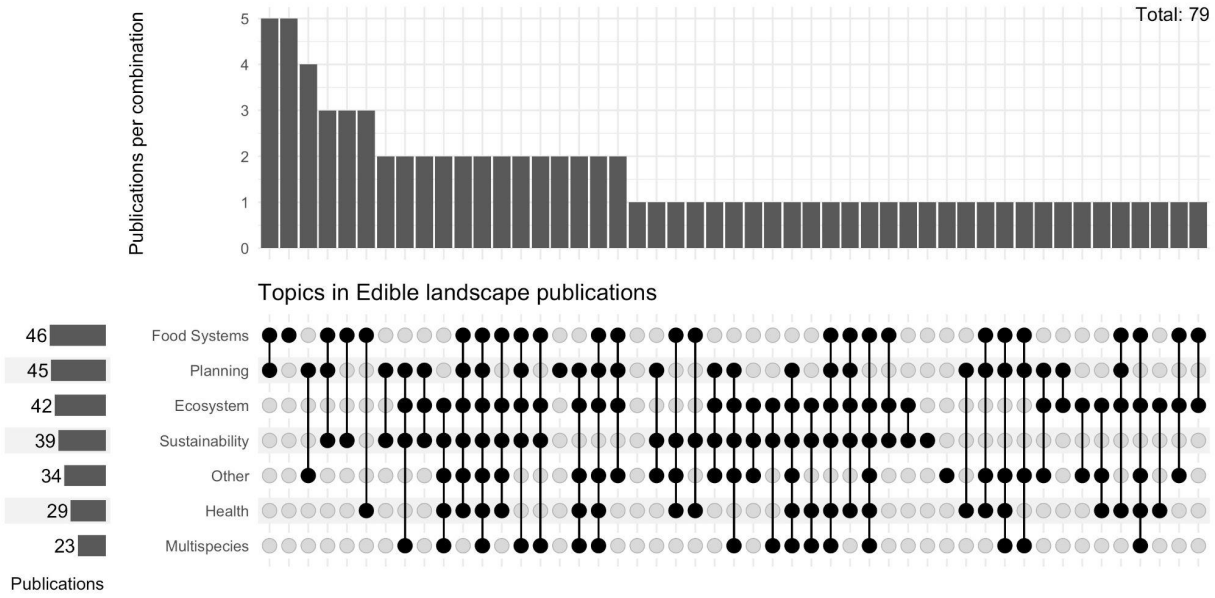


Figure 5. Co-occurrence of selected topics in the selected publications (n=79) on 'edible landscape'

3.2 Systematic review: synthesis of findings

A synthesis of overall findings from the reviewed studies revealed two major insights beyond observations regarding the pre-selected topics. Firstly, the broad and inclusive nature of the EL concept encourages applying a holistic approach to its many related contexts. Authors thus combined diverse socio-ecological, spatial and temporal aspects in their studies. A notable example is the first study published in Japan, where Kinoshita and colleagues (Kinoshita et al., 1998) trace historical land use change, how people's relationship with the landscape changed over three generations, inventoried what produce was available followed by a qualitative study of what these fruits and vegetables mean to residents, considered planning-relating inhibiting factors and reported on participatory workshop results. It is likely that some authors selected EL for this purpose, whereas others used EL as a lens to reveal complex relations that might otherwise have been overlooked. Secondly, even studies not explicitly discussing community-related topics noted the social implications of EL. This suggests an emphasis on food and landscape not limited to production or consumption alone and that EL has can go beyond established community-building aspects of urban planning. These two major insights were also reflected across the pre-selected themes in the form of both evidence (e.g. empirical

studies of EL characteristics and impacts) and expectations (e.g. outlining potential current or future impacts) for EL.

The seven distinct topics we screened the EL literature for were further analyzed individually (Figure 5). For food systems, bridging the consumer-producer divide, localizing food production, increased food security and grounding food systems socially and ecologically in local communities emerged as themes. For planning, many authors explored how edibility invites people to engage with the landscape more and in new ways. But EL planning was also associated with potentially heightened costs for management, and with institutional challenges around the use of public land. Such challenges included examples of public backlash against edible approaches. For ecosystems and sustainability, EL was widely expected to improve environmental outcomes of landscaping through reduced use of pesticides, water, soil and energy. For health, improved access to nutrition during everyday life as well as in disaster situations was noted alongside benefits of increased social interaction. For multispecies, designing landscapes to provide services for other species (e.g. birds or pollinators) as well as opportunities for multispecies encounters (including educational effects) were discussed in the literature. Overall, however, expressed expectations outweighed presented evidence, a point we will return to in our discussion of directions for future research.

3.3 Systematic review: defining EL

The systematic review confirmed that no widely used consensus definition of EL exists in the languages we examined. A tentative consensus appears to exist around the notion that EL should be both edible and aesthetic, the latter reflecting intentional human design which can be traced back to notions of landscape as designed space. The scenic value of EL is emphasized to distinguish the concept from related terms such as urban agriculture. Japanese articles in particular, likely influenced by early work of Isami Kinoshita and colleagues (Eguchi et al., 2020; Kinoshita, 1999; Kinoshita et al., 1998; Kinoshita & Yoshikawa, 1999), tended to cite Creasy's (1982) more detailed definition of EL. However, overall many reviewed studies failed to provide any definition of EL, apparently assuming readers would intuitively understand what was referred to, or defined EL not by their content but by their expectations of the landscape or spaces (Supplementary File 1). Absent in turn are places or approaches not thought about when the term EL is used but raise interesting questions, such as farms and livestock as well as viewing edibility from a non-human perspective. We further consider this point in the discussion.

3.4 Situating the edible landscape concept

Based on our systematic review of the literature, we compared characteristics of EL with definitions and of related concepts introduced in Table 1. In the next step, we expanded the table by looking beyond definitions at characteristics of the various concepts (Table 2). This revealed a set of differences around notions of space. While agroecology and agroforestry have recently been discussed in urban contexts, they remain rooted in rural discourses (Dagar & Tewari, 2017; Egerer & Cohen, 2020). Urban agriculture and edible green infrastructure are mainly situated within existing frameworks of urban land use planning (Oda et al., 2018). In

contrast, urban foraging and edible commons tend to defy such “thinking in lots”, either ignoring (foraging) or challenging (commons) notions of property and ownership deeply ingrained in urban planning processes (Sardeshpande et al., 2020; Shackleton et al., 2017). The concept of the edible city, in turn, asks us to reimagine urban space as designed to address eating as a basic human need, thereby questioning the urban-rural role of cities as spaces of food consumption supported by (increasingly globalized) rural spaces of production. Nevertheless, the term edible city still implies an abstract and/or tangible border, thereby retaining a basic if weakened urban-rural dualism.

Table 2. Properties of related concepts

Term	Goal/ intention	Term/ type	Urban vs rural focus	Land (private/commons)	Planted vs spontaneous	Economic orientation	Multispecies
Agroecology	sustainable, holistic food production	academic field social practice	rural (lately expanding to urban)	private	planted and spontaneous	yes, but not only	yes
Community gardening	food production plus aesthetic value	cultivation practice	urban	commons	planted	no	no
Edible city	food supply	greenspace planning paradigm	urban	private and commons	planted and spontaneous	no	potentially
Edible forest (related: food forests, forest gardens)	food production plus recreation	land use paradigm? food system?	urban	commons (mainly)	planted and spontaneous	no	potentially
Edible green infrastructure	food production	planning paradigm	urban	private and commons	mainly planted ("designed")	no	no
Edible landscape	food production plus aesthetic value	land use paradigm; food system	urban to rural gradient	private and commons	planted and spontaneous	no	potentially
Edible urban commons	food supply	greenspace planning paradigm	urban to peri-urban	commons	planted and spontaneous	no	potentially
Permaculture	sustainable food production	cultivation practice	agnostic	agnostic	planted	partially	yes
Socioecological production landscapes	food production	land use type	rural	private and commons	planted and spontaneous	yes	yes
Urban agriculture, urban farming	food production	cultivation practice land use type	urban to peri-urban	private	planted	yes, but depending on definition	no
Urban foraging	food supply	food procurement activity	urban	commons (mainly)	planted and spontaneous	no	no
Urban gardening	aesthetic value and leisure, plus food production	cultivation practice	urban	private and commons	planted	no	potentially

We also found that despite considerable overlap between the various concepts, EL frames a unique conceptual space. To visualize this conceptual space and its boundaries we created an Euler diagram in which each rectangle represents one term (Figure 5). On the horizontal axis, rectangles are arranged along a schematic rural-urban gradient, where mainly rural concepts tend to be located on the left and more urban concepts towards the right. The Euler diagram aims to make components of EL and lines of demarcation with related concepts tangible. In Table 3 we present examples for each and every area in the diagram including the areas denoting the overlaps between terms.

On the rural end of the spectrum, edible forests are part of the EL. Arable farming and traditional farming in socioecological production landscapes are mainly aimed at food production and thus also mainly part of the EL. However, farming of non-food products such as biofuels is not part of the EL because it meets neither the criterion of producing edible products nor does it necessarily contribute to the aesthetics of the landscape. On the urban end, the overlap between EL and urban gardening includes all structures and activities with food plant cultivation in an urban setting. The overlap corresponds to the edible green infrastructure. The edible city is partially represented by the EL and urban gardening overlap. However, the edible city extends beyond the landscape boundary due to indoor cultivation practices such as plant factories. Urban gardening emcompasses further components that are not part of the EL, such as the cultivation of plantings for purely decorative purposes.

The diagram has several important caveats: 1) the gradient must not be understood as a precise x-axis, 2) area coloring and pattern fill do not carry a semantic meaning but are applied as a visual aid when rectangles share borderlines, 3) the areas of the individual sets were chosen for best readability of the diagram and do not represent any quantifiable measure such as importance, number of publications on the topic or similar, 4) we make no claim of completeness for the diagram, but rather propose it as a starting point for a future systematic approach to the definition of all related terms.

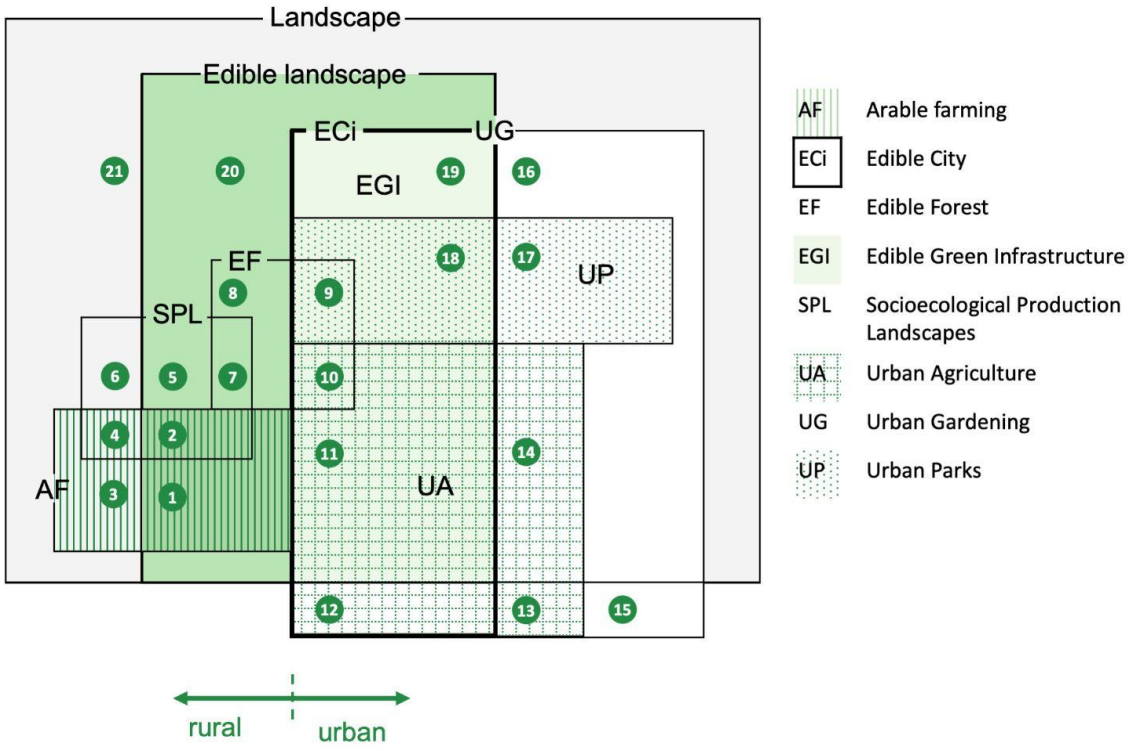


Figure 6. Edible landscape components and relationship to related systems

Table 3. Observed combinations of land use concepts with example practices

	Subset	**Examples**
1	Arable farming and EL, but not socioecological production landscapes	Industrial large scale agriculture of field crops and livestock, industrial orchards
2	Arable farming, EL and socioecological production landscapes	Vineyard landscapes, rice paddy fields in Satoyama landscapes, meadow orchards, pastoralism
3	Arable farming, but not EL and not socioecological production landscapes	Industrial large scale agricultural biofuel production
4	Arable farming and socioecological production landscapes but not EL	Fiber and other non-timber/non-forest production such as igusa (soft rush) used for tatami mats or hemp
5	Socioecological production landscapes and EL, but neither arable farming nor edible forest	Traditional cottage gardens and homegardens, high elevation grazing zones, traditional marsh fishing
6	Socioecological production landscapes, but not EL and not arable farming	Fuelwood and timber production in traditional farming systems, coppice; irrigation ponds
7	Socioecological production landscapes and edible forest	Biocultural diverse forest, forest gardens, agroforestry
8	Edible forest, but neither socioecological production landscapes nor urban gardening	Managed or wild forest with mushrooms and wild fruit foraging
9	Edible forest and urban park	Cropping tree forests in urban parks, such as fruit and nut trees

10	Edible forest and urban agriculture	Urban orchards
11	Urban agriculture and edible green infrastructure	Edible campus projects, allotment gardens, school gardens, home gardens, domestic gardens, vegetable rain gardens, urban outdoor food farms
12	Edible city, but not landscape	Vertical farming of fruit and vegetables, aquaculture
13	Urban agriculture, but not edible city and not landscape	Vertical farming of non-food crops, such as legal cannabis
14	Urban agriculture, but not edible city	Urban cut flower cultivation
15	Urban gardening, but not landscape and not urban agriculture	Decorative flower boxes
16	Urban gardening, but not urban agriculture, not urban park and not edible city	Decorative urban plantings, e.g. urban greening of traffic islands, roadside flower beds
17	Urban park, but not edible city	Urban park with the sole purpose of decoration, education or leisure, such as historical gardens, botanical gardens, playgrounds
18	Urban park and edible city	Urban parks designed with edible plants, e.g. berries and herbs
19	Edible city, but neither urban park nor urban agriculture	Spontaneous edible vegetation in the city, e.g. on vacant lots
20	EL, but not urban gardening, not arable farming, not socioecological production landscapes and not edible forest	Foraging of wild herbs, fruits and nuts in open landscapes
21	Landscape, but neither EL nor urban gardening, farming or socio-ecological production landscape	Deserts, industrial forestry and non-edible plantations (e.g. rubber trees, carbon sequestration monocultures)

4. Discussion

From urban agriculture to edible commons and urban food systems, growing in and feeding cities has become a lively topic of academic study and practice alike. In this light it is surprising that we lack not only a consensus definition for EL but have yet to engage in a healthy debate about how a useful definition as a basis for a flourishing subfield might look like. Despite a marked increase in peer-reviewed studies over the last seven years, the literature remains scattered both geographically and in terms of research approaches. On the other hand, our categorical analysis suggests the EL literature as well as the emerging field as a whole intersects with a number of themes highly relevant for urban planning, sustainability and the future of cities and the countryside.

One noticeable pattern in this literature review was a clear dominance of publications on 'edible landscape' in some East-Asian contexts. Firstly, this underscores the importance of conducting systematic reviews in languages beyond English already raised in previous research (Rupprecht et al., 2015). Secondly, it raises the questions whether and why the concept of EL seems to resonate with some East-Asian researchers and urban publics, and in contrast why the concept has not attracted more attention from academics in the Global North, who are usually overrepresented in related research. Beyond the obvious effect of including Chinese, Japanese and Korean and their special localized academic databases, we suggest two factors might contribute to the observed dominance. For Chinese and Japanese speaking academic communities, the literal translation of 'edible landscape' may be more readily adopted than in other language groups. For instance, the literal translation into the German 'Essbare Landschaft' results in no relevant academic publications at all. The scoping overview suggested that specifically for German, the concept of 'Essbare Stadt' (edible city) is used more prominently, possibly due to the lighthouse project in the city of Andernach (Kosack, 2016). In German, English terms and in particular 'urban gardening' are also commonly used as loan words.

A second reason for the dominance of publications from East Asia may be located in the way the EL concept is agnostic of the rural-urban binary and thus extends beyond purely urban contexts (Figure 5). Yokohari and colleagues (2000) have suggested that distinct histories of urban and land use planning have left some Asian cities with highly mixed land uses. As a result, wide-spread agricultural areas consisting of small-scale holdings remain even in densely built and highly urbanized areas such as the Kyoto basin (Oda et al 2018). In the case of China and its high density urban fabric, demands for farming activities and rural landscape are rising (Peng, 2020; Wang & Cao, 2019). Many of the urban residents, whose number has nearly tripled in the last three decades (World Bank, 2022), have migrated there from rural areas . In the context of rapidly aging Chinese society EL is seen as a suitable strategy to bring seniors together in community gardens and improve their social connections. EL might also offer new pathways to integrate urban and rural landscapes as part of larger sustainability transformations when considering research on Japan calling for decentralization of food production to tackle

high urban per capita ecological footprints (Tsuchiya et al., 2021). Research on rurban sustainability points in this direction (Petrescu et al. 2016).

A third possible explanation for the prominence of research from East Asia in this review are efforts in China to deploy EL as a strategy for rural development (Shi et al., 2022; Yang et al., 2020). EL here is expected to allow combining agricultural landscapes and food production with opportunities for tourism to deliver economic, educational and recreational benefits. While similar goals have been attempted in Japan through the FAO's Globally Important Agricultural Heritage Systems (GIAHS) system (Reyes et al., 2020), to our knowledge this strategy has to date not involved drawing on EL as a conceptDe.

Besides this bridging of urban-rural binaries, the concept of EL is also agnostic about the distinction between cultivated and spontaneous vegetation. Despite an apparent literature consensus that EL as a whole are designed, including foraging of spontaneous vegetation and mushrooms implies that not every element must be planted. Instead, design interventions can include modifying landscape processes to favor edible species, e.g. through removing competing plants or predators. Traditional farming and landscape management approaches such as those described in the socio-ecological production landscape concept embrace more holistic perspectives that go beyond simple notions of planting to include not only cultivation beyond the field but also traditional and ongoing foraging practices (Bharucha & Pretty, 2010; Saito et al., 2018). In this regard, recent work in anthropology challenges notions of agriculture established in Western scientific literature. Graeber and Wengrow (2021) argue that Indigenous peoples throughout the world have in the past and remain today engaged in practices of deliberate landscape management resulting in opportunities for foraging or harvesting wild food. Such blurred boundaries between agriculture, horticulture and landscape management are also identified by Kinoshita (1998) who identifies the peri-urban farmer's garden as a core element from which urban ELs in Japan then historically evolved. Returning to the defining EL, we thus propose a preliminary definition, following the genus-differentia style, that covers characteristic features of the edible landscape concept emerging from the systematic review:

'Edible landscape' is a concept for designing landscape across an urban-rural gradient
that uses both spontaneous and cultivated vegetation
and pursues the two main goals of food production and aesthetic value

However, this definition reflects merely the human side of EL. In an updated edition of her original agenda setting book, Creasy (2010) expands her initial definition of EL to accommodate wildlife. She reported how changes in management practices alone, such as refraining from cutting seed heads, can increase the utility for insects and birds. Several reviewed studies similarly mention how deliberately making the landscape more edible for non-human species, for example through providing pollinators with nectar and pollen, can in turn unlock additional benefits in the form of opportunities for environmental education. These trends point toward a shift underway in the broader understanding of EL. Yet moving from a classic anthropocentric view focused on human aesthetic perception and edibility to a multispecies notion of interdependent well-being raises new, little explored questions about the role of animals in EL.

Animals and other organisms such as fungi exist as both eating beings feeding off more-than-human EL while also being edible elements of landscapes for those feeding off them. The current literature, however, overwhelmingly focuses on plant-based food to be eaten by people, no doubt an effect of the concept's close relation with gardening and landscape as a physical place animals can absent themselves from. What role livestock including poultry and insects such as bees might play, and how this role might change human perceptions of EL in both urban and rural concepts thus emerges as a new sub-field ripe for investigation, be it from the perspectives of aesthetics, multispecies relations, sustainability, health or planning. Recent work on multispecies commoning further challenges notions of who actually participates in EL design, de-centering humans in favor of co-design approaches (Woelfle-Erskine, 2019). While a deeper enquiry of this issue is beyond the scope of this paper, we nevertheless propose our preliminary definition provided above might be amended to reflect a multispecies understanding of edible landscapes:

'Edible landscape' is a concept for more-than-human species (e.g. animals, plants, fungi, microbes) co-designing landscape across an urban-rural gradient
centered around both spontaneous and cultivated vegetation
and pursuing the main goals of more-than-human food production and aesthetic value for humans.

Note that we here substitute the term 'multispecies' with 'more-than-human' to emphasize that EL does always refer to cases where humans are involved in co-design, and where at least parts of the landscape are edible for humans. Adding the more-than-human dimension conceptually places EL in the vicinity of work on biocultural diversity (Maffi, 2001; Plieninger et al., 2018), the notion that human diversity and biodiversity are linked. EL thus appears to be situated well to answer calls for reconsidering anthropocentric notions such as nature-based solutions through more-than-human thinking (Maller, 2021).

This study has a number of limitations. While our systematic review included languages beyond English, we were unable to include other major languages of scientific discourse such as Spanish or French, in turn preventing us from making any claims about EL research in regions such as South America and most parts of Africa. The lack of a consensus definition drove our decision to select studies via a strict search term criteria. The review was limited to peer-reviewed literature and thus no systematic search was performed for gray literature such as reports. In our analysis of EL adjacent concepts we opted to exclude less prevalent ones such as continuous urban production landscapes or those already represented by other concepts such as the Japanese satoyama as a type of socioecological production landscape. The high heterogeneity of approaches in studies reviewed did not allow for quantitative metaanalysis.

Given these limitations, we outline some promising directions for future research. First, future work should explore wider linguistic and geographic contexts. Beyond widening the scope to other major languages of academic literature such as Spanish, French and Russian, care is required not to overlook knowledge and practices shared outside peer-reviewed journal articles. Identifying EL practices by utilizing our proposed definition rather than just the term might

uncover a wider group of studies in fact if not in name. Second, a typology of EL spaces similar to that proposed for informal greenspaces (Rupprecht & Byrne, 2014) might allow studies to move beyond case studies towards comprehensive assessments and subsequently systematic comparisons. Empirical studies of EL characteristics (e.g. species communities, design elements, food production), impacts (e.g. ecosystem and cultural services, contributions to pollinators, air and soil microbiota) alongside ambitious pilot projects are needed to understand how the potential of EL the literature agrees upon can be unlocked. Third, in contrast to urban agriculture or green infrastructure, conceptual and theoretical work on the role and potential of EL remains scarce. Such work seems well-positioned to contribute to larger agrifood system sustainability transformations as well as global environmental challenges such as biodiversity conservation and climate change. Work on the urban-rural, cultivated-spontaneous, and multispecies aspects of EL arisen from this article will likely prove to be fertile ground for future research. Finally, as outlined above, EL have inherent points of friction with existing land use governance structures, such as potentially higher management costs or conflicts around distribution of produce and benefits. We must learn how such barriers to implementation can be overcome. However, addressing these points of friction might also provide new opportunities for updating related governance processes and institutions. For example, increased management costs might not only be financially outweighed by flow-on health benefits from improved nutritional access and reduced health insurance costs (D. A. Guitart et al., 2014), but prompt a shift in thinking from infrastructure as government-managed to landscape stewardship (Rupprecht, 2020). Urban, peri-urban, rurban, rural and regional landscape planning research into EL and their potential integration into such structures could thus further facilitate unlocking its benefits for humans and nonhumans alike.

5. Conclusion

This work presents a systematic literature review of 79 academic publications on edible landscapes in English, Chinese, Japanese, German and Korean. We found that EL is commonly considered in food systems, planning, ecosystem and sustainability contexts. Expected benefits outweighed evidence, pointing towards a need for more empirical studies. The role of animals in the edible landscape was barely addressed. The literature failed to provide a concise consensus definition of ‘edible landscape’ but defined EL mainly on the expectations of being beautiful and producing food.

The contributions of this work are three-fold. First, we detailed properties of the edible landscape and related concepts. Tangible criteria for differentiating between the concepts include their urban versus rural focus, the use of private versus common land, the consideration of planted versus spontaneous vegetation, inclusion of a multispecies perspective and economic orientation. In addition, we visualized how EL is situated in comparison to adjacent concepts, supported by a list of examples. Second, we summarized the common denominator of the understandings of edible landscape into a genus-differentia definition. The proposed definition enriches the previous expectation based definitions by naming key values of the

differentiating criteria. In particular, the EL is understood to extend space designs to the whole urban-rural gradient and to be inclusive of both spontaneous and cultivated vegetation.
Third, we point out limitations in the status quo definition and propose an enhanced definition encompassing a multispecies perspective. Directions for future research include a wider linguistic and geographic assessment of the literature, improved empirical evidence including systematic comparisons, and work on conceptual and theoretical backgrounds of the role and potential of edible landscapes.

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