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Exploring the transformative potential of urban food

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Urban food is a key lever for transformative change towards sustainability. While research reporting on the urban food practices (UFPs) in support of sustainability is increasing, the link towards transformative potential is lacking. This is because research on urban food is often place-based and contextual. This limits the applicability of insights to large-scale sustainability transformations. This paper describes UFPs that aim to contribute to transformative change. We present signposts for potential change based on the types of intended transformative changes as described in the reviewed literature based on the processes and outcomes of the urban food policies and programmes. Secondly, we classify diverse UFPs to elevate them beyond their local, place-based contexts. We find that UFPs carry a lot of potential to facilitate sustainability transformations. Based on that analysis, we provide insights on how urban food research can further contribute to harnessing the transformative potential of UFPs for actionable purposes.

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INTRODUCTION

Urban food is regarded as a promising lever for transformative change towards sustainability^{1–3}. There are two main reasons for this. First, cities are considered hotbeds for alternative practices and experimentation^{4,5}, which are vital to address the urgent sustainability challenges cities face⁶. Second, food links to diverse domains such as ecological, political, social, health and economic systems^{7,8}. Acknowledging this potential, a shift towards considering urban food practice (UFP) for the design of sustainable cities is visible in both research and policy^{9–13}.

The field of urban food research itself is still emergent. Initially food was considered mostly an agricultural and ‘rural affair’, and not an urban issue¹⁴. This thinking has shifted since the seminal work by Pothukuchi and Kaufman¹³, that highlighted how urban food had the potential to increase quality of urban life across diverse domains. This was the start of a turn towards consideration of food as something that connects the urban and rural¹⁴ and as nested in a wider system¹⁵. This development sparked interest in urban food across various disciplinary communities, leading to a proliferation of research with diverse focal points in urban food, such as planning^{16,17}, policy making^{18,19}, diverse farming practices²⁰ and social justice²¹. While this research was first aimed at better understanding and documenting the rise of these food practices^{20,22}, more recently studies explore how alternative UFPs can be used to leverage cities towards sustainability in multiple ways^{12,23}.

UFPs encompass activities that are directly related to food such as growing, serving, designing policies for and about food, and other activities that take place in urban food systems^{23,24}. While the research is beginning to better understand UFPs, evaluation of their potential for transformation is still done at the individual case level (see Supplementary References for examples). Looking at single initiatives makes it difficult to evaluate the collective contribution of alternative UFPs to large-scale systematic change^{25–27} and to distil broader insights for sustainability

governance. How UFPs can be leveraged for sustainability governance has yet to be demonstrated^{12,28}.

This paper describes UFPs that aim to contribute to transformative change. We present signposts for potential change based on the types of intended transformative changes as described in the reviewed literature based on the processes and outcomes of the urban food policies and programmes. We use the metaphor of ‘signposts’ towards transformation (rather than realised transformative change) as possible indicators for processes towards transformative change (see Supplementary Note 1 for a Glossary). These signposts include processes and outcomes that are considered essential for transformative change within food systems in the literature²⁹, which we pool from an assortment of urban food literature. Second, to make better sense of the diversity we cluster the urban food literature into broad categories of practices, to elevate the findings on signposts beyond single cases. Finally, we elaborate how our findings relate to the emergent field of urban food and discuss avenues for future research.

Transformations research is a fast-growing field and is characterised by multi-disciplinary influences, incorporating insights from diverse research communities including social-ecological systems, transitions, political ecology and earth system governance³⁰. Transformations are broadly understood as ‘fundamental change’ that affects the structures, functioning and interrelations of a given system^{31–33}. Different schools of thought have various understandings of how such fundamental change happens. For example, transformation can be sparked by abrupt changes that present tipping points towards fundamentally new systems^{34–36}, can occur through the accumulation of small wins which add up incrementally to a larger shift³⁷, or it can be brought about by alternative ‘niche’ practices that manage to overthrow the dominance of mainstream ‘regime’ practices and give shape to a new system^{25,38}. Others have conceptualised transformation as processes that build on the diversity of existing, positive and innovative ways forward as a way (also understood as ‘seeds’ of the future) to ‘sustain and amplify’ existing initiatives towards

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transformation³⁹. From a 'seeds' approach, transformations can emerge as the result of multiple small-scale, experimental initiatives that build up over time, coalesce, mutually reinforce each other and use opportunities for change to become incorporated at higher scales^{40,41}. The approach's theory of change builds on the theories of transformations in social-ecological and socio-technical systems, viewing transformations as dynamic, multi-stage processes, with interactions across scales^{26,42}. In this paper, we approach UFPs through the latter approach and explore individual UFPs with the aim to better understand how transformative processes occur.

RESULTS

A descriptive analysis of the literature reviewed

Figure 1 shows the distribution of the reviewed articles and the UFPs they reported on over time. Two-thirds of the initiatives can be classified as (peri-)urban agriculture (30%), community gardens (24%) or food policy initiatives (21%), with the remaining one-third shared between food justice organisations (11%), short food chain initiatives (7%) and care and educational initiatives (6%). These studies came from Europe and North America (67%), Africa (14%) and the rest of the continents account for the remaining 19%. Over 72% of the studies are performed at the city and city regional spatial scales, with the remaining 28% spread across neighbourhood, peri-urban, community gardens and other scales (e.g. rooftops).

Most of the papers used qualitative methods (66%), with the rest using mixed methods (29%) and quantitative methods (5%). Papers also spread across several disciplines including social sciences (30%), urban studies (16%), political and interdisciplinary (15%), environmental studies (12%) and the remaining 11% shared by development studies, health studies and economic studies. These studies also used a variety of methods, reflecting this diversity of disciplines (see Fig. 2). An extended descriptive analysis is included in Supplementary Note 2.

A wide variety of actors including civil society actors (20%), public actors (17%), residents and citizens (16%) and producers (12%), among others (such as elderly and the poor) were represented, attesting to the grassroots nature of most of these initiatives (see Supplementary Table 2 for descriptions of actor categories).

Signalling transformative change in urban food practices

We demonstrate that urban food has potential to support transformative change in various ways (Table 1). Across all reviewed literature, our signposts for transformation (processes and outcomes) are represented in the UFPs presented there,

showing merit to the promise of urban food. However, some are better represented than others.

The most represented transformative processes are the 'use of participatory approaches' (32 papers, numbers henceforth represent the number of papers) and the 'creation of spatial synergies' (26). This shows that UFPs use some of urban food's key characteristics, such as the ability of food to connect to diverse domains with the aim to create synergies, and as well as its ability to connect to a broad range of actors. Second, the most represented outcomes are the 'increased reconnection to nature' (29) and increased ecological resilience (23), showing the potential of urban food to contribute to environmental awareness and sustainable practices. Also well represented is 'increased self-sufficiency' (28), indicating that urban food can provide place-based solutions to increase access to food, and 'connected flows of resources' (20), which can support making urban systems more circular. These processes and outcomes can be considered some of the main contributions of UFPs.

Several of the signposts such as 'adoption of a city-region perspective' (19) and 'taking an integrated approach' (17) are averagely represented across the research. These two processes indicate the potential to tap into urban-rural dynamics and to contextualise urban food into a wider system which considers various policy objectives. Some processes such as 'strategic planning for the future' (15) show the anticipatory potential to design forward-looking interventions. UFPs which aim at 'reclaiming or recreating urban space' (13), demonstrate the potential of urban food to facilitate participation in public space for urban dwellers; and those aiming to 'influence consumer decisions' (10) and raise awareness for sustainability can potentially mobilise people to take agency. Practices aiming to 'increase equity in the food chain' (19), highlight urban food as a vehicle to contribute to building justice. UFPs that contribute in 'establishing food governance arrangements' (18) are able to provide integrated strategies to address sustainability. Lastly, research also reports on urban food resulting in 'increased economic opportunities' (10) for local food system actors. These processes and outcomes were represented moderately across all reviewed literature, which indicates that while there is potential for urban food to contribute to these, they require more specific attention.

'Mobilisation of key actors' (5), 'increased social resilience' (4), 'greened urban spaces' (5), 'enhanced transparency' (7), 'changed diets' (9) and 'improved food quality' (9) are featured the least. A possible reason for key actor mobilisation lacking in the literature is because that literature is mostly focused on large, industrial actors that are conceptualised as 'keystone actors'^{43,44}, while the actors in these UFPs are often operating at a small scale, and are place based. Similar can be said about the 'enhanced transparency', which is often considered a crucial point for change for

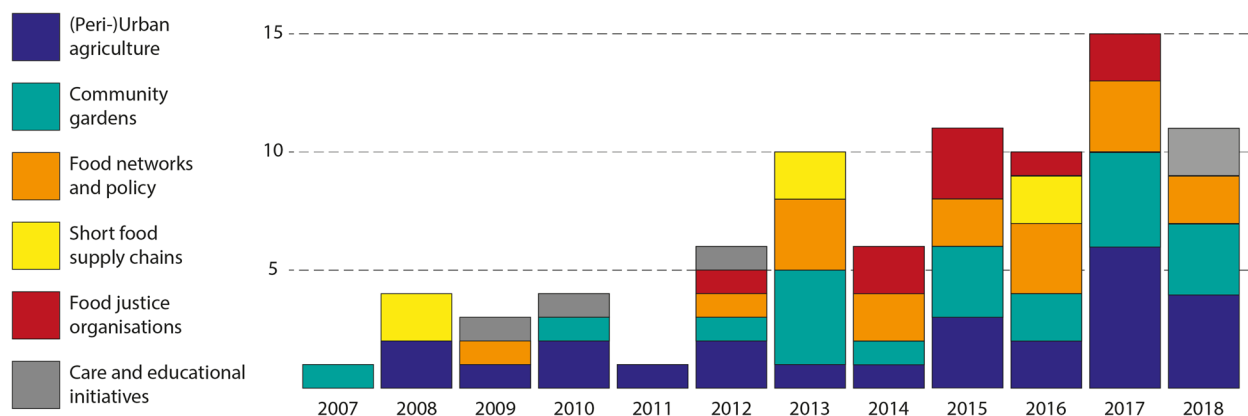


Fig. 1 Urban food practice clusters. The distribution of the reviewed articles ($n = 82$) and the urban food clusters (see Table 3) they reported on.

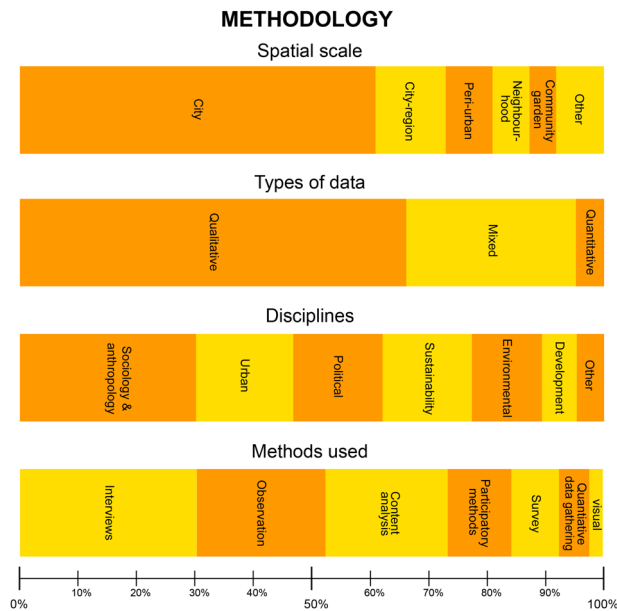


Fig. 2 Overview of spatial extent, data, methods and disciplines in the reviewed urban food literature. Descriptive analysis of the reviewed articles showing what spatial scale they focussed on, what type of data they used, what scientific disciplines they, and what methods were used in the research project. Multiple answers were possible for the spatial scale, disciplines and methods used.

larger actors, such as the food industry, wholesalers or retailers⁴⁵. Interestingly, outcomes that often come to mind when thinking of urban food, such as ‘increased social resilience’, ‘greened urban spaces’, ‘changed diets’ and ‘improved food quality’ are reported on the least in the reviewed papers. A possible reason being that the effects of urban food on these outcomes require a longer-term assessment or that the effects just were not significant. Our findings suggest that there is little potential for urban food to affect change in these topics.

Urban food practice clusters

We synthesised six categories of UFPs based on the main research focus (see Table 3). These include: (1) food networks and policy; (2) (peri-) urban agriculture; (3) short food supply chains; (4) community (and allotment) gardens; (5) care and educational food initiatives; and (6) food justice organisations (Fig. 1 and Table 1). Below we show how these individual clusters signal transformative potential.

Each cluster, except those aiming to shorten food supply chains, use between one and two transformative processes (Table 1). Participatory approaches and adopting a city-region perspective were used across all initiative types. Considering the wide-ranging number of actors involved, it is no surprise that participatory approaches are used widely. Mobilisation of actors is the least used approach, which may suggest that these initiatives are at a peer-to-peer level. The peri-urban initiatives appear to employ all eight transformative processes. However, this is in part due to the higher number of papers reviewed: they employ a similar number

Table 1. Urban food practices and their reported signposts for transformative change.

	Peri-urban agriculture	Community gardens	Food networks and policy	Food justice organisations	Short food supply chains	Care and educational initiatives	Total
Transformative processes	<i>n</i> = 25	<i>n</i> = 20	<i>n</i> = 17	<i>n</i> = 9	<i>n</i> = 6	<i>n</i> = 5	<i>n</i> = 82
Average processes per initiative	~1.5	~1.2	~2.4	~2.0	~0.8	~2.0	–
Adoption of a city-region perspective	6	4	4	3	1	1	19
Creation of spatial synergies	10	1	10	4		1	26
Influencing of consumer decisions	1		4	2		3	10
Mobilisation of key actors	1		2		1		5
Reclaiming or recreating urban space	4	7		1	1		13
Strategic planning for the future	3	5	4	2		1	15
Taking an integrated approach	4	2	8	2		1	17
Using participatory approaches	9	4	9	5	2	3	32
Transformative outcomes							
Average outcomes per initiative	~2.8	~2.0	~1.9	1.7	~1.8	~2.4	–
Changed diets	1	2	3	1		2	9
Connected flows of resources	9	4	4	1	1	1	20
Enhanced transparency	2		2	1	2		7
Established food governance arrangements	4	5	8	1			18
Greened urban spaces	2	3					5
Improved food quality	4		2		1	2	9
Increased (re-)connection to nature	12	7	3	<u>3</u>	1	3	29
Increased ecological resilience	12	3	2	<u>3</u>	2	1	23
Increased economic opportunities	4	3	1		2		10
Increased equity in the food chain	7	6	3	1	1	1	19
Increased self-sufficiency	11	6	5	4	1	1	28
Increased social resilience	2	1				1	4

For the total scoring: best reported signposts (20+) are marked in bold, averagely represented (10–19) in italic and least represented signposts (1–9) in normal font. For the individual UFPs: higher (7+) processes and outcomes are represented in bold font, medium (3–6) in italic font and low (1–2) in normal font.

of processes and achieve a similar number of outcomes on average as the other initiative types.

All types of initiatives were reported to achieve more than one and up to three potentially transformative outcomes. All types contribute to connecting flows of food-related resources to enhance circularity, to connecting people to nature by highlighting amongst others the origin of food, to increasing ecological resilience through more sustainable food production and processing methods, to increasing equity in the food chain by focussing on fair food prices and to increasing regional food self-sufficiency. Interestingly, only a limited number of initiatives are found to contribute to social resilience and greening the urban environment.

DISCUSSION

Since Pothukuchi and Kaufman's seminal paper in 1999, there has been an increase in the recognition of urban food as a site for transformation. The paper sparked diverse research communities to explore emerging urban food phenomena related to their fields, but also led to a proliferation of research departing from diverse viewpoints. We reviewed the fragmented literature on urban food practice (UFPs), in order to identify signposts for transformative change. We show that there is merit to the promise of urban food to contribute towards transformative change. Our review therefore underscores the value of urban food as a nexus for change. To help harness the transformative potential of urban food, we present three priorities for future research and policy.

First, our work points to the potential of a patchwork of transformative initiatives as a driver for broad, multidimensional change. Our analysis shows that different types of UFPs contribute to one or more transformative processes and outcomes and can therefore support transformations towards more sustainable food systems. Reflecting on diverse theories of change, we argue that several lines of exploration are needed to uncover the dynamics of change through which UFPs impact food systems.

Change is inherently a multi-scalar process⁴⁶, suggesting that when processes of change are set in motion by UFPs they might connect to and influence different scales^{47,48}. To better understand the scale character of system interactions, further interrogation of the mechanisms through which UFPs impact broader food system transformations is needed. Our analysis provides insights into the heterogeneous nature of UFPs and shows that their transformative processes and outcomes overlap (Table 1). The resilience-based understanding of diversity⁴⁹, suggests that this heterogeneity, overlap and redundancy is a potential strength, as it increases the resilience of urban systems. The diversity of UFPs is thus necessary for reducing dependency on a single initiative to bring change and instead creates a patchwork of transformative initiatives⁵⁰. To uncover the role of Urban Food Initiatives (UFIs) in increasing resilience, research unpacking the possibilities for synergies and collaboration between UFIs is needed, as well as research on their ability to withstand shocks and radical processes of change. An on-going example at the time of writing is the COVID-19 pandemic, which has likely limited many urban food initiatives while opening opportunities for others. Such lines of research also connect to the notion that 'small wins' can add up to large-scale and radical change and support the examination of the role of a coalition of diverse UFPs in adding up to food system transformation^{30,51,52}. Lastly, we argue that more forward-looking and longitudinal research engagements are needed to capture the impact of UFPs on (urban) food system change—as time is an inherent component of processes of change³³. This will help reveal the directionality of change towards sustainability and clarify who are potential winners and losers of change processes^{53,54}. The framework presented in this paper (Table 2) can serve as a foundation to reflect on transformation pathways that feature UFPs as a

patchwork, as well as explore their barriers to scaling their practices, what trade-offs they might lead to, or through what mechanisms they interact with incumbent actors.

Secondly, the different clusters of UFPs and the signposts for transformative change can provide insights to policymakers and planners. For example, on ways to address specific place-based challenges in cities through urban food and how they can better support existing UFPs. Research to interrogate the interactions between, and alignment of, more formal processes of urban food governance and UFPs is needed. Moreover, to strengthen a science-policy connection and support experimentation with diverse configurations of UFPs, we argue for reflexive monitoring, which is crucial for the development of evidence-based ways to justify spending resources on UFIs⁵². Additionally, this can contribute in providing a more concrete understanding of processes of transformation and therewith help overcome the notion's fuzziness and prevent abuse of the term as a metaphor for sustainability³².

Finally, we identified disciplinary, methodological and contextual differences between studies of urban food (Fig. 2). Despite this fragmentation of research foci, research on diverse practices can be complementary. We contend that integration of and cross-pollination of disciplines is crucial for a more comprehensive outlook on the role of UFPs. Exploring ways to integrate disparate areas without stifling research diversity will be crucial. For example, this should include newer types of UFPs such 'gastro-nomy innovators'^{55–57} and 'urban food entrepreneurs'^{58,59} which are not captured in our review. Similarly, for those included by fewer papers (e.g. care and educational initiatives) can be explored further. Our review also reveals unequal geography of the research exploring urban food system transformations, with the majority of papers in North American and Western Europe (see Supplementary Fig. 1). This imbalance in knowledge production has previously been highlighted specifically for food scholarship⁶⁰, and also more generally for sustainability research^{61–63}. As a result, this research is incapable of capturing the distinctly different contexts of UFPs worldwide and appropriately addressing the different sustainability challenges that are present in diverse contexts. Broader geographical examination of urban food systems and the UFIs that emerge within these systems is essential to utilise the urban food's potential on a global scale^{1,64}.

The potential change that urban food can induce is increasingly recognised. Through literature analysis of empirical research on UFPs and their role in furthering sustainable change, we have shown that there are diverse types of UFPs that differently contribute to transformative change. Our framing of this potential using signposts overcomes the temporal challenges that are inherent to evaluating transformative change.

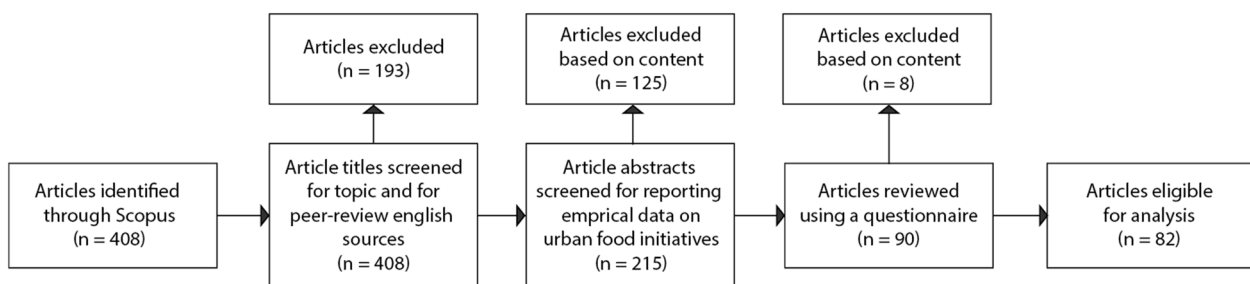
However, to harness this transformative potential for actionable purposes, the nascent field of urban food research requires integration of disciplines and methods and more attention to geographical relevance. Further, a deeper examination of the nature of the transformative potential and reflexive monitoring of the capacities of UFPs are needed. We consider this a step towards providing urban food governance actors with the tools to shape more sustainable urban food systems. More broadly, our signposting framework offers the language to speak about transformation without having to define how realised transformation looks like.

METHODS

To arrive at our findings, we reviewed literature that reports on urban food, focusing on empirical case studies, excluding all conceptual papers, as well as those not meeting our criteria (Fig. 3). To make sense of the diversity of practices from the reviewed literature, we clustered UFPs into six broad types (Table 3). Using the earlier developed framework on transformative change, we determined the potential for transformative change in these clusters of UFP.

Table 2. Food system processes and outcomes that are signposts for sustainable food system transformations.

Transformative processes	Description	Sources
Adoption of a city-region perspective	Including the hinterlands as part of the urban food system	Wiskerke ³ ; Garcia-Sempere et al. ⁷⁸
Creation of spatial synergies	Linking different policy objectives	Wiskerke ³ ; IPES-Food ⁷⁹ ; Horst et al. ¹⁶
Influencing consumer decisions	Raising awareness on food; sustainable nudging or marketing	Gordon et al. ⁴⁵
Mobilisation of key actors	Targeting several influential actors to accelerate change	Gordon et al. ⁴⁵ ; Österblom et al. ⁴³
Reclaiming or recreating urban space	Repurposing of space for common or community use; acts of resistance	Horst et al. ¹⁶
Strategic planning for the future	The use of foresight or forward-looking approaches	Zurek et al. ¹⁰² ; Rutten et al. ¹⁰³
Taking an integrated approach	Combination of multiple food system domains	Zurek et al. ¹⁰² ; Wiskerke ³
Using participatory approaches	The use of multiple relevant stakeholders to design, plan or develop within urban food systems	IPES-food ⁸⁰ ; Horst et al. ¹⁶ ; Zurek et al. ¹⁰² ; Garcia-Sempere et al. ⁷⁸
Transformative outcomes	Description	Sources
Changed diets	Changing consumption patterns towards more sustainable and healthier diets	Gordon et al. ⁴⁵ ; Zurek et al. ¹⁰²
Connected flows of resources	Efficient or circular use of resources	Wiskerke ³ ; IPES-food ⁸⁰ ; Gordon et al. ⁴⁵
Enhanced transparency	Between producers and consumers to provide context and information about the food system	Gordon et al. ⁴⁵ ; Garcia-Sempere et al. ⁷⁸
Established food governance arrangements	Establishment of a coalition, network with a common vision or strategy; the development of policy for food	Wiskerke ³ ; Moragues-Faus and Morgan ⁸¹ ; IPES-Food ⁷⁹
Greened urban spaces	To improve liveability of the urban domain	Wiskerke ³
Improved food quality	Provisioning of healthy and environmentally friendly food	Lang et al. ¹⁰⁴ ; Gordon et al. ⁴⁵
Increased connection to nature	Reconnection of people to food and nature; improving stewardship of the biosphere	Gordon et al. ⁴⁵ ; Garcia-Sempere et al. ⁷⁸
Increased ecological resilience	Of production systems and the biosphere; strengthening (agro-) biodiversity and multi-functionality in food production	IPES Food ⁸⁰ ; Gordon et al. ⁴⁵ ; Garcia-Sempere et al. ⁷⁸
Increased economic opportunities	Ensuring a fair and thriving economy that benefits all	Zurek et al. ¹⁰² ; Garcia-Sempere et al. ⁷⁸
Increased equity in the food chain	Ensuring fair and just treatment of actors in the food system	Zurek et al. ¹⁰² ; Garcia-Sempere et al. ⁷⁸
Increased self-sufficiency	Decreasing dependency on import-products; increasing the ability to supply one's own food	Kasper et al. ²⁴ ;
Increased social resilience	Contributing to social cohesion or strengthening a community	Moragues-Faus and Morgan ⁸¹ ; Horst et al. ¹⁶

**Fig. 3** Selection process of literature eligible for analysis. Flowchart of the systematic review process indicating the number of articles for each step.

Signalling transformative change

The main objective of transformations research is to better understand, indicate and reflect on processes of change that facilitate radical system change. Research on transformation initially focussed on indicating the need for transformation^{65,66} and unpacking the notion of transformative change^{26,32,67,68}. Increasingly, this research has become more actionable by identifying key actors and activities for social-ecological

transformation^{63,69}, setting out governance modes that further transformation at diverse scales^{70,71}, and imagines what transformations could entail^{33,72}. There is also work that is more critical of the concept, mainly exploring discursive and political use of the notion of transformation^{30,31,73}.

Attempts to uncover more specific leverage points and capacities needed to support urban transformation^{74,75}, have been complicated by

Table 3. Types of urban food initiatives.

Urban Food Initiatives	Main research focus	Sources
1. Food networks and policy	Potential for food system change; assessing existing integrated food policies and strategies; exploring inclusiveness and participation	Moragues-Faus and Morgan ⁸¹ ; Matacena ¹² ; Hebinck and Page ⁸² ; Sonnino et al. ⁸³
2. (Peri-)Urban agriculture	Production of sustainable food in urban environment; increasing resilience; increasing number of green urban areas	Kulak et al. ⁸⁶ ; Barthel and Isendahl ⁸⁴ ; Martin et al. ⁸⁷ ; Campbell ⁸⁵
3. Community gardens	Contribution to neighbourhood cohesion; fostering social resilience; allotments as a source of leisure for urban citizens	Turner et al. 2011; Veen et al. ⁹⁰ ; Van Holstein ⁸⁹ ; Glover et al. ⁸⁸
4. Short food supply chains	Developing local, transparent and equitable food supply chains; improving proximity between producer and consumer; improving rural-urban dynamics	Renting et al. ²⁰ ; Chiffolleau et al. ⁹¹ ; Berti and Mulligan ⁹² ; Dubois ⁴⁷
5. Care and educational food initiatives	Fostering food awareness; improving dietary health; using green space to improve mental health	Ashe and Sonnino ⁹⁵ ; Pedersen et al. ⁹⁶ ; Hake ⁹⁴ ; Cairns ⁹³
6. Food justice organisations	Providing food assistance; (re)claiming space for minorities; providing space as commons; challenging racial and economic inequities	Purcell and Tyman ¹⁰⁰ ; Wekerle and Classens ¹⁰¹ ; Certomà and Tornaghi ⁹⁸ ; Sbicca and Myers ²¹ ; Kneafsey ⁹⁷ ; Loh and Agyeman ⁹⁹

the temporal and future-oriented nature of transformations³¹. As such, much of the research on transformative change, explores what processes and practices may contribute to outcomes associated with or can become a starting point for transformation^{26,27,48,63}. The notion of ‘pockets of the future in the present’³⁹ is built on a similar premise that while it is impossible to know beforehand that something will be transformative, some practices that exist today have the potential to grow to become dominant in the future. Depending on the context, these practices can then ‘grow’ through various amplification processes: scaling up, scaling out, scaling deep, replicating, spreading, stabilising and so on^{48,76,77}. With this in mind, we look at characteristics (specifically processes and outcomes) that are considered to have potential to make a practice transformative, without claiming that such a practice is inherently transformative. Transformative change can thus be defined based on, or implied as a result of, the processes and outcomes which are expected to produce it, rather than precisely assessing the change itself.

In this paper, we start from this last perspective which sees existing initiatives as pockets of the future with potential for transformation³⁹. To signal transformative change potential in urban food, we need to distil from the reviewed literature, the processes and outcomes that may act as signposts to food system transformation (see Table 2). We take these processes and outcomes to indicate UFPs’ transformative potential based on research on transformation of (urban) food systems to sustainability^{3,8,16,24,45,78–81}.

We assess how existing UFPs reported in the reviewed literature reflect these outcomes and processes, or signposts for future urban food transformation. While we consider signposts useful for indicating what practices hold potential and which are worth supporting or strengthening, we do not consider this a guarantee for radical and systemic change. This depends on how these alternative UFPs will interact and co-evolve over time.

Systematic review

The aim of the systematic literature review was to understand the degree to which UFPs are reported as leading to transformative change. We used an iterative process to identify keywords and establish search terms able to capture publications of interest (see Supplementary Table 1). Boolean operators were used to filter for publications that focused on cases of alternative food practices in the urban domain specifically, while wildcards (i.e. *) were added to capture varied use of terminology. Moreover, the search string included a proximity operator (i.e. w/1) between the keywords ‘urban OR city OR town’ and ‘food OR agriculture OR garden* OR farm*’. The search was able to capture a broad range of UFPs, such as: urban food policy; urban school food; city farmers market; and urban food justice. To capture change aspects towards sustainability, we included ‘sustainab* OR resilien* OR transit* OR transform*’ and to capture in empirical cases, we included ‘case OR project* OR initiative* OR organisation* OR enterprise*’.

The search was conducted on 21 June 2018 in Scopus, and limited to abstract, title and keywords and to English only articles (see Supplementary Table 1). The titles of the 408 papers that this search returned were

screened for matching the criteria (see Fig. 3). This initial screening reduced the database to 215 titles that were considered a match or still in need of a closer look. These 215 papers were divided between all authors of this paper, who each reviewed between 10–62 papers. We excluded non-empirical literature which mostly described visions, strategies, guidelines and theoretical potentials which have not yet been implemented. After screening the abstract for eligibility on all inclusion criteria, a set of 90 papers were left for thorough review by reading the paper in full (see Supplementary References). Papers marked as ‘include’ were reviewed using a questionnaire developed by the first author based on the two theoretical frameworks that capture diversity in UFP and transformative processes and outcomes. This also included descriptive information and methodological details of the articles (see Supplementary Methods 1). Adjustments and clarifications to the questionnaire were made after reviewing the first 10% of the papers. A further eight papers were excluded after the coding process as upon detailed inspection they did not report on empirical data and urban food initiatives, leading to a total number of 82 reviewed papers (see Supplementary References for a full overview). The first author cross-checked the final list of reviewed papers for inconsistencies in using the questionnaire.

Clustering of urban food practices

Multiple research communities are working on various urban food research foci. Research on urban food governance and planning processes, for example, unites diverse actors^{17,19} and showcases the potential of food policy, participatory processes and integrated plans of urban food networks to facilitate urban sustainability^{12,18,82,83}. Farming practices research within the city investigates the ability of urban farms to provide sustainable alternatives for food production in cities, to green cities and to build resilience^{84–87}. Research also explores the community aspects by trying to understand the motivations of gardeners and potential to strengthen social cohesion^{88–90}. Other scholars explore alternative modes of food provisioning that can be organised more locally: here, research aims to understand the relation between consumer and producer^{47,91}, and the potential that short food supply chains can bring towards sustainability^{20,92}. Somewhat on the fringes of this field is research that explores the educational properties of alternative UFPs^{93,94}, and UFPs support for both dietary⁹⁵ and mental health⁹⁶. There is also research focussing on social justice in the urban food domain, ranging from exploring urban food assistance⁹⁷, to (re)claiming space for minorities, and challenging racial and economic inequities^{21,98–101}. We used these broad categories of research foci (Table 3) as a basis to cluster the UFPs we found in the literature.

DATA AVAILABILITY

All papers used in this review are available in the Supplementary information XYZ. The review database can be requested from the lead author A.H.

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AUTHOR CONTRIBUTIONS

A.H. conceived of the presented idea. A.H. and O.S. carried out the data collection. A.H., O.S., E.V., A.V., S.H., M.S., L.S., K.T., J.V. and A.W. contributed to the systematic review. A.H. and O.S. took the lead in the analysis and interpretation of the review. A.H., O.S., E.V., A.V., S.H., M.S., L.S., K.T., J.V. and A.W. contributed to the write-up of the results and discussion. A.H. and O.S. took the lead in finalising the paper with the input from all authors and doing revisions.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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