Do we still need to develop new tools to assess the sustainability of urban agriculture?

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Abstract

Urban agriculture initiatives are increasing in numbers. Projects are being created on all continents and in all kinds of cities large or small. The Covid-19 crisis has also increased the awareness of public authorities to the participation of this agriculture to food provisioning for some populations but also for its participation to social resilience of the city. Studies have been done to evaluate the impact of urban agriculture on city sustainability and tools have been developed to measure it at several scales from the city to the project. The private sector has also begun to work on tools to evaluate the sustainability of urban agricultural projects to help public authorities and landowners choose project to install in new places. With such a plethora of tools, do we still need to work on this subject? As the existing tools do not apply at the same scale, do not rely on the same goals of sustainability and are not always very transparent about their workings? The first step to answer all these questions is through a systematic review of published tools in scientific reviews. Therefore, the objective of this review is to compare the identified tools according to several criteria (scale, type of urban agriculture evaluated, sustainability dimensions studied, complexity/number/type of indicators, public availability…). This will enable us to identify both the conditions under which existing tools can be used, gaps in the existing pool of resources but also the gaps in knowledge to measure some part of UA sustainability and identified technical and organisation levers than can improve UA sustainability. The first pool of analysed articles shows the use of existing frameworks in half of them whereas half developed their own systems and sometimes indicators. Nearly all tools are based on the three sustainability pillars (environmental, economic and social) even though they are sometimes redesigned for the tool in different categories.

INTRODUCTION

In the past decades, urban agriculture (UA) initiatives have developed, especially in northern countries. Recent studies have measured the importance of urban agriculture for sustainable City Region Food Systems (CRFS) and the different services it brings to the city (Cohen et al., 2012) such as ecosystem services (Dorr et al., 2021) or social services (Kirby et al., 2021; Ilieva et al., 2022). We are facing today a need to stabilise the presence of this urban agriculture within the city, both public and private stakeholders are aware of this need and are looking for tools to help them integrate UA in their development strategies.

Stakeholders are very interested in the way UA can participate to increase the resilience of the CRFS but need to be reassured on its sustainability. Several studies are under way to measure precisely the services rendered by UA on the three classical pillars of sustainability (environmental, social and economic) (MacKenzie et al., 2019, Sanye-Mengual et al., 2019) as these data are severely lacking due to the recent development of this field of study and the high diversity of UA initiatives (for profit or not, low-tech or high-tech, with pedagogical, productive, social or mixed objectives). There are also question about the scale of the study, whether one looks at the scale of an initiative, of a borough or a city (FAO, 2013, Altman et al., 2014). This has given birth to many studies on the sustainability of UA using different tools, at different scales and developed by different stakeholders: scientists (Yan et al., 2022, see for example the Fewmeter and FoodE European programs) but also by collectivities like Ville de Paris. Newcomers in this subject can quickly become lost by the plethora of tools with sometimes unclear objectives or validity domains. A high diversity of scientific disciplines is also mobilised to build them.

There is a growing need to identify and classify existing sustainability evaluation tools in order to help the stakeholders choose the tool they need and to identify existing gaps in evaluation tools. This kind of review has been done more generally for farm sustainability assessment tools (Chopin et al., 2021) but still need to be done for UA as it has several specificities (Clerino et al., 2021). This literature review has been built to answer this need and identify the different existing approaches in sustainability evaluation of UA, including assessment of their scales and gaps.

MATERIALS AND METHODS

Data collection

We conducted a literature review to get a census of existing sustainability evaluation tools of UA and their frameworks. Our definition of UA, focusing on farming as gardening practices, is usually not evaluated in the same way by private and public stakeholders but we still tried to keep as broad a definition as possible using the definition of Mougeot (2000)

"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."

However, we did not exclude literature including other steps of the CRFS (processing or waste management for example) in order to have the broader view possible.

We used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method as systematic screening procedure to search and sift through the literature. Articles were limited to peer-reviewed publications in scientific journals indexed in Web of Science and Scopus. Database searches were conducted in the period of January 2022. 2 additional references were added and more will be added as elicited by experts during the second phase.

We used keywords as broad as possible with a very simple equation: (tool OR framework OR method OR approach) AND (sustainability) AND (eval* OR assess*) AND (urban agric* OR urban farm*). The terms were combined using the specific Boolean operators of each database and using the shortening operator to ensure the use of a whole family of terms (for example assessment, assessing and other derivatives for assess*). Tests were done to ensure which keywords would bring more information.

The screening of the literature for references of interest was then conducted using a predefined set of exclusion criteria: the articles had to be written in English, they had to deal with CRFS and it had to deal with sustainability evaluation whatever the scale or discipline used. However, articles describing one experiment on one farm or policy studies were excluded as well as full books. The article also had to have been published between January 2000 and January 2022.

Data analysis

The papers identified were then selected first on the basis of the title and keywords, then on the abstract and finally each article was read in full and analysed using a specific classification grid developed by the researchers (Table 1). Articles were then coded in a database using this grid.

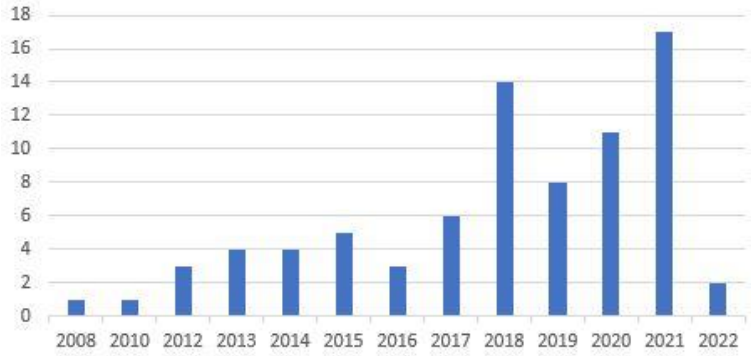
Table 1. Classification grid used to analyse the selected articles

Classification criteria	Objective of the criteria
Date of publication	Importance of the subject through the years
Localisation of tests/development	Cartography of the subject
Sustainability dimensions studied	Importance of the dimension
Sub-dimension when pertinent	Identify specific interests
Scale	Importance of the scale

Number of criteria and/or indicators	Complexity of the tool
Open source or not	Availability of the tool
Qualitative/quantitative evaluation	Complexity of the tool
Ex ante/In itinere/ex-post	Time of life of the project evaluated
For whom? What uses	Identify users
Results presentation/Aggregation	Tool uses
Use of an existing framework	Compatibility with other tools
Participative construction, which part?	Identify designers

PRELIMINARY RESULTS AND DISCUSSION

The literature search yielded a total of 122 unique, non-duplicate records in Web of Science and 145 in Scopus. After screening titles and comparing them to the exclusion criteria, 108 records were found in Web of Science and 135 in Scopus. Both lists were then combined to yield a total of 171 unique, non-duplicate record. After screening abstracts, 46 of them were removed because they did not meet at least one criterion leaving 170 for full reading. Articles were divided in two categories: 95 high priority articles and 30 secondary priority papers, which might be pertinent, and which will be read in a secondary time with the grey literature. After availability checking of the articles, only 79 of them could be recuperated online.



The studied sample thus includes 79 articles which are currently being analysed and classified using the grid presented in the previous section.

As can be seen in Figure 1, the thematic is quite recent and the number of published articles is small and very variable between years.

Figure 1. Number of high priority articles per year

The papers present very different approaches and frameworks: some use Life Cycle Assesment approaches and its declination (S-LCA and LCC for example) (Benis and Ferrão, 2017), some are based on existing frameworks (Alberti et al., 2020) while others develop their own approaches. These are very preliminary results as only a small part of the identified articles has been analysed at the time of the writing of this article. Out of the 32 articles already analysed, 6 directly refer to the LCA methodology but 2 others using foodprints methods can be linked to Life Cycle Thinking. 3 articles belong to the Mesmis framework, 2 use the ecosystem services framework and other framework used and cited comprise Delphi, Mives, Rapid Assessment Process, SWOT and SITES. This means that less than half of the article develop a framework specific to their tools.

Out of 32 articles, 27 of them look at the environmental pillar, 19 at the economic and 20 at the social pillar even though the redistribution in sub-dimension sometimes bring another distribution (for example using the Mesmis method the distribution can be production, resilience and adaptability, equity). The number of criteria used varies between 1 and 40 with some tools testing only a new sustainability indicator (Bagstadt et al., 2012).

What seems most interesting also is the diversity of tools and disciplines mobilised. A question that arises is the compatibility of these tools. Can they be used indiscriminately? Can they be used together or as complement? No consensus has yet emerged on the approach to

choose according to the scale or the use and this is where further research seems important to us. We also think there is a need to add to these scientific reviews a census of some of the tools used by private and public stakeholders in their day-to-day practice of UA project evaluation in order to create pertinent and solid evaluation tools. This is the next step of our research to be conducted after this study.

CONCLUSIONS

This preliminary study of existing evaluation tools has shown that this subject is quite recent and still under development. Several tools already exist to evaluate the sustainability of urban agriculture at different scales and using different frameworks. However, the compatibility of these different tools with the uses of the stakeholders has not yet been analysed even though we already know cities and private stakeholders have developed sometimes unsatisfying but needed tools to help them decide how to encourage urban agriculture. Further work is needed to add existing tools of the grey literature to this work and create a global database where stakeholders could find the existing tools and exchange about their practices with an operational objective.

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