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Criteria for selecting assessment tools for local food systems in the context of socio-ecological transitions

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Abstract

Local food systems (LFSs) have attracted growing interest around the world as locally rooted alternatives to globalized food supply chains. LFSs address persistent multidimensional challenges such as food insecurity, malnutrition, and environmental degradation while advancing more equitable and sustainable food systems, a process often referred to as a socio-ecological transition. Evaluation plays a key role in this process by helping LFS stakeholders clarify priorities, identify strengths and vulnerabilities, measure progress, inform necessary adjustments, and underpin accountability. Numer-

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ous LFS assessment tools have been published in scholarly and organizational documents to support holistic evaluation mechanisms covering the social, economic, environmental, and governance dimensions of sustainability. However, researchers and practitioners lack clear guidance on how to choose appropriate assessment tools. This study aimed to identify criteria for selecting LFS evaluation tools that can support effective socio-ecological transitions. Through a scoping review, we identified 22 holistic evaluation tools encompassing 24 components that contribute to a more sustainable vision of LFS. Our analysis yielded seven criteria to guide tool selection. These include (1) relevance to the local context; (2) capacity to assess strengths, assets, and challenges; (3) capacity to guide action; (4) use of a holistic and innovative framework; (5) comparability across territories and scales; (6) community and citizen participation; and (7) capacity to monitor and evaluate deep, systemic transformations. Following our analysis, we recommend adding an evaluation component focused on transition dynamics to monitor structural changes, particularly shifts in norms, policies, and rules that support local food initiatives. This component would also identify the structural barriers and resistance that impede the initiatives' consolidation. We further recommend that the selection of evaluation components be driven by a collective, stakeholder-led process to ensure alignment with local priorities. Future efforts should prioritize improving data accessibility, strengthening the inclusion of perspectives from vulnerable and Indigenous communities, and establishing mechanisms to explicitly link evaluation findings to policy decision-making.

Keywords
local food systems, sustainable food systems, food system governance, socio-ecological transition, assessment tools, sustainability metrics, food security

Introduction and Literature Review

Local food systems (LFSs) have attracted growing interest worldwide as responses to increasing concerns about the social, economic, and environmental consequences of globalized food supply chains, such as persistent food insecurity, malnutrition, and the degradation of soils, water, air, and biodiversity (Bisoffi et al., 2021; Campbell, 2021; Farmery et al., 2021). In this article, an LFS refers to a specific territory, generally a municipality, regional county municipality (MRC), or administrative region, where stakeholders concerned with food and agri-food issues collaborate to analyze challenges and implement coordinated solutions that promote equitable and sustainable food systems for present and future populations (Allen & Prosperi, 2016; Blay-Palmer et al., 2020; El Bilali, 2019). Although definitions vary, most LFSs share the goal of reducing inequalities and mitigating the harmful local effects of the globalized food system (Duarte et al., 2025). In this sense, LFSs act as levers to accelerate socio-ecological transition.

Socio-ecological transition is defined as:

> the passage from the current state of the system to a state that is socially more just, inclusive, and ecologically viable, achieved by transforming our democratic practices, modes of production, consumption, living together, and shared narratives, drawing on social relations conducive to social justice and inclusion. (Guay-Boutet et al., 2021, p. 24)

In light of this perspective, the socio-ecological transition of LFSs entails a profound, systemic transformation of food systems to confront planetary limits and social injustices (Audet et al., 2017; Guay-Boutet et al., 2021). It calls for stakeholders to shift behaviors, perspectives and strategies and to tackle priority issues shaping the future of food (Audet et al., 2017). The socio-ecological transition of LFSs also enacts a vision in which these systems progressively achieve a balanced integration of social, economic, environmental, and governance dimensions. According to Blay-Palmer et al. (2021), this integration has the following implications:

- The social dimension of such transition enhances access to healthy food and improves well-being, health, and equity for all.
- The economic dimension strengthens local agri-food production and the vitality of local businesses. It fosters fair and local

food networks that keep economic activity local and promote equitable sharing of value and risk.
- The environmental dimension focuses on addressing climate change and preventing ecosystem degradation.
- The governance dimension promotes participatory, inclusive, and democratic governance. Such governance shapes the policies, actions, processes, and institutions that define the food supply chain and food environment (Delaney et al., 2018; Moragues-Faus et al., 2017).

Framing LFSs as levers of socio-ecological transition implies that their role goes beyond the local projects they implement. They also have the capacity to influence the rules, norms, policies, and institutional arrangements that shape food systems and to support the consolidation of sustainable and equitable practices (El Bilali, 2019; Audet et al., 2017; Bui et al., 2016; Audet et al., 2024).

However, the socio-ecological transition of LFSs faces significant governance challenges. These challenges include the fact that LFSs operate at a territory scale within centralized governance structures (Boulianne et al., 2021; Lever et al., 2019). Although LFSs often appear politically acceptable, they lack structured institutional support and face regulations that ultimately reinforce globalized food supply chains (Audet et al., 2017; Mundler & Boulianne, 2022). In addition to these structural and institutional constraints, governance challenges also concern how priorities are defined and operationalized within LFS initiatives. The core requirements for ensuring food security and sustainable population health— namely, justice, equity, health protection, and environmental stewardship—remain weakly embedded in the actions of LFSs (Dorr et al., 2021; Rochefort et al., 2021). Moreover, LFSs rarely conduct holistic evaluations of the environmental, economic, and social impacts of their initiatives (Kang et al., 2022; Schiff et al., 2022), even though such assessments are essential for steering transitions (Lopez-Merino & Lamine, 2024; Marshall et al., 2021). In this context, demonstrating whether transformative processes are occurring in practice requires indicators and evaluation tools that capture the complexity of sustainable food systems and integrate multiple viewpoints (Audet et al., 2024; Hansson et al., 2024).

Numerous LFS assessment tools have been developed and published in both scholarly and gray literature (e.g., organizational reports, research reports, methodological guides). Among these, some are explicitly holistic, addressing at least three of the four dimensions of sustainability—environmental, social, economic, and governance (Doernberg et al., 2022; Landert et al., 2017). A few reviews have attempted to systematically catalogue and analyze tools specifically designed to assess LFSs (Alrøe et al., 2016; Garcia et al., 2025; Lopez-Merino & Lamine, 2024; Marchand et al., 2014; Sirdey et al., 2023). These reviews report that most tools focus on only one or two dimensions of sustainability or are limited to a specific sector—most often agricultural production—rather than capturing the multidimensional and systemic nature of LFSs. Moreover, the tools' indicators are rarely tailored to the specificities of local contexts, which limits their relevance and applicability.

Alrøe et al. (2016) emphasized that no single tool can meet all assessment needs. Their review highlights both the potential and the limitations of multicriteria assessments; the authors recommended the combination of complementary tools, the involvement of stakeholders, and methodological transparency to enhance decision-making. Other reviews stress the need to integrate diverse forms of knowledge and value systems. Sirdey et al. (2023) called for more systemic, multiscale, and participatory approaches. Lopez-Merino and Lamine (2024) advocated for a "post-normal" assessment perspective that recognizes the interdependence of ecological and socio-economic systems, the importance of past and future trajectories, and the central role of stakeholder engagement in evaluation processes.

Although relevant criteria for tool selection exist, such as the 11 criteria proposed by Marchand et al. (2014) to evaluate farms, it is noteworthy that only two tools were considered to establish these criteria. These two tools have focused on a single link in the food supply chain. Garcia et al. (2025) set out clear criteria for selecting and refining indicators, but they point out that these criteria are

inconsistently applied in practice. They also highlighted the lack of a clear, shared definition of sustainability in many tools and pointed to the fragmentation of conceptual frameworks and methodologies as a barrier to coherence and comparability. In this study, a conceptual framework for LFS evaluation refers to a structured model that establishes key sustainability components and guides how LFS performance is assessed and interpreted (Food and Agriculture Organization [FAO], 2014; Moragues-Faus & Marceau, 2018). A review of the gray literature on LFS governance (Rabialahy & Guillaumie, 2022) also recommends combining evaluations of processes and outcomes, while considering local resources and time constraints.

Despite the value of these contributions, none of these reviews explicitly address the criteria for selecting tools suited to evaluating the socio-ecological transitions of LFSs. In particular, these reviews overlook the need for tools that capture transformative processes, including structural changes through the implementation of alternative initiatives (e.g., organic farming, food hubs, community-supported agriculture, institutional procurement, cooperatives). Likewise, they do not examine changes within the policies, rules, norms, and infrastructures that maintain the structures of the globalized food system. Understanding these interactions is essential to grasp the pathways of transformation in LFSs (Rabialahy et al., 2025).

Therefore, this study aimed to review the selection criteria that can guide researchers and stakeholders in choosing tools capable of monitoring socio-ecological transitions of LFSs, capturing both progress toward sustainability and the transition dynamics that drive change. This work was part of a broader research project aimed at fostering dialogue between stakeholders and deepening understanding of the socio-ecological transition of Quebec's LFSs (Guillaumie et al., 2021). It also sought to provide an updated overview of available LFS assessment tools to support the development of robust, context-appropriate evaluation practices for LFSs in Québec and, more broadly, across Canada. More specifically, the study pursued three objectives: (1) identify the main characteristics of holistic assessment tools for LFSs, including their objectives, conceptual foundations, criteria for indicator selection, and key components; (2) analyze the strengths, limitations and recommended applications of these tools; and (3) document the recommended criteria for selecting assessment tools from a socio-ecological transition perspective.

Applied Research Methods

The scope of this study focused on LFS evaluation tools applicable in contexts similar to those of Québec and Canada. In this study, evaluation is understood beyond accountability purposes, as a strategic lever to assess and support the transformative capacity of LFS initiatives. Accordingly, our intention was to examine whether and how existing tools enable the assessment of the structural and systemic changes that characterize socio-ecological transitions. The following subsections detail the methodological steps undertaken to identify and analyze LFS assessment tools. They describe the study design, the search strategy, the eligibility criteria, the coding and data analysis procedures, and the theoretical approaches informing our understanding of socio-ecological transition.

Study Design

To identify LFS assessment tools, we carried out a systematic search of scholarly and gray literature (e.g., organizational reports, research reports, methodological guides) in March 2024. The review followed a scoping review approach inspired by Arksey and O'Malley (2005) and refined by Levac et al. (2010). This iterative approach can map the full breadth and depth of relevant evidence across scholarly and gray sources, regardless of study design, and allows the search strategy to be refined as new insights emerge (Arksey & O'Malley, 2005; Levac et al., 2010). This approach is particularly appropriate for complex or heterogeneous topics, helping researchers and decision-makers to synthesize current knowledge, reveal research trends and gaps, and incorporate stakeholder perspectives when validating findings (Granheim et al., 2020; Pham et al., 2014).

Search Strategy

We used an iterative three-part search strategy combining controlled vocabulary (e.g., MeSH, CAB Thesaurus) when available and free text

terms. First, we built three sets of terms: (1) food systems terms (e.g., food system / policy / council / strategy / initiative / project), (2) territorial qualifiers (e.g., community / local / municipal / regional / territorial), and (3) evaluation terms (e.g. evaluation / indicator / performance / measurement / tool). Within each set, terms were searched as synonyms with "or," and the three sets were combined with "and" to yield the query structure: (food system terms OR synonyms) **AND** (territorial terms OR synonyms) **AND** (evaluation terms OR synonyms). Second, we applied this structure in four bibliographic databases: CAB Abstracts, Food Science and Technology Abstracts, Ovid MEDLINE, and Web of Science. We then used the same keyword structure in English and French to search gray literature through Google and Google Scholar. Screening proceeded sequentially by page and stopped once three consecutive pages yielded no documents relevant to LFS evaluation. Each page displayed approximately 10 results. Third, we performed targeted follow-up searches when a paper merely mentioned a tool or provided a brief description. Given that the documentation for the tools retained in this study was often incomplete, we emailed authors, when applicable, to request additional materials, such as data collection grids or questionnaires, in order to enrich the analysis. Any additional documents obtained through this follow-up were added to the review corpus.

Eligibility Criteria

Documents were included when they met the following criteria:

1. They presented a food-system evaluation framework or an assessment tool for LFSs;
2. They addressed at least three of the four sustainability dimensions (social, economic, environmental, and governance);
3. They were designed for a local, municipal, or regional scale;
4. They targeted high-income contexts in Europe, North America, Australia or New Zealand that are similar to those of Québec and, more broadly, Canada; and
5. They detailed operational aspects such as conceptual foundations, development and validation procedures, or practical steps for implementation.

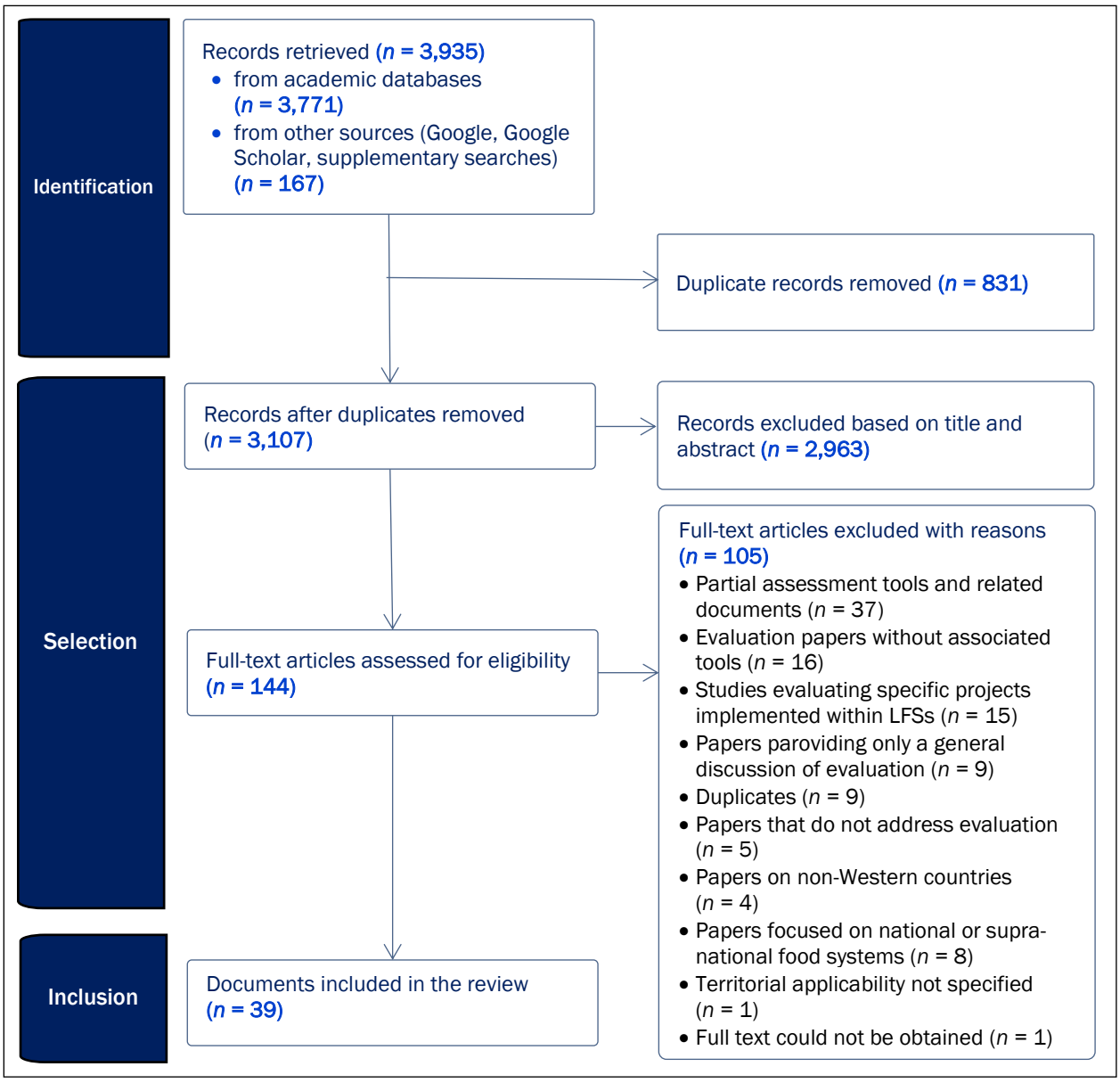
Study design and publication year were unrestricted. Studies were excluded if they were written in a language other than French or English; focused solely on provincial, national, or supranational scales; or mentioned a tool without describing it. Two reviewers screened titles and abstracts independently, then assessed full texts. Inter-rater reliability was high (Cohen's kappa values of 0.96 for the first phase and 0.83 for the second). Disagreements were resolved through discussion until consensus was reached. Figure 1 shows the flow diagram of this process.

Theoretical Approaches to Socio-Ecological Transition

Our intention was to examine whether and how LFS evaluation tools enable researchers and stakeholders to assess structural and systemic changes, as well as the emergence and consolidation of sustainable and equitable initiatives. With this in mind, we employed two complementary theoretical approaches to socio-ecological transition. These approaches helped clarify what constitutes transformative change and informed both our analysis of the components assessed by tools and the recommended criteria for tool selection, particularly those aligned with LFS equity and sustainable population health. The first theoretical approach is reflexive governance (Grin, 2010), derived from the field of sustainability transitions. The second is sustainable health promotion (Hancock, 1993, 2002), grounded in a socio-ecological systems perspective (Bricas et al., 2021).

Reflexive governance builds on the multilevel perspective (Geels & Schot, 2010), which describes how transitions unfold through interactions at three nested levels: niche, regime, and landscape. Niches are protected spaces where radical practices emerge through entrepreneurs, NGOs, and citizens. Regimes are the dominant configurations of policymakers, consumers, civil society organizations, scientists, and interest groups. Regimes also include the dominant rules, norms, and infrastructures that stabilize current systems through lock-in

Figure 1. Process for Including Documents in this Review



mechanisms (i.e., resistance to change that impedes the success of more sustainable niches; Audet et al., 2017; Geels & Schot, 2010). The landscape consists of exogenous forces that can destabilize a regime, such as financial, geopolitical, or ecological events, thus creating "windows of opportunity" for consolidated, sufficiently developed niches (Audet et al., 2017; Geels & Schot, 2010). The theoretical advantage of this transition perspective lies in viewing these niches as potential agents of social transformation, as they develop new practices, norms, and visions that offer alternatives to those promoted within the dominant globalized food system (Audet et al., 2024). Reflexive governance theory analyzes how actors steer change across these levels by using agency, or the capacity of actors to act intentionally and influence transition trajectories (Grin, 2010). The assumed goal of the actors is to align innovations within the niche with fundamental changes in the regime and to exploit landscape disruptions to create transition pathways (Grin, 2010).

Sustainable health promotion (SHP) was originally conceived to highlight the interdependence of the food supply chain, ecological sustainability, and population and planetary health (Kickbusch, 2010). SHP conceptualizes sustainable health as an outcome of social, economic, and environmental relations supported by good governance (Hancock, 1993). Widely applied in North American community food initiatives (Hancock et al., 2017), SHP advocates a deep transformation toward an ecologically and socially sustainable economy. SHP emphasizes the equitable distribution of natural resources and wealth to meet present and future needs. SHP advances four essential attributes, namely ecological sustainability, urban quality of life, community conviviality, and social equity (Hancock, 2002; Hancock & Gibson, 1996). It relies on empowerment, community health, and citizen participation to strengthen local development dynamics and cross-sector collaboration (Russell & de Viggiani, 1997; Thualagant & Jelsøe, 2015).

Coding and Data Analysis

We developed a coding template and piloted it on 10 documents before applying it to all included sources. For each tool, we recorded its name, the country of origin, its purpose, the sustainability dimensions it covers, and the number of indicators it features. We noted the tool's data collection methods, guiding concepts, validation procedures, licensing status, and contact details. The country of origin was identified based on the affiliation of the first author. We summarized quantitative variables using descriptive statistics including the numbers of indicators and sustainability components addressed. We also coded the conceptual frameworks, the criteria for selecting dimensions and indicators, the implementation steps, the data handling procedures, the interpretation guidance, and any supporting software. Verbatim narrative passages on strengths, limitations, and recommendations, including those related to the selection of assessment tools, were copied and examined through thematic analysis to classify, synthesize, and interpret key themes (Miles et al., 2020).

We then performed an inductive analysis of the tools' sustainability components to identify convergences, divergences, and trends in the way they address LFS sustainability. In the first stage, we retained only tools with explicit indicators or questionnaires that could be converted into indicators. We excluded tools that provide only a conceptual framework without their own indicators or those that simply suggest indicators from other tools without explaining how to integrate them, since they lacked stand-alone metrics. Following the inductive identification of sustainability components across the reviewed tools, we constructed a taxonomy based on the full set of tools included in the study. As an initial reference, we drew on the FAO's (2014) Sustainability Assessment of Food and Agriculture Systems (SAFA) framework, which offers a comprehensive, robust, and empirically tested taxonomy of 21 sustainability components (themes) and 58 subthemes organized into four dimensions: good governance, environmental integrity, economic resilience, and social well-being. These components represent major sustainability issues at every scale, while the subthemes capture the specific concerns within each component, thereby facilitating comparisons with other sustainability frameworks and tools (FAO, 2014). Developed through extensive consultation, SAFA has proven adaptable to agri-food systems, both terrestrial and aquatic, across multiple scales and for diverse stakeholder objectives, and it has already been applied to LFSs (Zarbà et al., 2025).

The SAFA taxonomy was subsequently expanded to incorporate additional components and subthemes emerging through inductive analysis when they were not covered by SAFA. Three new components were added:

- institutional governance,
- enterprise vibrancy and prosperity, and
- social capital.

Two components were expanded:

- The atmosphere component now encompasses climate change mitigation (actions to reduce greenhouse gas emissions) and adaptation (actions to adjust to impacts of climate change).
- The vulnerability component now covers resilience and food autonomy.

Two components were merged:

- The land and water components were merged, as proposed by Peano et al. (2015), to reflect their strong interdependent indicators.
- Three subthemes were added to governance: citizen participation, the participation of vulnerable populations, and public policy implementation.

These adjustments yielded a taxonomy of 24 components and 68 subcomponents, reflecting the components identified across all reviewed tools. The taxonomy is presented in Appendix A.

In the second stage, we coded indicators from each retained tool. We assigned each indicator to a single component within this adapted SAFA taxonomy, ensuring mutual exclusivity without redundancy (Gebara et al., 2024). However, we classified some indicators into multiple components when their description clearly indicated their application to more than one component.

In the third stage, we identified which sustainability components were most relevant for monitoring and evaluating LFS transition dynamics. Using the theoretical approaches to socio-ecological transition presented earlier, we analyzed how each component and its associated indicators reflect structural and institutional changes—such as changes in policies, rules, norms, infrastructures, and collective dynamics—that support or impede the consolidation of LFS initiatives. A component was considered particularly relevant when the scope and meaning of its indicators explicitly addressed these aspects of systemic change.

Results

The results first describe the characteristics of the identified LFS assessment tools, including the sustainability components they assess and their capacity to monitor transition dynamics. They then present the main challenges, levers, and recommendations identified in the reviewed documents, before proposing criteria to guide the selection of an LFS assessment tool.

Characteristics of the Tools Identified

We identified 39 records including 22 holistic LFS assessment tools that address at least three of the four sustainability dimensions. Table B in Appendix B summarizes the 22 tools, and the full list of sources and the additional documents reviewed are presented in Tables C1 and C2 in Appendix C. Thirteen of these holistic tools appeared in peer-reviewed journals and nine in gray literature. Seventeen of the tools had been published since 2014. Based on the affiliation reported for the first author, nine of these were developed in European countries (Italy, France, the United Kingdom, Germany, and Switzerland) and eight in North America (six of them in the United States and two in Canada). Seventeen tools covered the entire food supply chain, including production, processing, distribution, retail, consumption, and waste management, at the community or municipal scale. Eighteen addressed all four sustainability dimensions.

In terms of aims, 11 of the tools sought to provide an overall assessment of a given LFS's sustainability performance and compare it with other LFSs. Twelve were intended to inform decision-making regarding projects or policy priorities. Four tools aimed to evaluate the effectiveness of projects that had been implemented, and three focused on policy effectiveness. Two tools had very specific aims: one measured citizen and stakeholder participation within an LFS (FAO et al., 2021; O'Brien & Cobb, 2012), and the other assessed Indigenous food systems (First Nations Development Institute, 2014).

Twenty tools used at least one conceptual framework. The most common disciplinary orientations for these conceptual frameworks include political science (e.g., Advocacy Coalition Framework), environmental studies (e.g., life cycle assessment), and sustainability studies, notably the SAFA framework (FAO, 2014) and the Milan Urban Food Policy Pact (MUFPP) monitoring framework (FAO et al., 2021). Several tools adapted pre-existing tools or combined them with new instruments.

Our analysis shows three main criteria for selecting indicators. First, tools favor indicators for which data are easy to collect, either because they already exist in administrative or research databases

or because they can be obtained without using excessive resources (e.g., Cirone et al., 2023; Lulovicova & Bouissou, 2024; Mundler & Laughrea, 2016). Second, the tools generally rely on quality standards such as relevance, parsimony, scientific grounding, robustness, accuracy, measurability, clarity of presentation, usefulness for tracking progress and causal links, and transparency regarding what is covered. Several tools explicitly refer to the SMART standard (specific, measurable, accessible, reliable, timed; e.g., Bouroullec & Victoria, 2014; Darrot et al., 2022; Moragues-Faus & Marceau, 2018). Third, indicator choice seeks to reflect the priorities of local stakeholders (e.g., Cirone et al., 2023). This process is often political, participatory, and inclusive, shaped by the composition of stakeholders and their divergent interests and power dynamics (e.g., Valette et al., 2024).

The reviewed tools use markedly different indicator weighting approaches. Some tools adopt equal weighting, applying a noncompensatory principle that gives each indicator the same importance to preserve a balanced representation of each dimension's components (e.g., Cirone et al., 2023; Darrot et al., 2022; Peano et al., 2014; Peano et al., 2015). Others, by contrast, apply unequal weights but emphasize the difficulty of reaching consensus on each indicator's level of importance (e.g., Bouroullec & Victoria, 2014). Validation procedures were also rarely described. When reported, validation generally relied on face validity, whereby experts checked whether each indicator seemed relevant and appropriate for what the tool is intended to measure. Some authors have developed manuals to help people use these tools (e.g., Carey & Cook, 2021; FAO, 2023; Miewald, 2009; National Research Center Inc., 2006a). The tools developed for Indigenous food system assessment indicate community control, encouraging Indigenous communities to set their own objectives, choose data collection methods, and develop context-appropriate strategies (e.g., First Nations Development Institute, 2014; 2017).

Sustainability components assessed in the LFS evaluation tools

Of the 22 holistic tools included in the study, 20 provided explicit indicators or questionnaires convertible into measurable indicators and were therefore eligible for an analysis of their components. Across these 20 tools, a total of 2,358 indicators were extracted and subsequently classified using the adapted taxonomy, which grouped sustainability issues into 24 components numbered from C1 to C24 (see Appendix A). Each component comprises subthemes that capture specific issues.

Figure 2 provides an overview of how indicators are distributed across sustainability components, highlighting which issues are prioritized, or overlooked, across reviewed tools. The following results summarize the main patterns observed within each sustainability dimension.

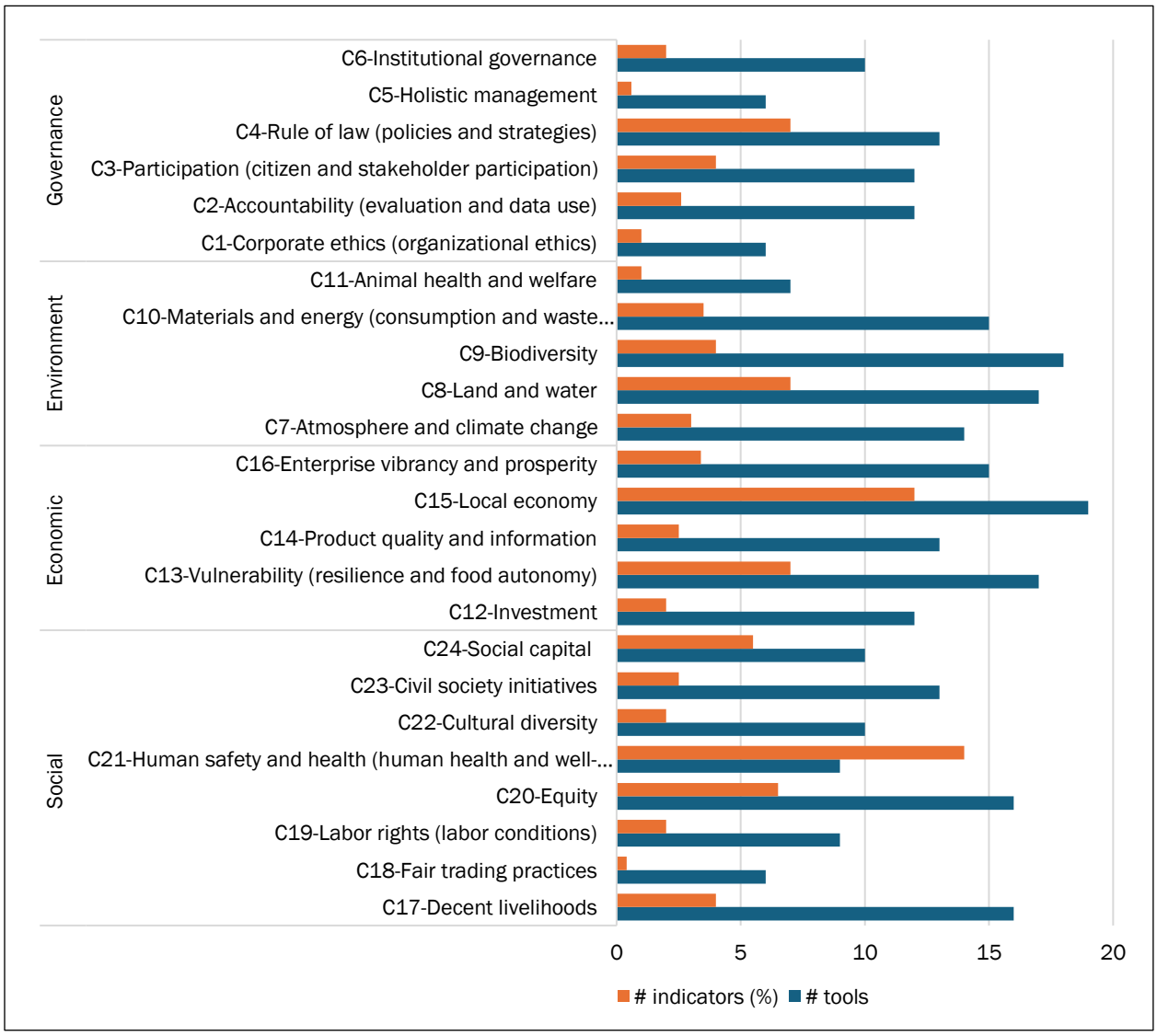
In the governance dimension, the most widely assessed component was *C4—Rule of law (policies and strategies)*, appearing in 13 tools. *C3—Participation (citizen and stakeholder participation)* followed, yet only one tool explicitly assessed the participation of vulnerable groups (Moragues-Faus & Marceau, 2018), and another focused on producer participation (Peano et al., 2015). *C2—Accountability (evaluation and data use)*, *C6—Institutional governance* and *C1—Corporate Ethics* (organizational ethics) received minimal attention.

The environmental dimension was led by the *C8—Land and water* component (17 tools), followed by *C9—Biodiversity*, *C7—Atmosphere and climate change*, and *C10—Materials and energy (consumption and waste management)*. The *C11—Animal health and welfare* component was very rarely considered, making up less than 1% of indicators.

In the economic dimension, *C5—Local economy* was the dominant component (addressed by 19 tools). *C13—Vulnerability (resilience and food autonomy)* was the next most common, whereas the *C12—Investment* and *C16—Enterprise vibrancy and prosperity* components were covered in fewer tools and indicators.

In the social dimension, *C21—Human safety and health (health and well-being)* was the most frequently assessed component but appeared in only nine tools and focused mainly on access to healthy food. *C20—Equity* and *C17—Decent livelihoods* followed, while *C23—Civil society initiatives*, *C24—Social capital*, and *C22—Cultural diversity* were limited. Food sovereignty and respect for Indigenous cultures appeared in only three tools, with one indicator each.

Figure 2. Sustainability Components of Local Food Systems Assessed (*n* = 20)



Components for monitoring and evaluating LFS transition dynamics

As outlined in the third stage of our analysis, we assessed which sustainability components were most relevant for monitoring and evaluating LFS transition dynamics. A component was considered particularly relevant when its indicators explicitly reflected structural and institutional changes (e.g., shifts in policies, norms, infrastructures, and collective dynamics). Based on this analysis, we showed that, while the components identified in these tools contribute to a broader vision of sustainability, none were explicitly designed to monitor and evaluate the systemic transformations that characterize socio-ecological transitions in food systems. Nevertheless, six components emerged as particularly relevant for capturing these dynamics. These components include, within the governance dimension, *C4—Rule of law (policies and strategies)*, *C3—participation (citizen and stakeholder engagement)*, and *C5—holistic management*; *C12—Investment* and *C16—Enterprise vibrancy and prosperity* within the economic dimension; and within the social dimension, *C20—equity* and *C24—social capital.*

C4—Rule of law (policies and strategies) captures the rules, norms, and structures that facilitate

or limit the diffusion of local food initiatives and signal the need for policy or structural change (e.g., FAO, 2014; Moragues-Faus & Marceau, 2018). Component *C3—participation (citizen and stakeholder participation)* records how decision-making power is shared, with explicit attention to materially affected groups (e.g., FAO, 2014; FAO et al., 2021; Moragues-Faus & Marceau, 2018). *C5-Holistic management*, particularly through the sustainability management plan subtheme, signals the existence of integrated, iterative planning across all four dimensions (e.g., FAO, 2014). Within the economic dimension, *C16—Enterprise vibrancy and prosperity* assesses how LFSs or local governments support sustainable local enterprises in achieving prosperity and economic viability (e.g., Center for Whole Communities, 2009; Peano et al., 2015). *C12—Investment* assesses the financial, human, and infrastructural resources devoted to transformation, such as agroecological research, facility upgrades, and community-led initiatives (e.g., Carey et al., 2018; FAO, 2014). Finally, within the social dimension, *C20—Equity* appears relevant as it assesses the fairness and inclusiveness with which resources are distributed, opportunities are offered, and decisions are made, ensuring justice for all. This component also incorporates equitable access to productive resources, such as land, financing and healthy food, as well as non-discrimination and pay equity (e.g., FAO, 2014). The *C24—Social capital* component allows for measuring the strength of LFS actor networks and their capacity to leverage formal and informal institutional resources in support of more equitable and sustainable LFS transformations (e.g., Peano et al., 2015).

Challenges, Levers, and Recommendations for Using Holistic LFS Assessment Tools

Our analysis revealed six key challenges that limit the use of holistic LFS assessment tools, along with levers and recommendations mentioned in the reviewed documents.

Limited access to administrative data

Several tools relied on administrative data from public agencies, community organizations, and enterprises, but these datasets were frequently incomplete, difficult to compare across territories, and infrequently updated (e.g., Cirone et al., 2023; Moragues-Faus & Marceau, 2018). To fill this gap, territories often gather primary data through surveys or semi-structured interviews (e.g., Doernberg et al., 2022). Thus, improving access to public administrative databases and supporting their regular updating should enable the ongoing monitoring of indicators (e.g., Moragues-Faus & Marceau, 2018).

The lack of standardized evaluation approaches

The reviewed tools used nonstandardized approaches, which limited comparison across territories and sometimes undermined local specificities. This challenge is exacerbated by the limited involvement of small businesses in the evaluation process and the difficulty of adapting tools to different scales (e.g., Landert et al., 2017; Moragues-Faus & Marceau, 2018). To address this, some tools recommend developing a standardized core set of holistic components that can capture the interactions and interdependence between LFs while accommodating local contexts (e.g., FAO, 2014; Moragues-Faus & Marceau, 2018).

High evaluation costs

Reviewed documents highlighted that comprehensive assessments require significant resources for consultant fees, data management, and logistics. Consequently, limited resources may constrain the scope of evaluations (e.g., Christensen & O'Sullivan, 2015; Peano et al., 2014). Some researchers have recommend defining the evaluation's scope early in the process, choosing between a rapid assessment or an in-depth assessment, depending on the available resources and the information required for the project (e.g., FAO, 2023). A rapid scan assessment provides an overview of an LFS based on available data, stakeholder knowledge, and institutional documents to determine what issues require deeper investigation. A subsequent in-depth assessment gathers and analyzes quantitative and qualitative data on the systemic issues, bottlenecks, and structural vulnerabilities identified by the rapid assessment (e.g., FAO, 2023).

Insufficient inclusion of vulnerable populations

Our analysis revealed that vulnerable populations were rarely included in the evaluation process. Sev-

eral authors also noted that such exclusion can limit the representativeness of data on these groups and the integration of their priorities (e.g., Clark, 2018; Moragues-Faus & Marceau, 2018). To better incorporate the perspectives and the lived realities of vulnerable populations, some tools recommended strategies such as randomizing the postal distribution of surveys, using social variables (e.g., gender, age, income, ethnicity, and location of food banks and grocery stores in low-income neighborhoods) and explicitly evaluating citizen participation (e.g., Clark, 2018; Cohen et al., 2002; Ross & Simces, 2008).

Lack of consideration for processes analysis

Our analysis confirmed that most tools focus on outcomes at the expense of process analysis. Several tools assess performance simply by noting whether specific actions, such as policy adoption, have taken place without examining the underlying dynamics that drive or enable change (e.g., Clark, 2018; Peano et al., 2015). Some authors recommend including process indicators that measure enabling conditions for transition and gather stakeholder feedback on transition mechanisms (e.g., Valette et al., 2024).

Limited dissemination of results

Our analysis revealed that findings were rarely integrated into decision-making processes. Suggested strategies to address this limit included holding regular meetings with policymakers and LFS stakeholders, combined with concise visual presentations of results (e.g., radar charts), which would enhance uptake and stimulate stakeholder dialogue (e.g., Clark et al., 2017; Darrot et al., 2022; National Research Center Inc., 2006b).

Criteria to Guide the Selection of an LFS Assessment Tool

Among the 39 documents included in this study, Doernberg et al. (2022) highlighted that selecting an appropriate assessment tool is challenging due to the wide variety of tools available. The tools demonstrate substantial variability in purpose, scope, scale, level of assessment, stakeholder involvement, and complexity. Doernberg et al. also emphasized the necessity of clarifying stakeholders' needs, resource constraints, and tool strengths and limitations. However, our analysis revealed that these aspects of tool variability are rarely detailed across the reviewed documents, whereas discussions on indicator selection were far more common. Drawing on the challenges, levers, and recommendations identified across the documents, our analysis led to the identification of seven criteria to guide the selection of LFS assessment tools.

Criterion 1. Relevance to the context

Our analysis identified that a relevant tool should allow the flexible selection, addition, or modification of indicators to reflect local contexts and priorities. Tools offering a wide range of indicators enable users to tailor assessments, reveal specific gaps, and encourage stakeholder dialogue (e.g., Landert et al., 2017; Moragues-Faus & Marceau, 2018). These indicators should reflect end-user priorities and support a shared understanding to inform collective action (e.g., Fraser et al., 2005; Moragues-Faus & Marceau, 2018). The tool should also be adaptable across multiple scales and administrative boundaries. A modular approach combining different tools and indicators was recommended to meet assessment needs and adapt to specific contexts (e.g., Doernberg et al., 2022).

Criterion 2. Effectiveness of strengths, assets, and challenges assessment

Several documents highlighted that tools should enable LFSs to identify their strengths (project, policy outputs), assets (available resources, skills, knowledge), and challenges (e.g., Martin & Morales, 2015; Mirzabeiki & Aitken, 2023). Others indicated that tools should help pinpoint the sources of external and internal problems to better highlight potential compromises and guide stakeholder dialogue (e.g., Doernberg et al., 2022).

Criterion 3. Capacity to guide action

Several documents stressed that tools should provide decision-makers with practical recommendations based on assessment findings (e.g., Darrot et al., 2022; Moragues-Faus & Marceau, 2018). These recommendations were described as helping to develop action plans, food policies, and concrete interventions (e.g., O'Brien & Cobb, 2012;

Sparrow, 2016). Others encouraged self-assessment tools, as they provide a rapid, participatory evaluation at a lower cost (e.g., FAO et al., 2021; First Nations Development Institute, 2014).

Criterion 4. Use of a holistic and innovative framework

Our analysis highlighted that tools using a holistic framework are essential for avoiding siloed approaches and capturing interactions within LFSs, particularly the links among sociocultural, agro-environmental, and economic factors (e.g., Doernberg et al., 2022; Peano et al., 2015). Such a framework was reported as helping to reveal mutual influences and highlight needed compromises (e.g., Cirone et al., 2023). Some documents noted that including the governance dimension makes it possible to examine the institutional and political mechanisms shaping the ways that LFSs are structured and to contribute to their sustainability (e.g., FAO et al., 2021; Valette et al., 2024). Others indicated that the framework must also measure emerging concerns, such as entrepreneurs' confidence in managing their activities and their relationships with the local community (e.g., Landert et al., 2017; Peano et al., 2015).

Criterion 5. Comparability between LFSs and across scales

Several documents mentioned that tools must make it possible to compare LFSs across administrative scales and align with national and global benchmarks (e.g., Bouroullec & Victoria, 2014; Lulovicova & Bouissou, 2024). This comparability requires the use of common indicators that can be matched to reference frameworks, such as the Sustainable Development Goals (SDGs; FAO, 2014; e.g., Cirone et al., 2023). Some documents highlighted that a holistic evaluation framework improves the consistency and usefulness of comparative data (Cirone et al., 2023).

Criterion 6. Community participation

Documents indicated that tools should feature mechanisms encouraging broad community engagement, including engagement with vulnerable groups, by raising awareness of LFSs' challenges and starting dialogue on gaps and priorities (e.g., O'Brien & Cobb, 2012; Whitt & Pitt County Food Council Task Force, 2016). Broader stakeholder involvement was reported as creating synergies and driving real change within LFSs (e.g., Chollett & Naidu, 2009).

Criterion 7. Ability to assess deep and systemic transformations of LFSs

Finally, some reviewed documents noted that tools should enable LFSs to construct their own transition trajectories by translating their values and convictions into structural change strategies, and by including indicators that monitor the key structural transformations underpinning socio-ecological transitions (e.g., Moragues-Faus & Marceau, 2018; O'Brien & Cobb, 2012). Priority should be given to indicators that track policies and strategies related to removing regulations that maintain the current unsustainable food system, and those that consolidate alternative initiatives (e.g., Center for Whole Communities, 2009; FAO, 2014; Lambie, 2019; Moragues-Faus & Marceau, 2018; Peano et al., 2015). These indicators should focus on the democratization of governance mechanisms through broader and more inclusive decision-making, and on sustained financial and organizational support to strengthen LFS networks. In addition, indicators should quantify projects that consolidate and strengthen the structures of LFS initiatives and should expose persistent barriers created by the dominant food system (such as policies, norms, or rules that constrain LFS actors) to explicitly identify obstacles to structural change (e.g., Cohen et al., 2002; Darrot et al., 2022; First Nations Development Institute, 2014).

Table 1 synthesizes the seven criteria that emerged from our analysis and presents their practical implications for selecting LFS assessment tools.

Discussion

This study identified 22 holistic LFS assessment tools and revealed recurring challenges and facilitators affecting their implementation. Seven criteria for selecting tools that can support socio-ecological transitions in LFSs were identified. According to our results, an appropriate tool should:

1. Be relevant to the local context by taking a modular approach that combines different suites of indicators and tools;
2. Identify strengths, assets, and challenges to clarify the LFS's achievements and to list available resources, the sources of problems, and the areas where the LFS has room to maneuver in solving them;
3. Guide action by translating findings into practical recommendations for decision-makers;
4. Use a holistic and innovative framework covering social, economic, environmental, and governance dimensions to capture complex interactions and emerging sustainability concerns;
5. Enable comparison across territories and scales through shared indicators that foster cross-territory learning;
6. Include mechanisms to enhance community and citizen participation, especially by improving vulnerable populations' influence on decision-making; and
7. Track deep and systemic transformations by measuring structural changes, such as intersectoral policy changes, inclusive governance reforms, and regime lock-in.

Table 1. Guidance for Selecting Assessment Tools for Local Food Systems (LFSs) Using the Seven Criteria

Criteria	Purpose	Key questions	Implication for tool selection
1 – Relevance to the local context	Ensure that assessment reflects shared issues and priorities	What are the most pressing issues and priorities in our local context, and how do selected components and indicators reflect shared issues and priorities?	Choose tools that allow flexible adaptation of components and indicators, and, when needed, allow combination with other tools to address local priorities and specific contexts
2 – Assess strengths, assets and challenges	Identify achievements, available resources, and process conditions that shape the current performance of LFS	How does the tool assess strengths, assets and challenges? Does it specify processes and sources of problems?	Select tools that assess both results and their underlying processes, identify available resources, and specify sources of problems
3 – Capacity to guide action	Ensure that assessment findings inform planning and decision-making	How does the tool present findings in a way that supports decisions, policies, and actions?	Choose tools that translate findings into practical recommendations for concrete interventions, priorities, and the development of food policies
4 – Use of a holistic and innovative framework	Ensure that assessment addresses the four sustainability dimensions and their interactions (holistic), as well as emerging issues (innovative)	How does the tool integrate social, economic, environmental, and governance dimensions? How does it incorporate emerging issues?	Favor tools that avoid siloed assessment, capture interdependencies across dimensions, make compromises explicit, and address emerging issues
5 – Comparability between LFSs and across scales	Enable meaningful comparison and alignment across territories and governance levels	How does the tool enable comparison across territories and administrative scales? Are its indicators aligned with shared reference frameworks such as the SDGs? *	Favor tools that use shared indicators (same definitions and measurement) to allow comparison across territories and administrative scales, and alignment with national or global reference frameworks like SDGs*
6 – Community participation	Ensure meaningful community participation in the assessment process, including by vulnerable groups	How does the tool engage stakeholders in the assessment process? How are vulnerable and marginalized groups included?	Select tools that include explicit mechanisms for stakeholder engagement and inclusive participation
7 – Ability to assess deep and systemic transformations of LFSs	Ensure that assessment tracks structural and systemic change in LFSs	How does the tool track structural transformations, including changes in policy, market conditions, social norms, and governance democratization that support or impede the consolidation of LFS initiatives?	Choose tools that include components and indicators to track structural changes, including both enabling factors and persistent barriers affecting the consolidation of LFS initiatives

The following subsections discuss the four main findings of this review and their implications for practice.

Tools Often Lack a Clearly Articulated Sustainability Perspective

The first finding is that most tools identified in this study lack a clear and coherent vision of sustainability, even though such a vision is recognized as fundamental to guiding transformation toward sustainability (Kantabutra, 2020). Economic and social dimensions tend to be overemphasized, often driven by production-oriented agendas and a growing interest in the social impacts of LFSs (Massuça et al., 2023). At the same time, environmental and governance components remain underdeveloped (Allen et al., 2019; Cirone et al., 2023; Dezio & Marino, 2018). Notably, although the dominant approach remains primarily focused on economic profitability, key components such as *Investment* and *Enterprise vibrancy and prosperity* are often unmeasured. Moreover, environmental indicators relating to biodiversity, climate change adaptation, and waste management are unequally represented and often superficial, partly due to the lack of disaggregated regional environmental data, particularly for small enterprises (Moragues-Faus & Marceau, 2018). As an example, in the province of Québec, Canada, regional bio-food portraits focus mainly on economic indicators (MAPAQ, 2024). Environmental data are limited to greenhouse gas emissions and water and air quality indicators from regulated establishments subject to reporting (MELCCFP, 2024). Biodiversity data also remain insufficient to rigorously assess biodiversity loss (Biodiversité Québec, n.d.). Such limited attention weakens the potential for a truly systemic and holistic perspective that would balance governance with economic contributions, the protection of ecosystems, cultural diversity, and social equity, including equitable access to livelihoods (Desiderio et al., 2022; Stephens, 2021).

In some cases, the vagueness surrounding the vision of sustainability appears strategic. It allows actors to manage tensions associated with the multiple and sometimes controversial meanings of the notion of sustainability by adapting it to local realities (Theys, 2020). This also facilitates dialogue with local policymakers, which is often shaped by economic orientation and industrial interests, and sidesteps institutional reluctance to deal with the uncertainty that characterizes transitions (Rahe et al., 2018; Stephens, 2021). However, this vagueness can compromise ecosystem preservation (Shi et al., 2019). These findings underscore the need for tools that allow a participatory, systemic approach with a genuinely holistic evaluation framework that equally balances social, economic, environmental, and governance dimensions and incorporates concrete indicators to quantify impacts, monitor progress, and inform decision-making (Blay-Palmer et al., 2020; Garnett, 2014; Zarbà et al., 2025). Implementing such tools requires dedicated resources for planning, data collection, and collaborative analysis with stakeholders (Rabialahy & Guillaumie, 2022).

Tools Have Limited Inclusion of Vulnerable Groups, Indigenous Communities, and Entrepreneurs, and Limited Consideration of Social Inequalities

A second finding concerns the limited integration of vulnerable groups, Indigenous communities, and small entrepreneurs into LFS assessment tools, as well as the limited consideration of social inequalities. Although several authors stress the importance of incorporating vulnerable groups into evaluations, current LFS assessment tools give little attention to them (Moragues-Faus, 2020). Only two tools include indicators on food policies aimed at these populations, and even those indicators measure whether a policy exists rather than measuring such a policy's real impact (Carey et al., 2018; FAO et al., 2021). This omission tends to reinforce the agendas of actors in positions of power, thereby undermining the transformative potential of evaluation and perpetuating existing inequities (Moragues-Faus, 2020). As a result, food justice, where everyone can both access healthy food and shape food governance, remains difficult to achieve in LFSs (Gallardo Gomez & Darrot, 2023; Hochedez et al., 2022).

Indigenous food systems issues were also rarely addressed and often received superficial consideration when they were. One tool, available in two versions, focused on Indigenous food sovereignty (Bell-Sheeter, 2004; First Nations Develop-

ment Institute, 2014). Four others (FAO, 2014; Landert et al., 2017; Moragues-Faus & Marceau, 2018; National Research Center Inc., 2006b) simply noted whether traditional knowledge was considered, without assessing how it was integrated or its effects. This superficial approach leaves critical blind spots, particularly regarding the use and transmission of traditional knowledge and Indigenous self-determination (Abdul et al., 2024). Effective evaluation must co-design indicators with Indigenous communities. This requires decolonial approaches that recognize Indigenous authority and the revitalization of traditional Indigenous knowledge and food practices, and that give priority to lived experience and to reciprocal relationships with land, water, and non-human life (Daigle, 2023).

Small entrepreneurs also receive little attention in existing evaluation tools. Current economic evaluation approaches often fail to capture their contributions (Phillips Goldenberg & Colasanti, 2017). In addition, small entrepreneurs are rarely inclined to participate in evaluation processes (Enthoven & Broeck, 2021; Phillips Goldenberg & Colasanti, 2017). Consequently, samples tend to be small, and their economic impact is likely to be systematically underestimated (Enthoven & Broeck, 2021; Phillips Goldenberg & Colasanti, 2017). In this context, a life-cycle costing approach can help LFS stakeholders clarify how private, public, and external costs are distributed among the various actors along a food supply chain (Pelletier, 2015). LFS governance should therefore recognize small enterprises as transition drivers by giving them formal seats at decision-making tables and actively involving them in evaluation activities (Rabialahy et al., 2025).

Our findings also suggest that the structural causes of social inequalities that shape food concerns for marginalized groups remain largely unaddressed in LFS assessment. Only three tools (Carey et al., 2018; Center for Whole Communities, 2009; Moragues-Faus & Marceau, 2018) address the structural determinants of social inequality, such as poverty, discrimination, precarious labor conditions, and inadequate housing, which shape access to healthy food and overall well-being (Cohen, 2020). The predominance of individual factors, such as diet quality, prevalence of diseases that may be diet-related (e.g., diabetes, cardiovascular illness), obesity rates, and adherence to public nutrition programs or dietary guidelines, reveals an underlying assumption that food-related challenges stem primarily from individual behaviors rather than from structural inequities (Cohen, 2020). This individual lens is too narrow to drive a meaningful socio-ecological transition, which implies structural changes (Bricas et al., 2021; Geels, 2024). Such sparse integration of structural determinants means that LFS assessment tools generally fail to adopt a broad vision of health that includes the reduction of social inequalities (Cohen, 2020). These findings highlight the need for assessment tools that adopt a broader vision of equity by integrating indicators related to the living conditions that underpin equity and by establishing data-sharing practices across sectors to systematically monitor how LFS initiatives contribute to reducing inequities (Cohen, 2020; Pozelli Sabio & Lehoux, 2019).

Limited Strategic Value Due to an Unresolved Methodological Tension and Gaps in Governance Analysis

The third finding highlights that existing assessment tools face both a methodological tension and important gaps in governance analysis, which together limit their ability to support strategic decision-making. The methodological tension arises from two evaluation approaches in LFS assessment: in-depth assessments offer comprehensive insights but rely on laborious methods, whereas rapid scans are simple but superficial. In-depth assessments are valued for their comprehensive coverage. They use extensive indicator sets and expert-led analysis cycles to capture the complexity of LFSs. However, they require consultants' services, which incur high costs and thus limit their feasibility in resource-limited contexts (Murrell et al., 2022; Schiff et al., 2022). They are also often criticized for failing to produce summaries that can inform strategic decision-making (Sirdey et al., 2023). Conversely, rapid scan tools prioritize affordability and ease of use by drawing on available quantitative data or stakeholder perceptions. They offer a viable alternative where financial and technical capacities are limited (Murrell & Jones, 2020; Schiff et al., 2022) but risk delivering superfi-

cial or incomplete analyses of critical LFS issues (Marchand et al., 2014). Self-assessment frameworks, such as the MUFPP monitoring tool, are lauded for their rapid and participatory evaluation, yet often struggle to adapt to local specificities, which limits their effectiveness (Sibbing et al., 2022). Ultimately, the choice between in-depth assessments and rapid scans depends on contextual factors such as available resources, objectives, and stakeholder capacities, as well as how the evaluation will be used, whether for strategic decision-making or for performance comparison. However, it is important to remain aware that each approach involves trade-offs and reflects strategic choices about what to prioritize in evaluating LFSs.

Furthermore, most evaluation tools, whether in-depth or rapid, fail to monitor whether and how their findings influence policy decisions (Ubertino et al., 2024). They also rarely analyze the power relations and competing interests among stakeholders that shape these processes (Prosperi et al., 2015). Similarly, few indicators assess the interactions between LFS initiatives and the dominant conventional food systems, even though these are key to identifying structural barriers to transformation (Grin, 2020). Another critical gap concerns the linkages across governance levels (local, regional, and national), which tools rarely address despite its importance for aligning political efforts and ensuring the coherent transformation of food systems (Robert & Mullinix, 2018). In this context, the ability of indicators to inform and influence policy decisions becomes particularly important along with the effective dissemination of assessment results. Evaluations should clarify their relationship to policymaking, examine how findings are communicated and used (Blay-Palmer et al., 2020), and actively involve policymakers through mechanisms such as public reporting and pre-deliberative consultations (Ubertino et al., 2024). Such improvements would enhance the potential of assessment tools to act as true levers for informed and systemic change.

Four Assessment Tools Emerge as the Most Aligned with Socio-Ecological Transition

The fourth finding concerns four holistic tools that emerge as better aligned with the selection criteria identified in this study, while also remaining adaptable to local contexts:

1. Indicators Toolbox for Measuring Progress in Sustainable Food Cities (Moragues-Faus & Marceau, 2018)
2. City Region Food System (CRFS) toolkit (Carey et al., 2018)
3. Food Policy Audit (O'Brien & Cobb, 2012)
4. Community Food Project Evaluation Toolkit (National Research Center Inc., 2006b)

First, all four tools allow flexible adaptation of components and indicators and can be combined to reflect local priorities and specific contexts (Criterion 1). Two of these tools assess 23 sustainability components, providing a comprehensive basis for identifying priority issues, and their wide range of indicators supports the development of dashboards to monitor progress (Carey et al., 2018; Moragues-Faus & Marceau, 2018). The Food Policy Audit also begins by identifying key local issues such as public health, economic development, environmental impacts, social equity, and land conservation (O'Brien & Cobb, 2012). Second, they assess both results and underlying processes, helping identify strengths, available resources, and sources of challenges (Criterion 2). Third, they translate findings into practical orientations that support concrete interventions and food policy development (Criterion 3). Fourth, they avoid siloed assessment by adopting a holistic approach; integrating social, economic, environmental, and governance dimensions; capturing interdependencies and emerging issues such as the capacity of actors to act and Indigenous sovereignty (Criterion 4). Fifth, their use of shared indicators enables comparison across territories, while the CRFS Toolkit (Carey et al., 2018) aligns explicitly selected indicators with the SDGs (Criterion 5). Sixth, these tools incorporate participatory mechanisms that support stakeholder engagement and inclusive participation (Criterion 6). Finally, beyond measuring results, these tools support strategic reflection and can help orient collective action. In particular, the Indicators Toolbox for Measuring Progress in Sustainable

Food Cities (Moragues-Faus & Marceau, 2018), through its structured framework built around six levers of change, helps make visible the structural conditions shaping transition pathways and identify areas where targeted action is needed. These levers include partnerships and collaboration, policies and strategies, infrastructure and planning, public support and services, knowledge and awareness, and market mechanisms.

However, as mentioned above, tools covering a larger number of components and indicators may require greater human, financial, and time resources. In addition, LFSs addressing Indigenous food issues may require complementary tools such as the Food Sovereignty Assessment Tool (First Nations Development Institute, 2014). In contrast, the Food Policy Audit (O'Brien & Cobb, 2012) covers 18 components and uses a binary (yes/no) response format, making it more accessible in contexts of limited resources. However, its limited depth requires complementary qualitative inquiry to better understand the underlying factors shaping both strengths and challenges. In sum, given that sustainability components cannot all be equally adapted to every local context, tools should be selected based on clearly defined local priorities, available capacities, and strategic objectives.

Study Limitations

This review has two main limitations. First, we included only assessment tools designed for community, municipal, or regional scales. National or international tools that could be adapted to local contexts were excluded, with the exception of multiscale frameworks such as SAFA and the CRFS Toolkit, which were retained due to their explicit guidance for application across multiple governance levels. This choice is consistent with the highly context-specific nature of LFSs, but it also limits the extent to which findings can be generalized across different territories. Second, we assigned each indicator to a single sustainability component, even when it could plausibly address several. This simplification, though imperfect, prevented redundancy (Gebara et al., 2024) from diluting scores for components with fewer or less pertinent indicators and highlighted aspects requiring substantial improvement.

Conclusion

This study reveals key challenges in LFS evaluation tools and provides seven criteria to guide the selection of such tools from a socio-ecological transition perspective. These findings contribute to reframing evaluation not merely as a technical exercise, but as a transformative practice capable of generating robust, critical, and shared data that both inform action and support the shift away from the dominant conventional food systems toward more sustainable and just LFSs. The holistic assessment tools reviewed in this study have strong potential to support this transformation by stimulating collective reflection and enabling locally adapted solutions (Moragues-Faus, 2020). However, most of these tools overlook key dimensions of transition dynamics. We therefore recommend integrating a dedicated component focused on transition dynamics, with indicators to monitor structural change, such as the evolving norms, policies, and rules that support LFS innovations and the structural barriers and forms of resistance that impede their consolidation (Rabialahy et al., 2025). In addition, the selection of evaluation components should move beyond technical criteria and become a collective, strategic process involving diverse stakeholders, including vulnerable groups. This process should be guided by two fundamental questions: What are the most pressing issues in our context? And how do the selected components reflect shared priorities? Such an inclusive approach helps avoid blind spots, allows for addressing major concerns, and anchors evaluations in the lived realities of local actors. Finally, greater efforts are needed to amplify the voices of vulnerable and Indigenous populations and to create clear mechanisms for linking evaluation findings to policy-related decision-making. Strengthening these aspects is essential for ensuring that evaluation tools contribute meaningfully to systemic, inclusive, and place-based food system transformations.



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Appendix A. Adapted Taxonomy of Sustainability Component

Purpose of this Taxonomy

This taxonomy is adapted from the FAO (2014) SAFA framework and was expanded through an inductive analysis of the 22 tools included in this review. During the inductive analysis, several components and subthemes were added, expanded, or relocated to better capture the issues reflected in the reviewed tools.

These modifications are indicated using these asterisks:

* (added component and subtheme),
** (expanded component and subtheme), and
*** (relocated component).

This taxonomy served as the analytical grid for classifying indicators and identifying which sustainability issues are prioritized or overlooked across LFS evaluation tools. It supports the analytical process described in the Methods section and ensures consistency with Figure 2 and the coding strategy.

Table A. Adapted Taxonomy of Sustainability Component (C1–C24)

Dimension	Component	Subthemes
Governance	C1 – Corporate ethics (organizational ethics)	Mission statement Due diligence
	C2 – Accountability (evaluation and data use)	Holistic audits Responsibility Transparency
	C3 – Participation (citizen and stakeholder participation)	Stakeholder dialogue Grievance procedures Conflict resolution Citizen participation* Participation of vulnerable populations*
	C4 – Rule of law (policies and strategies)	Legitimacy Remedy, restoration, and prevention Civic responsibility Resource appropriation Implementation of policies and strategies
	C5 – Holistic management	Sustainability management plan Full-cost accounting
	C6 – Institutional governance*	Governance structure* Coordination mechanism*
Environment	C7 – Atmosphere (climate change)**	Greenhouse gases Air quality Energy use***
	C8 – Land and water**	Soil quality Land degradation Water withdrawal Water quality

	C9 – Biodiversity	Ecosystem diversity Species diversity Genetic diversity
	C10 – Materials and energy (consumption and waste management)**	Material use Waste reduction and disposal
	C11 – Animal health and welfare	Animal health Freedom from stress
Economic	C12 – Investment	Internal investment Community investment Long-range investment Profitability
	C13 – Vulnerability (resilience and food autonomy)	Stability of production Stability of supply Stability of market Liquidity Risk management
	C14 – Product quality and information	Food safety Food quality Product information
	C15 – Local economy	Value creation Local procurement
	C16 – Enterprise vibrancy and prosperity*	Enterprise vibrancy* Business prosperity*
Social	C17 – Decent livelihoods	Quality of life Capacity development Fair access to means of production
	C18 – Fair trading practices	Responsible buyers Rights of suppliers
	C19 – Labor rights (labor conditions)**	Employment relations Forced labor Child labor Freedom of association and right to bargain
	C20 – Equity	Non-discrimination Gender equality Support to vulnerable people
	C21 – Human safety and health (human health and well-being)**	Workplace safety and health provisions Public health
	C22 – Cultural diversity	Indigenous knowledge Food sovereignty (Indigenous food sovereignty)
	C23 – Civil society initiatives*	Civil society initiatives*
	C24 – Social capital*	Horizontal social capital Vertical social capital

* Added component and subtheme
** Expanded component and subtheme
***Relocated component

Source: Adapted from FAO (2014) SAFA framework.

Appendix B. Main Characteristics of 22 Tools Included in This Study

Table B. Main Characteristics of 22 Tools Included in This Study

Tool (Title, Author[s], Year) Country of the first author	Primary objective	Number of components assessed by dimension (Env; Soc; Eco; Gov)	Conceptual approaches and/or pre-existing tool(s) guiding development	Number of indicators analyzed*
Tools from scholarly literature				
1 – Holistic sustainability assessment method for urban food system governance (Landert et al., 2017) Switzerland	Assess and compare the sustainability of urban food system governance	22 including: (5) Gov (5) Env (5) Eco (7) Soc	• Sustainability concept • SAFA (FAO, 2014) • The Milan Urban Food Policy Pact Monitoring (MUFPP) Framework (FAO, 2015) • Sustainability Monitoring and Assessment Routine (SMART; Schader et al., 2014)	97
2 – Formes urbaines et gouvernance alimentaire (Darrot et al., 2022) France	Assess and compare urban food systems, and support local authorities in decision-making for the development of food observatories and territorial food projects (comparable to LFS initiatives)	22 including: (5) Gov (2) Env (4) Eco (3) Soc	• IDEA method (farm sustainability indicator; Zahm et al., 2008; 2019) • Landert et al. (2017) tool • MUFPP Framework (FAO, 2015; FAO et al., 2021)	70 elementary indicators organized into 28 aggregated indicators
3 – Measuring Progress in Sustainable Food Cities: An Indicators Toolbox for Action (Moragues-Faus & Marceau, 2018) United Kingdom	Develop a set of indicators to support food councils and initiatives in decision-making and in measuring progress toward sustainable food system	23 including: (5) Gov (5) Env (5) Eco (8) Soc	• Place-based and food systems approach (Moragues-Faus, 2018) • Driving force-Pressure-State-Impact-Response framework (DPSIR) (Huang et al., 2015) • SAFA (FAO, 2014) • Landert et al. (2017) tool	423
4 – Sustainable Agri-food Evaluation METHodology Framework (SAEMETH Framework) (Peano et al., 2015) Italy	Monitor small-scale agri-food systems using indicators that reflect a sustainable vision of the food system	14 including: (2) Gov (4) Env (4) Eco (4) Soc	• Sustainable food system vision proposed by the Slow Food Foundation for Biodiversity's Presidia (Peano et al., 2014)	52
5 – A sustainability scoring system to assess food initiatives in city regions (Cirone et al., 2022) Italy	Assess the sustainability of City Region Food System (CRFS) initiatives through a holistic, coherent, and user-friendly tool enabling both quantitative and qualitative evaluation	15 including: (1) Gov (5) Env (3) Eco (6) Soc	• Life cycle thinking approach (Petit-Boix et al., 2017)	63
6 – The food policy audit: A new tool for community food system planning (O'Brien & Cobb, 2012; Updated by Clark et al., 2018) USA	Identify and assess, through an objective and practical tool, the role of local actors and the relevance of local, regional, and federal food policies influencing food systems	18 including: (5) Gov (2) Env (5) Eco (6) Soc	• Advocacy Coalition Framework (Sabatier & Jenkins-Smith, 1999)	113

Tool (Title, Author[s], Year) Country of the first author	Primary objective	Number of components assessed by dimension (Env; Soc; Eco; Gov)	Conceptual approaches and/or pre-existing tool(s) guiding development	Number of indicators analyzed*
7 – Towards an impact evaluation framework to measure urban resilience in food practices (Dezio & Marino, 2018) Italy	Assess the impact and effectiveness of initiatives on the resilience of urban food systems through a holistic framework incorporating social and ecological components and implications	15 including: (3) Gov (4) Env (4) Eco (4) Soc	• Co-evolutionary paradigm (Norgaard, 1984; Kallis & Norgaard, 2010) • Impact evaluation framework to support planning and evaluation of nature-based solutions (NBS) projects (Raymond et al., 2017) • City Region Food System Indicator Framework (Dubbeling & Carey, 2018) • SAFA (FAO, 2014)	105
8 – Systemic analysis model of short food supply chains (Mundler & Laughrea, 2016) Canada	Assess the contributions of short food supply chains to territorial development	12 including: (3) Gov (2) Env (5) Eco (2) Soc	• Job satisfaction framework (Paugam, 2000)	21
9 – Sustainable food system metrics (Allen & Prosperi, 2016) USA	Develop scenarios, generate projections, and support decision-making in contexts where historical data are lacking or insufficient	15 including: (2) Gov (4) Env (5) Eco (4) Soc	• A vulnerability/resilience conceptual framework (Allen & Prosperi 2016)	139
10 – Sustainability assessment of short food supply chains (SFSC) (Doernberg et al., 2022) Germany	Measure the sustainability impacts of LFS and short food supply chains to help food system actors justify policy interventions	9 including: (–) Gov (5) Env (2) Eco (2) Soc	• A normative approach (emphasizing consumer–producer relationships; Zasada et al. 2014)	15
11 – A framework for assessing the vulnerability of food systems to future shocks (Fraser et al., 2005) United Kingdom	Assess the vulnerability of food systems at the urban scale using multiple conceptual frameworks: panarchy framework, entitlement framework, pathway theory, and portfolio theory	Not determined	• Panarchy framework (Gunderson & Holling, 2002) • Entitlement framework (Sen, 1988) • Pathway theory (Fraser et al., 2005) • Portfolio theory (Markowitz, 1952, 1959)	No indicators
12 – Territorial LCA framework for local food systems assessment (Lulovicova & Bouissou, 2024) France	Assess the environmental impacts of LFS to improve local food planning covering all activities from production to consumption within a defined geographic area	6 including: (–) Gov (3) Env (1) Eco (2) Soc	• Territorial life cycle assessment (Loiseau et al., 2013)	16
13 – URBAL (Urban Driven Sustainable Food System Innovations) (Valette et al., 2024) France	Analyze the complex interactions among actors, governance structures, and city-specific contexts in food innovation processes. Using impact pathway mapping, the aim is to identify:	Not determined	• Theory of change (Padilla, 2002; Thornton et al., 2017) • Impact pathway maps (Douthwaite, 2003)	No indicators

Tool (Title, Author[s], Year) Country of the first author	Primary objective	Number of components assessed by dimension (Env; Soc; Eco; Gov)	Conceptual approaches and/or pre-existing tool(s) guiding development	Number of indicators analyzed*
	(1) the actual changes produced by innovation in terms of sustainability; (2) how these changes are generated through innovation activities; and (3) the links between actions and sustainability, from short-term changes (outputs) to medium-term changes (outcomes) and long-term changes (impacts).			
Tools from gray literature				
14 – SAFA Sustainability Assessment of Food and Agriculture Systems (FAO, 2014) International organization	Provide a harmonized framework for assessing the sustainability along the food and agriculture value chains across environmental, social, economic, and governance dimensions	21 including: (5) Gov (6) Env (4) Eco (6) Soc	• Sustainability vision of SAFA: food and agriculture systems worldwide are characterized by four dimensions of sustainability • LCA • Based on 7 other tools aligning with a global reference framework	116
15 – Outil ATOS (Alternative Territorialized food Organisations' Sustainability) (Bouroullec & Victoria, 2014) France	Assess the sustainability of alternative food systems through an evaluation tool that supports decision-making	16 including: (4) Gov (3) Env (5) Eco (4) Soc	• Goal-oriented conceptual approach (Von Wirén-Lehr, 2001) • Holistic content-based framework (Doumenge, 1998; Rey-Valette et al., 2008)	32
16 – Community food security assessment toolkit (Cohen et al., 2002) USA	Assess the different aspects of community food security, determine the adequacy between food resources and community needs, and inform local decision-makers	7 including: (1) Gov (-) Env (2) Eco (4) Soc	• Concept, design, and implementation (Winne et al., 1997)	61
17 – Whole measures for community food systems (Center for Whole Communities, 2009) USA	Provide an overview of the strengths, weaknesses, opportunities, and threats of a food system to support strategic planning processes	18 including: (2) Gov (5) Env (4) Eco (7) Soc	• Vision for whole communities (developed by Center for Whole Communities)	69
18 – City Region Food System (CRFS) Toolkit: Assessing and planning sustainable city region food systems (Carey et al., 2018; updated by FAO, 2023) International organization	Support cities in: (1) assessing the current state and performance of a city region food system using a comprehensive approach; (2) identifying priority action areas with clearly defined desired outcomes and means to measure change; (3) planning strategies and actions to achieve those desired outcomes; and (4) establishing baselines and monitoring changes resulting from	23 including: (5) Gov (5) Env (5) Eco (8) Soc	• A whole food system approach (according to a vision for CRFS; Carey et al., 2018)	210

Tool (Title, Author[s], Year) Country of the first author	Primary objective	Number of components assessed by dimension (Env; Soc; Eco; Gov)	Conceptual approaches and/or pre-existing tool(s) guiding development	Number of indicators analyzed*
	the (future) implementation of policies and programs			
19 – Community food system assessment (Ross & Simces, 2008; updated by Sparrow, 2016) Canada	Provide an overview of the key elements of the community food system and generate information to guide decision-making, planning, policy development, and program funding	13 including: (3) Gov (3) Env (3) Eco (4) Soc	• Community Food System Assessment Guide (published by Provincial Health Services Authority, Toronto)	67
20 – Food sovereignty assessment tool (FSAT) (First Nations Development Institute, 2014) USA	Examine community food assets and inform changes aimed at improving food planning and strengthening Indigenous food systems	16 including: (3) Gov (3) Env (5) Eco (5) Soc	• Solution-oriented approach (Bell-Sheeter, 2004) • Community participatory approach (Bell-Sheeter, 2004)	94
21 – Community food project evaluation toolkit combining 6 assessment tools: (1) Common Output Tracking Form (COTF) (2) The Farmers' Market tools (3) Community Garden tools (4) Community Supported Agriculture (CSA) tools (5) Farm to School tools (6) System-Level Evaluation Tools (National Research Center Inc., 2006b) USA	(1) Accurately document and highlight the impact of Community Food Security Projects so they can use these data to improve their programs (2) Meet funder requirements (3) Contribute to the development of shared knowledge on effective community food security practices	22 including: (5) Gov (4) Env (5) Eco (7) Soc	• Basic logic model developed by United Way of America • A companion community food project evaluation toolkit	582 including 121 (Tool 1) 78 (Tool 2) 84 (Tool 3) 64 (Tool 4) 110 (Tool 5) 125 (Tool 6)
22 – Milan Urban Food Policy Pact Monitoring Framework (MUFPPMF) (FAO et al., 2021) International organization	(1) Serve as a tool to identify priorities in food-related policies and programs. (2) Illustrate the extent to which "desired changes" are occurring and the impact of those changes. (3) Assess gaps in policy advancement and resource mobilization and reveal overall improvements in urban food systems (if measured periodically). (4) Foster collaboration among municipal departments, stakeholder groups, and national governments to address food system challenges in a systematic manner.	13 including: (4) Gov (2) Env (3) Eco (4) Soc	• Food system approach • Participatory, multistakeholder approaches • Place-based approach	44

* Only the indicators effectively analyzed in this study are reported

Appendix C. List of Identified Tools and Additional Documents Reviewed to Obtain Complementary Information (e.g., Development Process, Applications, Critiques)

Table C1. List of Identified Tools

Tool #	Source information
1	Food and Agriculture Organization of the United Nations [FAO]. (2014). *SAFA (sustainability assessment of food and agriculture systems) Guidelines* (version 3.0). https://openknowledge.fao.org/items/84c84661-7172-415c-b66e-7c1eee5db675
2	Landert, J., Schader, C., Moschitz, H., & Stolze, M. (2017). A holistic sustainability assessment method for urban food system governance. *Sustainability*, *9*(4). https:doi.org/10.3390/su9040490
3	Darrot, C., Marie, M., Bodiguel, L., Hochedez, C., Margetic, C., & Pecqueur, B. (2022). PSDR4FRUGAL-Approcher les systèmes alimentaires urbains par les indicateurs: décrire, comparer, prioriser [PSDR4 FRUGAL—Using indicators to approach urban food systems: describing, comparing, and prioritizing]. *Innovations Agronomiques*, *86*, 91–105. https://doi.org/10.17180/ciag-2022-vol86-art09
4	Moragues-Faus, A., & Marceau, A. (2018). Measuring progress in sustainable food cities: An indicators toolbox for action. *Sustainability*, *11*(1), 45. https://doi.org/10.3390/su11010045
5	Peano, C., Migliorini, P., & Sottile, F. (2014). A methodology for the sustainability assessment of agri-food systems an application to the Slow Food Presidia project. *Ecology and Society*, *19*(4). http://www.jstor.org/stable/26269668 Peano, C., Tecco, N., Dansero, E., Girgenti, V., & Sottile, F. (2015). Evaluating the sustainability in complex agri-food systems: the SAEMETH framework. *Sustainability*, *7*(6), 6721–6741. http://doi.org/10.3390/su7066721
6	Cirone, F., Petruzzelli, M., De Menna, F., Samoggia, A., Buscaroli, E., Durante, E., Orsini, F., Rufí-Salís, M., Tonini, P., Durany, X. G., Graamans, L., Fargue-Lelièvre, A., Saint-Ges, V., Fox-Kämper, R., Specht, K., Pascual-Fernández, J. J., & Vittuari, M. (2023). A sustainability scoring system to assess food initiatives in city regions. *Sustainable Production and Consumption*, *36*, 88–99. https://doi.org/10.1016/j.spc.2022.12.022
7	O'Brien, J., & Cobb, T. D. (2012). The food policy audit: A new tool for community food system planning. *Journal of Agriculture Food Systems and Community Development*, *2*(3), 177–191. https://doi.org/10.5304/jafscd.2012.023.002 Clark, J. K., Marquis, C., & Raja, S. (2017). The local food policy audit: Spanning the civic-political agrifood divide. In I. Knezevic, A. Blay-Palmer, C. Z. Levkoe, E. Nelson, & P. Mount (Eds.), *Nourishing communities: From fractured food systems to transformative pathways* (pp. 131–146). Springer. https://doi.org/10.1007/978-3-319-57000-6_8
8	Dezio, C., & Marino, D. (2018). Towards an impact evaluation framework to measure urban resilience in food practices. *Sustainability*, *10*(6), 2042. https://doi.org/10.3390/su10062042
9	Mundler, P., & Laughrea, S. (2016). The contributions of short food supply chains to territorial development: A study of three Quebec territories. *Journal of Rural Studies*, *45*, 218–229. https://doi.org/10.1016/j.jrurstud.2016.04.001
10	Allen, T., & Prosperi, P. (2016). Modeling sustainable food systems. *Environmental management*, *57*(5), 956–975. https://doi.org/10.1007/s00267-016-0664-8

11	Doernberg, A., Piorr, A., Zasada, I., Wascher, D., & Schmutz, U. (2022). Sustainability assessment of short food supply chains (SFSC): Developing and testing a rapid assessment tool in one African and three European city regions. *Agriculture and Human Values*, *39*(3), 885–904. https://doi.org/10.1007/s10460-021-10288-w
12	Fraser, E. D. G., Mabee, W., & Figge, F. (2005). A framework for assessing the vulnerability of food systems to future shocks. *Futures*, *37*(6), 465–479. https://doi.org/10.1016/j.futures.2004.10.011
13	Bouroullec, M. D. & Victoria, F. (2014). *ATOS : un outil d'analyse de la durabilité des systèmes agroalimentaires alternatifs – le cas des drives d'agriculteurs de produits locaux* [*ATOS: A tool for analyzing the sustainability of alternative agrifood systems – the case of farmers' "drives" for local products*]. https://www.researchgate.net/publication/326450433_ATOS_un_outil_d'analyse_de_la_durabilite_des_systemes_agroalimentaires_alternatifs-le_cas_des_drives_d'agriculteurs_de_produits_locaux
14	Cohen, B., Andrews, M., & Kantor, L. (2002). *Community food security assessment toolkit*. Food Assistance & Nutrition Research Program. https://www.ers.usda.gov/publications/pub-details/?pubid=43179
15	Center for Whole Communities. (2009). *Whole measures for community food systems: Values-based planning and evaluation*. https://wholecommunities.org/resources-archive/whole-measures-for-community-food-systems/
16	Carey, J., Dubbeling, M., & RUAF Foundation. (2018). *City region food system toolkit: Assessing and planning sustainable city region food systems*. Food and Agriculture Organization, RUAF Foundation, Wilfrid Laurier University, & Centre for Sustainable Food Systems. https://www.fao.org/3/i9255en/I9255EN.pdf
17	Ross, S., & Simces, Z. (2008). *Community food assessment guide*. https://canadacommons.ca/artifacts/40756662/community-food-assessment-guide/41655727/
18	First Nations Development Institute. (2014). *Food sovereignty assessment tool (2nd ed.)*. https://www.firstnations.org/resources/food-sovereignty-assessment-tool-2nd-edition/ Bell-Sheeter, A. (2004). *Food sovereignty assessment tool*. First Nations Development Institute. https://www.indigenousfoodsystems.org/sites/default/files/tools/FNDIFSATFinal.pdf
19	National Research Center Inc. (2006). *Community food project evaluation toolkit*. Community Food Security Coalition. https://foodsecurity.org/CFPTOOLKIT030805.pdf
20	Food and Agriculture Organization of the United Nations [FAO], Milan Urban Food Policy Pact & RUAF Foundation. (2021). *Milan Urban Food Policy Pact monitoring framework* https://www.fao.org/documents/card/en/c/ca6144en/
21	Lulovicova, A., & Bouissou, S. (2024). Use of territorial LCA framework for local food systems assessment: Methodological developments and application. *The International Journal of Life Cycle Assessment*, 1-17. https://doi.org/10.1007/s11367-024-02289-8
22	Valette, É., Blay-Palmer, A., Intoppa, B., Di Battista, A., Roudelle, O., & Chaboud, G. (2024). *Evaluating sustainable food system innovations: A global toolkit for cities*. Taylor & Francis. https://doi.org/10.4324/9781003285441

Table C2. List of Additional Documents Reviewed for Certain Tools to Obtain Complementary Information (e.g., Development Process, Applications, Critiques)

Tool #	Additional documents
6	Pelletier, N. (2015). Life cycle thinking, measurement and management for food system sustainability. *Environmental Science & Technology*, *49*(13), 7515–7519. https://doi.org/10.1021/acs.est.5b00441
9	Clark, J. K. (2018). From civic group to advocacy coalition: using a food policy audit as a tool for change. *Journal of Agriculture, Food Systems, and Community Development*, *8*(1), 21–38. https://doi.org/10.5304/jafscd.2018.081.004
10	Allen, T., Prosperi, P., Cogill, B., Padilla, M., & Peri, I. (2019). A Delphi approach to develop sustainable food system metrics. *Social Indicators Research*, *141*, 1307–1339. https://doi.org/10.1007/s11205-018-1865-8
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