



Original Research Article

A review of food asset maps in Canada

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Abstract

Food asset mapping is gaining prominence in Canada as an important planning tool for the evaluation of local food systems. In addition to being used by planners to identify opportunities for improved food security, food asset maps are also valuable references for sourcing food locally, particularly by people experiencing food insecurity. Seventy-three food asset maps were reviewed and categorized based on the types of food assets included as well as design characteristics. Built environment assets such as grocery stores and food banks were included in most maps, as were agriculture-based natural food assets like farms, community gardens, and orchards. However, representations of Indigenous-

focused food assets and natural food assets that are not agriculture-based, such as forests, water bodies, and foraging areas, were generally lacking. The lack of representation of Indigenous perspectives on what is considered a food asset reinforces the values of a settler-colonial food system in food asset maps. The methods for food asset mapping therefore need to be changed from current quantitative practices that largely rely on secondary data sources led by governments and non-profit organizations to collaborative approaches that centre the perspectives of Indigenous peoples and other equity deserving groups.

Keywords: Food asset mapping; local food systems; food security; Canada; food system planning

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Résumé

La cartographie des ressources alimentaires gagne en importance au Canada en tant qu'outil de planification important pour l'évaluation des systèmes alimentaires locaux. En plus d'être utilisées par les planificateurs pour identifier les possibilités d'amélioration de la sécurité alimentaire, ces cartes sont aussi des références précieuses pour l'approvisionnement local, en particulier pour les personnes en situation d'insécurité alimentaire. Soixante-treize cartes de ressources alimentaires ont été examinées et classées en fonction des types de ressources et des caractéristiques de conception. L'environnement bâti, incluant les épiceries et les banques alimentaires, a été inclus dans la plupart des cartes, de même que les lieux d'agriculture d'aliments naturels, tels que les fermes, les jardins communautaires et les vergers. Cependant, les

ressources alimentaires du point de vue des populations autochtones et celles d'origine naturelle qui ne sont pas issues de l'agriculture, telles que les forêts, les plans d'eau et les zones de cueillette, étaient généralement absentes. Le manque de représentation des perspectives autochtones sur ce qui est considéré comme une ressource alimentaire renforce les valeurs d'un système alimentaire colonial dans ces cartes. Les méthodes de cartographie doivent donc être modifiées et passer des pratiques quantitatives actuelles, qui reposent largement sur des sources de données secondaires gérées par les gouvernements et les organisations sans but lucratif, à des approches collaboratives qui tiennent compte des points de vue des peuples autochtones et d'autres groupes méritant d'être traités avec équité.

Introduction

Food insecurity is defined as "the inability to acquire or consume an adequate diet quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so" (Health Canada, 2020, para. 1). In 2020, 11.2 percent of the Canadian population was food insecure (Statistics Canada, 2022b). This has been exacerbated with the COVID-19 pandemic (Idzerda et al., 2022). The negative impact of rising food prices due to record levels of inflation in 2022 also contributed to food insecurity, with 24 percent of Canadians reducing the amount of food they purchased and 7.1 percent skipping meals (Charlebois & Music, 2022). In fact, the highest prevalence of food insecurity in Canada (17.8 percent of households in the ten provinces) was recorded in 2022 (Li et al., 2023). Barriers to food access may be caused by income (McIntyre et al.,

2016), lack of mobility (Rajasoosiar & Soma, 2022), or the closure of important food spaces offering food services that community members rely upon (Higgins et al., 2021). These barriers also disproportionately affect racialized and Indigenous peoples (Grann et al., 2023; Mori & Onyango, 2023). The highest rates of food insecurity were reported by people who identify as Black (39.2 percent), Indigenous (33.4 percent), and Filipino (29.2 percent) living in the ten Canadian provinces in 2022 (Li et al., 2023). In contrast, 15.3 percent of people who identify as White experienced food insecurity (Li et al., 2023). Note that the data reported by Li et al. (2023) did not include Indigenous peoples on-reserve. According to data collected from 2008 to 2016, 47.1 percent of households on-reserve were food insecure (Batal et al., 2021). These high rates of food insecurity

for Indigenous peoples, especially on-reserve, reflect structural disparities caused by hundreds of years of colonization by European settlers. Indigenous peoples were removed from their land, food sources, and culture. Ineffective food interventions for Indigenous peoples rooted in settler colonial ideologies persist to the present day (Robin (Martens) et al., 2022). Despite the presence of food insecurity, most local governments rarely consider food systems in urban planning. For example, a survey conducted by the American Planning Association found that only 1 percent of local governments view food systems issues as a priority (Raja, 2020). In Canada, a survey conducted with land use planners found that 67 percent of those surveyed (n=435) had no experience with food-related courses in their planning education (Hansen et al., 2021).

In the field of food systems planning, food asset mapping is one tool that has gained popularity in Canada to improve food security by identifying and characterizing the available resources in a municipality or region to better understand the local food system (Baker, 2018). Food assets are resources and infrastructure to support a local food system such as community gardens, urban agriculture, farmers' markets, food retail, food banks, community kitchens, and other organizations or programs related to food (Baker, 2018). Ways that food asset maps are used for food systems planning include tracking the number, density, and location of food assets, evaluating access (or lack of access) to food assets for vulnerable populations, identifying potential locations for programs and services, finding connections between food assets and food system stakeholders, and inform food policies (Baker, 2018; Pothukuchi, 2004). Moreover, food asset mapping has been identified as one of the tools that planners and policy makers can use for asset inventory and for food systems resiliency (Moore et al., 2022). Asset inventory can be used to better understand emergency responses and to facilitate food

systems resilience planning through the identification of critical food assets that are needed for the food systems to function (Moore et al., 2022). According to Soma et al. (2022a), food asset mapping may include food assets that are critical for cultural food practices (both formal and informal), natural/ecological food assets, the built environment, and also social food assets. Through a community food asset mapping process, the study identified the importance of ensuring that the currently underrepresented voices and food of Indigenous communities are included in the mapping process (Soma et al., 2022a). When identifying food assets, it is imperative for planners, geographers, and policy makers to ask: “food assets for whom?”

While studies on food mapping in general have been conducted to understand disparities in the food system, as revealed through food access mapping and food desert mapping (Sweeney et al., 2016), there has been no study about the content and diversity of food asset maps that currently exist. Even though food asset maps have been created in multiple jurisdictions across Canada, amid growing calls to use this tool to improve food systems resiliency (Moore et al., 2022; Soma et al., 2022a) and food security (Baker, 2018), there has been a lack of research conducted on the content of the maps and the types of food assets that are included. Without understanding the nuances and types of assets included in food asset maps, it is unclear whether the maps include assets that are critical for local food system functionality. This review investigates the prevalence, quantity, type, and distribution of food assets and food asset maps across the country. Based on the norms in current food asset mapping practices, and several studies highlighting gaps in Indigenous voices in food asset mapping processes (Soma et al., 2022a; Soma et al., 2022b), our hypothesis is that food asset maps in Canada are dominated by built environment assets and lack consideration of Indigenous and natural assets.

Literature review

The practice and use of the term “food asset mapping” has become more prominent in the field of urban planning in Canada since being introduced by Baker (2018). However, the practice of participatory asset mapping has been employed since the 1990s to identify community assets and seek solutions to social issues, including food security (Lightfoot et al., 2014). Since asset mapping projects are largely based in communities and conducted by practitioners, they may not be documented extensively in research literature. Nonetheless, there are some Canadian examples of participatory asset mapping that included food assets from the 2010s (Fast & Rinner, 2018; Tudge, 2010).

While food asset mapping is used more commonly by planners in Canada, there are other food mapping techniques that serve similar objectives. “Food access” mapping is a common term in the U.S. for mapping the food assets within a municipality or region where access to healthy foods is lacking (Hubley, 2011; McEntee & Agyeman, 2010; McKey et al., 2020). Food access mapping focusses directly on the built environment assets where food can be either purchased or obtained free of charge (e.g., retailers, food banks), in conjunction with natural assets such as community gardens where food is grown or produced (De Master & Daniels, 2019). “Foodshed mapping,” characterizes natural assets in terms of estimating potential agricultural land and yields for food products (Hu et al., 2011; Peters et al., 2012). Another term used is “food system mapping,” which characterizes a local or regional system as a whole and includes natural and built environment assets, as well as the linkages between them (Jensen & Orfila, 2021). For this review, the term food asset mapping will be used to encompass the various forms of mapping tools used to characterize food assets as identified by Baker (2018). The definition

of food assets used by Baker (2018) is broad since it includes physical and non-physical assets that maintain food security for communities and regions. Examples of physical assets are farms, orchards, processors, distributors, retailers, community gardens, community kitchens, food banks, and waste management facilities (Baker, 2018). Examples of non-physical assets are food programs and services, funding, investment opportunities, and political support (Baker, 2018). While the definition does not explicitly exclude any food assets, these examples represent an agricultural, market-based food system worldview. Land-based and informal food assets were not included, nor were cultural food assets such as gathering spaces and places for transmission of traditional knowledge. Due to the broad definition of food assets, it is not clear how the concept of food assets is mobilized by organizations and municipalities that choose to develop food asset maps.

Quantitative methods are commonly used to populate food asset maps using secondary data sources such as municipal databases, census information, and food retailer listings (Baker, 2018; Hubley, 2011; McEntee & Agyeman, 2010; McKey et al., 2020; Sweeney et al., 2016). While these types of maps provide a useful evidence-based tool for planning and decision making, there are limitations in their ability to represent the nuances and dynamics of the local food system. Quantitative data focusses mostly on the built environment and assets that can be spatially tracked (i.e., having an address or specific geographic location). They typically do not include traditional Indigenous ways of obtaining food such as foraging, hunting, and fishing, or non-market means such as personal gardening, livestock rearing, sharing, trading, and recovering food from waste (Hall et al., 2020; McEntee & Agyeman, 2010; Soma et al., 2022a). In their current

form, food asset maps can paint an incomplete picture of the local food system and reinforce existing negative assumptions and stigmas associated with communities that face greater food insecurity or rely more on traditional or non-market means of food provisioning (De Master & Daniels, 2019; Miewald & McCann, 2014; Soma et al., 2022a). Furthermore, the exclusion of food assets that are important for Indigenous peoples can reinforce the Eurocentric and colonial history of mapping, which was done to expand settlements and exert power while displacing Indigenous knowledge and experiences (Duncan, 2006; Hunt & Stevenson, 2017). Also known as “map tyranny,” it is important to be cautious about privileging the scientific worldviews of the map makers and scientists who develop maps (Duncan, 2006, p. 411). The omission of Indigenous values and worldviews in the practice of mapping perpetuates the dominant food system that is built on “the capitalist logic of the ceaseless expansion of production, consumption, and profit, and is fundamentally exploitative, wasteful, irrational, and inhumane to Indigenous Peoples and to society as a whole” (Bohunicky et al., 2021, p. 157). While qualitative methods such as surveys or focus groups, or the application of citizen science can augment

secondary data sources to provide a more comprehensive understanding of local food systems, their application has been limited due to the large amount of time and resources needed for implementation (De Master & Daniels, 2019; Florian et al., 2016; McEntee & Agyeman, 2010; Soma et al., 2022a; Sweeney et al., 2016).

Besides their use as a planning tool, food asset maps can act as a source of information for people who are food insecure and are looking for affordable food options in their locality. For practitioners such as municipal governments and community organizations, food asset maps are indeed purposely created to assist people facing food insecurity (City of Calgary, 2022; Region of Peel, 2022; Vancouver Coastal Health, n.d.). In response to the COVID-19 pandemic, some local governments created asset maps to provide up-to-date information to residents on where they can find community resources, including food banks, food delivery services, meal programs, prepared meal distribution, community fridges, and low-cost markets (City of Toronto, n.d.; City of Vancouver, 2022). However, these maps do not appear to be regularly updated after the pandemic.

Methods

Food asset maps from Canada were identified by conducting web searches on Google, Google Scholar, and Simon Fraser University's online library catalogue for keywords in English and French, the two official languages of the country. The English keywords used were “food asset map,” “food system map,” “food access map,” and “food map.” The French keywords were “carte des ressources alimentaires,” “carte du paysage alimentaire,” and “carte alimentaire.” These key words

were paired with “Canada” and the names of each of the provinces and territories in Canada, as well as their acronyms, to narrow down the search results. If the province or territory names were not generating a sufficient quantity of search results, the major city names within each province and territory were also included in the search to find additional maps.

Indigenous food assets were given their own category and search because these assets have been

identified as lacking in mainstream food systems planning (Soma et al., 2022a; Soma et al., 2022b). While there is also a lack of representation of other equity deserving groups in food systems planning, their food assets are found more within the built environment which is typically better represented in food asset maps. To search specifically for Indigenous food asset maps, the word "Indigenous" was added to the English keywords. As there are multiple terms for "Indigenous" in French, each of the following keywords was added to the two mapping keywords: "peuples indigènes," "peuples autochtones," and "indigène." Search results were reviewed to identify maps within Canada that were published on an interactive web mapping platform (e.g., Google Maps, ArcGIS) or as a static map that spatially depicts food assets (e.g., a PDF or image) that included at least one type of food asset. In some cases, search results led to links that did not work and those maps were not included.

Food assets on each map identified from the web search were categorized according to the definitions in Table 1 (Food asset categories). Built environment food

assets are defined as food assets in human-made or modified structures. Conversely, natural food assets are defined as food assets outside of human-made or modified structures. Farms, gardens, and orchards are categorized as natural assets due to the asset predominantly occupying space that is not in a human-made or modified structure, although such structures may be appurtenant to the asset. Indigenous food assets are defined as food assets that are oriented towards use by Indigenous peoples and may include traditional foods or land-based foods and associated infrastructure (e.g., smoke houses for smoking fish) (Robin et al., 2021). These food assets are identified through the use of Nation names or other label cues in the map title or description that may refer to traditional foods, country foods, or Indigenous focussed foods. Note that natural food assets and Indigenous food assets are not necessarily mutually exclusive, as most natural food assets such as fishing, hunting, and foraging spaces are traditional food sources for Indigenous peoples (Robin et al., 2021).

Table 1: Food asset categories

Asset Type	Asset Category	Examples
Built Environment Food Assets	Food charities	Food banks, food aid, meal delivery services for vulnerable populations, community restaurants, soup kitchens, meal & snack services
	Schools	Educational programming, gardening & cooking workshops, schools
	Commercial grocers	Convenience stores, supermarkets, seasonal markets, grocers, public markets, specialty food stores
	Commercial dining	Restaurants, cafes
	Community organizations	Religious organizations, community centres, community health centres, family centres, collective kitchens, fridge sharing, seed libraries
	Free or low-cost grocery	Low-cost markets, food vouchers, mobile/curbside/pop-up markets, free grocery items, low-cost grocery items
	Built environment gardens	Greenhouses, rooftop garden, vertical farming
	Alternative markets	Farmer's markets
	Farms/gardens	Community gardens, urban farms, institutional gardens

Natural Food Assets	Orchards	Dedicated orchard space, wineries
	Water bodies	Lakes, rivers, shorelines
	Forests	Forested land
	Land forage	Berries, fruits, wild food stuffs, hunting
	Marine forage	Fishing
Indigenous Food Assets	Indigenous food charities	Food banks, food aid, meal delivery services for vulnerable populations, community restaurants, soup kitchens, meal & snack services
	Indigenous community organizations	Religious organizations, community centres, community health centres, family centres, collective kitchens, fridge sharing, seed libraries
	Indigenous schools	Educational programming, gardening & cooking workshops, schools
	Indigenous community grocers	Convenience stores, supermarkets, seasonal markets, grocers, public markets, specialty food stores
	Indigenous farms/gardens	Community gardens, urban farms, institutional gardens

Characteristics, including the map scale, urban/ruralness, map developer, and purpose were recorded and categorized per Table 2 (Characteristics of food asset maps). The map developer was categorized as the entity that is responsible for the production of the map content. For maps that were developed collaboratively with multiple types of stakeholders, the entity that appeared to be leading the project or having the most responsibility (e.g., keeping the map up to date) was recorded as the map developer. The map purpose was determined by inferring the primary intended use case for developing the map from the map's title, description, and other information that was available online (e.g., project web page). The URL for each map and date of publication or most recent revision at the time of reviewing the map were also recorded.

If there was at least one location on a map that fit in one of the food asset categories, then that food asset was considered to have been included on the map. The number of categories displayed on each map were summed together. The subtotals of categories for each

province or territory and total categories in Canada were also tabulated.

Limitations

The food asset maps for this study were found via online keyword searches. Due to the many terms that are used to describe food asset mapping, a limitation of the study is that published food asset maps may not have been returned as results in the web search queries. Of the maps included in this study, only 12 percent contained the term "food asset map." For example, the map created for the Food by Ward project in Toronto (Toronto Public Health, 2018), which is considered the first large-scale, public, and web-based food asset map in Canada, is not called a food asset map. However, the term "food assets" was mentioned on the webpage of the map when it was still active. Since the term "food asset map" originated in Anglophone Canada and there is no equivalently used French term, it was particularly challenging to find maps from Francophone sources. In both English and French, searching more generally for "food map" and "carte alimentaire" was helpful for

returning more search results, but doing so also increased the quantity of search results that contained irrelevant content.

An absence of Indigenous food assets tagged specifically as “Indigenous food assets” posed a challenge to this study. Indigenous keyword searches returned very few results. Poor identification of Indigenous food assets leaves the contributions of these assets to the food systems landscape under-evaluated and unacknowledged. For example, smokehouses are important food assets for many Indigenous communities to preserve meat such as salmon (MacTavish et al., 2012) and used for ceremonial purposes. However, this food asset is nowhere to be seen in any of the food asset maps (Lane, 2018).

Another limitation is that only maps that were publicly available online were included in the study. There are likely many more food asset maps that have been created and not published online. For example,

participatory food asset mapping projects have been conducted in Canadian communities, but these maps were not published or no longer available (Fast & Rinner, 2018; Tudge, 2010). Paper maps may also exist and would not have been included.

Lastly, this study reviewed the types and categories of food assets included in food asset maps, but not the quality or completeness of the data. Maps varied widely in how many food assets were identified in a region. In some maps, data points were very sparsely distributed, and in others, they were very densely localized. Since this study did not include primary data collection, there were no means available to determine how many food assets were captured in the food asset maps compared to the actual number of food assets. Therefore, there is uncertainty as to whether food assets were representationally missing from maps or were just non-existent.

Results and discussion

Food asset map characteristics

The keyword search yielded a total of seventy-three food asset maps. See Appendix A for the list of maps. A summary of map characteristics is shown in Table 2. Most maps were on a municipal (55 percent) or regional (32 percent) scale and developed by non-profit organizations (44 percent) or government (41 percent).

The municipal and regional scale of food asset maps is logical, since the non-profit organizations and government entities that create these maps also operate at that level, such as municipal or regional governments, regional health authorities, and community organizations.

Table 2: Characteristics of food asset maps

Characteristic	Category	Definition	Number of Maps	Percentage of Maps (%)
Map scale	Municipal	One city or town	40	55
	Regional	A county, a region, or more than one city or town	23	32
	Provincial/territorial	One province or territory	6	8
	Inter-provincial/territorial	More than one province or territory	4	5
Urban/ruralness	Urban	Within a census metropolitan area or census agglomeration (Statistics Canada, 2023)	30	41
	Rural	Outside of a census metropolitan area or census agglomeration (Statistics Canada, 2023)	6	8
	Rural/urban	Includes both rural and urban areas	37	51
Map developer	Government	Municipal, regional, or provincial government or entity (e.g., health authority, tourism board) that is connected to government	30	41
	Non-profit organization	Charity, community organization, association	32	44
	Research institution	University, college, research institute	9	12
	Business	Private business (includes those providing services on behalf of government)	1	1
	Unknown	Developer is not known	1	1
Purpose	Affordable food	Identify places with affordable food for people who are seeking these food sources	23	32
	Local food	Identify places where consumers can purchase locally produced or manufactured food and support local businesses	12	52
	Inventory	Identify all or certain types of food assets within a geography, which can be used for finding food sources/programs or assessing the food system	38	16

About half (51 percent) of maps had a mix of urban and rural areas, 41 percent featured urban areas only, and 8 percent included rural areas only. Urban areas consisted mostly of large cities and their surrounding metropolitan areas, such as Toronto, Montreal, Calgary, Ottawa, Edmonton, Winnipeg, and Vancouver. With 73.7 percent of the population in Canada living in large urban centres (Statistics Canada, 2022a), it makes sense that there would be more food asset maps of urban areas. However, this may create a gap for representing food assets for Indigenous peoples. While close to half of the Indigenous population lives in large urban centres (44.3 percent) (Statistics Canada, 2022c), there is a larger proportion of Indigenous peoples living away from large urban centres compared to the overall population in Canada. Furthermore, many of the natural food assets that are important to Indigenous peoples are only available in rural areas, where land has not been privatized, habitats have not been removed or damaged by land development, and traditional food activities can still be practiced (Cidro, 2015; Grann et al., 2023; Russell & Parkes, 2018).

An interesting finding related to the map developers is that many maps were developed collaboratively between governments and non-profit organizations. These maps were usually featured on a governmental website as a service provided by the community, but non-profit organizations are responsible for updating the map data (and hence were considered the map developers). For example, on the Vancouver Coastal Health's (n.d.) Food Asset Maps website, the maps for Vancouver and Richmond were developed by municipal government and the North Shore, Sunshine Coast, and Squamish-Lillooet were developed by non-profit organizations. While it may be beneficial for non-profit organizations to fill gaps in services that governments are not able to fully provide, it also may

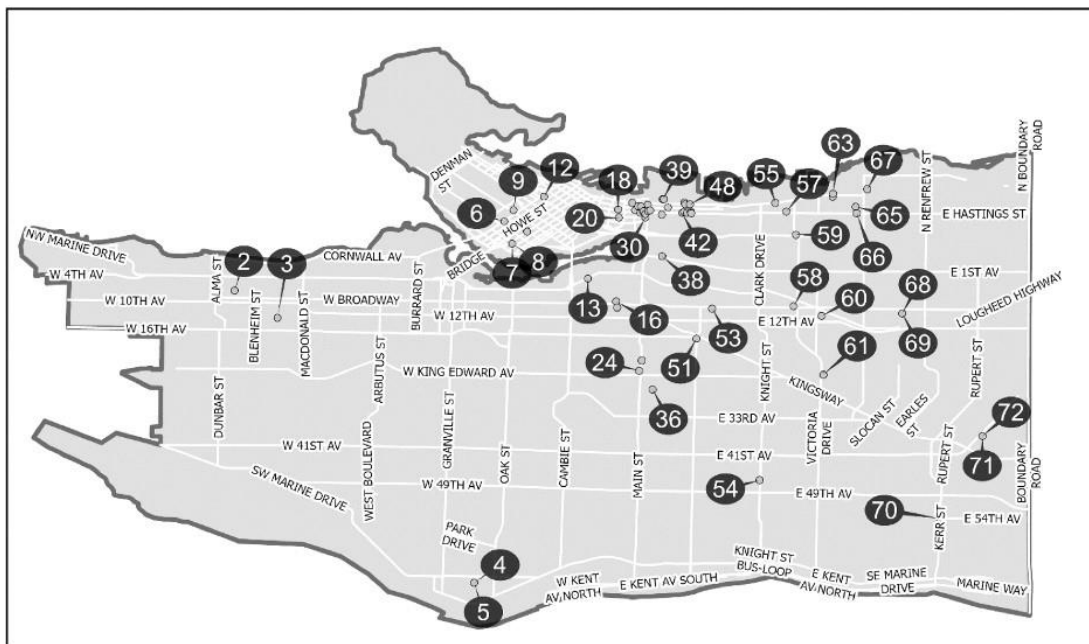
reduce accountability of the government and could lead to an overreliance on non-profit organizations to develop these maps.

Around half (52 percent) of the maps were inventory maps and about one-third (32 percent) were affordable food maps. Food asset maps with a focus on affordability puts a priority on identifying categories such as free or low-cost grocers, food banks, and other food charities. Many of the inventory maps were multipurpose and could be used for finding affordable food and/or local food. Most maps were published on an interactive platform (77 percent). Interactive maps are easier to update regularly since new information or changes are available online after it has been added or edited. Non-interactive maps, on the other hand, typically require more lengthy publishing layout, so updates cannot be immediately reflected on these maps. However, non-interactive maps can be beneficial for users who are not as familiar with interactive maps. Non-interactive maps are also easier to print, so they can be provided to users who do not have access to a computer or smartphone. Some food asset maps were published as both an interactive and non-interactive map (Figures 1 and 2), such as the "Free and low-cost programs in Vancouver" map (City of Vancouver, 2022). The information is displayed on both maps is identical. The interactive map allows users to zoom in and view details by clicking on the icons. The non-interactive map is a print-ready, black-and-white letter-sized PDF, displaying locations as numbers that are associated with a list of locations and their details. Offering maps in both a web and print-friendly format can be beneficial for improving accessibility of information and appeal to the different preferences of users. This is especially important for affordable food maps, which users may be relying on to find their next meal.

Figure 1: Screenshot of "Free and low-cost programs in Vancouver" interactive (online) map (City of Vancouver, 2022)



Figure 2: Screenshot of "Free and low-cost programs in Vancouver" non-interactive (print-friendly) map (City of Vancouver, 2022)



Google Maps was the most popular interactive map platform and was used for 45 percent of the maps. Google Maps is a free service and can be used with minimal training, which can be advantageous for map developers that have limited staff and/or financial resources. On the other hand, platforms such as ArcGIS, which have more advanced functionalities, require more technical knowledge and licensing fees. For the purposes of using maps to assess a food system, ArcGIS and other GIS-oriented platforms are advantageous since they have the capabilities to combine and analyze different types of spatial information such as the density or distances to food assets.

From a user-perspective, Google Maps is generally more intuitive and user-friendly because it has cross-platform functionality. For example, maps made on Google Maps can be opened in a web browser or within the Google Maps app on a smartphone, which is already a commonly used app for navigation. A user can click

on an icon on a food asset map and then receive directions to navigate to that location (Figure 3). Other interactive maps do not have this level of smartphone integration and therefore are not as easy to use for navigating to a food asset. One downside of interactive web maps is that they may not be accessible for people who do not have a smartphone with an Internet connection.

A publication date was available for 64 percent of the maps and 23 percent were updated in 2022, the year when this review was conducted (Figure 4). The publication date was not available or could not be inferred for 34 percent of the maps. For map users, it is useful to know when maps were published, especially if they are relying on the information on the map to locate food assets. Out-of-date information can reduce the credibility of the map and lead users to stop using the map because they cannot trust that the information is correct.

Figure 3: Screenshot of the NB Food Programs map on a smartphone (Food for All NB, 2022)

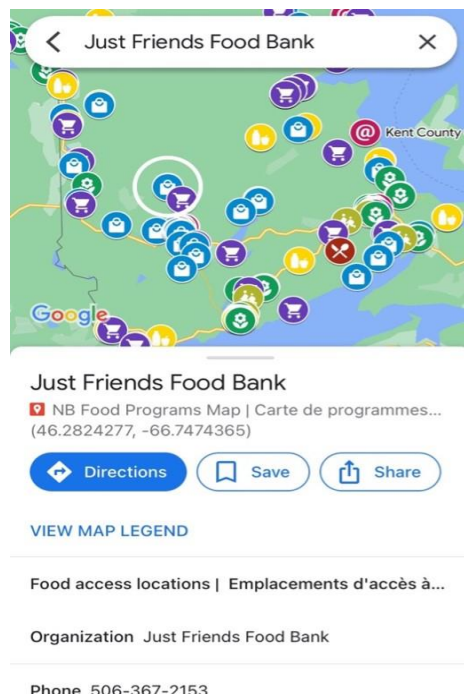
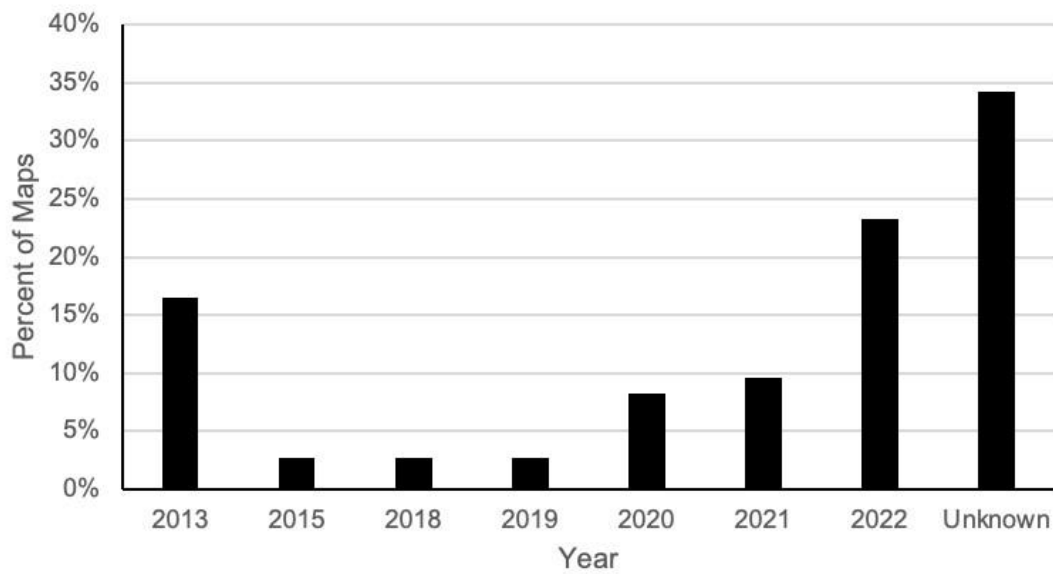


Figure 4: Year of publication of food asset maps

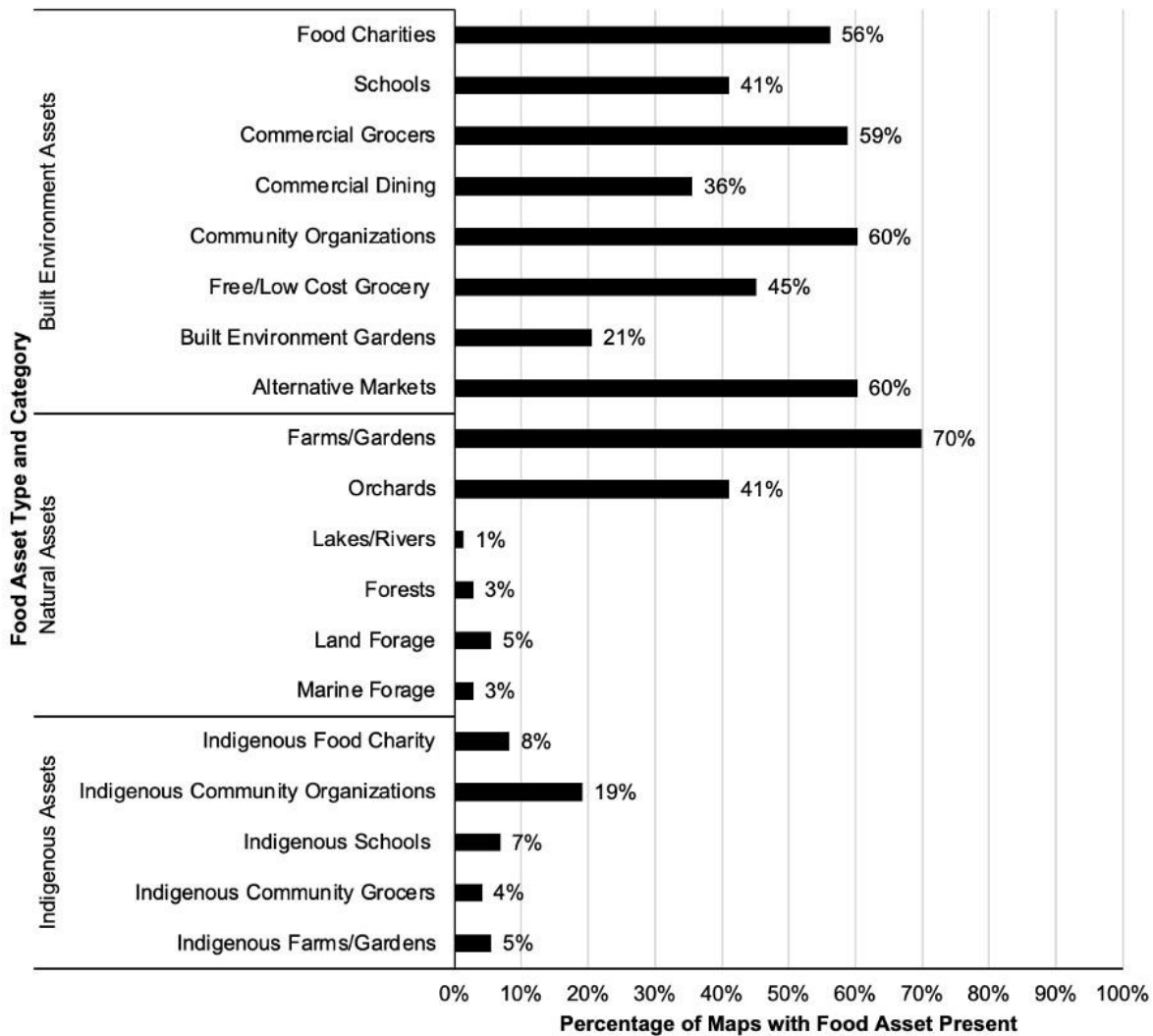


Food asset map content

Almost all (95 percent) of the food asset maps contained at least one category of built environment food assets. The most prevalent built environment food asset categories were alternative markets (60 percent), community organizations (60 percent), commercial grocers (59 percent), and food charities (56 percent) (Figure 5). Data on built environment food assets is

readily available online through sources such as web pages, business directories, and government databases. Built environment food assets also tend to have address locations so the process of geocoding is straightforward and can be done automatically by the mapping platform.

Figure 5: Prevalence of food asset categories on food asset maps



Natural assets were included in 71 percent of maps. Agricultural natural assets, including farms/gardens (70 percent) and orchards (41 percent) were the most prevalent in this category. Conversely, non-agricultural natural assets were largely absent from the available data sources. Farms/gardens and orchards, while categorized as natural assets, are similar to built environment assets in that they typically have address locations and have some form of registration (e.g., as a business or organization). In contrast, lakes/streams, forests, land

forage, and marine forage are not formally identified as food assets in most existing data sources. These food assets are important sources of traditional foods for Indigenous peoples. One feature of these types of natural food assets is that the locations may not be fixed. The areas may cross geographical boundaries and change over time. For example, wild game or fish may move through large geographic regions seasonally. Another issue with natural food assets is that their existence may not translate to accessibility. Even though

Indigenous peoples have called for return of land to Indigenous nations, governments have not done this in practice and settler control over lands and resources has been maintained (Kepkiewicz, 2017). Examples of settler control include privately owned land or requirements for licences or permits that prevent access to food sources in traditional territories (Grann et al., 2023). These natural assets may also no longer be available as food sources due to habitat destruction or pollution (Grann et al., 2023). All the food asset maps that were reviewed were made by non-Indigenous governments and/or organizations and mostly populated with secondary data from published sources. Knowledge about locations for land-based activities like hunting, fishing, and foraging are typically held within Indigenous communities, and therefore not published. There is concern that by identifying these natural food assets and making the information public that these assets will be exploited. However, recognition of these areas as food assets legitimizes their importance and could help make a case for preserving these areas, which may in turn improve food security for Indigenous peoples. Therefore, there is a tension between recognizing non-agricultural natural assets in food asset maps and ensuring that knowledge about these assets is not shared or used inappropriately.

Indigenous food assets were included in 22 percent of maps, with Indigenous community organizations being the most common category (19 percent). The lack of Indigenous food assets being reflected in Canadian food asset maps could be a result of these assets being a gap but could also be due to these food assets not being identified in available data sources, especially if the knowledge is kept within Indigenous communities.

Recommendations for food systems scholars

As more food asset maps are developed in Canada, both for planning and for locating local and/or affordable food options, this research shows that several gaps need to be addressed so these maps can better serve their purpose as an inventory or wayfinding tool. Currently, food asset maps generally appear to be developed as one-off projects or championed by community organizations rather than a service provided by local governments. Without regular updates and ongoing maintenance, the maps become less reliable for users. For planners, policy makers, and scholars, not having current information is also problematic because it may lead to decisions that are misaligned with community needs. Therefore, food asset mapping should be operationalized in local governments. Most local governments already have open data portals, so a food asset map could be a part of that, like the "Free and low-cost food programs" map made by the City of Vancouver (2022). The content of the food asset maps, which currently mostly focus on emergency and free or affordable food, can also be expanded. A food asset map can include other types of food assets that are often left out, but could be beneficial for improving food access, and added as layers or different sets of icons so a user can more easily filter for what they are looking for.

From a practical standpoint, it is understandable that a comprehensive map of all available food assets would require more resources. However, it is not necessary to create maps with an exhaustive inventory, but instead just have the maps be more relevant to the populations who will benefit most from them, like people who experience food insecurity. The added benefit of having better food security because people have better access to information on affordable food

sources will likely outweigh the cost of developing and maintaining a food asset map.

Planners, policy makers, and scholars working on developing food asset maps also need to consider what type of information is prioritized and who should have access to the information on food asset maps that are publicly available. They also need to consider the colonial history of mapping led by governments, which have embedded colonial values into maps. To reclaim Indigenous food systems and challenge colonial worldviews, Indigenous communities are leading their own forms of participatory mapping (Hunt & Stevenson, 2017). To decolonize the practice of food asset mapping, governments could support Indigenous communities to lead their own projects or co-develop projects together. Methods such as participatory food asset mapping can be used to examine the diverse values held within a community about their food environment (Jakes et al., 2015). A values-focussed asset mapping approach can support Indigenous resurgence by reflecting Indigenous values and worldviews in maps. This approach can also be an empowering exercise for other equity deserving groups to better reflect their values in food asset maps. The information in maps created through participatory asset mapping need to be carefully stewarded since they likely contain places of spiritual and cultural importance, such as harvesting sites for traditional foods. These could be exploited if the information became public. Therefore, a community may decide to keep the information on food assets within their community. This may limit the information that is accessible for research on food asset mapping (including this study). However, research should be of secondary importance because the primary objective of food asset mapping is to serve and honour the values of a community.

Having equity deserving groups take a leading or co-developing role in the mapping process can also help

direct how food asset maps are designed and published so they are more user-friendly and accessible for target users. For example, some people may prefer maps on a mobile app so they can get real-time information while others may prefer paper maps if they do not have a mobile phone with a data plan. For food assets that may not have a fixed location and/or should not be revealed publicly (e.g., hunting, fishing, or foraging areas), one way that they can be represented is by showing a general area instead of a specific location. This contrasts with how geographical information is typically displayed in food asset maps, which is as individual points. However, the ability to draw polygons is a common feature of mapping software and is often used for other purposes (e.g., zoning), so it could also be used for depicting food assets.

Future research

Food asset mapping is a tool that can be utilized for the purpose of food assessment and is increasingly being identified as having the potential to contribute to efforts towards achieving food security and strengthening food systems resiliency (Baker, 2018; Soma et al., 2022a; Moore et al., 2022). The preliminary research from this study has given some insights on the characteristics of food asset maps and categories of food assets that are included in the maps. One limitation of this study is that data completeness or representativeness was not accessed. This gap could be filled in future research to triangulate the information provided in food asset maps with what is actually present. For example, a future study could conduct primary data collection on food assets within a community and compare it with what is shown in an existing food asset map of the same community. This type of comparison would provide a more detailed

assessment of what types of food assets are represented or not.

Another area of future research is related to the user experience with food asset maps, specifically for food asset maps that act as a tool for people who experience food insecurity to find affordable food. This can be

Conclusion

This is the first study to systematically understand the types and categories included in food asset maps developed across Canada. A total of seventy-three food asset maps were reviewed. Although varied, most food asset maps in Canada are dominated by built environment assets such as food banks or community centres, and generally lacked Indigenous-focussed food assets and natural food assets. By mapping food assets in this way, the dominant food system built on industrial agriculture and settler colonialism is reinforced. Considering that food insecurity disproportionately affects Indigenous peoples, the current method of food asset mapping is inadequate for representing food sources that are important for Indigenous peoples.

Most maps were interactive web maps (77 percent), of which the majority were built using Google Maps (45 percent), a free and user-friendly platform both for map makers and users. The publication date was not available or could not be inferred for 34 percent of the maps. This is problematic for confirming accuracy of the information since it may have changed since the time of publication. This poses a challenge for developing a baseline for food systems resiliency as it is unclear how many food assets are still in operation or active. While most maps are jointly developed by governments and non-profit organizations, the responsibility of updating maps largely falls on non-profit organizations that may not have regular funding

accomplished by leveraging user surveys and/or focus groups as a data collection technique. The findings from this type of study can improve the efficacy and utility of food asset maps by putting users at the centre and building maps based on their needs.

or resources for maintaining the maps. Nevertheless, the existence of food asset maps in most of the large urban centres where nearly three-quarters of the population of Canada resides is an important first step for planners and policy makers to help community achieve food security. However, since approximately half of Indigenous peoples reside in rural areas and many food assets that are traditional food sources can only be found in rural areas, the lack of food asset maps focussed on rural areas creates another gap for Indigenous representation.

What is needed now is more resource mobilization to expand food asset maps and keep them up to date. The resources should be prioritized so the maps are relevant and user-friendly for people who experience food insecurity, as they may rely on these maps for locating sources of free or affordable food. This can be done by co-developing food asset maps with people who experience food insecurity, so the maps are based on their values. They can identify what types of food assets are important to them and how they prefer to access the information (e.g., paper map, website, mobile app). It is also important to consider what type of information should be available on publicly accessible maps to prevent exploitation of food assets, such as hunting, fishing, and foraging areas for Indigenous peoples. At the same time, recognizing these assets in

food asset maps could also contribute to their preservation.

Although this study focussed on a descriptive approach to identifying different types of food assets and the categories included, deep analysis of why certain assets was included and how the food asset maps were developed was beyond the scope of the investigation. Further research on the specific content of food asset maps would give a better assessment of

what is being represented and what is missing from food asset maps. Additionally, studies on the user experience with food asset maps could improve their efficacy and utility. Future researchers should take an increasingly comprehensive and systemic assessment of food assets and ensure that the process and methods that go into developing food asset maps are transparent and inclusive.

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