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Healthy people, healthy land: driving sustainable food systems transformation with community agroecological values and Indigenous food systems planning in Kakisa, Northwest Territories, Canada

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Food systems in northern Canada are under severe pressure brought on by climate change, colonial policies, resource extraction, settler migration, dispossession from ancestral lands, and changing ways of life. As communities seek to nurture more resilient food systems, agroecology is emerging as a relevant food system framing to address these challenges as it balances new forms of sustainable food production with traditional food practices and connects them to on-going struggles for self-sufficiency and Indigenous food sovereignty. This article showcases insights from a community-driven, food systems planning project in Northwest Territories, Canada that incorporates agroecology rooted in Indigenous values, principles, and Traditional Knowledge of the region. Using participatory action research, the Ka'a'gee Tu First Nation (KTFN) designed a vision for their food system structured by the Community Agroecological Values Framework (CAVF). The CAVF, co-created with KTFN, builds on the community capitals framework and northern agroecology dialogues to foster a holistic approach to Indigenous food systems planning. Through a workshop, participatory mapping, and storytelling, community members reflected on existing food projects and provided input on future developments. KTFN used this process to connect their food system with multiple components of agroecology in the North, including land stewardship, sustainable livelihoods, cultural resurgence, social cohesion, good governance, and human capacity, aligning them with Dene values of holistic well-being for people and the environment. This article shares a case study of how KTFN is combining participatory, values- and place-based planning with agroecology to strengthen their food system, advance self-sufficiency, and promote food sovereignty in the face of climate uncertainties.

KEYWORDS

agroecology, northern food systems, food systems planning, participatory action research, community capitals framework

1 Introduction

Across the Global North, agroecology is emerging as a response to national and international food system crises driven by industrialized food production and the global corporate food regime (Holt-Giménez and Altieri, 2013; Méndez et al., 2013; Gallardo-López et al., 2018; Isaac et al., 2018; Bless et al., 2023). Born out of the Green Revolution, for decades industrial agriculture has dominated farming practice, restructuring farms and food systems in the process. With the promise of higher yields and access to expanded markets, farmers have adopted proprietary technologies such as genetically modified seeds and synthetic fertilizers and pesticides, they have mechanized their operations, and have adjusted to value chain integration and corporate consolidation of lands and resources (Kilby, 2019; Sumberg and Giller, 2022; Clapp, 2023; Magnan et al., 2023).

Although industrial agriculture has delivered some short-term yield gains for select crops and increased farmers' access to global commodities markets, it is also a leading source of the global greenhouse gas emissions that are driving the climate crisis and the collapse of planetary boundaries that sustain environmental and human health (Conijn et al., 2018; Intergovernmental Panel On Climate Change [IPCC], 2019). Studies show that mechanization as well as use of synthetic fertilizers and pesticides contribute to soil degradation, water contamination and biodiversity loss (Daum et al., 2020; IPCC, 2019; Sumberg and Giller, 2022). They also have human health impacts ranging from immune system, respiratory, and neurological disorders, to nitrate toxicity, and cancer (Jote, 2023; Blair et al., 2025). Social and economic justice issues connected to this food regime, such as exploiting migrant worker rights, foreign and corporate land purchases, dismantling of marketing boards and corporate consolidation within the food value chain are coming into focus amidst increasing household food insecurity and rising food prices (Isaac et al., 2018; Dale, 2020; Laforge et al., 2021). As protectionist trade policies are being adopted among global powers, we are witnessing a retraction of the neo-liberal free trade agenda, the consequences of which are catastrophic for farmers and food systems as they face deteriorating global commodities markets.

To address the multiple and constantly evolving challenges we face globally to feed our communities, we are presented with diverse agrifood system narratives that contrast industrial agriculture and the global corporate food regime. Organics, permaculture, biodynamics, and agroecology, as well as regenerative, conservation, and climate-smart agricultures all have global footprints with varied histories, ideologies, and power dynamics in their struggles to challenge the dominant food system model (Isaac et al., 2018; Bless et al., 2023). Agroecology, which began among Indigenous and peasant movements in Latin America, has resonated with a global contingent of food actors (Holt-Giménez and Altieri, 2013; Isaac et al., 2018; Bless et al., 2023) as a social movement, a science, and a practice playing out across agrarian landscapes (Wezel et al., 2009). As a movement, agroecology questions the motivations of the existing political and corporate powers and their influence on sustainable rural livelihoods (Gliessman, 2013). As science, it seeks

to address environmental, social and economic challenges across scales from the farm to the food system (Wezel and Soldat, 2009). As a practice, it embeds inclusive community building in extension and knowledge sharing to facilitate solidarity, shared values, and transformative action (Méndez et al., 2013; Laforge and Levkoe, 2018; Laforge et al., 2021). Agroecology's ideological roots draw on the global food sovereignty movement, championed by the Via Campesina (VC), a grassroots collaborative of Indigenous and peasant farmers, pastoralists, fishers, and labourers promoting agroecology as an alternative to industrial agriculture, globalization and corporate control (Desmarais and Wittman, 2014; Isaac et al., 2018; Dale, 2020).

In Canada, where this research is situated, agroecology is slowly emerging from a mosaic of sustainable production practices, characterized predominately by organic agriculture and localized value chains that connect farmers and consumers through shared values of equity and environmentalism (Isaac et al., 2018; Nicholls and Altieri, 2018; Gliessman, 2019). The movement is finding a diverse audience with farmers and farm workers through the efforts of national VC members, Union Paysanne and the National Farmers Union, to connect agriculture to broader environmental, social and economic justice, food and land sovereignty, and Indigenous reconciliation issues and to support farmers as they seek solutions to reverse agriculture's environmental impacts with agroecological practices (Desmarais and Wittman, 2014; Isaac et al., 2018; Dale, 2020; Laforge et al., 2021). Regional expressions of agroecology reflect the diverse contexts, cultures, food systems and landscapes of the country (Isaac et al., 2018). For example, on the Prairies (Alberta, Saskatchewan, and Manitoba), where industrial agriculture and global markets drive the regional economy, climate change and the politics of the global market are forcing farmers to adapt to mitigate risks. Prairie agroecology is driven by a concern for the well-being of Prairie lands, families, and communities, and is practiced through sustainable farming that supports ecosystem health (Bowness et al., 2024).

In the Canadian North, agroecology is being imagined amid settler discussions of the potential contributions of a commercial agriculture sector to local food security and regional economic development contrasted by discourses on Indigenous self-determination, reconciliation, Land and food sovereignty, sustainable livelihoods, and economic diversification amidst an on-going climate emergency (Wilson et al., 2020; Johnston and Spring, 2021; Lemay et al., 2021; Price et al., 2022; Spring et al., 2025). In 2023, 19 of the Northwest Territories' (NWT), 33 communities were evacuated as wildfires burned 3.4 million ha of boreal forest (MNP, 2024). In Kakisa, home of the Ka'a'gee Tu First Nation (KTFN), fires came within 14 km of the community boundaries. KTFN community leaders remained to protect traditional lands and community infrastructure. Isolated for several weeks and without access to a store, community members consumed vegetables from the community garden to supplement reserves of traditional foods such as moose and fish.

Northern agroecology, put forth by KTFN, Sambaa K'e First Nation (SKFN) and Price and colleagues (2022), is characterized by land stewardship, collective governance, diverse economies, and

food sovereignty rooted in Indigenous values of the region. These principles stem from an Indigenous culture of care for people and the Land and over a millennium of building relationships with and knowledge about the surrounding environment and the traditional food system (Price et al., 2022; Spring et al., 2025). Traditional food systems in the North are characterized by harvesting food sustainably using subsistence practices—hunting, fishing, trapping, and gathering—that incorporate sharing and reciprocity among kin to balance land stewardship with community food security (Spring et al., 2018; Ross and Mason, 2020; Natcher et al., 2022). These activities have long played a central role in the collective well-being of Indigenous people, supporting cultural continuity, social cohesion, food security and sustainable livelihoods (Berkes and Ross, 2013; Council of Canadian Academies [CCA], 2014; Gutierrez et al., 2023; Kuhnlein, 2014; Lemke and Delormier, 2017; Spring et al., 2018). Intimately connected to the food system, Indigenous relationships based on reciprocity have maintained healthy people and healthy environments across generations (Johnston and Spring, 2021; Price et al., 2022; Spring et al., 2020, 2025; Wilson et al., 2020). These relationships ensure food system sustainability by balancing community food security with habitat and species conservation (Raja et al., 2017; Spring et al., 2025).

As climate change increases the risk and uncertainty of successful harvests, Indigenous communities are looking to sustainable food production to reverse the nutrition transition to highly processed retail foods (Damman et al., 2008; Kuhnlein, 2014). This nutrition transition contributes to high rates of food insecurity, diet-related illnesses, and weakened food sovereignty across the region (Luongo et al., 2020; Loukes et al., 2021; Mobetty et al., 2025; Slack et al., 2025). An agroecological transformation in this context therefore involves revitalizing traditional food harvesting activities and adopting new, alternative forms of sustainable food production to ensure local food activities remain central to community well-being and sovereignty (Price et al., 2022). As Kuhnlein (2014) notes, “for Indigenous Peoples to reverse the deterioration they see in their food systems, and to contribute to food system sustainability, activism for cultural renewal and ecosystem restoration is an important part of that picture” (p. 2418). Agroecology offers a way to realize these goals through social mobilization, and sustainable practices rooted in science and place-based knowledge.

This article showcases insights from a community-driven, food systems planning initiative in Kakisa, NWT Canada that incorporates agroecology rooted in Indigenous values, principles, and Traditional Knowledge of the region. Taking a participatory action research (PAR) approach, the KTFN designed a vision and action plan for their food system using the Community Agroecological Values Framework (CAVF) (Temmer et al., 2025). The CAVF was developed through an iterative process with KTFN during the development of their food system action plan. Principles of agroecology adapted for the northern context (Price et al., 2022) were incorporated into the research in response to community-identified shortcomings of existing analysis frameworks to incorporate community values when framing food system actions

and outcomes (Spring et al., 2018; Snider, 2021). The result was a novel approach that integrates the systems logic and holistic nature of the Community Capitals Framework (CCF) (Emery and Flora, 2006; Flora et al., 2016) and Indigenous values embedded in northern agroecology (Price et al., 2022) to foster a community-oriented approach to food systems planning. In this article we outline the participatory planning process KTFN used to develop their food system action plan, and we describe the plan’s goals and objectives highlighting their connection to the CAVF dimensions. Finally, we discuss agroecology’s role in fostering healthy northern communities and environments and how the CAVF as a conceptual framework and a participatory planning tool can facilitate agroecological transformations for Indigenous communities across the North and potentially elsewhere.

2 Community description

This research highlights work in Kakisa, a Dene community in Denendeh (NWT, Canada), describing their progress toward sustainable food system transformation and climate change adaptation as they work to conceptualize an agroecology model that aligns with Dene worldviews and is suited to local context. The Dene are also known as Athapaskan peoples whose ancestral homelands are spread across Northern Canada, Alaska, and parts of the Southern United States. Across Denendeh, Dene communities are connected through common language, identity, relationships, and shared struggles for land and food sovereignty (Dene Nation, n.d.). Located in Denendeh’s Dehcho region, Kakisa is KTFN’s sole settlement. Figure 1 depicts Kakisa’s location in the region. Like many northern communities, Kakisa is characterized by its remoteness, small population, and mixed land- and wage-based economy (CCA, 2014; Ross and Mason, 2020; Hancock et al., 2022). The community of approximately 40 people is located about 140 km northwest of the Town of Hay River, and has a band office, a community hall, a one-room K-9 school, and a cultural camp located near the mouth of First River, a small tributary flowing into Kakisa Lake, to the south of the community. Newly constructed emergency cabins are also situated throughout KTFN’s territory to enhance safety for land-based activities.

KTFN’s traditional food system is intimately connected to the community’s identity and well-being. Many people in Kakisa participate seasonally in land-based activities such as hunting, fishing, trapping, and gathering berries and medicinal plants. Community members fish a variety of lake fish including Walleye (*Sander vitreus*), Arctic Grayling (*Thymallus arcticus*), and Suckers (*Catostomus commersonii*) (Spring et al., 2025), and eat moose which is harvested in the winter and fall seasons. Harvesters also hunt wild ducks, geese, beaver, caribou, bison, rabbit, grouse, and muskrat (household interviews, June 2023). Traditional foods are shared among Kakisa families and regionally through Traditional Food Sharing Networks consisting primarily of relatives and friends (household interviews, June 2023). While the traditional food system plays an important role in community and regional food security, climate change is placing pressure on traditional lands and



FIGURE 1
Map indicating the location Kakisa, NT.

making it more difficult to access these important food sources (Spring et al., 2018).

To adapt to these landscape and climate changes, KTFN has begun growing food to diversify their diet and contribute to their land and food sovereignty goals. Since 2014, the community has maintained a small garden, expanding efforts exponentially in recent years. Currently, garden infrastructure includes two greenhouses, a 0.10 ha garden plot, raised beds and a tool shed. All garden food is shared with households at no cost. Although the garden has produced significant benefits, for some community members, growing food has been met with unease. Until the 1950's Kakisa families, like other Dene in the region, migrated seasonally to harvest food and had strong relationships with the Land (KTFN, 2024). In the early 1900's agriculture was introduced to the Dene through church and colonial government initiatives such as residential school education, settlement policies, and community agriculture programs designed in part to assimilate Indigenous people in the region (Price, 2023). For many who have experienced these policies and programs, the traumas associated with this colonial legacy are intertwined with the practice of growing food. In KTFN, the urgent need to address climate change impacts on their traditional food system, have prompted on-going conversations about how to ensure growing food is culturally reaffirming and contributes to community betterment (Johnston and Spring, 2021; Price et al., 2022; Spring et al., 2025).

For over a decade, KTFN has partnered with researchers from diverse fields to study climate change impacts on their land (Day et al., 2020; Dixon et al., 2020; Greuel et al., 2021; Bysouth, 2023; Jorgensen et al., 2023) and traditional food system (Simba and

Spring, 2017; Spring et al., 2018; Johnston and Spring, 2021) and tested community-oriented solutions that incorporate sustainability principles inherent in local Dene values and principles (Kok, 2020; Jayaratne, 2021; Snider, 2021; Malandra, 2023; Woodworth et al., 2024). These relationships are an essential component of the research as they built trust, facilitate knowledge sharing and promote the scaling-up of successful local food system innovations (Spring et al., 2020). Through this partnership, KTFN continues to explore new and innovative food projects aimed at increasing access to healthy foods and supporting self-determination based on local values of land stewardship, care for others, and cultural resurgence.

To date, research initiatives including traditional place name mapping and hunter safety education and participatory mapping for landscape resilience (Kok, 2020; Jayaratne, 2021; Kerubo Ombwori, 2025), recycling and composting (Snider, 2021), soil analysis (Bysouth, 2023); gardening (Malandra, 2023; Temmer, 2025), native berry species transplanting in the fuel break (Johnston, in progress), food distribution (Rodriguez Reyes, 2024; Rodriguez Reyes et al., 2025) and on-the-land camps (Woodworth et al., 2024). Despite its small population, the community is a regional leader in sustainable food systems transformation and climate change adaptation.

3 Theoretical framework

In 2013, KTFN and university researchers initiated a community-based research partnership to understand and address

climate change impacts on KTFN's traditional food system. An output of this initial community-research partnership was a food security action plan including suggested steps and action research projects to strengthen food system sustainability (Spring et al., 2018). KTFN's food system research, including the present work, takes a participatory action research (PAR) approach with the community partners guiding the process. PAR is ideal for Indigenous communities engaged in research as it embeds the research in local realities, and facilitates new ideas, actions and relationships for community benefit (Kemmis, 2010; Castleden et al., 2012). It also drives active collaboration among research partners emphasizing co-learning to solve local challenges (Méndez et al., 2017). In practice, PAR is cyclical process that involves multiple iterations of posing questions and planning, acting, observing the process, and reflecting on the processes and outcomes (McTaggart et al., 2017). Using this approach, over time KTFN and researchers have established relationships built on the four Rs of Indigenous research (respect, relevance, reciprocity, and responsibility) that are further nurtured by subsequent projects, research, and friendships, solidifying this into a partnership (Castleden et al., 2012; Leeuw et al., 2012).

The framework used to guide the action plan, the CAVF, builds on two complementary theoretical frameworks—the Community Capitals Framework (CCF) (Emery and Flora, 2006; Fey et al., 2006; Spring et al., 2018) and agroecology adapted to a northern context (Price et al., 2022). The CAVF is a systems-based, values-oriented framework that enables communities to assess their current food systems, envision a desired future state, and develop action plans grounded in Indigenous values and worldviews (Temmer et al., 2025). Using this framework, the research characterizes the community's food system, details its current state and future vision, and identifies local strengths, gaps and challenges, and opportunities within the current food system to develop a community plan that supports food system sustainability and community self-sufficiency goals.

By addressing the limitations of the CCF's technical language and incorporating dimensions modelled on agroecology in the North, the CAVF integrates local knowledge systems and Dene cultural values into food systems assessment. This approach expands existing community-level planning paradigms by emphasizing dimensions such as Land and Water Stewardship, Healthy Relationships, and Traditional Knowledge and Culture. Building on the participatory values-based approach of the CCF and northern agroecology, the CAVF addresses the unique needs of northern Indigenous food systems. The CCF has been widely used in rural development and community resilience initiatives globally (Emery and Flora, 2006; Gutierrez-Montes et al., 2009; Sseguya et al., 2009; Pigg et al., 2013; Spring et al., 2018; Cafer et al., 2019; Natarajan et al., 2022; Spring et al., 2023). Derived from the Sustainable Livelihoods Approach (SLA), the CCF focuses on empowering communities by leveraging existing resources for sustainable development (Scoones, 1998). The CCF identifies seven capital categories—natural, social, cultural, human, political, financial, and built—that contribute to community resilience and sustainability outcomes (Emery and Flora, 2006; Pigg et al., 2013). However, KTFN has noted that the

CCF's language was difficult for community members to understand, and the capitals categories did not fully resonate with their holistic understanding of their food system, which emphasize relationships with people, nature, and more-than-human elements (Spring et al., 2018; Snider, 2021; Spring et al., 2023). These findings align with broader critiques of the CCF's limitations in capturing Indigenous cultural values and relationships (Kamal et al., 2015; Huambachano, 2018; Rosset et al., 2021; Natarajan et al., 2022; Tsuji et al., 2023).

To address these limitations, the CAVF integrates the systems-oriented structure of the CCF with the values-based dimensions modelled on agroecology adapted to a northern context which was developed in partnership with Indigenous communities in the NWT (Price et al., 2022). The CAVF expands on the CCF by incorporating seven relational dimensions: Skills and Capacities, Traditional Knowledge and Culture, Land and Water Stewardship, Economies, Governance, Healthy Relationships, and Supportive Infrastructure. These dimensions, grounded in Dene laws and worldviews, emphasize self-sufficiency through collective decision-making, stewardship of the Land, and the importance of maintaining harmonious relationships for community well-being. This approach to food systems planning offers a contextually relevant framework for Indigenous communities in northern Canada, supporting their efforts for self-determination, food sovereignty, sustainability, and resilience in the face of external pressures of modernization, colonial governance, and climate change (Grey and Patel, 2015; Kamal et al., 2015; Daigle, 2019; Kepkiewicz and Dale, 2019; Dorries, 2022).

4 Methods

In, 2023, the partnership celebrated 10 years of research and relationships. In June, a workshop was organized in Kakisa, where researchers and community members gathered to reflect on the progress made toward their goal of building a more resilient food system and developing a new vision for the future. During this workshop, community members reflected on the previous 10 years of food systems work and mapped a vision for the future based on new knowledge and understanding generated through their experiences during the previous decade.

The authors include both researchers and KTFN community members. JT and AS are non-Indigenous researchers of European descent from Southern Canada. JT is an early career researcher and rural community planner who has collaborated with Indigenous communities in Central America and Northern Canada supporting action research on sustainable agri-food systems through agroecology. AS has worked closely with communities across Northern Canada for over a decade to design and implement community-driven solutions for food system sustainability. Both researchers have lived in Kakisa and have strong relationships with the community through their on-going community-led research on food system and climate change adaptation. This research was conducted in collaboration with KTFN and is part of a doctoral research project for JT. LC and RS are Dene and KTFN community members living in Kakisa. Both have key leadership roles- LC is

KTFN's longstanding chief, and RS is the band manager- and both spearhead community initiatives for greater food system sustainability and community well-being.

4.1 Data collection

During the June 2023 workshop in Kakisa, 15 community members (approximately half of all adults) participated in three activities to describe their current food system and future vision: Community Visioning (Lachapelle et al., 2010), Community Asset Mapping (Kramer et al., 2012), and World Café¹ (Recchia et al., 2022). During the 'visioning' activity community members wrote and drew on Post-it notes, indicated in the following section using quotes and *italics*, that describe positive and negative food system attributes and placed them in the 'now' category. Next, they identified all the existing positive food system attributes and moved those notes to the 'future' category. Finally, community members added attributes or descriptions of their desired future food system.

During the community asset mapping session, community members drew two maps. The first map represented all the assets or capitals present and available within the community for use to advance the local food projects. The second map depicted the regional food system and beyond. This process encouraged the community to consider the local resources that are already available and how they can be incorporated into the new food system vision. Figure 2 offers examples of the Post-it notes used during the visioning exercise (left) and a regional map developed for the asset mapping session (right).

The World Café was used to draw out community members' perspectives on integrating northern agroecology principles into the plan and across the food projects (Price et al., 2022). Community members contributed to conversation across five tables corresponding to key community food projects: community garden, food hub, fuel break farm and food forest, zero waste and composting, on-the-land camps, harvester safety, and the Indigenous names map. Questions were tailored to ask community members about how to ensure that the northern agroecology principles, which are modeled on the community's Dene values, are considered when implementing the action projects.

4.2 Analysis

To develop a food system profile and a vision statement, ideas and comments were collected from the Post-it notes used by community members to identify the current and future characteristics of the local food system. Post-it note details were divided into two categories and colour coded as current (green) and future (yellow). Next, the Post-it notes were divided into two themes: contributing (+) and degrading (-) characteristics.

¹ World Café is an inclusive participatory method aimed to democratise and capture diverse voices. Participants travel to multiple stations to discuss pre-determined topics with scripted questions (Lohr et al., 2020; Recchia et al., 2022).

Starting with the current category, the Post-it notes were coded and categorized using themes from the CAVF. Positive and negative characteristics were used to describe the current state of the food system. Current positive characteristics were also incorporated into the future category. Post-it notes were reviewed and categorized using the seven community capitals: financial, political, natural, social, cultural, human, and built (Emery and Flora, 2006; Flora et al., 2016; Spring et al., 2018). Descriptive statements regarding the community's future vision for their food system were also compared with the characteristics and values outlined CAVF categories: economies, governance, relationships, skills and capacities, land and water stewardship, traditional knowledge and culture and supportive infrastructure, generating 11 distinct objectives. To answer the question, '*How do we get there?*', recordings and notes from the World Café session were reviewed and themes were identified based questions based on northern agroecology principles. This information was applied to describe how the community garden project currently incorporates agroecological principles into its activities and programming and where they can be further incorporated into future activities.

4.3 Data validation and ethics

Prior to participating in the research, community members were provided with an overview of the research project and provided informed consent. All sessions were recorded and transcribed and materials developed during each workshop were saved to support analysis and plan development. Ethics approvals and licenses for this research were given by the university research ethics board and the Aurora Research Institute, the research licensing body for the NWT.

Results from the workshop sessions were combined to form the Community Food System Action Plan 2025–2030 described below. A draft of the plan was presented to the community in 2024 through follow-up conversations. This provided opportunities for community members to reflect and respond to the plan's contents. Community feedback was incorporated into the draft and once finalized and approved by KTFN leadership, a visual summary was developed for the community to display publicly. Results included in this publication were also shared with community members to verify the knowledge shared and ensure the perspectives and views of those who contributed were accurately represented. Furthermore, community leadership collaborated on to the development and validation of this publication and are identified as contributing authors (LC and RS).

5 Results

5.1 The current state of Kakisa's food system

In Kakisa, community members described the current state of the food system as they wrote on Post-it notes during a food system

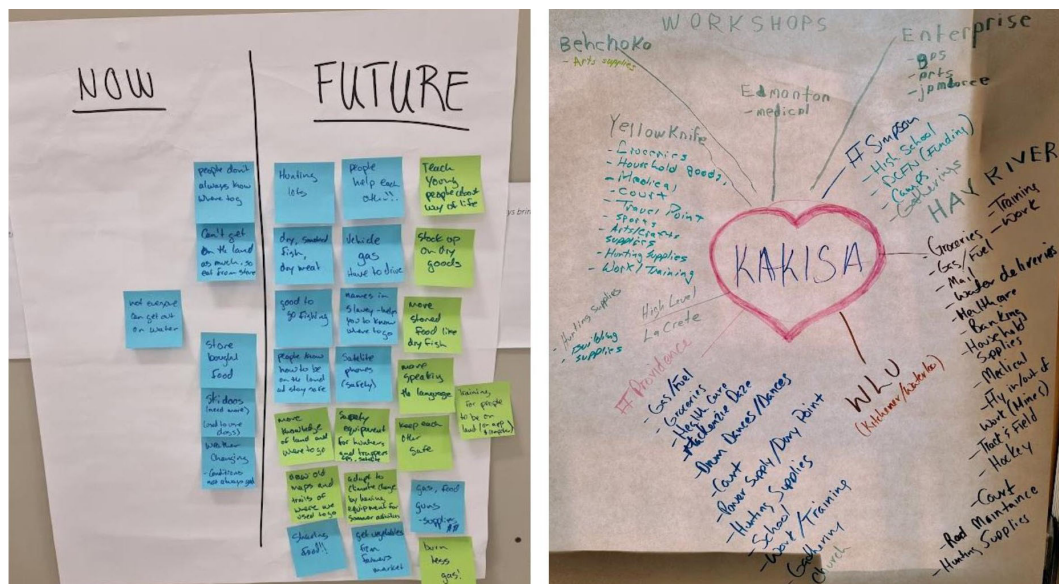


FIGURE 2

Data collection materials created during the visioning (left) and asset mapping sessions (right).

visioning workshop. They identified four concerns related to food affordability, negative health outcomes connected to shifting diets, barriers associated with harvesting traditional foods, and youths' declining interest in learning traditional skills and spending time on the Land. These workshop themes echo similar, well-documented concerns that are typical of many northern and remote Indigenous communities (Kuhnlein et al., 2004; Power, 2008; Gerlach and Loring, 2013; CCA, 2014; Loukes et al., 2021) and validate Spring and colleagues' (2018) description of the state of the food system in, 2015. Since the first analysis of Kakisa's food system, residents shared that they continue to experience increased reliance on expensive retail foods purchased outside the community. This was expressed through comments such as "high prices of food in Hay River". Declining health outcomes caused by transitioning diets were also noted, emphasizing the need to eat healthier as a result. One group included a Post-it note stating, "Diabetes needing to cut some foods (from diets)" and participants discussed the high costs of hunting equipment and climate change impacting individuals' ability to harvest traditional foods. They wrote comments such as "not enough equipment/too expensive", and "low water levels make fishing hard (and hunting in general)". Finally, community members talked about youths' declining interest in learning land-based skills, Traditional Knowledge, and Dene Zhatié. Post-it notes read, "hard to take kids on the Land because they are tethered to technology" and "some kids like traditional foods, some do not. They come hunting and like it".

Community members also identified existing positive food system attributes they want to continue to nurture into the future. First, continuing to harvest traditional foods, despite the costs and risks caused by climate change, was a community priority. Post-it notes with words containing traditional and garden foods were used, for example, "moose meat and fish", "strawberries and

raspberries", "dry and smoked fish, dry meat" and "potatoes, carrots, and corn". Community members also considered food harvesting and sharing activities to be important for community cohesion, well-being and food security. Comments such as "hunting lots", "good to go fishing", and "girls are learning to hunt too and like it" highlighted this sentiment. For many, continuing communal land-based food harvesting activities and food-sharing was one way to preserve Traditional Knowledge and language, adapt to climate change, and help each other. Community members wrote phrases such as "sharing food with elders", "people [still] know how to be on the Land and stay safe", and "adapting to harvesting changes".

The importance of harvesting and growing food to provide healthy dietary options for everyone was also noted. Community members referred to traditional and garden foods using words such as "healthy" and that they explained that proper access to locally harvested foods means that households "only need to purchase the basics", or staple foods from a store. When food needed to be purchased, some community members underscored the value of accessing alternative markets and locally grown and sold foods as healthy options. Community members identified farmers' markets and meat packages as two examples of alternatives to store purchased foods. Post-it notes included "get vegetables from farmers market", "YK [Yellowknife] and High Level farmers markets" and "Yellowknife, Grand Prairie meat packages".

Community members also identified infrastructure and equipment the community accesses to support climate change adaptation activities such as growing food and ensuring safer traditional food harvesting. The words "greenhouse", "satellite phones (safety)" and "gas, food, guns, supplies, \$\$ [money]" were used to describe this infrastructure. These attributes were carried over and included new ideas and characteristics community members wanted to incorporate into the food system moving forward.

5.2 A new vision for Kakisa's food system

In addition to describing the current state of the food system, community members discussed their future vision. The community developed a community food system action plan that envisions a future where harvesting food from the Land remains central to the community's identity and well-being and growing food plays a vital role in adapting to climate change and improving food security, ensuring that community members can access fresh, nutritious foods despite environmental uncertainties. Community members also emphasized that the plan should aim to build a self-sufficient food system that integrates both traditional and modern practices, ultimately contributing to the health, resilience, and overall well-being of Kakisa now and for generations to come. KTFN describes self-sufficiency as the means to steward the land and ensure community members are physically and mentally well. Both well-being and self-sufficiency are defined in their community plan:

A secure, healthy, and satisfying lifestyle for all members of the community – rooted in traditional values, a clean environment, personal wellness, good governance, and expanded educational and economic opportunities (KTFN, 2014, n.p.).

To achieve this food system vision, community members outlined 11 distinct objectives corresponding to the CAVF dimensions. When considering the complex relationships among components within a food system (Stroink and Nelson, 2013; Spring et al., 2018; Nelson and Stroink, 2020), it is unsurprising that many of the objectives are connected to multiple CAVF dimensions (see Table 1). To inform action for each objective, community members generated guidance based on their interpretation of agroecology principles suited to the local context. In this section, we review the CAVF themes and connect them to the community's food system plan objectives and their guiding agroecology principles.

5.2.1 Economies

Kakisa's economy includes activities of the Northern mixed economy (Natcher, 2009). This means that sustainable livelihoods are derived from traditional activities such as food-sharing, trading, and, in some instances, selling, and from non-traditional practices such as running businesses and wage labour. Community members identified four food system plan objectives connected to the CAVF Economies dimension. During the workshop, community members expressed a desire to access more locally produced foods from diverse and affordable sources (Table 1, Objective 1) and for the food system to offer more sustainable livelihood options through the food system (Table 1, Objective 2). Words they used to indicate these concepts included “farmers market,” “employment,” and “tourism.” Similarly, community members stressed the importance of growing and harvesting sufficient food to share with all residents and with communities in the surrounding region (Table 1, Objective 3). They indicated that this can only continue to be possible if community members can afford to harvest food despite the associated costs, and if they can adapt to landscape changes caused by climate change (Table 1, Objective 6). Although Kakisa's economy includes traditional harvesting activities and wage labour,

its small population and relative isolation limit the number of local jobs available to residents. The community's mixed economy provides sustainable livelihood options through harvesting, sharing, trading, and selling food alongside wage employment. A more robust food system with traditional harvesting activities expanded to include gardening could support seasonal and full-time wage employment while creating organized opportunities for harvesting and growing food for household consumption as well as sharing and selling garden food outside the community. Participatory mapping with Kakisa households found that families share and receive traditional foods with 21 other communities across NWT and Northern Alberta, including all ten communities in the Dehcho region. Through their traditional food sharing networks, households maintain social bonds, reinforce cultural values such as sharing with others, and contribute to greater regional food security promoting an economy based on cultural values of generosity and reciprocity.

To achieve these goals, community members provided guidance that incorporates local customs and values including sharing food, reciprocity, care and support for sustainable livelihoods, and community support for food systems projects. Community members emphasized the necessity of sharing food with everyone including with other communities, creating local jobs across food systems projects instead of bringing in outside contractors, training community members to do jobs they enjoy, and incentivizing volunteering through access to spaces and resources and by creating formal support roles to help employees.

5.2.2 Governance

Under the CAVF, the Governance dimension refers to KTFN's ability to leverage its relationships with resources and power brokers, such as organizations and solidarity networks to promote food sovereignty, social justice, and self-determination. During the workshop, community members suggested that KTFN could contribute to better regional governance and foster self-sufficiency by growing and harvesting enough food to share with other communities in the region (Table 1, Objective 3), practicing traditional activities together, and sharing food to preserve Traditional Knowledge and language (Objective 8). Community members discussed their abundant food resources from the Land and garden including, “moose meat and fish,” “strawberries and raspberries,” “potatoes, carrots, and corn,” “fish stocks from Wrigley Harbour to Beaver Lake; Dry Fish (Kakisa Lake),” and “dry and smoked fish; dry meat.” These foods are grown, harvested and shared by community members, promoting food sovereignty and food self-sufficiency. To further improve their efforts to be fully self-sufficient, community members suggested that in the future they could raise their animals to have “eggs and meat,” to reduce the number of products purchased from stores in instances when traditional foods are scarce. Similarly, they emphasized that food preservation and storage should be prioritized to extend the amount of time community-grown and harvested food can be accessed during the year. Phrases such as “stock up on dry goods” and “more stored food like dry fish,” spoke to this idea. Finally, community members felt a responsibility to continue sharing food with their

TABLE 1 Overview of community-defined objectives for the Ka’a’gee Tu First Nation food system vision, categorized by the community agroecological values framework dimensions.

Kakisa food system vision objectives	Economies	Governance	Land & water stewardship	Traditional Knowledge & culture	Relationships	Skills & capacities	Supportive infrastructure
1. People can access alternative food options that make locally purchased foods more affordable.	X						
2. The food system provides sustainable livelihoods through harvesting and growing, employment, tourism, and food sharing.	X						
3. The community harvests and grows enough food for everyone and can share their food with surrounding communities.	X	X		X	X		
4. Land stewardship is extended to include household activities to keep the community clean, healthy, and safe.			X				
5. Landscapes are designed to protect the community and provide people with access to wild foods close to home.			X				X
6. People harvest food despite costs and climate impacts and harvesters are adapting to landscape changes.	X			X		X	
7. Food harvested and grown in the community provides healthy options for everyone.				X		X	
8. People practice traditional activities together and share food with one another to help preserve traditional knowledge and language.		X		X	X	X	
9. Youth and elders work together to use Traditional knowledge and new technologies to record information, keep people safe and help them harvest food from the land and garden.				X	X	X	X
10. Community members have skills to grow, preserve and store food from the land and the garden, contributing to year-round food self-sufficiency.				X		X	
11. Infrastructure, equipment and technology are available to support climate change adaptation activities such as growing food and to ensure safe traditional food harvesting.							X

families and relatives in other communities, supporting regional efforts toward self-sufficiency and self-determination. To this end, one community member suggested that “a bigger garden to share with other communities” be developed.

5.2.3 Land and water stewardship

Taking care of the Land was a common theme that emerged from community dialogue. Community members identified two objectives connected to the CAVF Land and Water Stewardship theme, reflecting their commitment to caring for the Land and environmental elements of their food system. For community members, stewardship refers to honouring reciprocal relationships with and responsibilities to the Land through sustainable harvesting and growing food with the understanding that care for the environment leads to both healthy people and land. Objectives they developed concerning this theme related to the desire to extend stewardship to include household activities to keep the community clean, healthy, and safe (Table 1, Objective 4), and that landscape designs should keep the community safe and provide households with good access to traditional and garden foods close to home (Table 1, Objective 5). Community members also established guiding principles for this dimension including identifying actions that households and individuals can take to reduce their environmental footprint, determining how local resources can be reincorporated into food projects, and prioritizing the need to keep the community and nature safe. Significant actions include taking only what you need and using everything, taking care of the animals by keeping them away from the community, and using local resources as much as possible to grow food.

To reduce impacts on the local environment KTFN currently runs a successful community recycling program that removes substantial amounts of plastic, glass, tin, and paper from the community landfill. Collection sites are installed around the community for households to deposit their recyclables. Volunteers drive the collected materials to the capital, Yellowknife to be processed in the territory’s recycling facility. To further their landfill diversion efforts, Community members highlighted the need to further reduce waste by limiting the use of plastic packaging, seen in the statement, “waste reduction (less plastic)”. In addition to recycling, community members suggested that containers be collected from households to be reused for distributing vegetables during the summer stating, “collecting and reusing containers from households”. One community member also suggested that moose and other bones could be used to provide nutrients for the garden before being placed back into the bush by “boiling bones and using as liquid fertilizer”. Such activities help generate more value from items by reusing and reincorporating them into food system.

5.2.4 Traditional Knowledge and culture

For Dene communities, Traditional Knowledge, culture, and language that have been passed down across generations are the foundation for relationships with self, others, and nature, that form the Dene identity and a sense of belonging. Community members provided guidance on how to live and adapt in a changing climate

while maintaining respect for self and others. This included using multiple ways of knowing along with Traditional Knowledge to address complex food system problems, celebrating and reviving culture and language, and intergenerational knowledge sharing between youth and Elders through land-based activities. The Traditional Knowledge and Culture dimension was reflected in six of the food system plan objectives developed by community members, reflecting this theme’s importance to food system sustainability.

A significant objective identified by community members was that people practice traditional activities together and share food to help preserve Traditional Knowledge and language (Table 1, Objective 8). This objective also connects to the Skills and Capacities, Relationships, and Governance dimensions discussing the significance of traditional activities, including land-based harvesting skills, knowledge of the Land (Table 1, Objectives 6, 8), and food-sharing (Table 1, Objectives 3, 7) to foster a sustainable food system and a healthy community and the significance of passing that knowledge and skills on to future generations (Table 1, Objective 9). These guiding principles were discussed as community members stressed the necessity of preserving traditional ways and passing on land-based skills and they recognized the important role of group land-based activities to pass on knowledge, create opportunities for elder-youth mentorship, and build social cohesion in the community. Phrases community members wrote to connect these ideas included, “on the land safety training”, “more speaking the language (Slavey)”, “draw old maps and trails of where we used to go”, and “more knowledge of the land and where to go”. Community members also discussed the need to integrate more Traditional Knowledge and modern technology to adapt to climate change’s impacts on the traditional food system. This idea was captured in the phrase, “training for people to be on the land (on app and computer)”.

5.2.5 Relationships

Relationships with self, family, community, and nature are essential components of Dene worldview. According to community members, relationships are considered healthy when they are balanced and harmonious and are derived from acts of reciprocity grounded in cultural values, trust, and respect for the Land and people. They are nurtured through participation in social and cultural activities. Community members described three objectives connected to the CAVF Relationships dimension. These included: The community harvests and grows enough food to share with all households and with surrounding communities (Table 1, Objective 3), people practice traditional activities together and share food to help preserve Traditional Knowledge and language (Table 1, Objective 8), and youth and Elders work together to use Traditional Knowledge and new technologies to record information, keep people safe, and help them harvest food from the Land (Table 1, Objective 9). Each of these objectives is connected to multiple CAVF dimensions, further emphasizing the significance of healthy relationships to Dene ways of life. Community members wrote phrases such as “together”, “sharing”, “sharing food”, and “people help each other” when discussing the

relevance of relationships for the food system resilience. Guiding principles community members developed for this dimension focused on strengthening and expanding sharing networks to include more communities across the region, encouraging participation in food-related activities, particularly youth, and creating social spaces for people to spend more time together in the community and on the Land.

5.2.6 Skills and capacities

The Skills and Capacities CAVF dimension related to five of the food systems plan objectives, reinforcing the understanding that to be self-sufficient and food sovereign, community members require a wide range of skills and capacities including how to grow, preserve and store food from the Land and the garden (Table 1, Objective 10). For community members, to develop the necessary skills and capacities, they requested more hands-on training and knowledge sharing among communities and local experts and community-led research that is based on both Indigenous and Western approaches to identify promising practices. The guiding principles community members developed for this dimension state that training and knowledge needed for the new food production system should be included in the school curriculum, that they focus on life and employment skills, that they are in person and include supporting documentation, and that they are combined with land-based cultural camps.

When discussing new climate change adaptation activities such as gardening, community members felt they needed more training about how to grow, preserve, and cook traditional and garden foods to become more self-sufficient. Phrases included *“Teach how to cook differently (traditional food) and non-traditional(food)”* and *“workshops and classes on dehydrating, canning, etc.”*. Training sessions about food skills coincided with discussions about expanding projects such as recycling, the community garden, and composting programs, to be more effective stewards of the Land and to support family and friends in neighbouring communities through sharing and trading locally grown and harvested foods. Post-it notes included *“reducing food waste and using everything”*, *“more (household) composting done”*, *“bigger garden to share produce with other communities”*, and *“[produce] eggs and meat”*.

5.2.7 Supportive infrastructure

The CAVF Supportive Infrastructure dimension refers to the physical infrastructure communities use to achieve their food system goals. When discussing this theme, community members explained that for infrastructure to be supportive, design and location should incorporate cultural and climate considerations to increase local adoption rates and ensure utility for community members. Similarly, tools and technologies should be ‘appropriate’, meaning they are easy to use, they reduce time and effort to carry out tasks, they increase safety on the Land and in the community, and where possible, they have multiple uses.

To achieve their food system vision, community members noted that they need more supportive infrastructure to support climate change adaptation activities such as growing and harvesting food (Table 1, Objective 11). Here community guidance focused on

two themes; identification of specific equipment and infrastructure and considerations needed to ensure the infrastructure is suitable for local needs, contexts, and climate. Community members suggested that where possible infrastructure and spaces should have multiple uses. Supportive infrastructure and equipment ideas included a *“cellar for storing food”*, *“safety equipment for hunters and trappers (GPS, satellite phone)”*, *“small store”*, and *“gas pump”*. Meanwhile, considerations about existing infrastructure included comments related to adequacy of the infrastructure, e.g., *“bigger garden to share produce with other communities”* and that more equipment and infrastructure should help increase harvester safety when travelling on the Land and in the community, for example protecting people and infrastructure from interactions with wildlife, climate events, and extended exposure to extreme heat and cold. One workshop group provided the example of the fuel break providing closer access to wildlife for safer hunting, *“[the fuel break lets] geese get closer to the community (safety) [for hunting]”*. Finally, community members discussed the need to keep the community and nature safe by considering how new food infrastructure can attract wildlife. To ensure that food is safe to eat, and animals are not harmed a need was identified to *“keep wildlife out of the garden and greenhouse”* and *“to clean up and maintain unused land.”*

6 Discussion

6.1 Agroecology’s contributions to northern food system transformations

In the North, agroecology’s role in promoting a sustainable food system transformation differs from the rest of Canada, and from most food systems globally. This is because agriculture has not historically been a part of northern food systems. For agrarian societies, agroecological transformations suggest a shift toward more sustainable farming practices (Nicholls and Altieri, 2018). However, in the North the introduction of agriculture to the region has, and continues to be met with complex climate, geographic, cultural, governance, and infrastructure challenges (CCA, 2014; Lemay et al., 2021; Price, 2023). As such, in the North, an agroecological transformation requires a shift to revitalize traditional harvesting practices to reverse the nutrition transition toward imported, expensive and ultra-processed retail foods (Luongo et al., 2020; Little et al., 2021), as well as the integration of an entirely new ways of sustainably procuring food. Facing compounding pressures on their traditional food systems, KTFN and other Indigenous communities across the region are attempting to reconcile agriculture’s colonial legacy connected to residential school education and forced settlement (Price, 2023) and environmental impacts with its potential to transform food systems for a more sustainable future. Communities are experimenting with new forms of food provisioning, such as community gardens, greenhouses, and hydroponic containers, to improve access to and increase the diversity of local foods (Thompson et al., 2018; Chen and Natcher, 2019; Natcher et al.,

2021). To support this, agroecology contributes to the Indigenous food sovereignty movement and connects sustainable production practices with local Indigenous values that place relationships with the Land and community well-being at the center of all food system functions and ensures that the cultural values embedded in traditional food systems inform new practices as communities take up growing food to adapt to climate change impacts on local food systems (Price et al., 2022). For example, in Kakisa, the community has structured their garden model on the premise that food is a common good and have agreed that food produced from the community garden is to be shared with all members of the community and with other Dene communities in the region (Malandra, 2023; Rodriguez Reyes, 2024). Meanwhile, for KTFN, initiatives such as fish waste composting, embody Dene values of land stewardship, via improved waste management capacity, and knowledge sharing to support other community gardens in the region (Snider, 2021). Regional food sharing which is based on values of reciprocity and generosity, contributes to social connectivity, cultural continuity and food sovereignty (Ready, 2018; Ready and Power, 2018; Hall, 2021; Scaggs et al., 2021; Lanoue, 2023) and promotes further discussions among Dene communities about the benefits and future of agroecology in the North.

Regionally, northern agriculture policies are still being written. These policy gaps hinder progress and obscure the path forward for a sustainable agrifood system in the region (Lemay et al., 2021). To date, Indigenous voices in emerging agriculture policy debates in NWT have been limited to topics of land tenure and resource control (Wilson et al., 2020; Johnston and Spring, 2021; Lemay et al., 2021). In this regard, northern agroecology offers a vision for an agri-food system that contrasts colonial ambitions for agriculture expansion as a driver of economic growth, aligning it with Indigenous values, and promoting regional food security and sustainable livelihoods for all northerners while respecting Indigenous land and food sovereignty. By sharing their vision of northern agroecology, KTFN is contributing to this discussion and helping to shape the future of agriculture in the NWT.

6.2 The role of the CAVF in facilitating an agroecological transformation in the North

Academics and practitioners alike agree that agroecology along with food sovereignty are crucial for building more sustainable and just food systems and communities (Oteros-Rozas et al., 2019; Anderson et al., 2020; Lemay et al., 2021). To foster favorable conditions for agroecology to take hold, participatory food systems assessment and planning with communities are an important first step. As a field of research and a practice, community and regional food systems planning has emerged over the past two decades. As such, those in the field are still endeavoring to determine how to ensure that planning ensures more sustainable, just, inclusive, safe, and healthy food systems and communities (Raja et al., 2017).

Agroecological frameworks such as the CAVF, combined with participatory planning tools, empower communities to envision

what a sustainable transformation could look like and offer guidance about how to achieve it. The CAVF connects new forms of food provisioning with long-practiced activities rooted in values that revitalize Indigenous ways of life and rebuild relationships with self, family, community and nature (Settee and Shukla, 2020). From a practical standpoint, the CAVF assists communities to design holistic systems-oriented strategies that touch on multiple components of community well-being that correspond with Dene conceptions of healthy people and Land and contribute to their community food system goals. The use of participatory tools to emphasize local meanings and values places control over planning processes and outcomes in the hands of communities (Kamal et al., 2015; López-García et al., 2021). This empowerment, in turn, fosters greater engagement in the design and implementation of food system projects, ultimately leading to more impactful outcomes that address the unique food system priorities of Indigenous communities related to cultural resurgence, food sovereignty, self-determination, and holistic well-being (Matunga, 2013; Gutierrez et al., 2023). Thus far, the CAVF has been used in Kaksia to develop their food action plan. Here, community members guided the planning process, describing the types of activities they wanted to see and how they should be carried out. Activities are overseen by the KTFN band office and carried out by community members with support from student researchers. As KTFN shares their experiences and successes with others, it is anticipated that more communities will follow in their lead, adapting the CAVF to each individual community context and vision for a more sustainable and resilient food system.

7 Conclusions

This case study presents the findings from a local food system planning process involving KTFN, a Dene community in northern Canada. As a PAR study, it supports KTFN's efforts to create and implement a vision for their food system that accurately reflects their values and perspectives and respects their ways of knowing, being, and doing. The food system action planning process represented a significant milestone in an ongoing community-research partnership aimed at addressing and adapting to climate change impacts on KTFN's traditional food system (Spring et al., 2018). The KTFN community food system action plan was designed using the CAVF; a food system framework developed in collaboration with KTFN that takes an approach to food systems planning that draws on the strengths orientation and systems structure of CCF and integrates value perspectives of agroecology in a northern context. The CAVF presented KTFN with a broad framework to establish connections among a range of community priorities that intersect with their food system activities such as taking action on climate change, sustainable livelihoods, safety on the Land and within the community, environmental stewardship, cultural resurgence, social cohesion, appropriate infrastructure, and food sovereignty. The plan illustrates the interdependencies among cultural, natural, and social components within the food system and their contributions to community well-being. It also emphasizes the

importance that community members place on relationships and responsibilities between people and the Land, a recurring theme found within many Indigenous worldviews.

Case studies of this nature are essential as they provide researchers, planners, and advocates for Indigenous food sovereignty with critical insights into food systems planning with Indigenous communities and agroecology's contributions to driving sustainable transitions by integrating local values, perspectives, and priorities into the development and implementation of food system initiatives. Community-led food system planning and interventions yield considerable impacts when they adopt bottom-up approaches at the community scale and are vital for advancing Indigenous objectives related to self-determination. As food systems are place-based, they require tailored strategies that consider local context. The CAVF was designed in collaboration with KTFN and has supported food system transformation in the community. However, it remains to be seen whether this framework resonates with Indigenous communities across the North and elsewhere. Nonetheless, this case study provides insights into how northern agroecology can provide guidance for building healthy food systems. Furthermore, such case studies address a significant gap in the existing literature and have the potential to inspire communities aiming to develop food system action plans with Indigenous communities in rural and remote settings.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Wilfrid Laurier University Research Ethics Board and Aurora Research Institute. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JT: Project administration, Data curation, Conceptualization, Methodology, Investigation, Writing – original draft, Formal Analysis, Visualization. AS: Conceptualization, Writing – review & editing, Supervision, Funding acquisition. LC: Validation, Writing – review & editing, Conceptualization. RS: Writing – review & editing, Validation, Conceptualization.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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