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Research Article

Leveraging community agroecological values across scales for food system transformation in Ka'a'gee Tu First Nation, Northwest Territories

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Abstract

Communities in northern Canada are adopting community gardens as a means to address food insecurity, which has been exacerbated by climate change, rising food costs, and limited access to traditional and nutritious foods. Despite these initiatives, many northern communities lack the essential resources required to sustain such projects. This study seeks to address this gap through a Participatory Action Research approach, whereby community members identify both available resources and those necessary for maintaining their community garden, as well as potential regional and extra-regional opportunities for sustaining food system projects. The Community Agroecological Values Framework (CAVF) is applied to food system planning in Kakisa, Northwest Territories (NWT). The findings indicate that while the community has successfully leveraged regional and extra-regional resources by building relationships with organizations outside the territory, barriers such as unstable relationships and conflicting perspectives regarding land use and agriculture have constrained access to critical regional supports, including gardening knowledge networks, funding, and training opportunities. This study highlights the importance of both short-term regional support and long-term local capacity building to establish foundational knowledge and foster enthusiasm for food production over time. Lessons learned from strategies aimed at building local capacities indicate that both short-term regional assistance and sustained community-level capacity development are crucial for

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establishing foundational knowledge and enthusiasm for gardening in the North. These findings contribute to the design of a community food system action plan, emphasizing the necessity for collaborative strategies to build well-being and promote the sustainable transformation of food systems in northern Indigenous communities.

Keywords: Community capitals; community planning; northern food systems; participatory action research; regionality; sustainable food systems

Résumé

Les communautés du nord du Canada créent des jardins communautaires afin de contrer l'insécurité alimentaire, qui a été exacerbée par les changements climatiques, l'augmentation du coût des aliments et l'accès limité à des aliments traditionnels et nourrissants. Cependant, plusieurs communautés nordiques n'ont pas toutes les ressources essentielles pour soutenir de tels projets. Cette étude vise à combler cette lacune par une approche de recherche-action participative dans laquelle les membres de la communauté identifient à la fois les ressources disponibles et celles qui manquent pour maintenir leur jardin communautaire, de même que les éventuelles opportunités régionales et extrarégionales pour soutenir des projets liés au système alimentaire. Une charte de valeurs agroécologiques communautaires est appliquée à la planification du système alimentaire à Kakisa, dans les Territoires du Nord-Ouest. D'après nos résultats, alors que la communauté a mis à profit avec succès les ressources régionales et extrarégionales par l'établissement de relations avec des organisations en dehors du territoire, les difficultés, telles que des relations instables et des points de vue divergents quant à l'usage de la terre et à l'agriculture, ont limité l'accès à des soutiens régionaux critiques, incluant des réseaux d'échange de connaissances en jardinage, du financement et des opportunités de formation. Cette étude met en évidence l'importance à la fois du soutien régional à court terme et du renforcement des capacités locales à long terme pour établir une base de connaissances et susciter un enthousiasme durable vis-à-vis de la production de nourriture. Parmi les leçons tirées des stratégies visant à renforcer les capacités locales, il apparaît que l'aide régionale à court terme et l'accroissement durable des capacités au niveau communautaire s'avèrent cruciaux pour établir les connaissances fondamentales ainsi que l'enthousiasme pour le jardinage dans le Grand Nord. Ces observations contribuent à la conception d'un plan d'action communautaire pour le système alimentaire ; ils mettent l'accent sur la nécessité d'adopter des stratégies collaboratives pour construire le bien-être et promouvoir une transformation durable des systèmes alimentaires dans les communautés autochtones nordiques.

Introduction

In 2012, the United Nations Special Rapporteur to Canada highlighted the health and ecological benefits of local food systems, including improved access to fresh, nutritious foods, for remote northern communities (United Nations, 2012). Over a decade later, systemic and policy barriers continue to limit these benefits (Hall, 2021; Johnston & Spring, 2021; Judge et al., 2022; Wilson et al., 2020) despite grassroots efforts supporting traditional food harvesting (Lamalice et al., 2018; Ramirez Prieto et al., 2023; Ross & Mason, 2020). Although geographically diverse, contemporary northern food systems are influenced by both settler and Indigenous economic models that have gradually become intertwined over time through remoteness, cultural shifts, and necessity (Kuokkanen, 2011; Wenzel, 2019). The settler food system is centered on the economic notion that food is a commodity to be used for commercial production, processing, and distribution for monetary gain (Lemay et al., 2021). Indigenous or traditional food systems are place-based systems that include foods available from the surrounding natural environment, referred to as the "Land" (Council of Canadian Academies [CCA], 2014). Traditional food systems are deeply rooted in Traditional Knowledge (TK), emphasizing reciprocity and collectivism (CCA, 2014; Gerlach & Loring, 2013), and connect networks of food actors through shared landscapes, histories, politics, social and economic relations, and culture (Blay-Palmer et al., 2018; Marsden, 2012, 2013). These networks of people and activities emphasize the vital roles of relationships with food and the land and waters where it is harvested as a foundation for collective identity and community wellbeing (Blay-Palmer et al., 2021; Power, 2008). In this context, the authors define 'Northern Canada' as the region north of the sixtieth parallel including the territories (Yukon, Northwest Territories, Nunavut) and northern portions of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Newfoundland and Labrador (Hancock et al., 2022).

Over time, social, economic, and political pressures have influenced northern food system dynamics. Despite these changes, Indigenous communities strive to uphold their land-based harvesting practices, such as hunting, trapping, fishing, and foraging, alongside food-sharing networks, TK sharing, and land stewardship (Gutierrez et al., 2023; Hall, 2021). At the same time, colonial policies and economic and societal pressures are driving a dietary shift toward expensive, imported foods and cash-based livelihoods (Burnett & Hay, 2023; CCA, 2014). This transition has contributed to high food insecurity rates among Indigenous households and is accompanied by rising instances of chronic diseases and poor mental health outcomes (CCA, 2014; Kuhnlein, 2015).

Seeking solutions to these challenges, northern communities are adapting their food systems to address climate change and rising living costs by practicing gardening and small-scale food production alongside traditional harvesting and purchasing food (Chen & Natcher, 2019; Lamalice et al., 2018; Poirier & Neufeld, 2023; Ramirez Prieto et al., 2023; Ross & Mason, 2020; Thompson et al., 2018). By adopting food production approaches aligned with local ecological values, communities can reduce food insecurity and support more sustainable development pathways (Price et al., 2022).

However, these food production systems require new resources and skills (Ross & Mason, 2020; Spring et al., 2018). Scoping reviews and case studies of northern food programs highlight community-level barriers such as limited funding, volunteer retention, relevant knowledge, natural resources, infrastructure, and supportive food policies (Lamalice et al., 2018; Ramirez

Prieto et al., 2023; Ross & Mason, 2020; Spring et al., 2018). Adopting a regional strategy, particularly through collaborative partnerships and knowledge sharing, communities can expand available resources to support the success and sustainability of their food system goals (Blay-Palmer et al., 2021).

Using a case study approach, this research applies the Community Agroecological Values Framework (CAVF) (Temmer et al., 2025a), to describe the state of an emerging food production system in Kakisa, the home of the Ka'a'gee Tu First Nation (KTFN), a Dene Nation in the Dehcho region of Denendeh, (Northwest Territories [NWT]), Canada. It discusses strategies the community uses to leverage regional and extra-regional resources to achieve their food system goals. Specifically, KTFN asks what local and regional attributes and resources are available to support them to achieve their food system vision, and how can these resources be leveraged to enhance the viability of food system projects over the long term?

KTFN and the authors developed the CAVF through a collaborative and iterative process while developing the community's food action plan (Temmer et al., 2025b). The CAVF incorporates the Community Capitals Framework (CCF), which was used for a previous food system analysis (Spring et al., 2018), along with ongoing discussions with KTFN to characterize northern agroecology (Price et al., 2022; Spring et al., 2025).

The CCF is an assessment model used to support community development, climate resilience, and food system adaptation (Cafer et al., 2019; Gutierrez-Montes et al., 2009; Natarajan et al., 2022; Pigg et al., 2013; Spring et al., 2018). It includes seven assets or "capitals"—natural, social, cultural, human, political, financial, and built—which can be leveraged to transform systems, foster resilience, and support sustainable outcomes. The CCF emphasizes strategies that account for social, economic, environmental, and institutional factors to enhance sustainability and wellbeing (Emery & Flora, 2006; Pigg et al., 2013). Northern agroecology is a values-based approach to northern food systems (Price et al., 2022). It is based on agroecology, an ecological approach to stewarding the food system encompassing ecological, economic, and social dimensions (Francis et al., 2003), and aligns those themes with Dene cultural values and stewardship principles. Northern agroecology identifies five value dimensions: Stewardship, Economies, Knowledge, Social Dimensions, and Governance, emphasizing Dene values in food systems design. The CAVF expands these to seven dimensions: Skills and Capacities, Traditional Knowledge and Culture, Land and Water Stewardship, Economies, Governance, Relationships, and Supportive Infrastructure. This approach incorporates the CCF's analytical strengths while embedding Indigenous value-based perspectives, enabling a more inclusive and relational approach to food systems adaptation. Table 1 compares the CCF, Northern Agroecology and CAVF categories.

Table 1: Overview of Community Capitals, Northern Agroecology, and Community Agroecological Values Frameworks.

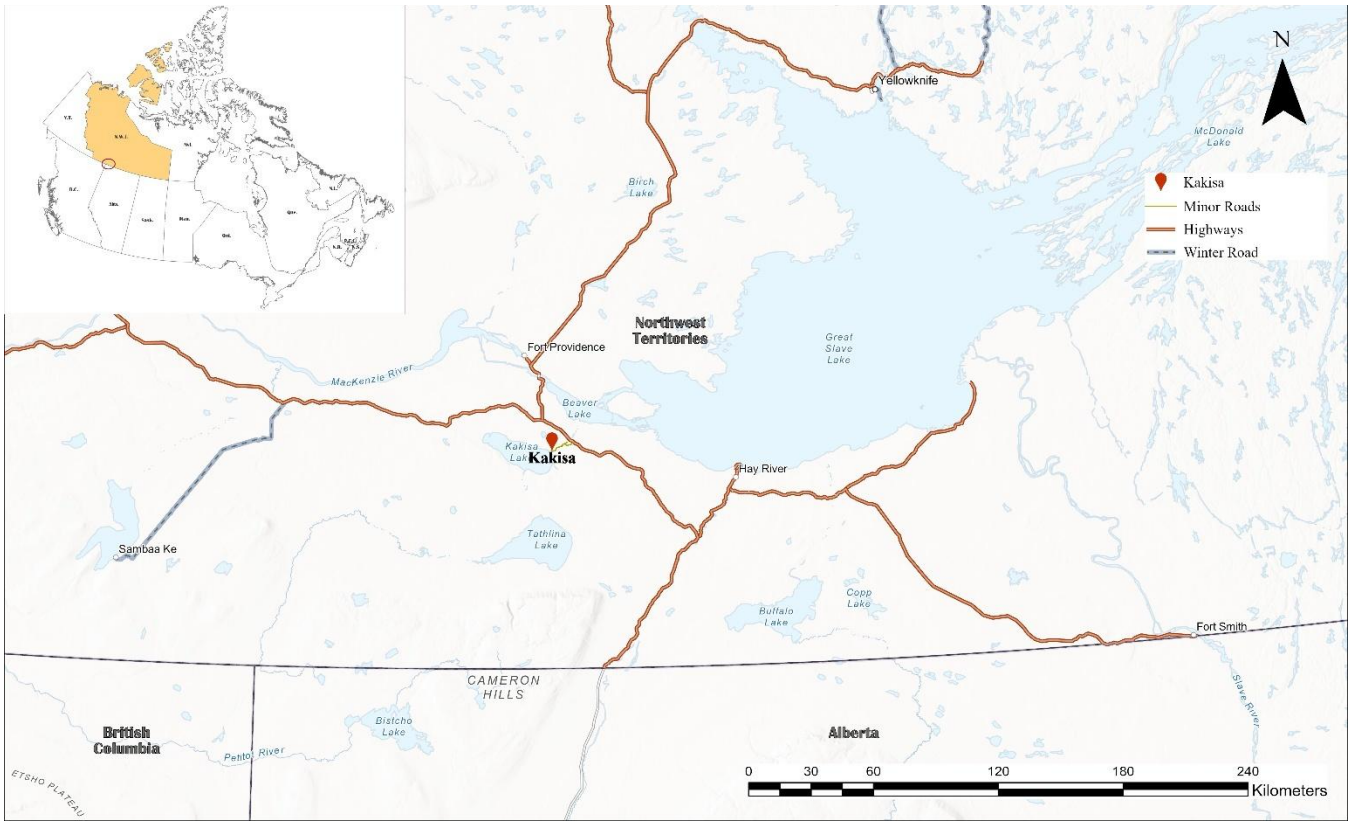
Community Capitals	Northern Agroecology	Community Agroecological Values
Natural Place-based assets that occur naturally, including natural resources (e.g., minerals, forests, bodies of water), amenities, and natural beauty. It can also include geographic location (e.g., urban, rural, remote).	***Stewardship*** Healthy people, healthy land; hunting, gathering, growing	***Land and Water Stewardship*** Sustainable harvesting practices such as hunting, fishing, trapping, gathering, and growing. Taking care of natural resources (e.g., forests, bodies of water), amenities, and natural beauty leads to healthy people and healthy Land.
Financial Resources that can be accessed to invest in capacity-building, economic development, and social/civic programming.	***Economies*** Food-sharing and trading; support for sustainable local livelihoods	***Economies*** Sustainable livelihoods are derived from food-sharing, trading, and selling. Financial resources that contribute to community and food system well-being efforts.
Cultural The way people "know the world." Includes traditions and language, power dynamics that influence collaboration across ethnicities and generations, individual voices, and influence, as well as how creativity, innovation, and influence emerge and are nurtured.	***Knowledge*** Traditional Knowledge; community-led research; two-eyed seeing	***Traditional Knowledge and Culture*** Traditional Knowledge, two-eyed seeing, cultural resurgence, and traditional language use. Inter-generational knowledge sharing with youth and Elders through land-based activities.
Social The networks and connections of people and organizations that can be utilized to create change.	***Social Dimensions*** Culture; language; youth and elders	***Relationships*** Balanced and harmonious relationships with self, family, community, and nature that are derived from acts of reciprocity rooted in cultural values, trust, and respect for the Land and people and nurtured through participation in social and cultural activities.
Political Connections to resources and power brokers, access to power and organizations. The ability of individuals to find and use their voices to contribute to community betterment.	***Governance*** Self-governance; solidarity networks; land and food sovereignty	***Governance*** Connections to resources and power brokers, access to power, organizations, and solidarity networks to promote social justice and self-determination through self-sufficiency. The ability of individuals to find and use their voices to contribute to community betterment.
Human People's skills and abilities to access and enhance resources and knowledge within and outside of their communities to increase		***Skills and Capacities*** Community-led research, value for multiple ways of knowing, and skills training. Local capacity to enhance resources and knowledge within and

understanding, identify promising practices, and build community		outside the community to increase understanding, identify promising practices, and build community.
Built The physical infrastructure supporting the use of other capitals to advance the process of community building.		***Supportive Infrastructure*** Physical infrastructure considers cultural and practical design and location implications to maximize community adoption and utility. Tools and technologies are easy to use, reduce labour efforts, address pertinent problems, and, where possible, have multiple uses.

Community description

Kakisa is home to the Ka'a'gee Tu First Nation (KTFN) (spelled *K'ágee* in Dene Zhatié, KTFN's ancestral language). Located in the Dehcho region of Denendeh (also called NWT), Kakisa is situated at the end of a year-round access road, thirteen kilometers from the Mackenzie Highway, 400 km south of Yellowknife, and 140 km northwest of Hay River (Figure 1). It is the smallest community in Denendeh, with approximately forty residents (Statistics Canada, 2023). KTFN is in the Taiga Plains ecozone, which features boreal forest, wetlands, and muskeg (Government of the Northwest Territories, 2009). In Dene Zhatié, *Tu* and *Tue* mean water and lake, reflecting a strong connection to the lands and waters (Dehcho First Nation [DFN], 2020).

KTFN members, referred to as K'ágee Gotii, identify as Dene, and many maintain traditional lifestyles. Community members access food through traditional means, purchase it and access it from the community garden. Residents harvest traditional foods such as fish, moose, waterfowl, berries, and medicinal plants on K'ágee Land, sharing their harvests with relations across the region through traditional food-sharing networks. As Kakisa has no store, food is purchased in Hay River or Yellowknife, requiring extensive time and money for travel and food imported from southern Canada. Since 2021, KTFN has distributed garden vegetables among households. In general, the garden is welcomed by all; however, some Elders have shared that their primary experiences with agriculture were through residential school agriculture programs. These programs separated children from their families and culture and imposed gardening and husbandry skills in place of land-based knowledge (Price, 2023).



For KTFN, the traditional food system is vital to community life, fostering deep connections between humans, nature, culture, and kin that span generations and reinforce Dene identities (Fresque-Baxter, 2015). However, climate change has hindered traditional food harvesting, affecting food quality and quantity and disrupting the transmission of TK and land stewardship values to younger generations (Spring et al., 2018). Recently, forest fires and floods have also compromised community health, safety, and access to essential services, further straining already vulnerable households (Dodd et al., 2018). Such climate events strain food access as they cause safety concerns for traditional harvesters and force residents to travel up to 800 km round trip for groceries. Limited summer harvesting activities have curtailed intergenerational knowledge transfer and reduced traditional food access.

To address these vulnerabilities, KTFN has engaged in food systems and climate change adaptation research (Bysouth, 2023; Jayaratne, 2021; Johnston & Spring, 2021; Kok, 2020; Malandra, 2023; Rodriguez Reyes et al., 2025; Snider, 2021; Spring et al., 2018, 2020). Since 2014, community members have worked with researchers and organizations to develop strategies addressing food insecurity and wellbeing challenges (Blay-Palmer et al., 2021). Over the past decade, KTFN has developed a food production system grounded in Dene values, including land stewardship, social connections, sharing economies, intergenerational knowledge, collective governance, and diverse ways of knowing (Price et al., 2022).

Methodology

This research builds on ongoing Participatory Action Research (PAR) spearheaded by KTFN. Since 2014, KTFN has experimented with gardening to enhance food sovereignty and community wellbeing goals. Building on Spring et al. (2018), this is the second iteration of the PAR cycle (McTaggart et al., 2017). PAR emphasizes shared power, decision-making, and co-learning (McTaggart et al., 2017; Méndez et al., 2017). It is particularly suited to Indigenous-settler research collaborations as it values TK systems, respects diverse ways of knowing, and focuses on community-driven initiatives to create social change that advances the interests of Indigenous communities (Castleden et al., 2012; Denscombe, 2025; Fahlberg, 2023; Leeuw et al., 2012). As a flexible approach to inquiry, PAR creates space to integrate TK and Western methodologies, empowering communities to actively shape the research agenda and guide the process and outcomes (Grimwood, 2022; Smith, 2012). The iterative nature of PAR's planning, acting, and reflecting also helps to strengthen relationships between communities and researchers over time, offering richer insights as trust is built through reciprocity and shared experiences (Grimwood, 2022).

This PAR approach involved community collaboration, relationship building (Tondu et al., 2014), and collective action to build local capacity to establish and maintain the KTFN community greenhouses and garden. The research and action project were facilitated by J.T. as part of their doctoral research, with support and supervision from A.S. and A.B.P. All three authors are white settler scholars living in Southern Ontario. J.T. has a background in rural and community planning and has lived and worked with Indigenous and subsistence farming communities in the Canadian North and Global South to help drive community wellbeing through sustainable agriculture. A.S. has collaborated with communities across the NWT to advance sustainable food systems and community wellbeing employing PAR. Both authors have strong relationships with KTFN, having lived and collaborated with the community on multiple food system projects since 2021 and 2014 respectively. A.B.P. is an internationally recognized food systems researcher who has supported PAR actions in Kakisa through A.S. and J.T. for over a decade. This article is not co-authored by a community representative due to time and capacity constraints; however, KTFN community members, including knowledge holders, leaders, and youth, generously contributed to this research, including setting the research agenda, participating in data collection and validation, sharing ideas contributing to the theoretical framework, participating and volunteering in gardening activities and trainings, and extending teachings and friendship to the authors and extended research team. This research was conducted over five field seasons from 2021 to 2025. J.T. travelled to Kakisa annually in spring and summer for up to three months. Extended stays afforded time to form relationships built on trust and reciprocity generated through shared experiences. In addition to formal data collection and reporting, J.T. managed the community garden, led gardening skills training and mentorship, started a vegetable box program, organized community feasts, and participated in cultural and social activities in Kakisa and neighbouring communities. These activities contributed to the depth and quality of knowledge shared, the success of the garden, and an enriched experience for everyone. Notably, nearly every community member, including Elders and youth (thirty-five of thirty-eight people), contributed to this

research through one or more avenues: interviews, workshops, storytelling sessions, participating in training, and volunteering in the garden.

In 2021, through this action research, Kakisa's community garden evolved from a pilot project to an established program. To address community concerns about maintaining the garden, in 2023, KTFN and the J.T. and A.S. hosted a workshop, volunteer day, and community feast. Fifteen community members (about half of all Kakisa adults) attended the workshop. Participants were informed of the research objectives and consent process and provided written or oral consent, including connecting names with quotes. Workshop sessions included food system goal visioning (Lachapelle et al., 2010), community asset mapping to identify leverageable local and regional assets (Kramer et al., 2012), and a world café (Recchia et al., 2022) focusing on food action projects, strategies to address resource gaps, and connections to Dene values. J.T. organized the data based on attributes community members identified as contributing (+) or degrading (-) KTFN's food system vision and sorted and analysed the data across CCF and Northern agroecology dimensions. Simultaneously, KTFN leaders and the authors contributed to the development of the CAVF dimensions through conversations about how food projects contribute to community wellbeing. J.T. organized responses into a draft action plan using the CAVF dimensions, and community members then offered feedback through one-on-one follow up conversations. Community feedback helped to validate the CAVF categories and contributed new activities to be carried out across the food action projects. J.T. integrated comments and revisions. A finalized action plan was presented to KTFN leadership in December 2024 and was shared with community members at a regional gathering on community gardens hosted by KTFN in July 2025.

Results

KTFN's food system adaptation work with academic partners began in 2014 with the development of a climate change adaptation strategy (Spring et al., 2018) encompassing four initiatives: a community garden, a fuel break farm and food forest, a fish and garden waste composting initiative, and a food hub. These initiatives align with KTFN's goals of land stewardship, social connection, sustainable livelihoods, cultural revitalization, and food sovereignty. Through this research, the community assessed their existing strengths and identified areas requiring external supports for project implementation. Members noted that land and water stewardship, supportive infrastructure, and social dimensions contribute to project successes. However, they emphasized the need for more skills and capacities including training, knowledge sharing, and community participation in garden activities. In response, KTFN is addressing these deficits by partnering with the research team to secure summer student support and organize training for community members.

KTFN's food production system

Land and water stewardship

KTFN's food system thrives on its careful management of land and water. The community values its natural

resources and strong connection to the Land. During the community asset mapping exercise, members highlighted the importance of healthy landscapes using phrases such as "healthy lake and land," "clean air," and "natural soil." They also identified new natural infrastructure supporting food production projects, including "plants/gardens," "compost," and "fuel break." However, KTFN's Land and Water Stewardship attributes face challenges. Boreal soils, while abundant, are not ideal for vegetable production; they are nutrient-deficient, acidic, and low in organic matter (Bysouth et al., 2021). Moreover, climate change is impacting Kakisa, particularly in terms of its natural resources for food production. Shifts in hydrological cycles drive drought and forest fires and impact water availability and safe conditions for growing vegetables. In 2023 and 2024, high temperatures and low precipitation reduced water levels in Kakisa River and Lake, limiting irrigation capacity and the ability to harvest fish.

KTFN is addressing these limitations by incorporating agroecological practices such as composting, mulching, intercropping, and low flow irrigation. These activities help build soil, improve water retention, increase biodiversity, and enhance agroecosystem health, leading to higher yields and healthier plants. The community also acknowledges the potential negative impacts of food production on the Land's health and is committed to using practices that uphold stewardship principles of conservation and care. KTFN's conversations with academics and neighbouring First Nations about how to grow and distribute food in accordance with Dene values have led the community to consider agroecology as a suitable framework to be adapted to a northern context (Price et al., 2022; Spring et al., 2025). These conversations stem from a field visit to Brazil, where KTFN Chief Lloyd Chicot learned about agroecological food forests (Johnston & Spring, 2021). For KTFN, Northern agroecology offers a whole food systems approach that is centred on the community's conceptions of food sovereignty, environmental stewardship, diverse economies, and collective governance that are rooted in a culture of care for people and the Land (Price et al., 2022; Spring et al., 2025).

Skills and capacities

During the asset mapping workshop, community members highlighted skills contributing to food access, particularly those arising from the traditional food system such as hunting, dry fish making, fish filleting, catering, and meal preparation. Reflecting community voices from previous engagements (Malandra, 2023; Snider, 2021; Spring et al., 2018), they expressed a need for more skills and knowledge in gardening, food preservation, and household waste reduction. A community member emphasized that training remained a priority, especially when employing community members to work on the food projects: "if people work, they need to be trained." While some residents have transferable skills, such as knowledge of pumps and water systems, carpentry, food safety, and money management, gardening and food preservation skills are also needed for sustainable production and processing. There was a suggestion to leverage existing skills by "allowing community members to choose where they'd like to work and focus on their skills," as well as a recommendation that "strong programs" be implemented to support further skills development.

The band office, the economic development corporation (Noda), and the school support community-level skills and capacity building. Under the guidance of the Chief and Council, the band manager and financial controller administer KTFN services including social, cultural, physical, emergency

preparedness, and food system portfolios. Noda supports local economic development initiatives such as the food hub, a space that facilitates the distribution of locally grown and harvested foods to Kakisa households and regionally, in addition to offering a space to learn food skills and to socialize (Rodriguez Reyes et al., 2025). The food hub is currently in the planning phase and will begin operations in 2027. Kakisa's kindergarten to grade nine school, despite rapid teacher turnover, plays an active role in supporting the community garden, coordinating student involvement in workshops and caring for seedlings.

Regionally, institutions and non-profits offer opportunities for training in gardening and other food systems skills. Ecology North, a territorial environmental organization, runs youth gardening training and food preservation programs in collaboration with local schools in the region. Student researchers have also organized community and regional garden training workshops. However, floods and forest fires have hindered access to training, as event coordination and travel have become more complex and unpredictable.

Relationships

KTFN has a strong sense of community, with close social bonds rooted in a "social fabric" that includes "Elders, knowledge, family, and relationships." However, challenges like limited social spaces, COVID-19 stresses, and the need to leave for employment and education opportunities have strained social bonds (Rodriguez Reyes, 2024). The community garden and food hub are considered crucial for enhancing healthy relationships by offering spaces to learn, share, and foster connections. The proposed food hub will serve as a space to gather, hold training sessions, share food, and nurture relationships with self, community, and nature (Rodriguez Reyes et al., 2025).

KTFN has developed healthy relationships both at home and with neighbouring communities. These relationships are supported through kinship connections, shared cultural values and experiences, and participation in political organizing such as through DFN Regional assemblies and ongoing Dehcho land claim negotiations, as well as in social and cultural activities such as traditional food-sharing networks, sporting events, dances, church, and cultural camps. These practices strengthen social ties, reinforcing relationships among communities. In Kakisa, community members extend traditional food-sharing practices to garden produce. One community member suggested the community have a "bigger garden to share produce with other communities."

While their relationships with other First Nations and local communities are strong, KTFN faces challenges in relationships with groups outside their network. Efforts to establish healthy bridging relationships with regional organizations have had limited success. The Northern Farm Training Institute (NFTI) was disbanded in 2022, leaving the region without an extension and training centre. Ecology North's territorial mandate and budget restrict its capacity to offer regular technical assistance beyond youth gardening. Further afield, the community's relationships with university research networks have helped establish relationships connecting KTFN with organizations and training across NWT, providing avenues for addressing communication gaps and accessing needed funding, skills, and capacities.

Traditional Knowledge and culture

From the asset-mapping workshop, community members identified opportunities for food initiatives to

rebuild cultural capital, including "building strong cultural programs" that teach families self-sufficiency and reduce reliance on retail foods. They stressed that food programs should facilitate "connecting youth and Elders" to transmit language, TK, and values across generations. Cultural activities and values were seen as essential for supporting individual and collective healing. However, time and financial constraints limit participation in traditional harvesting and gardening activities. To reduce these barriers, KTFN Chief and Council organize cultural and food harvesting activities such as the fall hunt, Indigenous Peoples' Day celebrations, and community suppers, but individual households cover personal harvesting costs.
The transmission of local knowledge and values has been hampered as some youths prefer not to engage in traditional and gardening activities, and Elders and youth face communication barriers.

Historically, gardening was part of the northern traditional food system, and, for those who attended residential schools, gardening can be associated with the trauma attached to those experiences (Price, 2023; Price et al., 2022). However, KTFN is leveraging local and regional TK and Culture as they collaborate with other Dehcho Dene communities like Sambaa K'e First Nation (SKFN) to design a food production system that aligns with Dene values and principles. Northern agroecology, as conceptualized by KTFN and SKFN, illustrates that diverse forms of food provisioning such as growing food can align with Dene worldviews (Price et al., 2022). For example, in Kakisa, food is considered a common good to be shared by all:

> "It's always been like that, the people always shared stuff with people and that, a long time ago. We always shared food back and forth" (community member).

Extending Dene principles and values to the emerging food production system ensures that the community is reflected culturally in the food projects and a holistic sense of wellbeing is achieved. Integrating Dene TK into food production projects has the potential to address past trauma associated with agriculture and colonial institutions and create space for community empowerment. Evidence of knowledge transfer among communities to support food production system activities is already apparent. One community member shared a solution for vegetable storage, taken from a trip to SKFN:

> I had this idea from Trout Lake [SKFN] where they had this cellar. They built it into the ground like you keep things cool. You put your seeds, your potatoes, but it has to be at a certain temperature like during the winter. (George Simba)

Economies

Kakisa households take part in a mixed economy common to northern communities that includes land-based subsistence and income generating activities connected to food provisioning (Stephens et al., 2019). Like other Indigenous groups across the North, in Kakisa, sharing traditional food among households continues to be an important part of the subsistence economy and is directly connected to Dene values including food as a common good, sharing and reciprocity, sustainable livelihoods, and stewardship through responsible harvesting and consumption. These values are reflected in the food action plan, through statements such as, "bigger garden to share produce with other communities," and "take only what you need and use everything." Meanwhile, KTFN also sustainably manages a commercial fishery dating as far back as the 1950s, and some community members fish on commercial and subsistence bases (Spring et al.,

2025). In keeping with this mixed economies approach, community members prefer that garden foods are shared among Kakisa households, while they are open to sharing, trading, and selling surplus vegetables to neighbouring communities.

When envisioning their new food action plan, community members expressed a desire for more employment and livelihood options within the community. They included visioning words such as "employment," "tourism," and a "farmers market." KTFN's community food production projects offer valuable seasonal employment opportunities while contributing to sustainable livelihoods to support this new vision. Food growing initiatives offer employment for adults and youth, allowing them to gain essential life and employment skills, work in a social setting, and contribute to projects that benefit the entire community. Community members also discussed that the need for cash employment reduces time for land-based activities:

> "There's not much work around here sometimes, so you go to try to figure ways [to] make money because that's what this world's modern days now, it's all about money" (community member).

The flexibility of employment in the community garden enables community members to participate in diverse livelihood strategies. The garden offers paid, seasonal employment and a flexible work schedule with supports from visiting university students and community volunteers. This way, community members can earn money to purchase hunting supplies and take the time off work to participate in traditional harvesting activities, which in turn contribute to individual and community-wide food security, cultural resurgence, and community wellness goals. Participation in these activities contributes to the maintenance and development of the community's Economies, TK and Culture, and Social Dimensions by creating opportunities for diversified livelihoods and participation in both traditional and cash elements of the mixed economy.

Despite providing seasonal and flexible employment and access to healthy foods, the projects are not currently financially self-sustaining and require ongoing support to operate. One community member wrote on their asset map that "more funding for projects" was needed. Reliance on external funding sources, such as territorial and federal government grants, present a challenge to project sustainability, and differences in funder and community mandates have been an area of contention for KTFN. Government priorities emphasize economic development and employment opportunities through food production, whereas KTFN aims to establish a community-based food production program that promotes self-sufficiency and food-sharing. Chief Lloyd Chicot explained that "we always share what we have with everybody so that's the model that I think would suit the community." This sentiment was reiterated by community members as they indicated that "family sharing food" was an asset.

To contribute to the garden's success and the broader goal of self-sufficiency, and as an act of reciprocity for receiving garden foods, many community members contribute to garden operations by volunteering, lending tools and equipment, contributing ideas to solve problems, and by sharing garden food regionally across their food sharing networks. KTFN is also seeking to overcome funding challenges by establishing a food hub that will share food locally while trading and selling it regionally. As discussed previously, Dene Laws emphasize sharing, especially for traditional food which is important for maintaining reciprocal relationships, passing on cultural values, and ensuring relations and the Land are cared for (Newell et al., 2020; Price et al., 2022; Ready, 2018).

At the same time, community members are keen to explore the potential for selling and trading garden foods locally to community programs such as the supper club and regionally to other food hubs and neighbouring communities to generate funds to offset operating costs.

Governance

Kakisa has a local government that advocates for community members and actively strives to fulfill its mandates of self-determination and food sovereignty. This includes establishing sustainable food programming to ensure all households have access to healthy foods grown in the community. At the same time, there are opportunities to increase community members' participation to further democratize this process. To date, the absence of a community-led governance structure or oversight committee has hampered greater participation in food projects. To compensate for this, decision-making about the project activities comes via the community-research partnership. Community voices are integrated into decision-making, facilitated through research, in place of regular engagement in collective discussion and decision-making about food projects. Furthermore, community members have shared that they occasionally feel research burnout as engagement on multiple projects occurs at specific times of the year.

Regionally, KTFN faces uncertainties regarding access to and jurisdiction over their territory (Johnston & Spring, 2021). Negotiations for unresolved regional land claims have been ongoing for over twenty years (DFN, 2015, 2023). For KTFN, this has included important climate adaptation projects such as the fuel break infrastructure and corresponding berry project. In 2023, KTFN commenced construction of their fuel break of their own accord in anticipation of a severe wildfire season. This proved advantageous as wildfires came within fourteen km of the community boundary. In 2024, the community established a test plot of transplanted wild berries at the edge of the fuel break to provide easy access to traditional foods and to sustainably maintain the fuel break infrastructure. The community also plans to expand the garden area into the fuel break as the converted land is suitable for food production purposes.

Supportive infrastructure

KTFN began gardening in 2014 and has since expanded its infrastructure significantly. In 2021, two greenhouses and composting infrastructure were added. In 2022, raised beds were relocated, new beds built, and a field established. The following year, field expansion and soil improvement continued. In spring 2022, heavy snow caused a greenhouse collapse, limiting growing capacity. In 2024, a sturdier replacement greenhouse was installed, increasing food production for community distribution through the food hub.

Beyond the garden, community members indicated that "band office," "community hall," "school," and "research house" were built assets that support food objectives. The band office facilitates economies, social dimensions, TK and culture, and skills and capacities activities, as community members manage projects, write and administer grants, run cultural programming, and facilitate on-the-land and garden activities. It also supports healthy relationships through a central space to connect with others. The band office generates jobs for the community that provide income while enabling people to pursue a traditional lifestyle. However, community members have noted that it no longer meets storage and office needs. The community hall serves as a venue for processing and distributing garden produce and hosting workshops and social and cultural

events. The school offers life skills and cultural programming, bridging connections between youth and Elders. Lastly, the research house is a bridge between local and regional/beyond-regional attributes, accommodating students and regional partners supporting food system projects.

KTFN has also improved critical infrastructure, including paved road access which facilitates service, food, and resource transportation. Recent internet upgrades have enhanced communication and regional knowledge-sharing. However, the community still lacks permanent electricity, water, and sanitation infrastructure. Addressing these gaps would expand food production options, support year-round growing, and improve overall quality of life.

Table 2: Summary of Community Agroecological Value Attributes in KTFN's food system at the community, regional, and beyond-regional levels, showing elements that contribute (+) or degrade (-) community value attributes

Cultural Value	Community Attribute	Regional Attribute	Extra-Regional Attribute
Land and Water Stewardship	(+) Abundant sources of traditional food (+) Abundant access to clean water (-) Concerns about the impacts of food production on the health of the Land	(-) Regional causes of climate change impacts occurring at a local scale (e.g., mining, forestry, agriculture)	(-) Global causes of climate change impacts occurring at a local scale (e.g., industrial pollutants, transportation emissions)
Skills and Capacities	(+) Engaged community (active in training opportunities) (-) Small population (-) Time and effort are needed to travel to other communities for store-bought goods (+) Some skills are transferable for agri-food projects (-) Limited knowledge of how to grow food within the community (+) Knowledge about the Land in and around Kakisa	(+) Programs and opportunities are in place to train community members on gardening skills, food preservation, etc. (-) Climate change impacts affect the ability of communities to convene and share knowledge and experiences (+) Regional knowledge of how to sustainably grow food in northern climates	(+) The community-research partnership brings students into Kakisa to support summer food projects.
Social Dimensions	(+) Strong social economy (food-sharing within the community) (+) Small, close-knit community (bonding social capital) (-) Some issues with degradation of bonding social capital in the community (-) People leave the community for education and jobs	(+) Strong social economy (food-sharing across multiple communities) (+) Social connections outside the community (bridging social capital) (+) Experience with socially-oriented organizations and networks outside of the community (bridging social capital)	(+) Experience with research networks outside of the community (bridging social capital) that enable gardens for the last many years

		(-) Limited communication from food-related programs offering training/knowledge sharing	
Traditional Knowledge and Culture	(+) Most community members maintain traditional practices and activities and a strong connection to the Land that can be used to maintain traditional values when establishing agri-food projects (-) Limited time available to take part in traditional and gardening activities (for some) (-) Language is a barrier to transferring Traditional Knowledge (-) Some youths are not as engaged in learning sustainable gardening practices based on Dene values	(-) Limited cultural relevance or Traditional Knowledge associated with food production among DFN communities (+) Communities collaborate to envision a food production system that holds cultural relevance (+) Cultural camps bring in youth from other communities to learn and share enthusiasm for traditional culture	(+) Potential for the community to collaborate with researchers and scientists to incorporate two-eyed seeing into gardening trainings
Economies	(+) Food production projects generate seasonal employment and job skills for adults and youth while enabling them to participate in diverse livelihood options (+) Garden foods offset costs of retail foods	(+) Access to community funding and government grants (-) Reliance on external funding presents sustainability issues for food production projects	(+) Grant writing support provided through a research partnership
Governance	(+) Active local government (-) No community-led governance structure for food production programs (-) Limited decision-making ability in terms of control of lands	(-) A small number of constituents means less access to funding and resources (-) Dehcho Land Claims unresolved for the region	
Supportive Infrastructure	(+) All-weather road access (+) Local school (+) Community hall and cultural camp (+) Community garden infrastructure (-) Limited infrastructure (health, water, hydroelectricity) (-) No store	(+) Road access connects the community to the rest of the region and to services (+) Communications systems (phone, internet) connect the community beyond its boundaries	

(Snider, 2021; Spring et al., 2018; community workshop, 6 June 2023; interviews 2023)

Discussion

Through community workshops and conversations, an understanding of how KTFN leverages regional and extra-regional assets to support community-level food system innovations has emerged. These attributes include social and cultural connections with neighbouring First Nations, academic supports, and participation in regional training initiatives. Using Emery and Flora's (2006) concept of "spiraling up"—where investments in social capital increase other capitals—food system development can be facilitated across scales. CCF assumes that capital stocks can grow by investing in existing assets and that each community has a unique asset profile they can access (Lamm et al., 2021). Communities assess capital stocks across scales to determine where to invest locally and generate upward momentum toward their local goals. This approach enables communities with limited local capacity to expand and diversify the capitals available to them.

The CAVF reframes social capital through a Dene lens, defining it as relationships with self, family, community, and nature that arise from acts of reciprocity rooted in cultural values, trust, and respect for the Land and people. These relationships are nurtured through participation in social and cultural activities such as sharing food (see Table 1). Drawing on Emery and Flora's (2006) concept of spiraling up, the CAVF suggests that fostering reciprocal relationships with people and groups with established connections such as kin (bonding relationships), or with public or private entities with limited or no prior connections (bridging relationships), facilitates the exchange of knowledge, skills, cultural values, and natural and economic resources, enabling shared responsibilities and mutual goals.

Framing food systems as relational networks situated in place (Marsden, 2013; Nguyen, 2018), Kakisa's food system can be described as connections between TK and culture and land and water stewardship that rely heavily on the maintenance of social relationships across space and over time (Spring et al., 2018). In moving to expand food security and climate change initiatives, KTFN has identified knowledge and skills, funding, and infrastructure as resources they require to advance their food system vision. Our results highlight that KTFN has a considerable collection of community resources and values to support its evolving food system projects. However, expanding the food system model to incorporate food growing activities poses challenges as they require new forms of skills and capacities, economies, and supportive infrastructure to carry out their work. These findings are consistent with other community garden program assessments within northern Indigenous communities (Lamalice et al., 2018; Ramirez Prieto et al., 2023; Ross & Mason, 2020).

To address these local gaps in CAVF attributes, communities can leverage their healthy relationships by connecting regionally with diverse actors to enhance other attributes such as knowledge and skills, creating a spiraling-up effect. In this regard, KTFN faces a key challenge: regionally, the community has healthy bonding relationships with actors who participate in traditional food system, including friends and relations in neighbouring Dene communities. However, they lack the necessary healthy bridging relationships with groups such as farmers, gardeners, and agri-food organizations who hold the skills, funding, and social connections needed to support their goals for the regional food production system. Accessing needed attributes from these groups is further complicated

because, as Lemay et al. (2021) note, tensions exist regarding the perceived vision for the regional food system as well as differing values among the settler and Indigenous food actors. Reconciling these tensions will require further dialogue and gradual relationship building rooted in trust and reciprocity.

Spring and colleagues (2018) highlight the importance of cooperation across scales to leverage attributes that strengthen local skills and capacities for achieving community-level food system goals. In Kakisa, KTFN has fostered healthy bridging relationships outside the region to overcome barriers to food production. For over a decade, KTFN has collaborated with a southern university to build a foundation for its food projects. This partnership has facilitated access to resources, filling "buckets" across CAVF categories and contributing to an upward spiral. Through these extra-regional relationships, KTFN has also accessed regional resources otherwise unavailable to them. KTFN's partnerships with academics have connected them with regional food actors outside the traditional food system, addressing funding, knowledge, and infrastructure needs (Blay-Palmer et al., 2021). However, there are limits to supporting participation in the regional food system due to competing priorities, differing perspectives on food production, and deep-seated mistrust in colonial governance structures. The Dehcho Region land claim negotiations, which includes KTFN territories, is an example of these compounding challenges. Since 1999, the Dehcho Process has been underway between the federal government and Dehcho First Nation (DFN), the regional Indigenous governing body representing First Nations with lands in the Dehcho land claim Region (Dehcho First Nation, 2015, 2023). Differing visions regarding resource management, including land use for agriculture, continue to stall this process. Similarly, the GNWT's Protected Areas Strategy process, which would offer KTFN more protection and control over their lands, has also stalled since 2012 (Johnston & Spring, 2021). Without a land claim or protected area status, KTFN is limited in its ability to implement actions to steward the food system and adapt to climate change. Such challenges highlight the complexities of building viable, multi-scalar food systems in Indigenous communities in the region.

Questions also remain about the lasting impact of community-researcher efforts on building long-term community capacities. To address skills and capacities gaps, KTFN employs two strategies at the regional and extra-regional levels, each influencing community-level CAVF attributes differently. The first strategy involves bringing external knowledge and labour into the community. This approach addresses short-term needs but may lead to long-term sustainability issues due to reliance on outside support, generating project viability concern. The second strategy fosters local skills by engaging community members in capacity-building opportunities, such as regional garden training workshops organized through the community-research partnership. This approach transfers skills from regional and extra-regional sources to the community, strengthening long-term self-sufficiency and project viability. These strategies provide insights for policymakers and practitioners on the complexities of leveraging CAVF attributes across scales for sustainable development. They also suggest, as others have, that Emery and Flora's (2006) concept of spiraling up is more complex and unpredictable than originally assumed (Pigg et al., 2013).

While the first strategy focuses on importing external resources, including economies, relationships, and supportive infrastructure, the second endeavors to foster local skills and capacities, revealing contrasting approaches to community empowerment. The first strategy accelerates short-term garden goals by

substituting regional and extra-regional skills and capacities, however its eventual absence may pose long-term project viability challenges due to insufficient local knowledge. Meanwhile, the second strategy builds internal capacity slowly over time but fails to address more immediate challenges such as infrastructure, funding, and enthusiasm gained through short-term project successes.

Considering Kakisa's small population, this case study does not speak to some of the limitations that may be present in communities with larger populations and more complex social and political contexts. Nevertheless, Kakisa serves as a clear example of how local values influence a community's ability to generate healthy bridging relationships with diverse regional actors. This case also illustrates how incorporating scale into the analysis of strengths-based frameworks expands the number of potential strategies that communities can employ to leverage existing healthy regional relationships and good governance, drawing on and accessing other regional-level CAVF attributes to support community-level development priorities.

Further analysis of the complexity and dynamics of food production within the NWT regional food system was beyond the scope of this study. Moving forward, further research that identifies points of connection between multiple food actors is important to negotiate a unified agenda for northern food production that supports the diverse needs and interests of Indigenous and settler food actors while providing local, fair-priced, nutritious, and culturally relevant food for everyone in the region.

Conclusion

Across the North, communities are looking to food production to address barriers to accessing healthy foods and as an adaptation measure to address climate change impacts on traditional food systems. However, integrating new ways to grow, harvest, and consume food requires a range of resources presently unavailable at the community scale. Using a participatory action research approach, this research examines the potential pathways available to KTFN to strengthen CAVF dimensions by identifying attributes across scales. This research contributes to ongoing discussions around complex relationships within food systems and emphasizes that these relationships are contingent upon specific community contexts which in turn influence the outcomes of their interactions. For example, Kakisa's small population poses advantages and challenges for managing food systems. While a small population offers advantages such as close kin bonds that support increased participation and sharing, there is simultaneously limited capacity to take on growing numbers of projects. Additionally, this research analyzes how communities with limited community-level attributes can develop strategies to access and leverage CAVF attributes at regional and higher levels to acquire and maintain the attributes and resources they require over the long term to achieve their community goals.

To support the long-term viability of local food system projects in the North, more space is needed for communities to share culturally relevant knowledge and skills that can be utilized and passed on to future generations. To accomplish this, KTFN has taken a two-pronged approach to achieve long-term viability. The community has established garden infrastructure, programming, and financial support for growing food within a short timeframe to generate local interest and

demonstrate the immediate impacts that garden foods can have on community health and wellbeing. They are also providing opportunities for community members to build needed skills through local training sessions and workshops. Such skills building is part of a longer-term strategy to grow capacity within the community so that food projects can be managed locally. This strategy takes a multi-scalar approach, drawing on available resources from the surrounding region and beyond to focus on rapidly building critical infrastructure and project support while also nurturing long-term community capacities, which can contribute to long-lasting project viability, along with positive community wellbeing and self-sufficiency outcomes.

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