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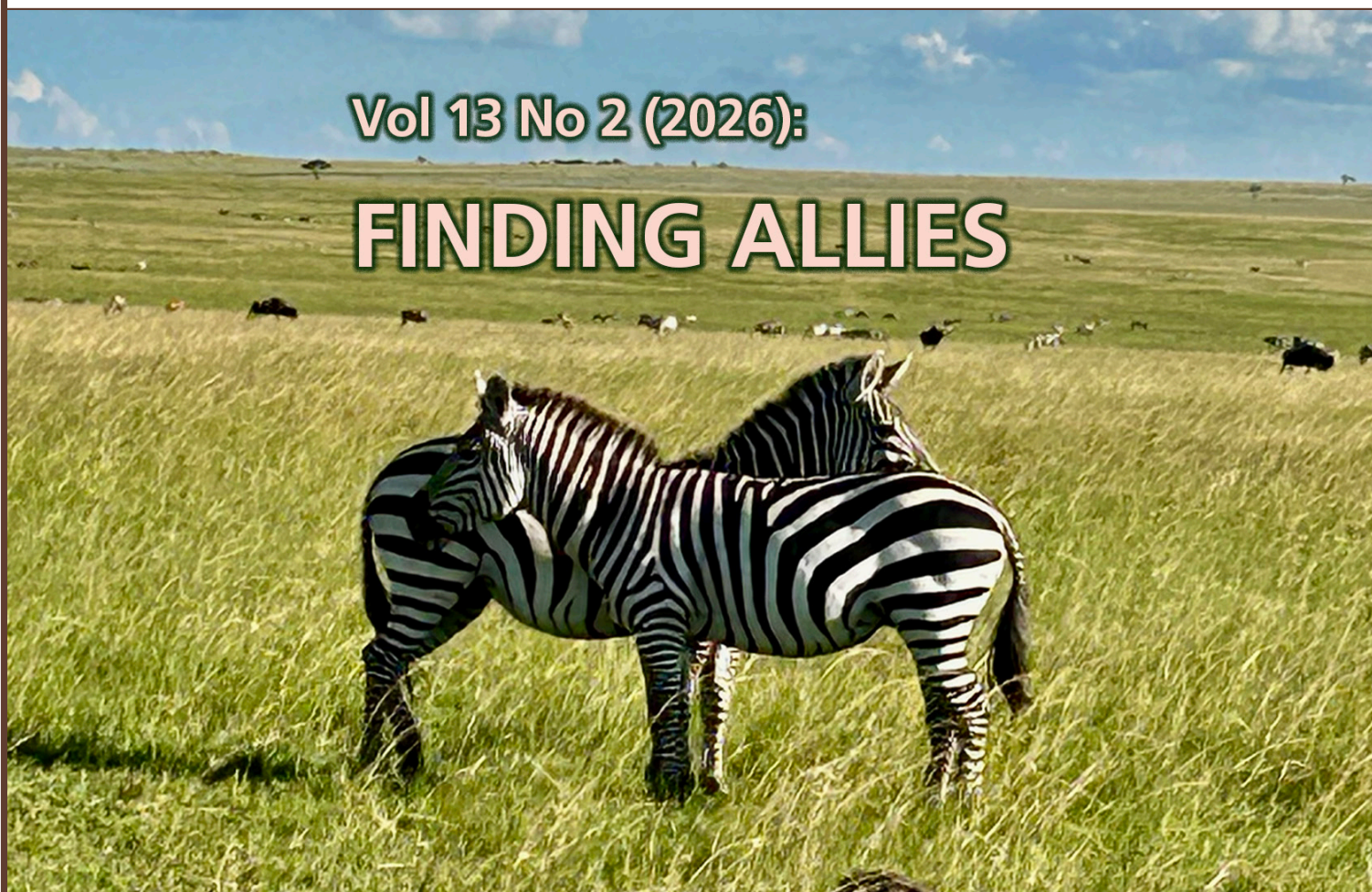


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Emily Dickenson wrote: “To make a prairie it takes a clover and one bee.”

As Geneviève Boudreau observes in her own urban garden and notes in her field journal/collection of poetic essays, *Une abeille suffit*, the association between red clover and bumblebee is a close one. The former is a principal food source for the latter. And that latter is the principal pollinator of this self-sterile flower, attracted as it is by the shape of its florets and by its sweet scent. Together, bee and plant transform Boudreau’s twelve square meters of lawn into a prairie.

They are allies. A clover. A bee. Such a small scale with such tremendous consequences.

Allyship and solidarity are at the centre of this issue, starting with our cover image. Apparently, zebras often stand this way, tip to tail as it were, so that they can have a shared 360° view of the savannah, and thus protect each other from predators.

Co-Managing Editor David Szanto posits that it looks like the zebras are smelling each other. Read his editorial to find out why this kind of sensual engagement matters.

In a similar vein, the articles in this issue explore allyship in many forms.

It shows up in methodology where, for instance, researchers who position themselves as members of their research population decide to co-interview each other. (See Da Costa & Tremblay.) It also appears in an analysis the alliance between agricultural support policies on the one hand and high-income farmers on the other. (See İşcan et al.) With its focus on “increasing volumes and export competitiveness of a small range of feed crops, food grains, and livestock production”, this is a powerful partnership that ultimately serves few, and with high environmental costs. And, on the heels of a pan-Canadian, bilingual food insecurity event, Knezevic et al. take pains to unpack the challenges and opportunities that come out of another type of allyship, between community and academia.

We invite you to read through this issue with these themes in mind, being attentive to the stakes at play around the matter of *Finding Allies*.

Bonne lecture !

Boudreau, G (2024). *Une abeille suffit* :
Carnet d’observation d’un jardin urbain. Noroît.



Editorial

Smells like food studies

David Andrew Szanto*

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At the end of May 2026, I was part of a five-day, international gathering at [Rongo University](#) in Migori County, Kenya, focussed on the successes, challenges, and knowledges related to agroecology. We were about forty-five people, and the meeting included student and farmer presentations, workshops on storytelling and problem-solving, visits to a nascent avocado plantation and an experimental farm, and innumerable one-on-one conversations. The whole was infused with a spirit of solidarity and commensality, even as we navigated differences of discipline and modes of expression. Comprising the second face-to-face encounter of the seven-year, SSHRC-funded FLOW (Food, Learning and Growing) Partnership, it was a key occasion to exchange ideas and perspectives on agroecological production in multiple global regions—everything from recipes for organic fertilizers to tactics for engaging policy makers in supporting traditional farming practices.

In our planning and lead-up to the meeting, I sometimes joked that we were all coming together *to smell each other*—my shorthand for breaking out of Zoom’s confines and spending time together in physical proximity. The FLOW Partnership brings together several dozen practitioners, producers, and academics across ten regions of the globe, and the vast majority of our contact is virtual. Despite many of us having relationships going back more

than a decade (thanks to PI Alison Blay-Palmer’s extraordinary connection-building), we mostly know each other through screens and speakers. Beyond seeing and hearing, we don’t have much sensory contact.

For me, therefore, “smelling each other” meant learning about each other in more casual circumstances—often involving food and drink—so that our communicative skills could become better attuned to the *how* and *why* of our exchanges, in addition to the more normative *what*.

Ultimately, though, we really did do a lot of smelling. Some touching, too, through hugs and handshakes and help getting in and out of vehicles. A third “lower” sense—tasting—was reserved for the food we ate (hello HR!), yet we did develop a sense of each other’s *tastes* when it came to art and literature, daily scheduling, epistemologies, and humour. The five days of visuals and conversations in Migori generated copious notes, ideas, solutions, questions, and research directions, but they also engendered a powerfully anchored sense of trust, care, and allyship—feelings that were not necessarily connected to the use of our “higher” senses.

In the last couple of months, I have been wondering more about my off-hand joke about smelling each other. In the early writings of Western scholars on the senses, smell was portrayed as coarse, even vulgar, along

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with taste and touch. They were considered animalistic senses—embodied and subjective, difficult to measure (Borthwick, 2000). Sight and hearing were celebrated and minutely unpacked as our “higher” senses, leading to the intellectual valorization of practices such as painting and architecture, music and oration, literature and mathematics. If you could see it or hear it, it was noble; if you had to touch, taste, or smell it, it was base.¹ This framing persists in our academic worlds, in which sight and sound are privileged as more “legitimate” tools for data gathering.

My mental meanderings on smell brought me back to two moments when I had a sudden, strong sense of how smell performs in lived experience and, potentially, in academic contexts. The first was during the mid-1990s, in New York, where I was then living and working as a book editor. I was also trying to activate a more theatre-focussed life for myself, and was taking classes for stage acting. During one exercise, our teacher had us pair up randomly and hold one another closely, face-to-face, moving fluidly and in sync as if we were slow dancing. I was teamed up with a slightly larger man, quite handsome, about my age or a bit younger. It felt both pleasingly intimate and somewhat uncomfortable, and, as an acting exercise, surprisingly safe.

The teacher then told us: *Okay, now take a risk.* No other instruction, no advice. Intuitively, though, a risk-act suggested itself. I leaned in a little closer to my partner and smelled his neck. I’m not sure if it was audible, and I don’t remember what risk he himself took. We were then told to pull apart and perform an improvised, non-dialogue scene in which we were to express a distinct emotion. We did. The results were... what? *palpable? striking? buffeting?* Very notable, in any case, whatever the touch-based adjective. Risk brings trust: that was the acting lesson. But what I did not quite understand, more broadly, was why smelling someone seemed risky.

Flash forward twenty years, and I am in Seoul, South Korea, in the international breakfast room of a hotel with a handful of colleagues from the University of Gastronomic Sciences. It is the start of my postdoc and the end of our week at AsiOGusto, a Slow Food–partnered conference and exhibition. I have been tasting wonderful mushrooms and grains and ferments and soups over the last days, and

I am enrobed in a rich peacefulness. The focus of our time here has been gastronomic communications, food culture pedagogy, and experimental epistemologies. We have also been eating very intentionally. A royal banquet, a workshop lunch of kimchi and heritage rice species, a Buddhist monastery dinner. The tastes have been quite new to me; the narratives, too—full of a holistic sense of food’s everythingness.

As I sit in the breakfast room spooning up dumplings and miso soup and rice with pickles, I realize that taste is not my primary learning modality right now. It is smell. And it is my *own* smell, yet also not the one I am more usually familiar with. It is a cloak of aromas that are both of my food and of myself, of my *self* and of an *other* much larger than food. In wonderment, I scribble a few words into my creased notebook: *an olfactory ethnography...? an (auto)ethnography performance...*

I have never succeeded in developing the methodology for an auto-ethno-something based in olfaction. (I can only imagine the SSHRC—no, NSERC!—adjudicators reading my grant application...) I know, too, why such a project has never come about, and I am sorry that it may be a good long time before it does. Smell: the least-trustable, least-controllable, most-evanescent, most-temporal of the senses. So potentially valuable to food studies, yet so generally relegated to cookery and aesthetics.

Sensory scholar Viktoria von Hoffmann has written extensively on the genealogy of the “low” and “high” senses, including the ways in which historical biases against smell, touch, and taste have shaped—and failed to shape—contemporary understandings of art, science, food, and numerous other fundamental practices (see von Hoffmann 2012; 2013; 2016; 2022). Philosophers such as Hegel, Kant, and Schopenhauer denigrated smell, tying it to transience and consumption, and naming it intrusive, ungrateful, and anti-objective. Today, I think we suffer an ontological hangover from having overconsumed their ideas—either first-hand or through discursive derivatives.

On a very different note, anthropologist David Howes once posited that sensory studies is the “first” discipline, noting that without our senses, we have no awareness or understanding of the world around us.² Along with co-authors, he expanded human sensing (including more

than just “the five senses”) to the notion of the *sensorium*: “the entire perceptual apparatus as an operational complex” (Bull et al., 2006, p. 5). As part of the sensorium, the senses are indelibly embedded with and within social and political constructs, future expectations, and past experiences of sensing. Together, the whole sensing corpus and its context become an entangled mechanism for meaning making, yet non-separable from the systems of meaning they co-construct. A systems-thinking interpretation of the senses, in other words.

In the last weeks, it has been both urgent and difficult for me to frame this text. I know I already value smell in many ways—as risk, as experiment, as thrill, as comfort—and I know that what was a joke in the FLOW context was also entirely serious. I am convinced that experimenting with olfactive epistemologies can produce value for our field, yet I am also mindful of the urgencies of polycrisis and decolonization and concentrations of power that clamour for our attention. I have felt caught in a swirl of no/but, much as I try to embrace yes/and.

And then I return to what happened in Kenya, and the zero-sum-nature of olfaction all sublimates away. I smell the tilapia stew and the two types of ugali and the beef samosas and the steamed arrowroot. I smell the Migori farmers’ dedication to their land and to both traditional and innovative agroecological practices. I smell the media savvy of communications master’s students and the pride felt by their Rongo professors and collaborators. I smell the diesel fumes and telcom advertising and red soil as Eric drives us down a potholed highway—as well as the mosquito spray and roasted peanuts and hope and kindness that linger in his van. I come back to Montreal, and those smells are part of my smell, and I smell them again, and I call them sensorial knowing and memory, as well as solidarity and trust and capacity building.

Many languages use one verb to cover smelling, sensing, hearing, and feeling, suggesting either a historic conflation of the “lower” senses or a discursive acknowledgment that the rationalist project to isolate the senses has been problematic. Whatever the interpretation, it prompts thinking about how to deploy the wholeness of the sensorium within food studies and food systems research. We have a diversity of sensory-informational channels at our

disposal: wouldn’t using more of them generate a broader diversity of understandings about food? Endless academic arguments support *not* engaging with smell (and/or taste, touch, proprioception, nociception, interoception), yet I sense that they are mostly grounded in fear and uncertainty about perceived legitimacy.

I wonder now, as you read this: Can you recall a moment when smell intervened in your knowledge-making pathways, or surprised you, or made you feel at risk? Did it complement other data you were gathering? Did it make you question that data or the results you generated? Could the moment have been repeated, unpacked, documented, or formalized? Are you tempted, the next time you meet your colleagues and research partners, to lean in a little closer and smell them, either surreptitiously or with a preceding caveat? Can you imagine what solidarity and partnerships and care you might build in that way?

The specific aromas of Rongo University’s conference room and kitchenette and avocado grove have mostly dissipated for me, translated into other forms of knowing. Embedded within my sensorium, the people and foods and conversations and hope are now a web of trust and confidence, reassuring me and inspiring future work, exchange, and mutual support. The composition of that web is both of me and of them, of the past and the future, of groundedness and of curiosity. I know it. I can smell it.

Endnotes

¹ Notably, the “low” senses are also more often associated with female-gendered practices and knowledges, while the “high” senses are those that are deployed in fields that were conventionally masculinist-framed.

² David Howes and his partner Constance Classen have written extensively on the senses—I do a disservice to the depth of their work here, but this is an editorial and not a review article. See the References for additional work.

David Szanto is a teacher, digital producer, researcher, and artist, taking an experimental approach to food and food systems through design, ecology, and performance. He is the co-managing editor of *Canadian Food Studies/La Revue canadienne des études sur l'alimentation* and the host/producer of the journal's podcast, [Digesting Food Studies/Concentré d'études sur l'alimentation](#). Having previously taught at Concordia University, l'Université du Québec à Montréal, and the University of Gastronomic Sciences in Italy, he currently teaches part-time in the George Brown Bachelor of Food Studies program and works as a freelance academic.

Conflicts of Interest: None to declare.

References

- Borthwick, F. (2000). Olfaction and Taste: Invasive Odours and Disappearing Objects. *The Australian Journal of Anthropology*, 11(3), 127–140. <https://doi.org/10.1111/j.1835-9310.2000.tb00052.x>
- Bull, M., Gilroy, P., Howes, D., & Kahn, D. (2006). Introducing Sensory Studies. *The Senses and Society*, 1(1), 5–7. <https://doi.org/10.2752/174589206778055655>
- Howes, D. (2003). *Sensual Relations: Engaging the Senses in Culture and Social Theory*. University of Michigan Press.
- Howes, D. (2022). *The Sensory Studies Manifesto: Tracking the sensorial revolution in the arts and human sciences*. University of Toronto Press.
- Howes, D., & Classen, C. (2013). *Ways of Sensing: Understanding the Senses in Society*. Routledge.
- Howes, D., Morgan, K., Radice, M., & Szanto, D. (2013). *The Sensory City Workshop: Sensing the City through Touch and Taste*. Centre for Sensory Studies.
- von Hoffmann, V. (2012). The Rise of Taste and the Rhetoric of Celebration. In M. McWilliams (Ed.), *Celebration: Proceedings of the Oxford Symposium on Food and Cookery 2011*. Prospect Books.
- von Hoffmann, V. (2013). *Goûter le monde: Une histoire culturelle du goût à l'époque moderne*. Peter Lang.
- Von Hoffmann, V. (2016). The Taste of the Eye and the Sight of the Tongue: The Relations between Sight and Taste in Early Modern Europe. *The Senses and Society*, 11(2), 83–113. <https://doi.org/10.1080/17458927.2016.1195564>
- von Hoffmann, V. (2022). Epistemologies of Touch in Early Modern Holy Autopsies. *Renaissance Quarterly*, 75(2), 542–582. <https://doi.org/10.1017/rqx.2022.107>



Field Report

Fieldnotes from the organizers of the food insecurity community-oriented event “Let’s Move Beyond Charity!”: Challenges, opportunities and learnings

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Abstract

In 2024, our team organized the pan-Canadian, bilingual event, “Food insecurity: Let’s move beyond charity!” / “L’insécurité alimentaire : allons au-delà de la charité!”, which convened community and academic actors in a discussion of food insecurity in the country. In addition to serving as a space for knowledge exchange, the event anchored a broader set of collaborative efforts with the participating community groups, efforts that began well before the event and continued in the weeks that followed.

In these fieldnotes, we report on our approach to this work, the importance of community-academia dialogue, and the challenges and opportunities for food security work in institutional contexts. Our observations suggest that community-engaged activities require a significant time and administrative commitment as well as careful navigation of institutional obstacles. Such efforts, however, are justified by the value of community expertise when discussing issues of significant social importance.

Keywords: food insecurity, food charity, community-academia dialogue, knowledge sharing, systemic change

Résumé

En 2024, notre équipe a organisé l'événement pancanadien et bilingue « Food insecurity: Let’s move beyond charity! » / « L’insécurité alimentaire : allons au-delà de la charité ! », qui conviait des acteurs de la communauté et de la recherche à une discussion sur l'insécurité alimentaire au pays. En plus de servir d'espace d'échange de connaissances, l'événement a

solidifié les bases de plus vastes efforts collaboratifs avec les groupes des communautés participantes, des efforts qui ont commencé bien avant l'événement et se sont poursuivis dans les semaines suivantes. Dans ces notes de terrain, nous rendons compte de notre approche de ce travail, de l'importance du dialogue entre communauté et milieu de la recherche, et

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des défis et opportunités concernant le travail sur l'insécurité alimentaire dans les contextes institutionnels. D'après nos observations, des activités impliquant la communauté requièrent un temps considérable et un engagement ad-

ministratif aussi bien qu'une progression prudente à travers les obstacles institutionnels. De tels efforts sont cependant justifiés par la valeur de l'expertise communautaire en matière d'enjeux sociaux d'importance.

Mots-clés : insécurité alimentaire, charité alimentaire, collaboration entre communauté et chercheurs, partage des connaissances, changement systémique

Convening community experts and scholars

These fieldnotes gather some key reflections that emerged through the process of organizing the pan-Canadian, bilingual event, “Food insecurity: Let’s move beyond charity!” / “L’insécurité alimentaire : allons au-delà de la charité!”, held in Montreal (QC, Canada) on June 18, 2024. The event occurred in conjunction with the Congress of the Humanities and Social Sciences, which was held in Montreal that year, the annual conference of the Canadian Association for Food Studies, and the Concordia DevOur Campus Conference. While we were excited by the possible presence of many food scholars around that period in Montreal, “Let’s move beyond charity!” was first and foremost a community-oriented and community-focused event that would convene a variety of participants, from food networks and community organizations in Montreal and the surrounding area to food and public health experts and authorities. In addition to the value of having other events take place in Montreal at that time, the location also represented a relatively accessible geographical location and one well suited for bilingual discussions. The event featured a community group roundtable followed by a community-engaged scholars’ panel, with ample time around and during the event for networking and informal discussions.

The event¹ was not a simple showcase, and we approached its organization as a collaboration process with the groups involved that would provide them with a space for exchange, visibility, and resources. The Connection Grant funding we received from the Social Science and Humanities Research Council (SSHRC) was used not only to make the event happen, but also to develop

knowledge mobilization activities that took place through a process lasting more than a year and a half (before, during, and after the event).

Motivation for these fieldnotes

Much has been published already in the academic context on food insecurity: on its root causes, its various impacts, its possible solutions, and the lived experience of it. With this event, we, the three co-organizers and co-authors of these fieldnotes, wanted to hear and learn directly from—and highlight the perspectives of—community food groups currently responding to food insecurity in different ways across the country. We learned early on that even framing the issue as “food insecurity” was limiting: trying to engage some groups showed us variable enthusiasm for the topic. (We offer an example below, in the ‘Ethics as a process’ section.)

Our previous experiences working with community groups suggested that bringing these groups into conversation with one another, where they could speak from different geographical, political, and cultural contexts, might enable a space in which exchange about on-the-ground experiences, advocacy strategies, and perspectives on solutions could happen. Their participation in the roundtable entailed a brief introductory presentation from each group’s representative, facilitated discussions throughout the day, and responses to the scholars’ panel. We thought of this event as a pretext to provide a venue and resources to these groups, to amplify their work and spotlight their expertise on the systemic and structural solutions for which they advocate. With this objective in

mind, we also developed various collaborative knowledge mobilization activities that took form throughout the process, in an attempt to increase visibility of community advocacy and contribute to the public discourse around food insecurity. The activities involved support from student assistants and production of media content, op-eds, policy briefs, media appearances, and a web repository of relevant resources, along with continuous knowledge sharing among the participating groups. The event was the lynchpin of our activities, but our efforts encompassed activities reflecting a broader cultural and political approach to food insecurity.

Sharing knowledge

This was not a research project: the presenters, who actively collaborated to frame and orient the event, were not involved as research participants or co-researchers. Yet, the event and its related activities contributed to the sharing and creation of knowledge that benefitted all those involved, including us, the organizers. In a context in which institutions and funding bodies valorize and call for more community-engaged work (research, involvement in community action, knowledge sharing, etc.), institutional understanding of such work remains limited, and there is too little published on the “how to” of developing thoughtful and careful, ethically sound collaborations and relationships. One defining element in our approach to this collaboration was the respect for the time and effort required for community-academic relationship building and ethical collaboration. We were mindful of the power dynamics that often permeate cross-collaborations between academics and food practitioners. It was important for us that the focus of this event and its related activities be the food groups’ work, with research as secondary and intended to support and further validate community work. We wanted to ensure that the event would benefit ongoing community efforts, and not become “simply” a showcase of their work to academic peers.

These fieldnotes reflect on our process, and more specifically on the ethical insights and considerations we pondered. Some readers will find these familiar; anecdot-

ally, we know that many of the challenges or concerns we describe below are common. Still, there is value in enhancing the literature on this topic for emerging scholars (or established ones keen to pivot their work towards community engagement) who are considering working at the community-academia junction. We hope this piece can help nourish our collective thinking about academic-practitioner-activist collaborations and relationships with a shared goal of better food systems. To demonstrate self-awareness, we acknowledge that this piece is co-authored by three academics, to be published in an academic journal, and in a tone very much intended for an academic audience—all on the topic of community-engaged work. This is intentional: it is not up to community practitioners to educate academics on how to do community-based scholarship. With our formal credentials and associations with institutions that wield significant authority, we academics bear special responsibility to learn about ethical, respectful, mutually fulfilling, community-engaged scholarship, to practice that scholarship with diligence and humility, and to share with others what we know about it.

A few words on who we are and how we envisioned our role in this process

The three of us have a shared research interest in food justice and the inequalities found in current food, political, and economic systems. Each of us has conducted research on food insecurity and food system inequities. We share a commitment and strong desire to learn from communities and practitioners who address these issues directly, on the ground, and outside of academia. We have developed a deep interest in and experience in cross-sectoral collaborations and knowledge co-creation and sharing, along with a commitment to think through the ethics and politics of such collaborations and relationships. Our combined experience in working with communities and grassroots initiatives well positioned our team to facilitate an event like this one.

Beyond the practical demands of organizing and managing a project, we saw our role as organizers and convenors as fulfilling three functions: (1) **connecting**

scholarship and community practice, as well as facilitating connections among community groups; (2) **amplifying** community work and advocacy to increase their visibility and reach within and, more importantly, beyond academia; and (3) **channeling** resources that enhance knowledge creation and mobilization within and from the community. Below, we briefly reflect on each of these functions and then expand on ethical, institutional, and research implications of this type of work.

Connecting

As organizers and conveners of the event, we played an important role in bringing these groups together and establishing links between them. We were mindful that they addressed food insecurity in very different ways, in very different contexts, and with varied (and variable) resources. We were responsible for identifying what these groups share in terms of perspectives and approaches to food insecurity, and for highlighting how their activities connect with the event's theme. We defined the original orientations of the event (its theme, approach to food insecurity, objectives, etc.) while inflecting and refining the themes through discussions with the groups (more on this in the next section). As such, we tried to bring into dialogue the perspectives and insights coming from the academic literature with the propositions and work of the groups. We accomplished this through carefully thought-out phone and video calls with each organization, followed by calls with all of the organizations together, and finally with all of them on the same calls with participating scholars. We also had frequent meetings to consider all aspects of our planned activities, like deciding whether the community roundtable would precede or follow the research panel. (We opted for the former so that the community participants could set the stage.)

The consultations were labour intensive, but something we were committed to because we knew a relational approach would be more fruitful, albeit one that requires more work. We drew on our collective experience in community-engaged scholarship, expecting that by featuring the groups themselves as the key knowledge holders on

food insecurity and its solutions, we were creating a space and stage for these groups to be heard, seen, and recognized as valuable knowledge holders and contributors, within academia and beyond. While this approach may seem commonplace in critical food studies in Canada, it remains on the margins of much Western scholarship, which continues to privilege academic forms of knowledge production and exchange.

Amplifying community work

We saw our role as facilitating exchange and amplifying community groups' work and advocacy, offering a setting for them to share their objectives and ideas. This sharing took place both in the context of the event, but also through the knowledge mobilization activities that occurred throughout the whole process. These activities included the development of media content, op-eds, policy briefs, media appearances, and a web repository of relevant resources. We accomplished this in part by providing the groups with resources to hire research assistants. These student assistants supported the organizations in preparing for and participating in the event, while also fulfilling some of their pre-existing needs for communication and knowledge mobilization. The students conducted policy-related research, prepared communication materials, developed editorials and other media content, and produced notes from the event itself. We trusted that this event and what surrounded it could contribute to broader efforts to change the public discourse around food insecurity.

Channeling resources

Our efforts were made possible thanks to Connection Grant funding from SSHRC. This funding was necessary to cover logistical and travel expenses for the event and to hire a team of research assistants who helped with the knowledge mobilization activities over several months. While we initially thought of providing each group with a research assistant we found within our networks, our early

discussions suggested a better approach. Instead of the academic partners simply selecting students to work with the groups, we offered that the groups first determine if they already have a suitable student in their networks. This seemed more appropriate, allowing the groups to work with someone already familiar with their work, supportive of their activities, and aligned with their mandates and advocacy strategies. Similarly, while we had an idea of the type of knowledge activities we wanted to conduct (accessible knowledge outputs in text or multimedia formats), we ended up being much more flexible and agreeing that the groups should decide for themselves what they wanted to do with the resources and how. Using academic resources to support the already existing work of these groups, and enhancing their advocacy efforts, is a form of scholar activism (Sandover, 2020; Liboiron, 2021) that offers a different approach to the more conventional academic/community-engaged collaborations, which often entail a predetermined research and knowledge mobilization agenda.

The ethics and politics of curating a community-academic event

Guided by combined ethical principles of scholarship, community-based research, and Indigenous knowledge (such as the First Nations principles of *ownership*, *control*, *access*, and *possession*, or OCAP), we forefronted the value of community practitioners' knowledge. These ethical approaches consider a variety of risks to participants, which include emotional and community harm. They recognize the value of varied forms of knowledge (or ways of knowing) and emphasize reciprocal relationships as opposed to extractive approaches. They insist on working *with* and not *on* communities, and privilege scholarly activities that emerge from community needs and not academic interests. Our role in this process was to listen and facilitate. Our activities took place for several months before and after the event, because the event itself was an opportunity to crystallize—practically and discursively—the key policy and systemic goals of community initiatives working to address food insecurity. To ensure this opportunity was

used to its full potential, the event was seen as only one phase of our collaboration—an important one, but one that could not be delivered effectively without significant preparatory and follow-up efforts.

Ethics as a process

Preparatory work served to build agreement from each group and ensure that our collective activities were in line with their needs, which in turn enhanced their resulting contributions to the event and subsequent activities. The preparations involved deciding on what type of work student assistants would do, what kind of “outputs” would be most useful for the participants, and how the event space and schedule would best facilitate fruitful engagement. We provided the initial framing of the event with some specificity, but ultimately maintained flexibility to integrate different ways of defining and approaching food insecurity and its potential solutions. One example of this is when we approached some Indigenous-led groups whose work around food we saw as enacting a form of resistance to the systemic issues that lead to food insecurity. We asked them to contribute to the roundtable and offered resources for a student assistant who could support their work. The theme of our event included the idea of *advocacy* at its core, and the other groups we had approached engaged in active political advocacy-type work or lobbying. Although we saw their potential contribution as valuable, at least one Indigenous group did not see themselves fitting within this framing. While we saw advocacy as taking many forms, they feared that the dominant, largely Western understanding of the term was not a good depiction of their ongoing work of resistance.

This anecdote speaks to the challenges that scholars who are invested in inclusion sometimes encounter. Put simply, while we wanted to find ways to include a wide range of perspectives on food insecurity, not everyone wanted to be included in this specific effort. This occasion for reflexivity allowed us to recognize the limitations of how we framed the event. We imagined that our framing of food insecurity, its root causes and solutions, and the resistance—or “advocacy”—work that can be done in

response to it would speak to a wide audience. We anticipated the audience to include the other food groups across the country, and the communities and stakeholders with which they work and engage. The framing, however, was still limited by the kind of discourses and knowledge that it could produce. Some groups understandably hesitated to take part; we respected their decisions. As researchers, we continue to learn how and why inclusion is so often seen as performative and honour that self-determination is critical to respectful engagement.

Even ethical approaches have limitations

In a context in which many groups represent or work with marginalized communities, it is to be expected that many fear that their participation in events can easily become tokenized or exploited. It is then not surprising that some of the groups we approached expressed their right to refusal and declined to take part in the event. The active role we took in framing the event was also influenced by our will to alleviate the burden of that responsibility for the groups, since we were well aware of the limited resources with which most of them work. Concretely, that means that we arrived with propositions that we then discussed together and modified as needed. While this process did alleviate the amount of work and time investment required of the groups, it also predetermined the range of possibilities within which discussions, insights, and knowledge could emerge.

The knowledge generated and shared through our activities included experiences, perspectives, and observations (or “data”). The groups shared their on-the-ground expertise that spanned working with those with lived experience of food insecurity to generating their own research. They also shared perspectives on possible solutions as well as advocacy or other strategies they developed for cultural, political, and systemic change, and for immediate on-the-ground activities (e.g., creating a school food program that also favors Indigenous food sovereignty and support for a strong and resilient local food system). Instead of recording data in a conventional sense, we provided resources to the groups to facilitate their own knowledge mobilization and dissemination, ensuring that those outputs would

stay with them. Nevertheless, we, as academic co-organizers, benefitted from this process, as the knowledge they shared informed our scholarship (and will continue to do so). This raises unusual ethical questions.

Since participating groups were neither “research subjects” nor co-researchers, and since the event was to be public, we were not required to apply for institutional ethics clearance. Yet, as we were progressing with the knowledge mobilization activities, many ethical considerations arose. These concerned several areas. We had to discuss the groups’ possible use of each other’s knowledge shared in the context of the event. We had to prepare for the implications of setting the stage for the groups to share their knowledge publicly and risk having some of their propositions be appropriated or misinterpreted. We faced the conundrum of some collaborators wanting to stream the event online and others being more hesitant to do so (we did not stream because this suggestion came relatively late in the process and would have required a different kind of ethical planning). These questions, while not necessarily coming from Indigenous groups, echoed the ongoing debates around Indigenous data sovereignty: How is knowledge produced and shared, and who gets to make those decisions? The institutional approach to ethics approval would not have been very helpful for many of these questions and considerations, but it might have brought about interesting and important discussions with the groups had we made a point of formally discussing the ethics and politics of our activities early on. While we followed the OCAP principles in emphasising each group’s needs and preferences around their data and discussed ethical concerns with the groups throughout—including in the context of the knowledge mobilization activities—a more formal and explicit discussion at the very beginning of the process, around the ethics and politics of such cross-communities and academic collaboration, could have been relevant and insightful.

Institutional limitations

Funding opportunities that both encourage community-academic collaborations and recognize the nuances of such work remain rare. While we were fortunate to secure

a Connection Grant, this also came with some common institutional limitations. The funding was sufficient to put on the event and pay student assistants, but it could not fully facilitate the type of inclusion needed for discussions of such important topics. For example, simultaneous French-English translation was essential to make the event bilingual, but the expense of that service restricted the travel budget for participants. One academic participant suggested bringing a community collaborator, who also needed someone to accompany them due to medical reasons, and though this was a request we wished we could have honoured, we were unable to cover those expenses.

We were mindful that the participating groups needed not only student support, but also compensation for their members to participate in preparation, the event, and follow-up activities—but the honoraria we could offer were merely symbolic, since we were limited both in the amount of money we had and by a \$500 limit². To limit the burden on the participating groups, we tried to streamline the event's framing and planning. However, this also surfaced community-academia power dynamics and limited the type of knowledge that could emerge from the event and the entire process. The one-year span of the grant also limited our ability to develop stronger relationships with and among the community participants. That said, we also recognize that smaller grant programs provide more opportunities for more initiatives. We commend the funding bodies for continuing such programs, despite requiring greater administrative commitments from funders and reviewers alike, compared to larger grants dispersed to fewer projects. Additionally, our experience suggests that longer-term grants can also be more difficult for securing buy-in from community groups. For example, a five-year Partnership Grant can produce excellent collaborations, but many community groups cannot forecast their resources and staffing five years ahead, making it more difficult for them to commit to long-term projects.

Administratively, it was difficult to have participants from under-resourced groups plan their travel to Montreal and bring along their student assistants, as it proved nearly impossible to provide them with cash advances. This meant that most participants paid for their own expenses, which were reimbursed after the event, but not

everyone was in a position to do so. While we were able to make travel arrangements for some, this also meant significant back-and-forth around travel times and needs for overnight accommodations, with participants at times having to share personal information if they had a specific health- or ability-related requirement. In some instances, where participants were affiliated with an organization that had some resources, their participation in our event was recognized as paid work. They wanted the \$500 to be issued to their organization, but only individuals, not organizations, can receive honoraria. We made it all work, but underscore that it is important to recognize just how much administrative labour was required for a project funded through a grant of just under \$25,000.

Final reflections

We close these fieldnotes with some final reflections to inform future work on food insecurity. We hesitate to call them recommendations, as our experience with the event confirms that the conditions for successful community-academic collaborations are time-, place-, and topic-specific. Nevertheless, we offer some suggestions for institutions and funders, fellow scholars, and community groups interested in working with academics. Ongoing conversations with community collaborators and willingness to adjust plans as needed are essential. For scholars new to community collaborations, exploring context-specific resources on ethics is essential. Finding such resources best emerges through developing collaborative relationships with a willingness to learn. For instance, OCAP training offers invaluable insights that are fundamental to work with First Nations communities and can inform ethical thinking and decision-making in other community contexts. But OCAP training may not be most appropriate approach in working with all Indigenous communities, refugees, or people from other contexts.

We reiterate our commendation for institutions and funding bodies that are slowly starting to recognize and sometimes facilitate the value of community-academic collaborations when seeking solutions to critical social problems. These entities must continue to review and

revise policies, procedures, eligibility criteria, and administrative processes if current claims about inclusion and accessibility are to be put into practice in earnest. Specifically, creating mechanisms that minimize bureaucracy and enable easy and speedy advances, reimbursements, and remuneration for community partners is critical, as is compensation for organizations whose employees contribute to projects as part of their job.

Fellow scholars must be prepared for significant administrative commitments in facilitating collaborations with community practitioners—the monetary and bureaucratic obstacles and hurdles are bound to arise, and it is our responsibility as scholars to use our status, power, and institutional knowledge to usher collaborations through such hurdles. Many marginalized communities experience research fatigue in such collaborations, and our responsibility is to ensure valuable and rewarding experiences for community collaborators in working with us, without souring them on academic initiatives more generally. A skilled and dedicated team (preferably with a mix of established and emerging scholars and students) invested in the work is essential for successful community-academic events and collaborations more broadly.

For community groups working on food insecurity, we extend our gratitude for their willingness to collaborate—with us and with many of our colleagues across the country. These collaborations have been, and will continue to be, fundamental to food studies scholarship in Canada, but as scholars, we are always learning. Asking for resources and support that a community group may need to participate in such collaborations is part of our learning. We encourage community collaborators to actively voice those needs, because they allow scholars to improve and adapt their own approaches, and to advocate for changes to funding, policies, and processes.

To learn more about the event and the participating community food groups, please see [our post-event article in *The Conversation*](#).

Endnotes

¹ The event comprised two main elements: a roundtable conveying the messages of four food groups followed by an interdisciplinary panel of scholars working from different angles and perspectives on the theme of food insecurity. We invited scholars with a research practice or agenda rooted in communities and an understanding of the deeply community-oriented focus of this event. While the community groups headlined this event, integrating scholarship seemed conducive to fostering dialogue and connections between academia and practitioners, particularly since all the community groups included in the roundtable had already engaged in some form of research, either their own or in collaboration with academic institutions.

² Canada Revenue Agency considers anything over \$500 to be employment income. Whereas honoraria are also taxable income, amounts over \$500 require a tax slip be issued. Many grant opportunities do not allow for employment payments, and institutions administering grant funds avoid the burden of paperwork, but also sometimes have limiting procurement policies for “services” for amounts over \$500 that have to be invoiced by the recipient. The accounting officers at Carleton University, where our funds were held, were tremendously helpful and assisted us greatly in this entire process, but could only do so much within the existing bureaucratic constraints.

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References

- Liboiron, M. (2021). *Pollution Is Colonialism*. Duke University Press.
- Osinski, A. (2022). The persistence of power: Reflections on the power dynamics in a merging of knowledge research project. *Gateways: International Journal of Community Research and Engagement*, 14(2). <https://doi.org/10.5130/ijcre.v14i2.7762>.
- Sandover, R. (2020). Participatory food cities: Scholar activism and the co-production of food knowledge. *Sustainability*, 12(9), 3548. <https://doi.org/10.3390/su12093548>.
- Simpson, A. (2007). On ethnographic refusal: Indigeneity, 'voice' and colonial citizenship. *Junctures*, 9, p. 67-80. <https://www.junctures.org/index.php/junctures/article/view/66>



Field Report

Strengthening food systems governance: Civil society efforts within and beyond government

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Abstract

Food systems face a polycrisis on multiple environmental, social, economic, and political fronts—each challenge amplifies the others, making solutions all the more complicated to achieve. To address these challenges, communities are turning to critical and creative approaches to make food systems governance more accessible to a wider range of people. Yet, there is still much to learn about how communities have contributed (and could or should contribute) to building solutions based on differing governance and engagement structures. The Participatory Food Governance project has studied diverse perspectives on governance issues from food movement and civil society (CSO) leaders through a national survey, in-depth interviews, and a series of case studies. To understand how the overall insights from the project resonated with the organizations, networks,

and movements we studied, five CSO leaders from across Canada were invited to reflect on these insights.

This field report outlines a process of dialogue with five CSO leaders and how they experience food systems governance. By connecting conversations between academics, community-based practitioners, and CSO leaders, this process seeks to advance both theory and practice. The CSO leaders who participated offered stories about what governance means on the ground, while also expressing how government processes could better reflect local, contextualized realities. In addition to revealing important insights about the different power dynamics and objectives at play, the reflections captured in this field report highlight key possibilities, tensions, and complexities that proponents of participatory governance must address moving forward.

Keywords: civil society, food system governance, participatory governance

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Résumé

Les systèmes alimentaires font face à une multicrise sur les plans environnemental, social, économique et politique : chaque difficulté amplifie les autres, ce qui rend les solutions d'autant plus complexes à mettre en œuvre. S'attaquant à ces enjeux, les communautés adoptent des approches critiques et créatives pour rendre accessible la gouvernance des systèmes alimentaires à un plus grand éventail de personnes. Il y a cependant encore beaucoup à apprendre sur la manière dont les communautés ont contribué (et peuvent ou doivent contribuer) à l'élaboration de solutions en fonction de diverses structures de gouvernance et d'engagement. Au moyen d'une enquête nationale, d'entrevues approfondies et d'un ensemble d'études de cas, le projet « Gouvernance alimentaire participative » a étudié les perspectives offertes par des leaders de mouvements alimentaires et d'organisations de la société civile concernant des enjeux de gouvernance. Pour comprendre comment les observations d'ensemble du projet trouvaient un écho dans les organisations, les réseaux et les mouvements que nous avons étudiés, nous avons invité cinq de ces leaders

répartis à travers le Canada à réfléchir à ces idées.

Ce rapport de terrain expose le processus de dialogue avec les cinq leaders et la manière dont ces personnes expérimentent la gouvernance des systèmes alimentaires. En ouvrant la conversation à des gens du milieu de la recherche, à ceux impliqués dans des pratiques basées sur la communauté et à des responsables de mouvements alimentaires et d'organisations de la société civile, il s'agit de progresser à la fois dans la théorie et dans la pratique. Les leaders de mouvements alimentaires et d'organisations de la société civile qui ont participé ont raconté ce que la gouvernance signifiait sur le terrain et ont mentionné en quoi la manière dont le gouvernement procède pourrait mieux s'arrimer aux réalités locales et contextuelles. En plus de révéler des observations importantes sur les multiples dynamiques de pouvoir et les objectifs en jeu, les réflexions recueillies dans ce rapport mettent en évidence des possibilités, des tensions et des complexités importantes auxquelles doivent faire face les partisans de la gouvernance participative pour aller de l'avant.

Mots-clés : société civile, gouvernance des systèmes alimentaires, gouvernance participative

Introduction

Food systems face a polycrisis on multiple environmental, social, economic, and political fronts—each challenge amplifies the others, making solutions all the more complicated to achieve. The urgency of addressing these crises is well documented and recognized by governments, producers, harvesters, and eaters around the world (IPCC, 2023; FAO et al., 2025; HLPE, 2020, 2025). To better understand the challenges and solutions, scholars have pointed to the critical role of governance in food systems transformation (Andrée et al., 2019, p. 216; Wilkes, 2022; Moragues-Faus et al., 2024; HLPE, 2025), including how power interplays with decision making and policy processes (Montenegro de Wit & Iles, 2016; Clark, 2021; Wilkes, 2024). To address these challenges, communities are

turning to critical and creative approaches that attempt to make food systems governance more accessible to a wider range of people—especially those made most vulnerable by the dominant system (e.g., landless peoples, people living in poverty, Indigenous people, people of colour, people with disabilities, people who identify as part of the LGBTQ2SQA+ community). Yet, there is still much to learn about how communities contribute (and could or should contribute) to building solutions based on differing governance and engagement structures.

Our ongoing research through the Participatory Food Governance (PFG) project investigates how food movement leaders and civil society organizations (CSOs) across Canada and Indigenous territories envision and

experience food systems governance and analyzes what these experiences can teach us about building more just and sustainable food systems. Our PFG research aims to better understand and connect diverse perspectives about governance issues from food movement and CSO leaders through several ways, including a national survey, in-depth interviews, and a series of case studies (i.e., the Canadian National Food Policy Advisory Council, the Coalition for Healthy School Food in Canada, and the Technical Committee on Organic Agriculture¹ (see Levkoe et al., 2023, 2025; Littlefield et al., 2024). To date, our research has identified four key insights.

First, the CSO initiatives that we studied go beyond just engaging with existing governance structures that are too often experienced as top-down and siloed. Instead, many CSOs advance more engaged approaches to food systems governance through their attempts to co-develop participatory, holistic, and multi-scalar actions. As Levkoe et al. (2025) explore, CSOs demonstrate how systems-based governance works to create change within food systems and how governments can learn (and in some cases have learned) from these efforts. For example, the announcement of a national Food Policy Advisory Council in 2021 came after significant advocacy efforts by civil society actors and a growing and sustained movement of local and regional food policy councils across the global North (Schiff et al., 2022). Our research illuminates the opportunities and challenges national governments face using this model to engage CSOs in governance processes (Wilkes et al., 2025a).

Second, CSOs work to influence governance by creating alliances, including building cross-sectoral coalitions to further new policy solutions, as demonstrated by the Coalition for Healthy School Food in Canada² (Ruetz et al., 2024). The Coalition is a network of over 375 CSO member organizations from every province and territory. Since its establishment in 2014, the Coalition has advocated for a universal cost-shared school food program that would ensure daily access to healthy food for all students from kindergarten to grade twelve across Canada and Indigenous territories. This kind of coalition building supports more systemic ways of thinking and acting that can impact government policy and civil society activities.

As a result of these collective efforts, in spring 2024, the Canadian government announced the launch of a National School Food Program that aims to provide healthy meals and snacks across Canada (Government of Canada, 2024).

Third, despite centering social justice and environmental sustainability, many CSOs unintentionally reinforce settler-colonial structures (see Littlefield et al., 2024). Several CSO and food movement leaders have acknowledged their complicity and clearly articulate the need to more deliberately address justice through meaningful reconciliation and the development of alliances with Indigenous communities and organizations—along with the significant work required to actualize change. Littlefield et al. (2024) highlight the importance, tensions, and connections made through settler CSO engagement with Indigenous People. For example, participants engaged with the National Farmers Union (NFU) highlight the organization’s attempt to build on decades of allyship toward creating normative change. The authors note that the NFU “encouraged their membership to learn about the realities of settler colonialism and work toward reconciliation as individuals, organizations, and a broader farming network” (p. 1092). The process of awareness acts to shift normative understandings of settler-Indigenous relations and supports the re-imagining of roles and histories beyond allyship and toward action. We also considered the motivations underlying settler CSO engagement with Indigenous peoples. Our analysis emphasizes the need for settlers to clarify their motivations, shift toward more meaningful action, and remain self-reflexive in engagement opportunities.

Fourth, CSOs operate strategically within differing governance approaches. Structures with narrowly defined mandates and enhanced decision-making power may have more direct, short-term impact on policy making than broader advisory structures. For example, Brynne and Wilson (2025) and Wilson et al. (2026) show how the narrowly focussed Canadian Organic Standards Council carved out a space (not without challenges) for farmers and others to be part of the decision-making process for the renewal of national organic standards. On the other hand, Wilkes et al. (2025a) found that the experiences of those involved with the Canadian Food Policy Advisory

Council highlight how its wide-ranging mandate and absence of robust report-back mechanisms make it difficult to identify how council members' input is reflected in policy outcomes. Although these wider structures may have the opportunity to create long-term structural and normative change, their impact is less direct and difficult to measure.

While the aggregate findings of the PFG project have been shared through publications and presentations, it is important for the research team to understand how these findings relate to the experiences of current food systems leaders. We invited five CSO leaders from across Canada to reflect on the insights outlined above to explore whether and how they resonate with proponents within food systems organizations, networks, and movements.

Engaging civil society organization leaders

The authors of this article (all part of the PFG research team) and five individuals with significant experience working within food systems spaces (namely agriculture, policy, networking, anti-racism and equity, food sovereignty, Indigenous rights, and community building), joined together in a process of collective discussion and reflection. We sought to ensure different geographies and positionalities were represented to understand how different communities experience, face challenges, and identify opportunities within food systems governance. The participants included:

- > Marissa Alexander, Co-Executive Director, Food Secure Canada (FSC)³
- > Rachel Cheng, Mobilization Officer, Montreal Food Policy Council⁴
- > Mair Greenfield, Director, Gord Downie & Chanie Wenjack Fund⁵; former Advisor, Nourish⁶
- > Scott Ross, Executive Director, Canadian Federation of Agriculture
- > Wendie Wilson, Board Member, FSC; African Nova Scotian and Black Food Sovereignty Advisory; Pan-Canadian Black Food Sovereignty Caucus; Indigenous and Black Food Sovereignty Advisory Circle⁸; Coalition for Healthy School Food Nova Scotia

To hear from these individuals both individually and collectively, we created several engagement opportunities as part of (and ahead of) the Canadian Association of Food Studies (CAFS) conference held in Toronto. These included a virtual meeting (held on May 7, 2025), written/oral reflections on the main findings of the PFG project, an interactive workshop (held on June 2, 2025), and a roundtable discussion⁹ (held on June 3, 2025). Each of these field sessions provided an opportunity to build a better understanding of each other's perspectives and to discuss research insights in relation to the CSO leaders' experiences.

Virtual meeting

The virtual meeting was guided by an overview of the central PFG insights (outlined in the previous section). We developed a set of questions that probe each CSO leader's experience with participatory food governance and how those experiences connect to—or differ from—PFG insights. The questions included how to better understand the value of participatory governance, what opportunities and challenges it presented, what the CSO leaders' priorities were in this space, and a reflection on the key PFG insights presented.

Written reflections

After the virtual meeting, we gave the leaders a set of questions and each submitted their written or oral reflections ahead of the in-person workshop and roundtable. Together, the research team analyzed the reflections and identified emerging themes shared by the leaders and experiences unique to a specific leader or organization. We used the following questions to guide the individual reflections:

1. What do you see as the value of inclusive, participatory, food systems governance in Canada?
2. How have the opportunities and challenges to engage in food systems governance changed over the last five to ten years?
3. What are your priorities for further food systems governance engagement at this historical juncture?
4. How does your experience resonate with the research results chapter you read before the event?

In-person workshop and roundtable

The in-person workshop allowed for an intimate conversation between the participants and the research team about the challenges, opportunities, and connections that exist across food systems governance; it provided space to collectively discuss the research insights in relation to each individual's experiences and reflections and to identify and prepare key highlights to share at the CAFS roundtable discussion the following day. The roundtable comprised a round of introductions, general reflections, a discussion with the audience, and a last word from each of the CSO leaders.

In the next section, we present a synthesis of these discussions along with our own reflections about what these conversations mean for making food systems governance more participatory.

Synthesis of the reflections

Overall, participants' responses underscore the need for meaningful spaces of dialogue about food system governance that include a wide range of community voices to elevate the realities of those most impacted by the dominant food system. The CSO leaders highlight how their experiences and advocacy contribute to regional and international efforts. While the conversations did not always fit neatly into the original questions posed to the five CSO leaders, the themes that emerged from these discussions supported and enhanced the questions in a way that highlights the connections, insights, and challenges central to food governance. While the observations of the participants spoke to the aggregate learnings from the CSO leaders across the PFG data, their observations also enriched and broadened the discussion to incorporate important elements that were not prominently featured in the summary presented in the virtual call. Further, these sessions proved valuable for encouraging conversation among diverse CSO leaders on issues of participation and inclusion in food systems governance processes.

Value and importance of participatory governance in decision making

Both the workshop and the roundtable discussions highlight the role of participatory processes in elevating and connecting different voices. With respect to food systems decision making, Wendie Wilson notes: "Decisions need to be made by those who will be impacted the most. To me, those will always be the best decisions." Wilson describes noticing what kids were eating in school—making an explicit connection to academic performance: "The better they ate, the better they did, and vice versa." This insight led Wilson to find ways to elevate the voices of her community. One such effort was through becoming involved in initiatives at the local and national scales that focus on the need to get healthy school food to children in Halifax and elsewhere. The goals of these initiatives, including those of the Coalition for Healthy School Food, are, in part, to contribute to changing norms, shift governance practices, maximize impact, center community, and ultimately, get



Wendie Wilson

culturally appropriate, sustainably sourced healthy food into the hands of people as a right, not a privilege.

In addition to supporting better outcomes within a particular community, these multi-scale efforts also help connect leaders. For example, both Mair Greenfield and Rachel Cheng participated in Nourish to instill a sense of inspiration and connection among local communities. As some of the panelists described, sitting in company with one another allows space to recognize the pluralities within different initiatives (e.g., working toward food sovereignty while acknowledging and respecting diversity across Black and Indigenous communities and community members). These discussions among the participants emphasized that policy and governance processes need to respond to the complexity of different experiences, geographies, and identities rather than treating the initiative or concern as a monolithic phenomenon.

Opportunities and challenges within participatory food governance

Participatory food governance outlines challenges between invented and invited spaces. MirafTAB (2004) describes invited spaces as “ones occupied by those grassroots and their allied non-governmental organizations that are legitimized by donors and government interventions” (p. 1). While invented spaces are also defined by grassroots and non-governmental organizations, they centre on “directly confronting the authorities and the status quo” (p. 1). Experiences from CSO leaders across the PFG project and those who participated in the roundtable highlight the tensions and challenges that can arise when an invented space transitions into an invited space.

CSO leaders with experience in the advocacy and implementation process of the Food Policy for Canada frame it both as an opportunity and a challenge in participatory food governance. Two of the food systems leaders, Scott Ross and Marissa Alexander, discuss how the Canadian Federation of Agriculture and FSC, respectively, have participated in lengthy discussions (an invented space) with CSO, academic, and industry leaders around the need for a national joined-up food policy (see MacRae, 2011). As a result of this advocacy (and the work of many

other organizations and individuals), the Food Policy for Canada (announced in 2019), along with the supporting Canadian Food Policy Advisory Council (announced in 2021), attempted to bring a systems lens to the work of government and centre the need to support sustainable food systems across the country (Levkoe & Sheedy, 2019; Andrée et al., 2021).



Marissa Alexander

However, our research found that the government fell short in implementing the vision for the Canadian Food Policy Advisory Council as presented by over 20 civil society organizations involved in developing the model (Wilkes et al., 2025a, 2025b). Instead, the government announced and created a Canadian Food Policy Advisory Council that reports only to the Minister of Agriculture and Agri-Food Canada rather than a cross-departmental government committee (an invited space). This limits the ability of members to discuss topics with their communities or engage in dialogue with other stakeholders—in

addition to struggles with representation and capacity issues over its tenure.

Participating CSO leaders whose organizations had engaged in the government's consultation process leading up to the announcement of the Food Policy for Canada, such as Ross and Alexander, reflect that with the benefit of hindsight there is value beyond just developing the proposal for the government. The connections built throughout the process are critical. For example, the Canadian Food Policy Advisory Council advocacy process involved the formation of unlikely alliances as well as community building to strengthen understanding of different positions and common goals. Ross and Alexander lament that these relational bonds were not actively maintained after the Canadian Food Policy Advisory Council was launched and about the possibility to rebuild these bonds in the future.

During the roundtable discussion, participants emphasized the role of relationality within advocacy work. Ross explains:

Relationality is just so key. And so much of what could have made a Food Policy for Canada substantive and real was already being done, and the government didn't need to be the centre of that discussion [...] If we had just continued to work on that and build momentum and build energy, [if we had] really conscientiously tried to foster and create more substance around the unique relationships and diverse networks that we had established, there could have been a lot of substance that had followed from that regardless of how government had reacted...

Alexander reiterates the value generated in the advocacy process itself as well as the need to rebuild deeper connections. While FSC was a central force in the advocacy process, their efforts during Canadian Food Policy Advisory Council discussions were also connected to their broader mandate to support the food movement and effect change. In its role of convenor of different actors, FSC expressed interest in re-creating a coalition of diverse actors to engage on important issues. Alexander reflects on the potential "to bring a lot of folks together who do not all have common goals, but [who] have enough agreement that something needs to change and something needs to



Scott Ross

happen." Of the previous effort to build a national food policy council, she explains: "It was then handed off to the government—that is inherently siloed—and fell flat." In response, she says: "That is where we are picking up as FSC, really trying to do that again [i.e., rebuild the collaboration] but without a centering of government...."

The tempered reception of the Canadian Food Policy Advisory Council and power of the advocacy process that preceded its implementation highlight the need to reconcile, further study the tension between invited and invented spaces within participatory governance efforts, and better understand the space in which they meet (see Le Roux, 2015 for a South African example). This emphasis on relationality and the importance of connection that transcends institutional change is an essential element often underrepresented in discussions of governance and central to participatory processes seeking transformative change.

Creating participatory spaces that can hold discomfort and respond at critical junctures

Food governance, when thoughtfully undertaken, has the potential to create space for the difficult conversations desperately needed in today's increasingly polarized political climate. This is the case both within movements with shared ideals, as Alexander articulated, and across stakeholder groups in the process leading up to FPC, as Ross described. The work toward a more participatory food governance can also be achieved through innovative government spaces where community converges with municipal processes, such as local food policy councils. Rachel Cheng, in discussing work at the Montreal Food Policy Council, shares the need for collaborative decision making that brings in a diverse set of voices.

Initiatives rooted in a food systems approach can create contextualized and scale-appropriate governance responses that allow for divergent opinions and difficult conversation. For example, the Montreal Food Policy



Rachel Cheng

Council aims to create a space where diverse voices are welcomed and encouraged. Cheng explains:

We work with over 200 community organizations and partners, academics, and others to set the strategy we are going to take for more sustainable food, more accessible food for every person in Montreal. And so, we are trying to do this participatory process where we get more voices, especially community members, but because it is the first time, we are looking for inspiration from our peers in other cities... So, this fall we are organizing a series of events with civil society and community members across the Island of Montreal, as a way to get more diverse perspectives on what food in Montreal should and could be like. Related to this, we set up a goal last year when we were recruiting members for the Conseil to have a minimum of 50 percent applications come from underrepresented communities—of which some council members were skeptical. But I am really pleased to say that we did get minimum 50 percent applications. We were able to outreach in different ways and explain the importance and reach of municipal food policy work to different people. For example, I love that someone who runs one of the best restaurants in Montreal who is also a butcher, sits on the food policy council next to an environmental worker and vegetarian, who believes that there is no place for meat in the future of food. And I love that we can have some difficult conversations together.¹⁰

In a discussion about the participatory engagement process the Montreal Food Policy Council is undertaking, Cheng elaborates on the different positionalities of council members and that, while they may come from different perspectives, the Council is a space they can work to find common ground.

Going beyond government

The participants also highlight that many governance efforts led by CSOs go beyond government. Rather than centering all efforts on attempting to make change within government (as seen, for example, in the Food Policy for

Canada process), the idea of change in other areas of food governance (e.g. at the community, organisational, or network level) proved to be a central point of discussion. Some of the initiatives cited include those that focus on local action, collaboration across positions on shared challenges, and support for one another in advocacy work. The CSO leaders further consider how this work—through impact and collective action—has the potential to ripple out from communities to influence or impact government. Mair Greenfield explains that organizations are stronger when they collaborate and the importance of predictable resourcing models. She highlights an Indigenous food sovereignty initiative coordinated by the Thunder Bay District Health Unit with a group of First Nations located in Northern Ontario that was shared by a public health nutritionist at the CAFS conference.¹¹ Greenfield explains:

Two things come to mind, accessibility and sustainability. So, I find that I am in a really awesome position right now where [the public health nutritionist] just handed me this beautiful colouring book that has been made. And I am in a position that I can share this nationally—it can reach communities way up from Big Trout Lake to Nunavut. And for sustainability, right, we want things to keep going. We don't want to have to rely on funding. We want people to be in a position to grow their own food and access their own food... and just keep going.

Discussion

These discussions bring to life key findings of the PFG project, showing how ideas about, and approaches to, governance span far beyond what governments do; they illuminate the critical work of civil society actors within and across communities (Levkoe et al., 2025). The roles that CSOs play and the value they bring to governance processes are increasingly recognized by governments and scientific experts. However, there remains a need to further identify governance structures that allow communities to work within and outside of government in ways that effectively



Mair Greenfield

support food systems transformation while ensuring the agency, dignity, and impact of those most affected.

By connecting conversations between academics, community-based practitioners, and CSO leaders, a synergy is created that advances both theory and practice. The CSO leaders who participated in this process offered stories of what governance means to those working at the forefront of change and expressed how governance processes could better reflect local, contextualized realities.

The food systems leaders who participated in the PFG processes showed how they are forging new ways for communities to lead and build more equitable and sustainable food systems by engaging in collective advocacy and action as well as how CSOs can interact with one another to mobilize change at the national level. Through the essential role of relationality in food systems governance, these leaders strengthen ties to external networks and other leaders while also deepening their connection to community. More research is required to explore how

to elevate civil society voices within governance structures through invented and invited spaces as well as all the connecting space in between. This includes bringing the needs and values of past, present, and future generations to the fore. Specifically, these conversations point to the value of diverse civil society actors discussing and working on food systems issues among themselves without solely focusing on how they can influence governments to take action.

In addition to continuing these conversations with the five CSO leaders who participated in this engagement process, our research team is in the process of archiving¹² in-depth interviews with more than 30 food movement elders (featuring 5 Indigenous elders and 23 senior food movement leaders, including civil society representatives and community-engaged academics) as one of the primary data sources of the PFG project. These interviews embody the idea of Sankofa by working to bridge the intergenerational knowledge gap identified within the food systems movement (Levkoe et al., 2025). We will also disseminate elders' interviews using an online, open source, and interactive educational resource.

Conclusion

The overarching goal of the PFG project is to glean lessons learned with the benefit of hindsight and share these lessons to support learning for the broader food systems community. Institutional memory, institutional capacity, collective impact, and reflection on how people who are part of the food movement can help (re)envision what the future looks like are. These are essential elements of participatory food governance work. During the roundtable, Wilson presented the idea of Sankofa as a metaphor for the collective work required:

Sankofa (an adinkra symbol out of West Africa) is a bird looking backward, body facing forward, head looking backward at an egg—the next generation—but also looking back to the past. So, it is not wrong to go back to the past to find those things that you need in order to propel yourself into the future... And so, what we are talking about here is that institutional memory, which I think is so important,

and going to the elders—looking for the information and doing that research—and bringing that forward to the next generation so that we have past, present, and future. We need to meld all of those things.

Collectively, these food systems leaders reflected on a range of themes: their own personal (and organizational) successes and limitations in building healthier, more equitable, and sustainable food systems and the strategies they employed; the value of participatory governance in supporting long-term, systemic change; the different scales of policy strategies; and the potential to model alternative food futures via more participatory governance processes. The reflections captured in this article reveal important insights about the different power dynamics and objectives at play that build on, and deepen, our previous research findings. They also highlight the many possibilities that participatory governance supports and the tensions and complexities to be addressed. The PFG team looks forward to continuing its work with the CSO leaders who have been involved in this process to unpack and further explore how food governance can support more equitable and sustainable food futures.

Endnotes

¹ Learn more about [the Participatory Food Governance research on the Sustainable Food Systems Lab website](#).

² [The Healthy Food Coalition](#) is Canada's largest school food network that advocates for access to healthy food.

³ [Food Secure Canada](#) is "an alliance of organizations and individuals all across Canada working together to advance food security and food sovereignty."

⁴ The Montreal Food Policy Council ([Conseil du système alimentaire montréalais](#)) started in 2018 and is the first food policy council in the francophone world. It is a non-profit organization that works closely with the city, with representatives from the city of Montreal sitting on the council, as well as from major institutions such as the public health department, the provincial ministry of agriculture, and the school sector.

⁵ According to [their website](#), the goal of the Gord Downie & Chanie Wenjack Fund is "to continue the conversation that began with Chanie Wenjack's residential school story and to aid our collective reconciliation journey through a combination of awareness, education, and action."

⁶ [Nourish is a national network](#) that uses food as a tool within the health care sector to address issues of health equity, climate action, and community well-being.

⁷ The [Canadian Federation of Agriculture](#) is a national organization representing Canadian farmers.

⁸ See the Food Secure Canada website for more about the [2023 Indigenous and Black Peoples' Food Sovereignty Advisory Circle](#) gathering in British Columbia.

⁹ A [recording of the roundtable discussion](#) is available on YouTube.

¹⁰ This quote has been lightly edited—without removing substantive elements—in collaboration with the CSO leader to assist with brevity and clarity. A full, unedited audio version of the quote will be available as part of the Carleton University Dataverse Collection.

¹¹ More details are available on the [Understanding our Food Systems project website](#).

¹² The full, unedited audiovisual files and transcripts will be housed on the Carleton University Dataverse Collection (as part of our commitment to making openly accessible data available for future research), beginning in spring 2027.

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References

- Andrée, P., Ballamingie, P., & Coulas, C. (2021). Integrative governance for ecological public health: An analysis of 'Food Policy for Canada' (2015–2019). *Canadian Food Studies/La Revue canadienne des études sur l'alimentation* 8(2): 189–226.
- Andrée, P., Clark, J.K., Levkoe, C.Z., & Lowitt, K. (2019). *Civil society and social movements in food system governance*. Taylor & Francis.
- Brynne, A. & Wilson, A. (2025). Canadian Organic Standards Council. Presentation, Canadian Association for Food Studies.
- Clark, J.K., Lowitt, K., Levkoe, C.Z., & Andrée, P. (2021). The power to convene: Making sense of the power of food movement organizations in governance processes in the Global North. *Agriculture and Human Values*, 38(1), 175–191.
- FAO, IFAD, UNICEF, WFP, & WHO. (2025). *The State of Food Security and Nutrition in the World 2025—Addressing high food price inflation for food security and nutrition*. Rome. <https://doi.org/10.4060/cd6008en>
- Government of Canada. (2024, April 1). *National School Food Program to set kids up for success*. Announcement, Prime Minister of Canada Office Archives. <https://www.pm.gc.ca/en/news/news-releases/2024/04/01/national-school-food-program-set-kids-success>
- HLPE. (2020). *Food security and nutrition: building a global narrative towards 2030*. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. <https://www.fao.org/cfs/cfs-hlpe/publications/hlpe-15/en>
- HLPE. (2025). *Building resilient food systems*. Rome, FAO. <https://www.fao.org/cfs/cfs-hlpe/publications/hlpe-20>
- IPCC. (2023). Summary for Policymakers. In: *Climate Change 2023: Synthesis Report*. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 1–34, <https://doi.org/10.59327/IPCC/AR6-9789291691647.001>
- Le Roux, A. (2015). Contesting 'invited spaces': Where a ward committee and a social movement meet. *Transformation: critical perspectives on Southern Africa*, 89(1), 87–111.
- Levkoe, C.Z., Wilkes, J., & Andrée, P. (2025). Advancing food systems governance: Perspectives of Canadian civil society organizations. *Journal of Civil Society*, 21(1), 83–102.
- Levkoe, C.Z., Andrée, P., Ballamingie, P., Tasala, K., Wilson, A., & Korzun, K. (2023). Civil society engagement in food systems governance in Canada: Experiences, gaps and possibilities. *Journal of Agriculture, Food Systems and Community Development*, 12(2), 1–20.
- Levkoe, C.Z., & Sheedy, A. (2019). A people-centred approach to food policy making: Lessons from Canada's People's Food Policy project. *Journal of Hunger & Environmental Nutrition*, 14(3), 318–338.
- Littlefield, C., Stollmeyer, M., Andrée, P., Ballamingie, P., & Levkoe, C.Z. (2024). Exploring settler-Indigenous engagement in food systems governance. *Agriculture and Human Values*, 41(3), 1085–1101.
- MacRae, R. (2011). A joined-up food policy for Canada. *Journal of Hunger & Environmental Nutrition*, 6(4), 424–457.
- Mirafteb, F. (2004). Invited and invented spaces of participation: Neo-liberal citizenship and feminists' expanded notion of politics. *Wagadu: A Journal of Transnational Women's & Gender Studies*, 1(1), 3.
- Montenegro de Wit, M., & Iles, A. (2016). Toward thick legitimacy: Creating a web of legitimacy for agroecology. *Elementa*, 4, 1 24. <https://doi.org/10.12952/journal.elementa.000115>
- Moragues-Faus, A., Clark, J.K., Battersby, J., & Davies, A.R. (2024). The potential of urban food governance to transform lives, cities, and the planet. *Global Food Security*, 40, <https://doi.org/10.1016/j.gfs.2024.100751>
- Ruetz, A., Michnik, K., Engler-Stringer, R., Alaniz-Salinas, N., Doyle, E., Kirk, S., ... & McKenna, M. (2024). *School food programs in Canada: 15 promising cases*. University of Saskatchewan and Coalition for Healthy School Food.
- Schiff, R., Levkoe, C.Z., & Wilkinson, A. (2022). Food policy councils: A 20—year scoping review (1999–2019). *Frontiers in Sustainable Food Systems*, 6, 1–11. <https://doi.org/10.3389/fsufs.2022.868995>
- Wilkes, J. (2022). Reconnecting with nature through good governance: Inclusive policy across scales. *Agriculture*, 12(3), 382.
- Wilkes, J. (2024). Challenging agricultural norms and diversifying actors: Building transformative public policy for equitable food systems. *Journal of Agriculture, Food Systems, and Community Development*, 13(3), 317–336.
- Wilkes, J., Levkoe, C.Z., Andrée, P., & Clark, J.K. (2025a). Strengthening democratic governance in times of crisis: Lessons from the Canadian Food Policy Advisory Council. *Canadian Food Studies/La Revue canadienne des études sur l'alimentation*, 12(1), 140–144.
- Wilkes, J., Levkoe, C.Z., Clark, J. & Andrée, P. (2025b). *Understanding participatory food systems governance in a changing world*. The Canadian Food Policy Advisory Council. Report. <https://foodsystems.lakeheadu.ca/participatory-food-governance/>
- Wilson, A., S. Klassen & A. Brynne. (2026). "Power and Participation: Assessing Collaborative Governance of Organic Standards in Canada." Regulation & Governance 1–17. <https://doi.org/10.1111/rego.70192>



Review Article

What do Canadian agricultural policies support?: The need to prioritize environment and health

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Abstract

Industrial agri-food systems and food consumption patterns in high-income countries contribute to a range of environmental problems, including greenhouse gas emissions, biodiversity loss, persistent toxicity, and freshwater pollution. Industrial agri-food systems also receive considerable government support in many high-income countries. This study provides a critical assessment of Canadian agricultural production support policies, showing how they have overwhelmingly focussed on increasing the volumes and export competitiveness of a small range of feed crops, food grains, and livestock production, ultimately subsidizing energy- and input-intensive practices. Our analysis also reveals how

these support policies have mostly served to enhance the revenues and incomes of relatively higher-income farmers, during a period marked by the dramatic consolidation of farms and the concentration along the agricultural supply chain, while doing little to stabilize the livelihoods of small- and medium-scale farmers, evident in the steep decline in the number of smaller farms. Our central aim is to explain how Canada's agricultural production support policies make key aspects of its agri-food system worse not better, and why there is an urgent need to reorient these policies to focus on improved environmental sustainability, distributional outcomes, and public health.

Keywords: agriculture, farm subsidies, consolidation, environment, dietary patterns

Abbreviations and conventions: Throughout the text “mt” refers to metric tons. All dollar figures are in Canadian dollars (CAD), in current prices unless otherwise stated.

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Résumé

Les systèmes agroalimentaires industriels et les habitudes de consommation alimentaire dans les pays à revenu élevé contribuent à un ensemble de problèmes environnementaux, notamment l'émission de gaz à effet de serre, la perte de biodiversité, les produits toxiques persistants, la pollution de l'eau douce. Les systèmes agroalimentaires industriels reçoivent aussi des aides gouvernementales considérables dans plusieurs pays à revenu élevé. Cette étude réalise une évaluation critique des politiques canadiennes d'appui à la production agricole et montre qu'elles ont grandement été axées sur l'augmentation de la production et de la compétitivité à l'exportation d'un petit nombre d'aliments, de grains et d'animaux, en subventionnant des pratiques très exigeantes en énergie et en intrants. Notre analyse révèle aussi comment

ces politiques ont principalement servi à augmenter les chiffres d'affaires et les revenus d'agriculteurs ayant déjà des revenus relativement élevés, pendant une période marquée par la concentration des fermes et celle des différents maillons de la chaîne d'approvisionnement agricole, alors que peu a été fait pour stabiliser les moyens de subsistance des petits et moyens agriculteurs, comme en témoigne le déclin important du nombre de fermes plus petites. Notre objectif principal est d'expliquer en quoi les politiques de soutien à la production agricole du Canada aggravent les aspects primordiaux de son système agroalimentaire plutôt que de les améliorer, et pourquoi il y a un urgent besoin de réorienter ces politiques vers la durabilité environnementale, la répartition des revenus et la santé publique.

Mots-clés : agriculture, subventions agricoles, concentration d'entreprises, environnement, habitudes alimentaires

Introduction

There is a growing scientific consensus about the need to urgently transform agri-food systems and consumption patterns (FAO, UNDP and UNEP, 2021; Gautam et al., 2022), and an important part of this is to better align policies that relate to agriculture, food, environmental sustainability, and human health (Willett et al., 2019; Damatla et al., 2023). In addition to directly and indirectly affecting farmer incomes and the competitiveness of certain export commodities, agricultural production support policies have significant impacts on environmental aspects of agricultural production, including land use, water, chemical inputs, energy, and greenhouse gas (GHG) emissions. By incentivizing some forms of production over others, agricultural production support policies have significantly enhanced the relative affordability and availability of certain foods, which in turn influences consumer behaviour and dietary patterns, with implications for population health (Cash et al., 2006; Batini, 2021). As we show in this paper, the impact of agricultural production support pol-

icies has been *highly* uneven with relatively larger support for feed crops, food grains, and beef cattle, and relatively less support for fruits and vegetables, directly affecting relative affordability across these products. Canada has strong agricultural production support policies, including supply management focussed on dairy and poultry, risk management involving crop and livestock insurance, and direct subsidies for certain inputs, agricultural research, and marketing. These government support programs have consistently focussed on increasing agricultural productivity (understood in terms of rising yields and output per farmer) in a small range of feed crops, food grains (especially wheat), and livestock products (especially meat and dairy). The basic assumptions are that highly mechanized, energy- and input-intensive farms are needed to provide affordable and abundant food for increasingly urbanized modern populations and to ensure export competitiveness. The historical record indicates that the focus of these support programs on increasing productivity, volumes,

and exports has succeeded in generating large volumes of select commodities. However, there is a negative flipside to this narrowly-defined success, as these policies have consistently given inadequate attention to the importance of healthy diets, sustainable production, and the vitality of rural communities (MacRae, 2011; Kevany et al., 2024).

Our analysis combines publicly available data from OECD, Statistics Canada, and FAO, and uses a systems approach that combines economic, environmental, and health indicators, to critically assess Canadian agricultural production support policies. Following the analytical approaches of MacRae (2011) and Batini (2021), our framework examines both direct and indirect consequences of these policies on the environment and population health, as well as extending it by incorporating distributional considerations. Our analysis in sections 5 and 6 draws links between agricultural production support policies and ongoing farm consolidation and farm income polarization.

An important aspect of this is our discussion of how Canada's agricultural support policies relate to trends in farm consolidation and the dramatic decline in the number of small-scale farms, which we consider at both national and provincial levels. Despite relative increases in food prices since the mid-2000s and stable levels of total government expenditure on agriculture, farming has remained a perennially precarious financial enterprise for many Canadian farmers, especially those operating on small and medium scales. Most of the growth in the agri-food sector has been dominated by major agricultural enterprises—with tremendous concentration occurring in the processing and retail sectors—and the largest and most industrialized farmers, which has had detrimental impacts on the fabric of rural communities.

Another key aspect of our analysis of how agricultural production support programs have overwhelmingly focussed on increasing the productivity and export competitiveness of a small number of feed crops, food grains, and livestock products is that practically no attention has been given to the implications of these policies with respect to the dietary patterns they foster. This policy orientation has contributed to unhealthy and unsustainable agri-food systems, as agricultural practices associated with livestock-heavy diets have been shown to: heighten

risks of a range of non-communicable diseases; account for disproportionately higher demands on land, water, and other resources; and be responsible for a substantial share of the GHG emissions from agriculture that are accelerating global warming (Steinfeld et al., 2006; IPCC 2019, Willett et al., 2019; Poore and Nemecek, 2018). Our analyses show that continuing the historic focus of Canada's agricultural production support programs would contradict both the dietary recommendations in Canada's Food Guide (Government of Canada, 2025) and the government's expressed commitment to achieve net zero by 2050. In contrast, we argue that there is an urgent need to rethink Canada's agricultural production support policies and the overarching economic objectives that have guided them (Figure 1), with support policies reoriented to focus on simultaneously improving the financial stability of small- and medium-scale farmers who are producing in less resource- and pollution-intensive ways and encouraging healthier dietary patterns.

The rest of the paper is organized as follows. We begin with an overview of Canadian agricultural production support policies in section 2, before examining the impact of these policies by commodity in section 3 and linking these policies to Canadian food consumption and dietary outcomes in section 4. Our analysis in sections 5 and 6 draws links between agricultural production support policies and ongoing farm consolidation and farm income polarization. We conclude by reviewing key findings and policy implications, before providing suggestions for future work.

Overview of Canadian agricultural production support policies

Canada's agricultural production support policies have considerable historical continuities, though there also have been several significant changes in recent decades. The most notable changes were the phase out of grain market price support following the establishment of the Agreement on Agriculture in the World Trade Organization (WTO) in 1995, and the phase out of export subsidies for dairy products by 2020 under political pressure from the first Trump

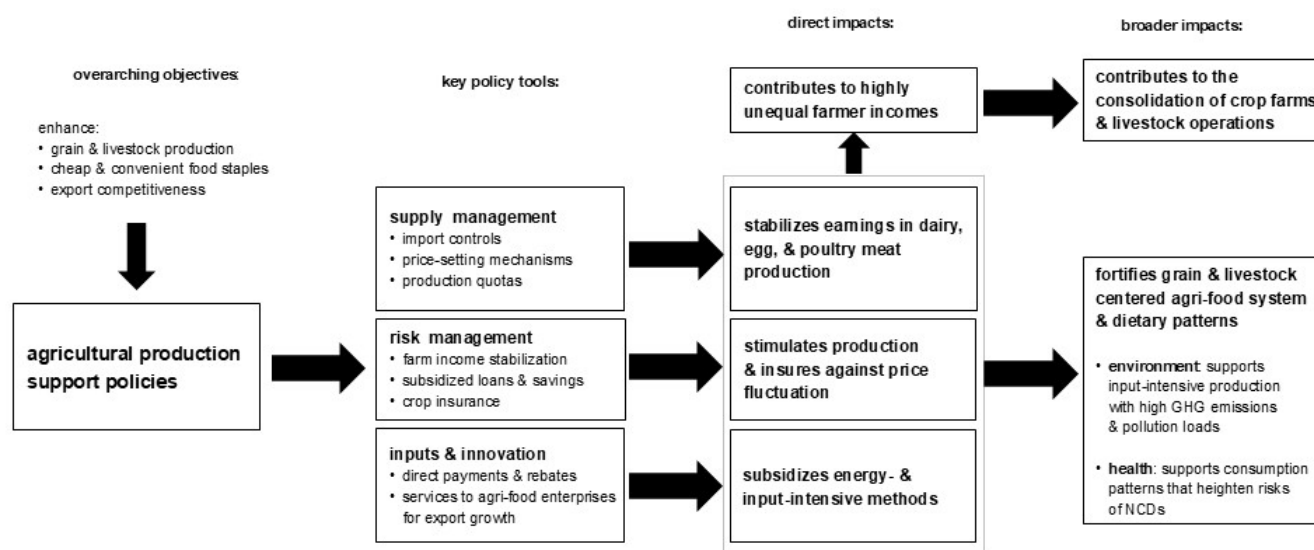


Figure 1: Agricultural production support policies in Canada: Key objectives, policy mechanisms, and impacts

administration in the United States. Currently, the support given by the Canadian government to agri-food production falls under the broad umbrella of the Sustainable Canadian Agricultural Partnership (Sustainable CAP) and is funded by federal and provincial governments. The policies that involve government funding are primarily based on risk management and input and innovation subsidies (OECD, 2024), while there are also sizable implicit transfers from consumers to producers of certain commodities that result from supply management. Figure 1 highlights these key policy tools in relation to their primary objectives and impacts.

The primary goal of supply management is to stabilize the domestic marketable volume of commodities¹, and in turn the unit prices that farmers receive. In general, supply management is pursued through a combination of import controls, price-setting mechanisms, and production quotas, producers are required to hold a quota license from the government, which allows them to sell in the market only up to, and not beyond, the volume that it defines. Canada's supply management policies are largely focussed on dairy (raw milk), egg, and poultry meat production, which is dominated by chickens (but also includes turkeys).

Although there is no outlay cost to the government for supply-managed commodities, these policies trans-

late into positive market price support for producers; as indicated above, they amount to a transfer from paying consumers rather than a transfer of taxpayer-generated revenue. Without supply management, greater domestic production and imports would dampen prices, reduce profit margins, and increase price volatility. Lower profitability and higher uncertainty would inevitably cause some farmers to exit the industry and lead towards more consolidation in the sector, as larger-scale producers tend to be better equipped to cope with thinner margins and higher price volatility than smaller-scale producers and farm consolidation can generate short-term financial benefits for the remaining producers. During the first Trump administration (2016-2020), the United States put considerable political pressure on Canada to eliminate its import restrictions on dairy products, and the 2018 U.S.-Mexico-Canada (USMCA) trade agreement that was renegotiated during this time gave dairy producers in the United States and Mexico increased access to the Canadian market, though other key aspects of supply management continued (Agriculture and Agri-Food Canada, 2024). The second Trump administration has, from the outset, shown a willingness to dismantle all existing rules with its trading partners, including Canada, and we can expect that further pressure on supply management in the

dairy sector will be part of ongoing trade negotiations.

Supply management tends to be broadly supported by most Canadian farmers (NFU, 2024), apart from some of the largest scale producers who would be poised to increase their market share at the expense of smaller scale peers in the absence of these constraints. At the same time, supply management has long been criticized by economists for its impact on the prices paid by consumers. The critique has two main threads: first, restricting supplies and enhancing domestic market prices above border market prices, which in this context effectively amounts to comparing prices in Canada with those in the United States, are seen to reduce consumption relative to what would be the case under less constrained market conditions (OECD, 2024); second, from an economic standpoint, increasing prices on major food staples is understood to be regressive. As far back as the 1970s and 1980s, research findings indicated that the higher domestic prices on supply managed commodities had disproportionate impacts on lower income households, given that food purchases comprise a higher share of household expenditures, though estimates involved a high degree of uncertainty and were difficult to calculate with precision (Schmitz, 1983). More recently, Cardwell et al. (2015) attempted to calculate the regressive impacts of supply management by comparing the differentials between the border and domestic prices, and estimated that the financial burden was as much as 2.3 percent of the annual income of the poorest households in Canada.

In contrast to supply management, risk management policies involve direct transfers from taxpayers to farmers, including through farm income stabilization payments, subsidized loans and savings, and crop insurance, and together these policies tend to stimulate rather than stabilize production (OECD, 2023). The primary goal of risk management policies is to insure farmers against fluctuating prices in commodities not affected by supply management and where there are no private insurance options (NFU, 2024). These policies protect against weather-, climate-, and market price-related declines in farm incomes primarily from the production of grain crops, although other commodities such as fruits, vegetables, and more recently, beef and dairy can also be covered.

While dairy had long been exempted from direct transfers due to supply management, this changed in 2023, when the federal government earmarked \$1.6 billion over six years to support the incomes of dairy farmers through its Dairy Direct Payment Program (Agriculture and Agri-Food, 2025a) to mitigate the impact of increased market access for the US and Mexican dairy imports.

Distinct from the objectives of supply and risk management lies another aspect of Canada's agricultural support policies: the direct subsidization of inputs and agricultural research oriented towards science and technological innovation. These supports include direct payments and rebates for some inputs (e.g., diesel fuel) and public funding geared to promoting "innovation; competitiveness and market development; and adaptability and industry capacity."² One example of the latter is an Agri-Food Trade Services program that provides a suite of services to Canadian agri-food enterprises that are seeking to expand into international markets³.

As noted at the outset of this section, the combination of Canada's agricultural production support policies is framed as promoting "sustainability". However, these policies consistently fail to prioritize concerns that are commonly associated with sustainability, such as reducing GHG emissions and other environmental burdens, and improving public health outcomes (for instance, enhancing the affordability of a greater diversity of nutrient-rich foods). On the contrary, the focus of these policies has overwhelmingly been on stabilizing the prices, increasing production, or managing the short-term risks with respect to a relatively small range of industrial agricultural commodities (OECD, 2024, p. 155). Also, while science and technological innovation will undoubtedly remain significant foci of agricultural support in Canada (OECD, 2024), it would be self-defeating if innovation-oriented initiatives are not increasingly integrated with climate change policies and health goals, given how negatively the failure to mitigate climate change is expected to affect both agriculture and public health outcomes. (IPCC 2022; Willett et al. 2019; Yang et al. 2024). The failure to reorient Canada's agricultural policies to mitigate climate change will continue to negatively affect agricultural and public health outcomes.

Canadian agricultural production support

Total support estimates

The task of estimating the total value of agricultural production support is more complex than one might assume, as it is necessary to consider both the direct financial transfers to farmers from taxpayers (from all levels of government) and the indirect financial transfers from consumers that result from supply management policies. To assess the value of Canadian agricultural production supports over time, we rely on two complementary data sources: OECD's Agricultural Production Support program data on Canada, and Statistics Canada data on Net Programs Payments to farm operators. The OECD data are compiled and reported for comparability across reporting countries and use several core indicators that are all measured relative to a broad metric⁴ (Supplementary Material (S) S.1.1). While the Statistics Canada data on program payments tend to be more detailed by commodity and more comprehensive (including being disaggregated by farm revenue and by net farm income classes), the data do not include estimates of transfers from consumers to producers. Moreover, the policies associated with the net program payments are becoming the most significant way that agricultural production in Canada is subsidized (Figure S.1 and the discussion surrounding it).

Support by commodity

The OECD's estimate of total agricultural production supports is broken down by commodities and distinguishes between transfers from taxpayers (directly paid by governments) and transfers from consumers (paid through higher prices, which are ultimately inflated by various government policies) and tends to be reported as a share of the total value of production by commodity (Figure 2A). These so-called "producer single commodity transfers" are transfers from consumers and taxpayers that are uniquely devoted to supporting the production of a single commodity, as distinct from general government agricultural support programs and services that do not necessarily target a commodity. Since Canada terminated

its grain transportation subsidies in 1995 (by repealing the Western Grain Transportation Act of 1983), livestock production has received the lion's share of transfers both from taxpayers and consumers; in 2020, more than 80 percent of total production transfers associated with individual commodities were associated with dairy, eggs, and meat (Figure 2B). A large part of this stems from the prices received by Canadian producers in excess of prices for comparable commodities on the other side of the border and is associated with supply management programs in dairy, eggs, and poultry meat, with transfers from consumers to producers exceeding half a billion dollars on average from 2020 to 2022 (Figure 2C-E). Feed crop producers are also major recipients of transfers from taxpayers to producers, which further braces livestock production. Beef and veal receive a significant level of support through such policy mechanisms, and beginning in 2023, support for dairy, poultry and egg farmers was augmented through the Dairy Direct Payment Program (see above) and the Poultry and Egg On-Farm Investment Program (Agriculture and Agri-Food Canada, 2025b).

As noted above, the net program payments reported by Statistics Canada reflects a growing share of total agricultural support payments and excludes transfers from consumers to producers. From 2019 to 2022, an average of \$2.52 billion per year was devoted to crop production and \$1.21 billion per year was devoted to livestock production, with the share of program payments received by crop production increasing steadily over time (Figure S.3B). Alberta, Saskatchewan, Quebec, and Ontario have been by far the largest recipients of net program payments (Figure S.3D). Below, we discuss the use of these crops as feed, food, and exports to give an indication of how these payments also serve to subsidize the consumption of certain food items.

Canada's agricultural support payments also heavily subsidize the use of inputs, led by fuel. These highly distortionary subsidies are not capped, and thus payments to individual farmers increase with the volume of inputs they use. In 2023, payments for input use alone were \$908.2 million, and this annual figure has been increasing in constant terms over time (OECD, 2025).

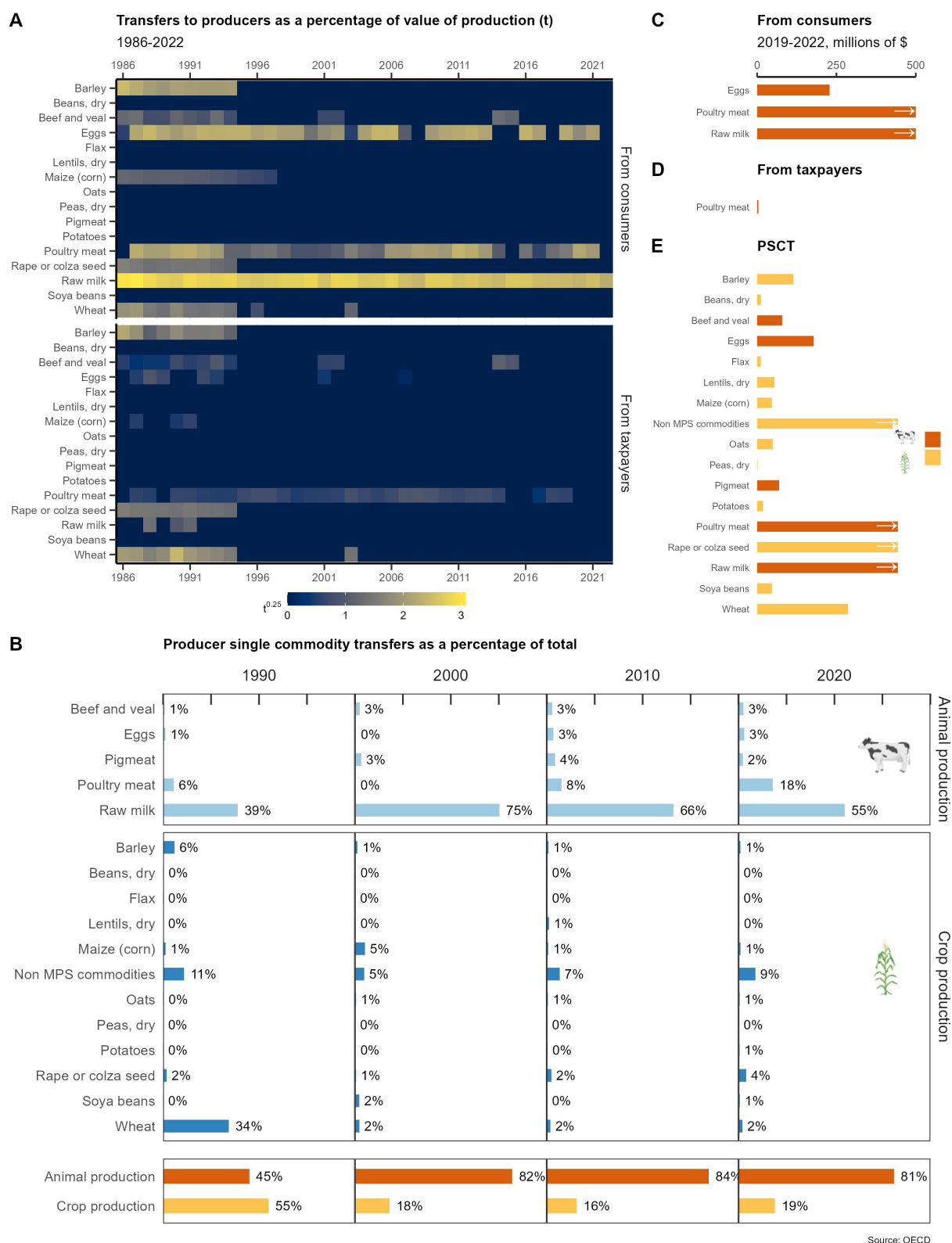


Figure 2: OECD agricultural producer support estimates by commodity (Note: In Panel (A) the heat map shows government transfers to producers as a percentage of value of production, with darker shades indicating lower percentages and lighter shades indicating higher percentages. The percentages are uniformly scaled to improve shade readability.

Agricultural production

This section examines the connections between Canada’s agricultural support policies and agricultural production patterns, discussing the consequences separately for livestock and crop production. Our results show that animal feed crop production receives a large fraction of Canada’s agricultural production support program payments, which amounts to an implicit subsidy for livestock production where it is a key input (Figure 3).

Livestock

As noted, Canada’s agricultural production support policies have historically been heavily concentrated on livestock production and largely aimed at increasing total volume, stabilizing the prices of select commodities, and enhancing export competitiveness. This subsidy regime has contributed to a massive expansion in livestock production over time.

From 1961 to 2022, the total annual volume of meat (cattle, chicken, and pig) produced in Canada increased

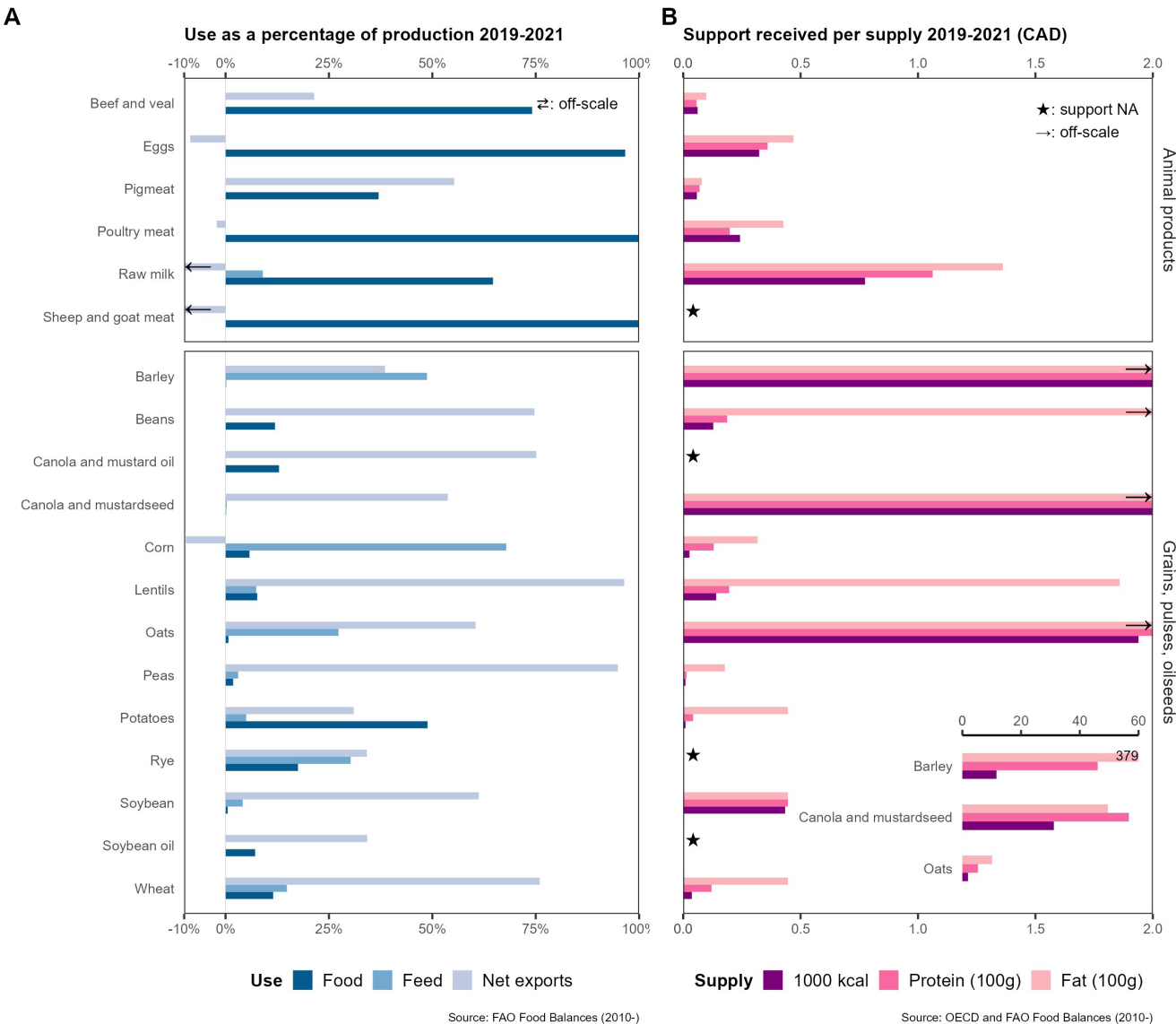


Figure 3: Use, disposition, and support estimates by commodity. (Note: Domestic includes “loss in handling” so that domestic supply equals domestic use, at least in principle.)

by a factor of 3.6 (FAO 2025), and the nature of this growth has been largely in line with global patterns, with pigs and poultry accounting for nearly all the increased volume since the 1970s (Figure 4A). In 2023, nearly three-quarters of all meat production in Canada was from pigs (44 percent) and poultry birds (30 percent), mainly chickens, and pig meat accounted for more than 60 percent of Canada's total meat exports (FAO 2025). As will be elaborated further below, this production is now concentrated on vastly fewer and larger farms than was the case just a few generations ago. Among animal products, Canada runs a significant trade surplus in beef and veal, and pigmeat, and a trade deficit in eggs, poultry meat, raw milk, and sheep and goat meat (Figure 3).

Milk production per dairy cow increased significantly since the 1970s (Figure 4A), such that a rising volume of total milk production now comes from a smaller relative population of dairy cattle. Although Canada is a net exporter of beef cattle, total stocks have fluctuated over time for a variety of reasons, including shifting consumer preferences for pig and poultry meat and periodic health risks such as bovine spongiform encephalopathy (BSE).

Crops

Among crops, support and program payments have had the largest impact increasing the production of canola, corn silage, lentils and soybeans, while wheat and rye notably receive relatively little support (Figure 4B). From the second half of the 1990s until the second half of 2010s, the total volume of canola production increased by a factor of almost three, soybeans by 2.5, corn silage by 2.1, and lentils by 4.5. The increased volumes in many crops relate significantly to rising yields that stem from a combination of new varieties and greater input use. Canola is a good example of this, as yields increased by 61% from the 1990s to the 2010s, while the yields of other crops appear to have been flattened out in recent years (Figure 4C).

There is little doubt that Canada's agricultural policies have been successful in stimulating increased crop output. One very important aspect of this increased production is that only a fraction of total crop production is directly consumed by humans as food. We draw upon data from Statistics Canada to disentangle the various

ways that crop production is used, including for human food, animal feed, industrial inputs, seeds, dockage, and exports, as well as some that gets wasted.

However, in pursuing this line of inquiry, it is necessary to acknowledge that there is a degree of fuzziness about various categories, which the three biggest crops produced in Canada—wheat, corn, and canola⁵—help to illustrate. These three crops are directly consumed by humans to varying degrees, such as with wheat milled to produce flour, high fructose corn syrup used in a countless array of processed foods and beverages, and canola pressed into a widely used cooking oil. They are also used as industrial inputs, but there is no standard definition for this, and categorization is done on a case-by-case basis. For corn and wheat, industrial use refers to the portion of production that is diverted to produce ethanol for blending into gasoline. For canola, some oil is used to produce biodiesel and a historic variety of rapeseed is used to produce a specialty high-temperature resistant lubricant (as with other oilseeds, industrial use refers to the amount of product that is known to be used solely for industrial purposes)⁶. Moving beyond these three crops, an additional concern arises from the fact that there are no separate estimates distinguishing human food and industrial uses for several grains, or estimates of human use have remained constant over time, which appears more like an assumption than a direct estimate⁷. There is also some fuzziness about the share of agricultural production used as animal feed, as Statistics Canada does not have separate estimates for what is used as feed, apart from wastage and dockage (S 1.3).

The primary crops used for animal feed on a world scale are corn and soybean. For instance, corn accounts for up to 95 percent of total grain crop used for animal feed (with sorghum, barley, and oats making up the rest) and soybeans supply virtually all of the protein-dense oilseed meal (ERS 2025a)⁸. While these specific estimates are from the United States, it is possible to get a sense of the scale of feed crops in Canada from a combination of Statistics Canada and FAO data, and we report these feed estimates as a share of domestic supply (and use) and production (Figures 3, S.4C-D).

Canada is a large net exporter of grains and oilseeds,

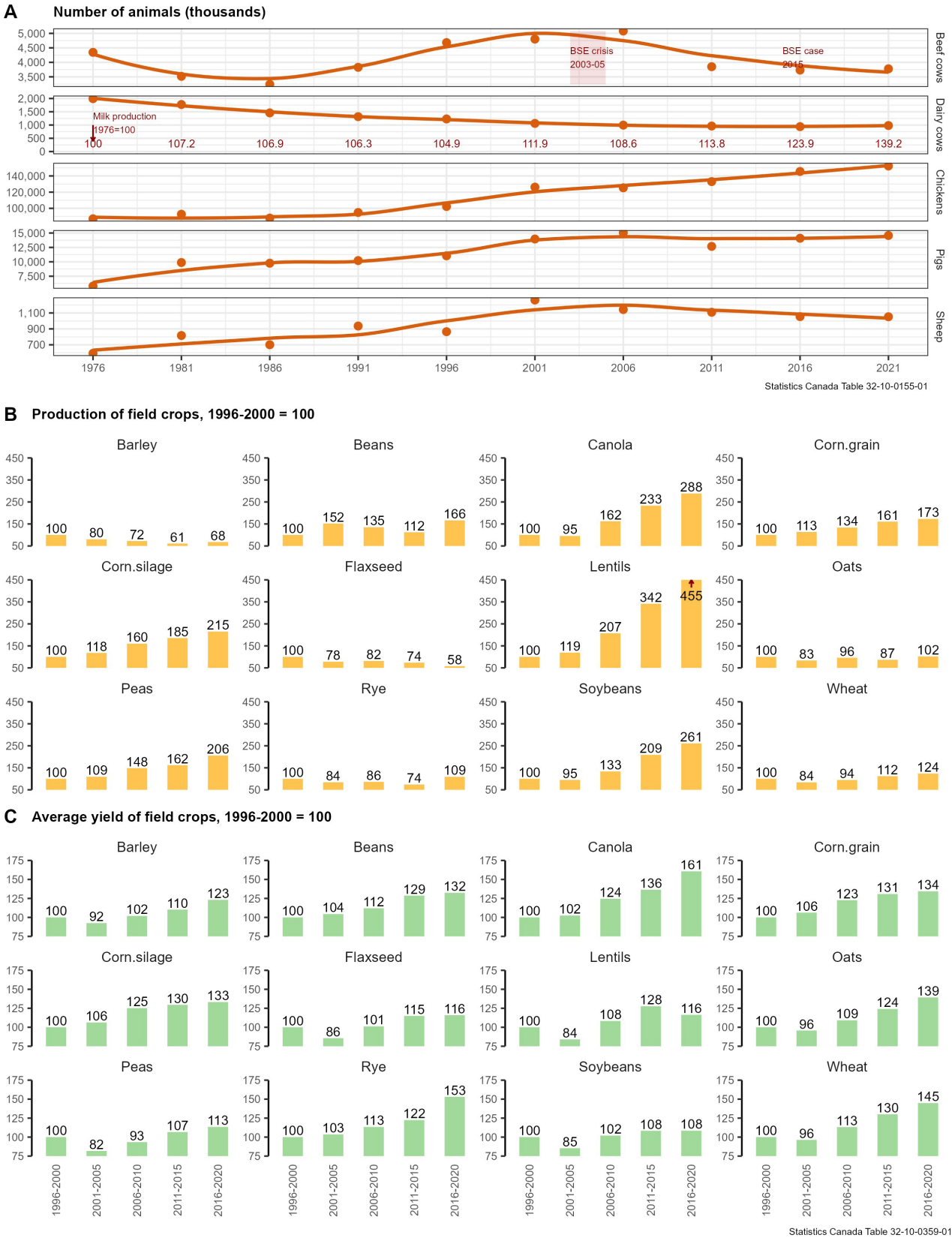


Figure 4: Farm production and yields

led by wheat and canola, demonstrated by the large differences between ratios using domestic use and production values. However, one grain crop that Canada consistently runs a minor trade deficit with is corn, which averaged less than 10 percent of the total volume of Canadian production in the 2019-2021 period (Figure 3).

Although the Statistics Canada and FAO data on feed is not consistent (as Statistics Canada fails to separate feed from waste and dockage), both estimates agree that a large share of Canadian grain and oilseed production are used as animal feed⁹. Both estimates indicate that more than 70 percent of Canada's domestic supply of barley and oats are used as animal feed, along with more than 50 percent of corn, and about 40 percent wheat. Canadian oilseed production is overwhelmingly used for either animal feed or industrial inputs, and a large share (roughly 75 percent) of the total annual volume is exported (Figure 3). In 2023, close to 60 percent of the canola (6.2 of 10.6 mt) that was processed domestically in Canada comprised meal, which is mostly used for livestock feed, and just over 40 percent comprised oil, which is used in cooking and as an industrial lubricant and fuel (Canadian Oilseed Processors Association, 2025). In 2023, nearly 80 percent of the soybeans processed domestically in Canada comprised meal, and was primarily used as a protein-rich animal feed (Soy Canada, 2024)¹⁰. In addition to grains and oilseeds, Canada is also a significant producer of pulses, and these are also highly export oriented (Figure 3). Of what remains in Canada, 40 percent of pulses are used for animal feed.

In sum, it is evident that most grains, oilseeds, and pulses cultivated in Canada are not being directly consumed by Canadians and instead are either used as animal feed or industrial inputs or sold as exports. Although we cannot trace what happens to Canadian exports of canola or soybeans, we can assume that their use in Canada is representative, and that they will also be largely used as animal feed or industrial inputs in importing countries (Nye & Youngman, 2024). Despite limits in the data, it is possible to get a good approximation of the total volumes of Canadian grains, oilseeds, and pulses that are used as animal feed, either domestically or through exports, and a number of these crops are heavily supported through various agricultural policies. We can also translate the

volume of feed crops produced to the land they command, which amounts to more than 20 million acres or about 30 percent of all cultivated land in Canada, which is about the same size as the entire country of Austria (Figure 5).

Consumption and diets

Agricultural production support policies directly and indirectly affect the production of various commodities, the prices that farmers receive, and the prices that consumers pay, and because the volumes and prices of some foods are being subsidized relative to others, these policies should also be understood to have a significant effect on societal food consumption patterns. Since the 1960s, the total annual volume of meat consumed in Canada has nearly quadrupled, and the average Canadian consumes nearly 100 kg of meat per year, more than double the world per capita average (45 kg/year). Nearly all the increased volume in Canadian meat production and consumption since the 1970s has come from pigs and poultry, while the per capita consumption of milk, beef, sheep, and goat meat have declined (FAOSTATS 2025; Figure S.4A), reflecting a shift in domestic consumer preferences. This shift may be motivated by a combination of factors, including prices, tastes, marketing, and health advocacy favouring “white” meat over the fattier flesh of ruminants. Meanwhile, the durability of Canadian beef exports reflects the competitiveness of the sector in the absence of direct subsidies.

These consumption patterns have important implications for sustainability and health. To appreciate this, it is helpful to evaluate the average Canadian diet in relation to the dietary guidelines in the EAT-Lancet Commission (henceforth EAT), which involved a global consortium of experts assessing a vast array of literature at the intersection of diets, epidemiological patterns, and environmental science, and concluded with an assessment of food consumption patterns that would optimize human and planetary health (Physicians Committee for Responsible Medicine, 2025; The Nutrition Source, 2025; Springmann et al. 2020; Willett et al., 2019; Figure S.5). It is

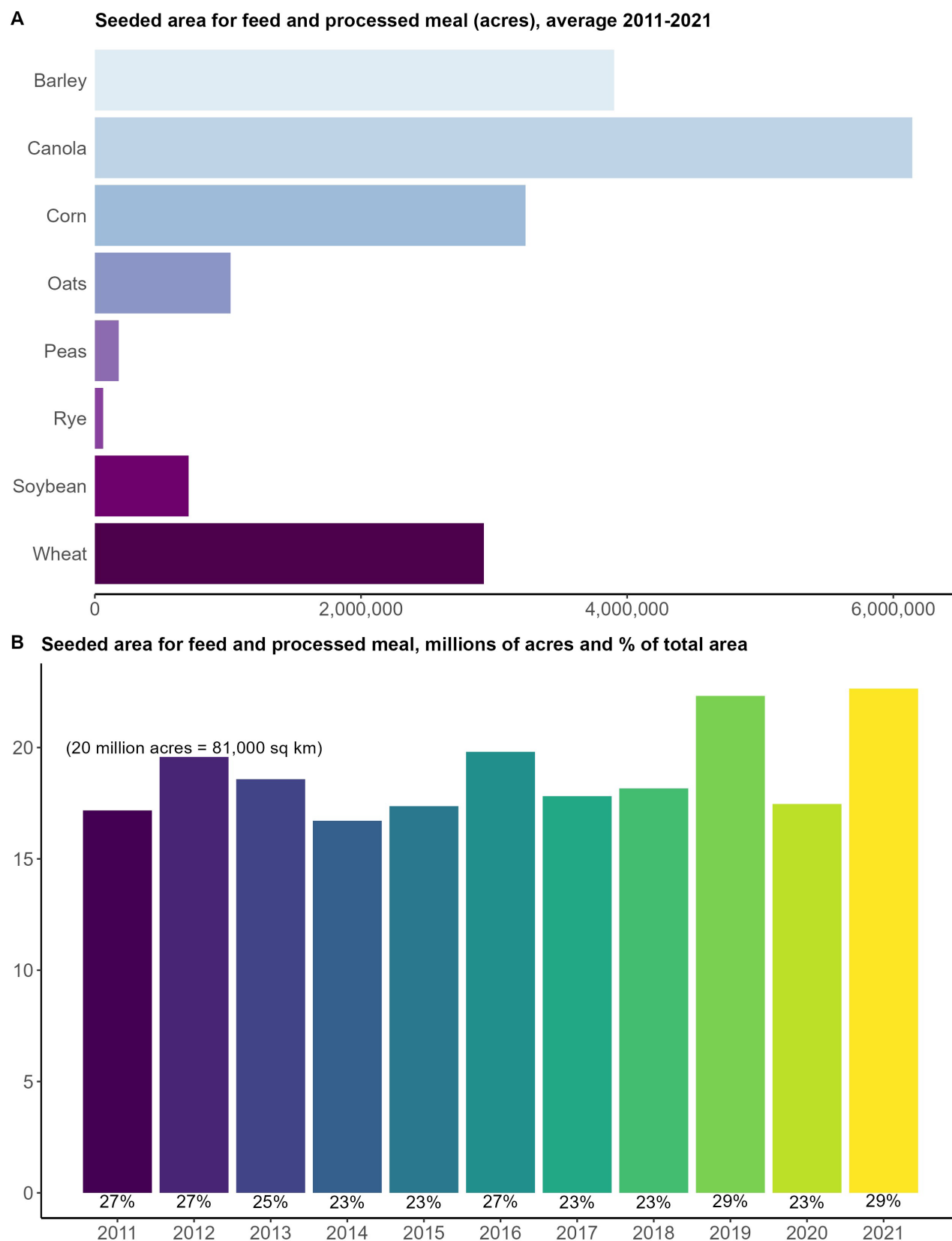


Figure 5: Seeded area for feed and processed meal, by commodity and total

also notable that Canada's Food Guide (Government of Canada, 2025) is broadly consistent with these recommendations, though it is not prescriptive and focusses on health without attempting to account for environmental considerations.

As illustrated in Figure 6, if the average Canadian were to follow EAT guidelines, this would entail reductions in the consumption of animal products by roughly 80 percent, from around 100 kg to 20 kg, as well as a 50 percent reduction in sugar and a 15 percent reduction in fruits. As well, a growing body of research links the rising consumption of Ultra Processed Foods (UPFs) to worsening health outcomes. The convenience, alluring flavouring, and “snackability” of UPFs like chips, breakfast cereals, cookies, cakes, and crackers regularly contain unhealthy amounts of salt, sugar, and fat (Moss 2013). One systematic review linked the consumption of UPFs among adult populations to greater risks of: obesity, unhealthy weight, and cardiovascular diseases; a variety of cancers; type-2 diabetes; irritable bowel syndrome; and depression. The consumption of UPFs among children and adolescents is also implicated in a range of adverse health outcomes (Elizabeth et al. 2020). Conversely, following EAT guidelines would compel far greater consumption of other food groups, as the average Canadian would need to increase their consumption of vegetables, whole grains, and staple foods (like grains and potatoes) by at least 25 percent and increase their consumption of pulses by more than 165 percent.

In short, Canadian dietary patterns are very far from the EAT guidelines, and the goal of improving both sustainability and health outcomes, and two of the most important features of this discrepancy are the overconsumption of animal products, UPFs, and the insufficient consumption of pulses, vegetables, and whole grains. One troubling and contradictory element of this is that despite being a major producer of several pulses and grains, Canadians are consuming them well below recommended levels and exporting them in large volumes. Viewing Canadian dietary patterns in relation to EAT guidelines also shines a light on the extreme misalignment between Canadian agricultural production support policies and sustainability and public health goals. Making matters even worse,

the benefits of these support policies have been unevenly distributed across farmers and have disproportionately advantaged large-scale producers, and the failure to sufficiently support small and medium-size farmers is reflected in the polarizing trajectory of agriculture in Canada.

Increasing consolidation

Consolidation and increasing concentration are two key long-term trends in the Canadian agri-food sector. Consolidation is a process driven by mergers and acquisitions, which increases the average size of operations. Concentration is an outcome which measures the market power of firms and tends to increase with consolidation when entry is limited. Canadian agriculture has long experienced farm consolidation, and it is illuminating to consider this over the past half century. From 1976 to 2021, there was a nearly 45 percent drop in farm operators in Canada, falling from 338,552 to only 189,874 (Statistics Canada, 2022). According to the most recent census, current to 2021, beef cattle and dairy cattle were the livestock farm types with the largest number of operators, while oilseed, grain and other field crops were the crop farm types with the largest number of operators (Figure S.6B). The trajectory of farm consolidation increased the number of large farms relative to small and medium-size farms as measured by revenues. From 1981 to 2016, there was a significant decline in the number of farms with annual farm receipts of \$250,000 or less and an increase in the number of farms with annual receipts above \$500,000 (Figure 7A)¹¹.

From 1976 to 2021, the cultivated area declined only slightly, as a result the decline in the number of farm operators largely represents a massive consolidation in agriculture measured by the number of farms by area. Statistics Canada reports the size distribution of farms by area in 14 distinct area classes, ranging from “Under 10 acres” to “3,520 acres and over” (Figure 7C). Classifying farms as small, medium, and large by area is admittedly imperfect, and does not account for regional differences in agro-climatic considerations¹². Nevertheless, using these categories, the data illustrate that small- and medium-scale farms have been shrinking in numbers. From 1976 to 2021, the number of farms in size categories with less than

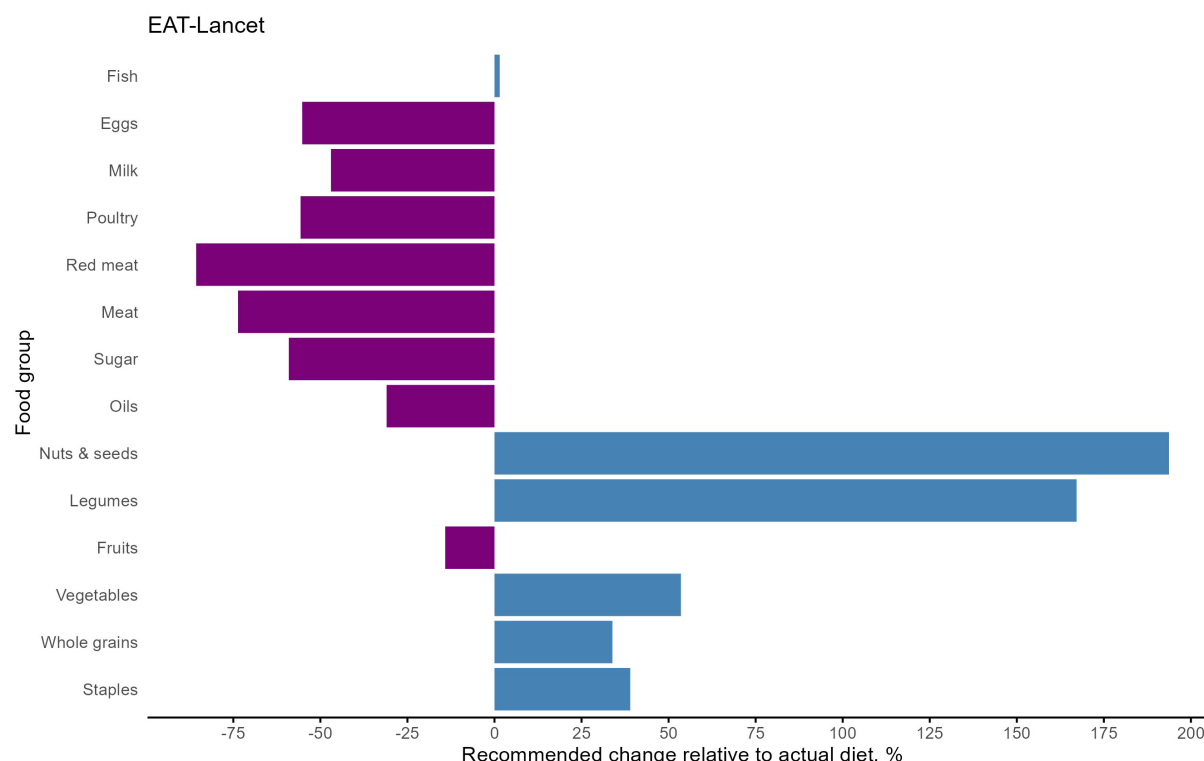


Figure 6: Recommended change in average diet by food product relative to EAT-Lancet Commission guidelines, based on Springmann et al. (2020)

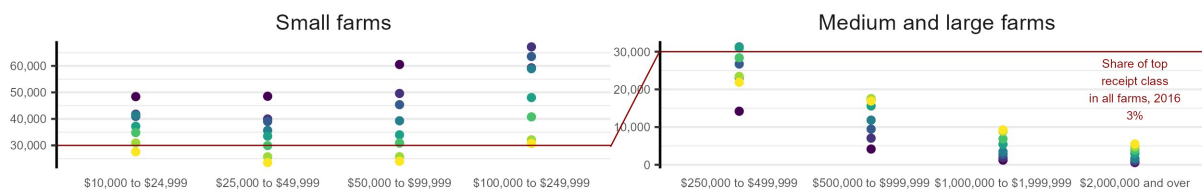
1,600 acres decreased significantly, while there was a noticeable increase in the number of large farms with more than 2,240 acres¹³.

Provincial data on the number of farms by receipt class and by area (Figures 7B, D) indicate significant differences across these two distinct measures of farm size. In the case of receipt class, national trends are consistent across all the provinces, with a noticeable decline in the number of small- and medium-scale farms and an increase in the number of large farms. In the case of area, however, there are observable differences across provinces, with the consolidation of farms over time especially striking in the prairie provinces of Alberta, Saskatchewan, and Manitoba. Ontario has experienced a sharp decrease in the number of small- and medium-size farms, but not a corresponding increase in large farms, while Quebec has been relatively less affected by farm consolidation. Regardless of the provincial differences and the differences measured by receipt class and area, it is abundantly clear that the average farm in Canada is getting bigger and small- and

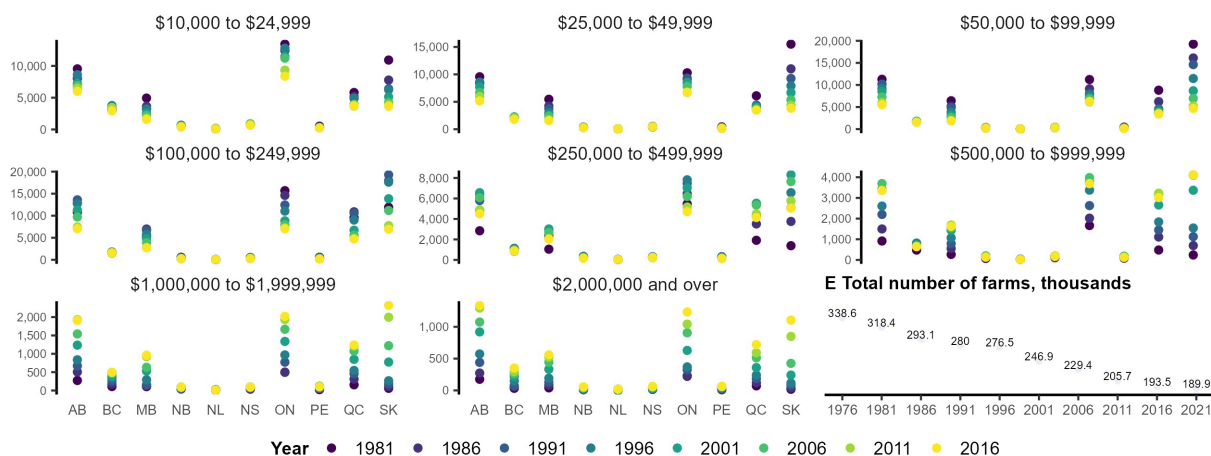
medium-scale farms are in decline.

While the consolidation of Canadian agriculture is evident in both livestock and crop production, it is especially dramatic with livestock. In 1951, most Canadian farms had relatively small populations of multiple livestock species: 79 percent reported cattle (493,321), 58 percent reported pigs (364,068), and 69 percent reported chickens (427,317), either for eggs or flesh or both. Since then, however, livestock farming has been entirely transformed, by the rise of Concentrated Animal Feeding Operations (CAFOs) or what are widely referred to as “factory farms”. The design of CAFOs has been shaped by the twin goals of increasing bodily yields and labour productivity with rising densities and automation essential to the reduction of unit costs—a competitive discipline that has made it increasingly harder for smaller scale operations to survive (Weis, 2025). From 1976 to 2021, the number of beef cow operators decreased by an average of 1.5 percent per year and the number of pig farms decreased by an average of 2 percent per year, while the average number of beef

A Number of farms by receipt class, 2015 constant dollars
Canada

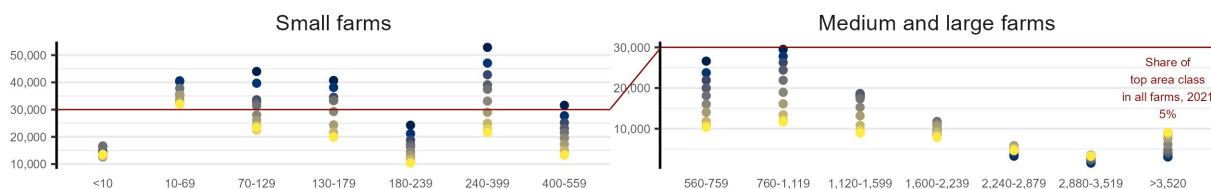


B Provinces

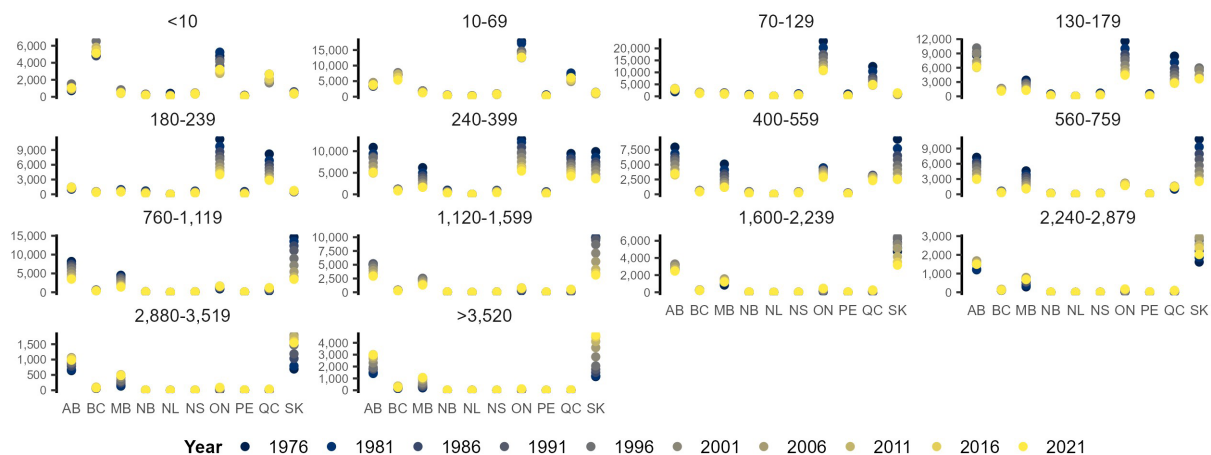


Source: Statistics Canada, Table: 32-10-0157

C Number of farms by area in acres
Canada

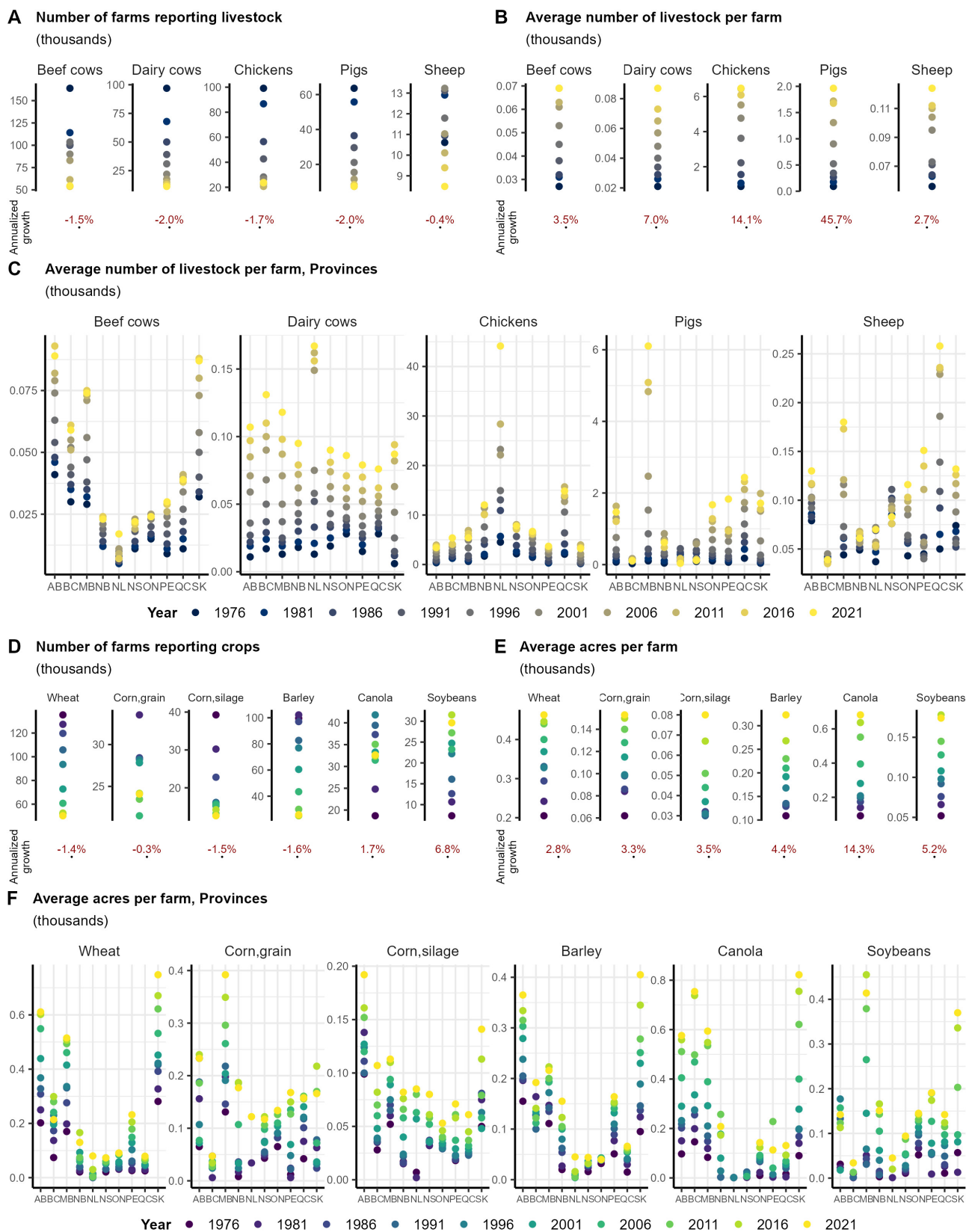


D Provinces



Source: Statistics Canada, Table: 32-10-0156-01

Figure 7: Number of farms by receipt class and area Note: Each dot in the panels corresponds to a year and the number of farms by receipt class (panel A), by area (panel C) or by province (panels B and D). Data are in five-year intervals. Data on receipt class start in 1981, and data on area start in 1976. For both series, the latest year for which we have available data is 2021. Lighter shade values correspond to more recent years.



Source: Statistics Canada, Table: 32-10-0155-01

Figure 8: Number and average size of farms reporting livestock and crops

cows per farm operator increased by 3.5 percent (Figure 8A-C) and the average number of pigs per farm literally exploded. Dairy and poultry farms—sectors that operate under supply management—did not fare much different. From 1976 to 2021, the number of dairy cow farms decreased by about 2 percent per year and the number of chicken farms decreased by 1.7 percent per year, while the number of dairy cows per farm increased by 7 percent and the average number of chickens per operator increased by a whopping 14.1 percent per year. As a result of this trajectory, there are now vastly fewer and larger operations than there were in the mid-twentieth century. In 2021, pig production in Canada occurred on a mere 7,423 operations, only 7,505 operations reported producing broiler chickens (with the average broiler farm growing nearly 14,400 birds at a time and turning over this “inventory” many times a year), and only 18,536 operations reported producing eggs (with the average layer shed housing over 1300 hens at a time) (Statistics Canada, 2021).

The dramatic consolidation in livestock production in Canada is fundamentally rooted in declining margins, market pressures imposed by supply chains, and the competitive advantages associated with larger scales of operations. However, Canada’s agricultural production support policies should also be understood to have played a significant enabling role in this trajectory. In supply management systems, one driver of consolidation is the capitalization of ever-increasing rents in quota valuations, which increases barriers to entry for prospective young farmers with limited start-up equity. Another emerging way that government support policies reinforce consolidation in the livestock industry is the response to the HPAI (avian flu) crisis that began in 2022, which has involved the “depopulation” of around 15 million birds in Canada, mostly in BC (Charlebois, 2025). While industrial livestock enclosures are worsening long-term threats associated with infectious diseases, government support policies (Agriculture and Agri-Food Canada 2025b) have focussed on increasing the biosecurity of industrial enclosures and compensating farmers for depopulated flocks (subsidizing their repopulation), which serves to further reinforce the trend towards more consolidation and larger-scale industrial operations.

There has also been a large degree of consolidation in grain and oilseed farming, with the increasing production of oilseeds influenced by the growing demand for livestock feed. From 1976 to 2021, the number of farm operators growing canola increased by 1.7 percent per year and the number of farm operators growing soybeans increased by 6.8 percent per year (Figure 8D-F). Further, canola and soybeans were only cultivated on a relatively small number of acres per farm in 1976, but the average acreage dedicated to these crops increased dramatically over the ensuing 45 years. As discussed, large shares of canola and soybeans are used as livestock feed, and thus the increasing conversion of farmland from crops that directly feed humans to crops that primarily feed livestock is one important component of the overall consolidation in crop production in Canada.

As with livestock, while declining margins, market pressures and market-induced advantages of economies of scale prove a driving force in the consolidation of crop production, the nature of Canadian agricultural production support policies has further contributed to this trajectory. Transfers from taxpayers and consumers to agricultural producers are partly capitalized in land values (OECD, 2002) and thereby contribute to the rising valuation of farmland. Rising farmland values, in turn, constitute a significant barrier to both prospective young farmers and to farm succession within families, and this makes the consolidation of farmland more likely.

In sum, the consolidation of farm operations in Canada over the past half century was not simply a matter of average farms getting bigger, but of agricultural production as a whole shifting towards a greater focus on livestock, through both increasingly large-scale meat, dairy, and egg operations and greater feed crop production. Although it is beyond the scope of discussion here, the growing consolidation of farms and the declining number of farm operators should also be understood to have had major negative implications for the vibrancy of rural communities. Dramatic increases in the value of farmland and production quotas will complicate the challenge of intergenerational renewal in agriculture and further inhibit the entrance of prospective young farmers (FCC, 2025)¹⁴.

The polarization of farm incomes

While Canadian agricultural production support policies have contributed to increased total farm revenues, rising total production and yields, and competitive exports in several commodities, many farmers face constant financial stress. The root causes of farmers' financial woes are long standing and multifaceted, with rising debt an important manifestation of increasingly precarious economic conditions. Between 2000 and 2019, total farm debt in Canada nearly doubled, topping \$100 billion (Qualman and the National Farmers Union, 2019, p.5), and by 2022, farm debt had risen further to \$139 billion (Statistics Canada, 2025). This translates to a debt-to-revenues ratio of 128 percent and a debt-to-revenues net of expenses ratio of 686 percent.

Increasing farm debt, of course, does not by itself imply economic duress. On the asset side of agriculture balance sheets, farmland valuations have also been increasing over the last 20 years, doubling from 2006 to 2014 and doubling again from 2015 to 2024 (valued at \$785 billion in 2024; Statistics Canada, 2026). Because farmland valuations increased faster than liabilities over this period, the debt-to-equity ratio in the agricultural sector is now lower than what it was in 2006, although still above what it was in the 1990s (Figure S.7).

There are several considerations that qualify the gains in asset values. While agricultural prices exhibit high volatility, which contributes to volatile farmland prices, farm debt is contractually fixed in value. The debt-to-equity ratio does not make an allowance for the risk of future price declines that farmers bear. Moreover, the rate of return on investment is a common indicator of economic profitability. With an average annual return on equity often less than 2 percent (Figure S.8), unadjusted for risk, agriculture is not a sector with high economic returns. In addition, rising farmland values largely benefit older and more established farmers, while making access financially more difficult for younger aspiring farmers. According to the estimates by Farm Credit Canada (FCC, 2025), purchasing new farmland has become much more expensive in Canada since the mid-2010s, raising concerns about the uneven distribution of benefits across generations and the

prospect of generational renewal, especially for aspiring farmers who do not have access to a family farm.

A common indicator of farm profitability is to express, for a given year, farm expenses as a ratio of farm revenues, with a ratio above one indicating economic losses. This ratio tends to vary by revenue classes, with farms in upper revenue classes exhibiting lower expenses-to-revenues ratios. To illustrate the highly uneven distribution of farm profitability in Canada, we thus assessed the expenses-to-revenues ratio by revenue classes (see Figure 9A). Between 2015 and 2022, an average farm in the lower revenue classes (less than \$100,000) consistently faced operating expenses exceeding revenues, at times at a margin of 1.5 to 1. Sometimes, sudden economic losses can stem from crop failures or livestock disease outbreaks, and for operators carrying significant debts this can have a devastating impact on profitability. Nevertheless, the differences in expenses-to-revenues ratios are on average 30–50 percent lower for higher revenue classes, indicating that profit margins are highly unequally distributed between the lower to upper revenue classes.

Livestock and crop production tend to have different expenses-to-revenues ratios. Livestock production accounts for about half of all farm expenses in Canada, but less than half of all farm revenues, indicating that crop farming tends to involve greater margins and be more economically profitable (Figure 9B). Among crop farms, those with annual operating revenue of \$2,000,000 or over accounted for roughly 60% of the national total (Figure 9D), with this share having increased significantly over time, despite accounting for less than 3% of all farms (Figure 7A). Among livestock farms, in 2022, those with annual operating revenues of \$2,000,000 or over accounted for about 65% of the national total. But despite these differences between livestock and crop production, in both cases operators in higher revenue classes tend to have lower expenses-to-revenues ratios (Figure 9C), although the highest revenue-class of livestock operators exhibit relatively high expenses-to-revenues ratios. Given the limits of available data, it is difficult to extend this analysis to differences across farm types within livestock and crop production (but see Figure S.6 and the discussion surrounding it).

In sum, the data on farm incomes and expenses-to-revenues ratios starkly illustrates the precariousness of farming, especially for small- and medium-scale farming operations. Many farmers consistently struggle with low profit margins and heavy reliance on costly machinery and inputs, which has resulted in unsustainable debt loads (Qualman & NFU, 2019), and the consolidation of farms is reflected in a striking degree of revenue polarization.

Unfortunately, the impact of agricultural production support policies on the distribution of income among Canadian farmers has not received sufficient attention. While most of these policies are not explicitly intended to have either progressive or redistributive outcomes among farmers, their design and delivery inevitably have inadvertent distributional effects. In the late 1990s, an analysis of the distribution of agricultural supports received by farms in Canada found that they tended to be more concentrated than gross farm output, with a disproportionate amount of support going to larger producers (OECD, 1999), and this in turn increased the concentration of farm receipts and tilted the distribution of income within the agricultural sector even more towards larger farms. However, a more recent study (Moreddu, 2011) found that in Canada in 2007, the top 25 percent of the farms by gross agricultural output accounted for slightly less than 70 percent of gross agricultural output and received almost 60 percent of the total support payments, whereas the bottom 25 percent of the farms accounted for about 5 percent of gross agricultural output and received about 8 percent of the total support payments (Moreddu, 2011, figures 3.1 and 3.2)¹⁵. This regressive pattern, with the biggest operators getting the most total support, is made worse by the fact that the financial benefits of various support policies do not fully accrue to farmers, and a significant portion gets captured at other points in the supply chains, as indicated in the preceding section.

Although we are unable to update these estimates (because of restrictions on access to the data needed to calculate the distribution of income and support payments across farms) we can shed some light on recent dynamics by combining several data sources published by Statistics Canada on net program payments. Between 2015 and 2022, the distribution of net program payments

across revenue classes and farm types shows that farms within higher revenue classes received a larger share of these payments (Figure S.3D). During this period, farms with annual operating revenues of \$2,000,000 and over received about 45 percent of all the payments, including 15 percent received by livestock producers and 30 percent by crop producers, while farms in the lowest three revenue categories received a negligible share of the payments (Figure S.3B).

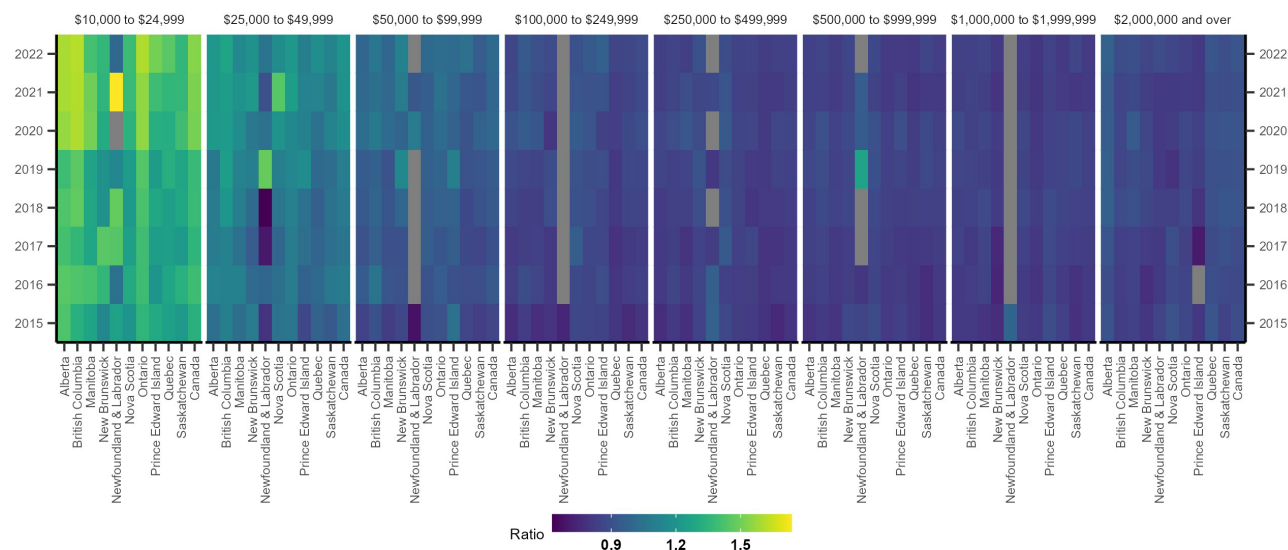
Conclusion and future research

We have argued that while Canada's agricultural production support policies have contributed to long-term increases in volumes and yields in many commodities, they have not helped stabilize the financial situation for most farmers, and have disproportionately benefited large-scale operations, which amplify the financial incentives to consolidate farms and effectively "get bigger". We have also argued that these policies have outsized impacts on a small range of commodities, benefiting crops that are largely used for livestock feed and industrial products and that are heavily exported. The bias towards large-scale livestock operations and crop farms has exacerbated the striking consolidation that is occurring in both realms and has also indirectly benefited corporations within increasingly oligopolistic agricultural supply chains, a topic that deserves further analysis in future research.

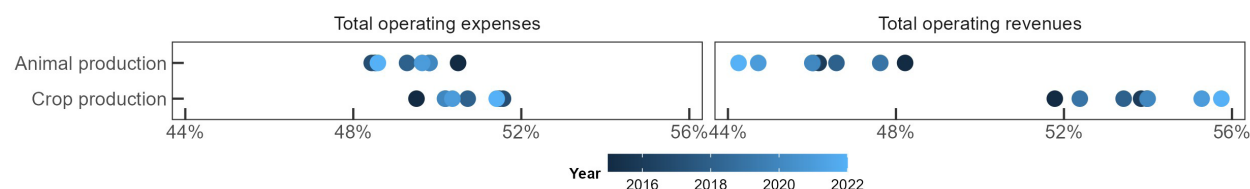
The focus of support on livestock feed, industrial products, and meat and dairy does not align with major scientific assessments about sustainability and healthy diets, or the central objectives set out in Canada's Food Guide. Moreover, Canadian agriculture remains highly input-intensive, with agricultural support policies, such as fuel subsidies, further incentivizing industrial methods, although it is not clear to what extent these policies stimulate the use of pesticides and synthetic fertilizers (and this is a subject that warrants attention in future research).

We acknowledge that Canada may not necessarily produce the volumes of fruits and vegetables to match the level of domestic consumption recommended by Canada's Food Guide. However, there is nothing inevita-

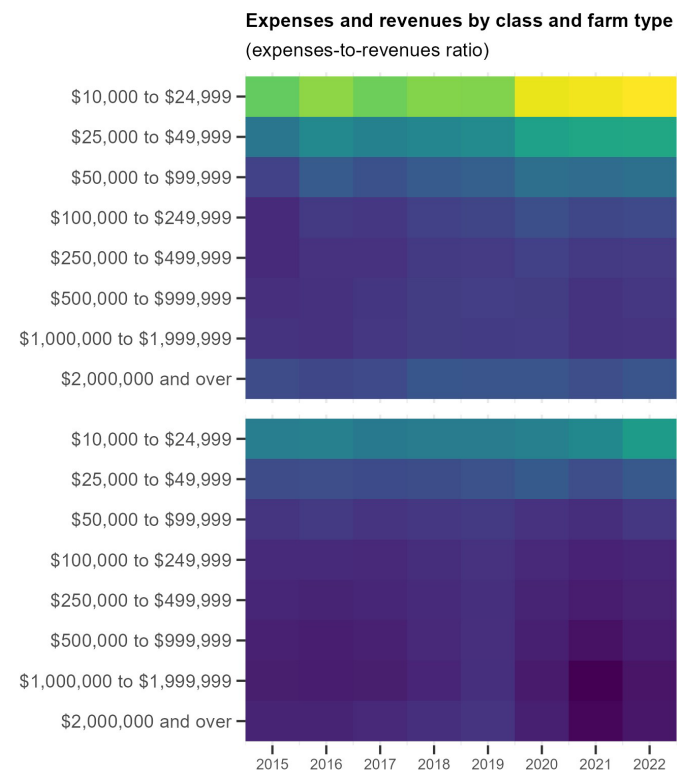
A Expenses-to-revenues ratio



B Revenues and expenses by farm type, as a percentage of total



C



D

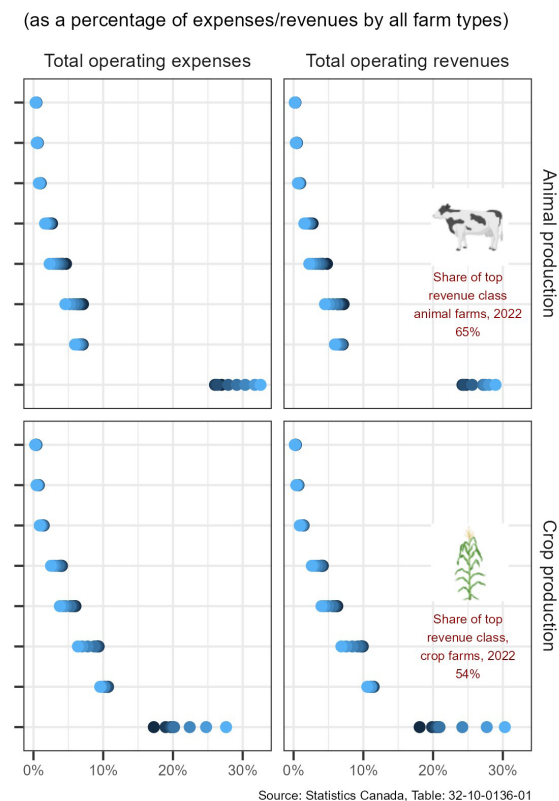


Figure 9: See caption on following page.

Figure 9 (previous page): Farm expenses and revenues by farm type and revenue class. Note: Panel (A) The heat map of the expenses-to-revenues ratio by revenue class (by subpanel), province, and year (from 2015 to 2022). Darker shades indicate lower expense-to-revenue ratios (higher financial profitability), and lighter shades indicate higher ratios (lower financial profitability). For a revenue class-province pair, going from bottom to the top of the map illustrates the changes in expenses-to-revenues ratio over time. Panel (D) The heat map of the expenses-to-revenues ratio by revenue class, year, and farm type (by subpanel). Darker shades indicate lower expense-to-revenue ratios (higher financial profitability), and lighter shades indicate higher ratios (lower financial profitability). For a revenue class-farm type pair, going from left to the right of the map illustrates the changes in expenses-to-revenues ratio over time. Panels (B) and (D) Each dot in the panels corresponds to a year from 2015 to 2022. Lighter shade values correspond to more recent years.

ble about this, and efforts to enhance fruit and vegetable production in Canada could be directly linked to the goal of supporting more sustainable smaller-scale farms and more resilient bioregional agri-food systems.

As noted at the outset of this paper, Canada’s agricultural support policies are framed by notions of “sustainability” (the Sustainable Canadian Agricultural Partnership, Agriculture and Agri-Food Canada, 2025c) and “resilience” (the Resilient Agricultural Landscape Program, Agriculture and Agri-Food Canada, 2025d). There are also programs operating outside Agriculture Canada’s portfolio that are meant to “tackle” or “solve” climate change (the Agricultural Climate Solutions, Agriculture and Agri-Food Canada, 2025e). However, most of these new programs focus on extensive land management practices related to grain, oilseed, and livestock production, such as cover cropping, rotational grazing practices, and even the subsidization of synthetic fertilizer use¹⁶. These are not transformative changes and fall far short of tackling the negative environmental and health implications of Canadian agri-food system as it is currently configured. We argue that there is an urgent need to reorient agricultural production supports in Canada, with improved environmental sustainability, equity, and public health outcomes the overarching objectives that should guide future policies.

Endnotes

¹ Before Canada’s dairy export subsidies were dismantled, they complemented supply management by helping to stabilize domestic supplies and increase domestic market prices—though in this case involving a cost to consumers.

² The quotation is from a concise submission to the World Trade Organization (WTO) by the Canadian delegation dated 29 May 2018 (WTO, 2018).

³ We stress that farmers are not typically the sole beneficiaries of the transfers from taxpayers and consumers because part of the additional income earned through such programs “leaks” to input producers, processors and landowners. One estimate (OECD, 2001) suggests that on average only 25% of a market price support program directly benefits farmers, and in the case of input subsidies this further declines to as low as 17%. Thus, these policies support a range of activities outside the intended beneficiaries.

⁴ These are: consumer support estimate as a percentage of value of production; general services support estimate (GSSE) as a percentage of total support estimate (TSE); producer support estimate (PSE) as percentage of gross farm receipts (GFR); total budgetary support estimate (TBSE) as a percentage of gross domestic product (GDP); total support estimate as a percentage of GDP. We also report (Figure S.1) all the estimates in the numerators as a percentage of farm net operating income (NOI).

⁵ Canola is a Canadian-developed variety of rapeseed and is largely produced for export markets.

⁶ Email communication by the AAFC specialist, dated April 16, 2024

⁷ In the case of flaxseed, even aggregated data on human food and industrial use are unavailable due to data confidentiality (because of concentration in the processing industry), meaning that domestic use data are grossly understated, comprising only the estimates of seed, loss in handling, feed, waste, dockage, and statistical discrepancy.

⁸ According to Gary Berg of the United Soybean Board “animal agriculture consumes 97 percent of U.S. soybean meal” (mostly for chickens, hens and pigs) and “investing in animal agriculture helps grow demand for U.S. soybean farmers” (Smith, 2023). Soybean meal is a protein-rich byproduct of soybean crushing for oil extraction. Aside from being consumed as animal feed it is also used as human food in tofu, soy milk, and meat substitutes, and has industrial uses like adhesives, biodegradable plastics, and biofuels (Agrilinkage, 2023). In the United States, in 2023, 47 percent of domestic soybean supply was crushed, 45 percent was exported, and out of the total domestic disposition 42 percent was for biofuel production (ERS, 2025b; tables 3–5). Soybean disposition in Canada is also dominated by animal feed and exports.

⁹ According to the Animal Nutrition Association of Canada, in 2023 an estimated 29.2 million mt of feed processed by commercial and on-site farm mills were consumed by Canadian livestock, meaning domestic feed processors are almost exclusively producing for the domestic market. Pigs, cattle, and poultry birds accounted for about 97% of that total. While the share that feed

represents in the total cost of livestock production varies across species, it is estimated to be as high as 75 percent in ruminants, which have lower feed conversion ratios (Animal Nutrition Association of Canada, 2025).

¹⁰ The soybean sector in Canada is representative of the logic of the contemporary international trade system, as about 24 percent of total meal produced and 42 percent of total oil produced were exported in 2023 (with China being by far the top destination), while that same year, 434,000 mt of soybeans, 1.1 mt of soy-based meals, and 223,000 mt of soy-based oil were imported.

¹¹ We are only able to use data from 1986 to 2016 because Statistics Canada does not always adjust the revenue data for inflation. The revenue classes we report here are in 2015 constant dollars and are not consistently available from 1976 to 2021. There are nine revenue classes, ranging from “less than 10,000”, which we drop as these farms are likely to be a very heterogeneous group, to farms with revenues “2,000,000 or over.” So, the changes in the number of farms in each revenue class is not due to changes in prices, but due to the expansion of the number of large-size farms.

¹² In the Prairie provinces, for example, it is unlikely that a contemporary farm less than 5,000 acres would be considered

large—a category that is higher than the lower bound for largest area class in Statistics Canada’s reporting system.

¹³ Unfortunately, Statistics Canada does not publish data on holdings by size as a percentage of total holdings. A brief discussion of the ongoing concentration along the agricultural supply chain is included in the supplementary materials.

¹⁴ Farm consolidation is increasingly influenced by the growing investments made by large-scale financial institutions in farmland and agricultural production (Stephens, Clapp, & Isakson, 2022; GRAIN, 2024). A brief discussion of the ongoing concentration along the agricultural supply chain is included in the supplementary materials.

¹⁵ The findings for a more narrowly defined total “direct” payments are similar: the share of the top 25 percent farms is over 50 percent and the share of the bottom 25 percent farms is less than 15 percent (Moreddu, 2011, figures 3.1 and 3.2).

¹⁶ In 2023, for example, the On-Farm Climate Action Fund (Agriculture and Agri-Food Canada, 2025f) reimbursed farmers impacted by the rising price of synthetic fertilizers.

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References

- Agriculture and Agri-Food Canada (2024). *Canada's dairy industry at a glance*. <https://agriculture.canada.ca/en/sector/animal-industry/canadian-dairy-information-centre/dairy-industry>
- Agriculture and Agri-Food Canada (2025a). *Dairy direct payment program*. <https://agriculture.canada.ca/en/programs/dairy-direct-payment>
- Agriculture and Agri-Food Canada (2025b). *Poultry and egg on-farm investment program*. <https://agriculture.canada.ca/en/programs/poultry-egg-farm-investment>
- Agriculture and Agri-Food Canada (2025c). *Sustainable Canadian agricultural partnership*. <https://agriculture.canada.ca/en/department/initiatives/sustainable-canadian-agricultural-partnership>
- Agriculture and Agri-Food Canada (2025d). *Resilient agricultural landscape program*. <https://www.canada.ca/en/agriculture-agri-food/news/2024/07/resilient-agricultural-landscape-program-ralp.html>
- Agriculture and Agri-Food Canada (2025e). *Agricultural climate solutions*. <https://agriculture.canada.ca/en/environment/climate-change/climate-solutions>
- Agriculture and Agri-Food Canada (2025f). *Agricultural Climate Solutions—On-Farm Climate Action Fund*. <https://agriculture.canada.ca/en/programs/agricultural-climate-solutions-farm-climate-action-fund>
- Animal Nutrition Association of Canada (2025). *Feed industry: Canadian livestock feed consumption*. <https://www.anacan.org/feed-industry/public-resources/canadian-livestock-feed-consumption/>
- Batini, N. (Ed.). (2021). *The economics of sustainable food: Smart policies for health and the planet*. Island Press.
- Agrilinkage (2023, April 10). *The many uses of soybean meal: From animal feed to human food and industrial applications*. <https://www.agrilinkage.com/post/soybean-meal-uses>
- Canadian Oilseed Processors Association (2025). *Crush & oil & meal production*. <https://copacanada.com/supply-disposition/>
- Cardwell, R., Lawley, C. & Xiang, D. (2015). Milked and feathered: The regressive welfare effects of Canada's supply management regime. *Canadian Public Policy* 41(1), 1–14. <https://doi.org/10.3138/cpp.2013-062>
- Cash, S. B., Goddard, E. W., & Lerohl, M. (2006). Canadian health and food: The links between policy, consumers, and industry. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, 54(4), 605–629.
- Charlebois, B. (2025, April 07). With 8.7 million birds dead, B.C. farmers assess avian flu toll, and worry about what's next. CBC. <https://www.cbc.ca/news/canada/british-columbia/bc-avian-flu-toll-1.7503297>
- Damania, R., Balseca, E., de Fontaubert, C., Gill, J., Kim, K., Rentschler, J., Russ, J., & Zaveri, E. 2023. *Detox development: Repurposing environmentally harmful subsidies*. The World Bank. <http://hdl.handle.net/10986/39423>
- Elizabeth, L., Machado, P., Zinöcker, M., Baker, P., & Lawrence, M. (2020). Ultra-processed foods and health outcomes: a narrative review. *Nutrients*, 12(7), 1955.
- ERS (2025a). *Corn and other feed grains*. U.S. Department of Agriculture, Economic Research Service. <https://www.ers.usda.gov/topics/crops/corn-and-other-feed-grains>
- ERS (2025b). *Oil crops yearbook*. U.S. Department of Agriculture, Economic Research Service. <https://www.ers.usda.gov/data-products/oil-crops-yearbook>
- FAO, UNDP and UNEP. (2021). *A multi-billion-dollar opportunity—Repurposing agricultural support to transform food systems*. Rome, FAO. <https://doi.org/10.4060/cb6562en>
- FAO (2025). *FAOSTAT: Production*. <https://www.fao.org/faostat/en/#data>
- Farm Credit Canada, FCC (2025, May 26). *Canadian farmland affordability trending down*. <https://www.fcc-fac.ca/en/knowledge/economics/canadian-farmland-affordability>
- Gautam, M., Laborde Debucquet, D., Mamun, A., Martin, W., Piñeiro, V., & Vos, R. (2022). *Repurposing agricultural policies and support: options to transform agriculture and food systems to better serve the health of people, economies, and the planet*. The World Bank and IFPRI. <http://hdl.handle.net/10986/36875>
- GRAIN (2024, February 15). *The Davos-isation of the climate COP*. <https://grain.org/e/7104>
- Government of Canada (2025). *Canada's Food Guide*. <https://food-guide.canada.ca/en/>
- IPCC. (2019). *Special report: climate change and land*. <https://www.ipcc.ch/srccl/>
- IPCC (2022). *Climate change 2022: Impacts, adaptation and vulnerability. IPCC Sixth Assessment Report*. <https://www.ipcc.ch/report/ar6/wg2/>
- Kevany, K., Nye, H., Mullinix, M.K., & Iscan, T.B. (2024). Canada's agricultural policies are falling short of health and sus-

- tainability goals. *The Conversation*. <https://theconversation.com/canadas-agricultural-policies-are-falling-short-of-health-and-sustainability-goals-239560>
- MacRae, R. (2011). A joined-up food policy for Canada. *Journal of Hunger & Environmental Nutrition*, 6(4), 424–457.
- Moreddu, C. (2011). Distribution of support and income in agriculture. *OECD Food, Agriculture and Fisheries Papers*, No. 46, OECD Publishing, Paris. <https://doi.org/10.1787/5kgch21wkmbx-en>
- Moss, M. (2013). Salt, sugar, and fat: How the food giants hooked us (New York: Random House) NFU (2024). National Farmers Union submission to Senate Foreign Affairs and International Trade Committee regarding Bill C-282. <https://www.nfu.ca/policymatters/>
- OECD (1999). *Distributional effects of agricultural support in selected OECD countries*. OECD, Directorate for Food, Agriculture and Fisheries Committee for Agriculture. AGR/CA(99)8/FINAL. [https://one.oecd.org/document/AGR/CA\(99\)8/FINAL/en/pdf](https://one.oecd.org/document/AGR/CA(99)8/FINAL/en/pdf)
- OECD (2002). *The incidence and income transfer efficiency of farm support estimates*. OECD, Directorate for Food, Agriculture and Fisheries Committee for Agriculture. AGR/CA/APM(2001)24. [https://one.oecd.org/document/AGR/CA/APM\(2001\)24/FINAL/en/pdf](https://one.oecd.org/document/AGR/CA/APM(2001)24/FINAL/en/pdf)
- OECD (2023). *Agricultural policy monitoring and evaluation 2023: Adapting agriculture to climate change*. OECD Publishing, Paris. <https://doi.org/10.1787/b14de474-en>
- OECD (2024). *Agricultural policy monitoring and evaluation 2024: Innovation for sustainable productivity growth*. OECD Publishing, Paris. <https://doi.org/10.1787/74da57ed-en>
- OECD (2025). *OECD Data Explorer: Agricultural policy monitoring and evaluation*. <https://data-explorer.oecd.org/>
- Physicians Committee for Responsible Medicine (2025). *Good nutrition: The power of a plant-based diet for good health*. <https://www.pcrm.org/good-nutrition>
- Poore, J. & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360(6392), 987–992. <https://www.science.org/doi/10.1126/science.aag0216>
- Qualman, D. and the National Farmers Union (2019). *Tackling the farm crisis and the climate crisis: A transformative strategy for Canadian farms and food systems, discussion document* (Saskatoon: NFU). <https://www.nfu.ca/wp-content/uploads/2020/01/Tackling-the-Farm-Crisis-and-the-Climate-Crisis-NFU-2019.pdf>
- Schmitz, A. (1983). Supply management in Canadian agriculture: An assessment of the economic effects. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, 31, 135–152. <https://doi.org/10.1111/j.1744-7976.1983.tb01193.x>
- Smith, R. (2023, February 3). Animal ag continues to be top U.S. soy consumer. Iowa Agribusiness Radio Network. <https://iowaagribusinessradionetwork.com/animal-ag-continues-to-be-top-u-s-soy-consumer/>
- Soy Canada (2024). *At a glance: Canadian soybean industry*. <https://soycanada.ca/industry/statistics/at-a-glance/>
- Springmann, M., Spajic, L., Clark, M.A., Poore, J., Herforth, A., Webb, P., Rayner, M., Scarborough, P. (2020). The healthiness and sustainability of national and global food based dietary guidelines: modelling study. *BMJ*, 370:m2322. <https://pubmed.ncbi.nlm.nih.gov/32669369/>
- Statistics Canada (2022). *Farms classified by total farm area, Census of Agriculture historical data*. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210015601>
- Statistics Canada (2025). *Farm debt outstanding, classified by lender*. Retrieved 16 July 2025, from <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210005101>
- Statistics Canada (2026). *Balance sheet of the agricultural sector as at December 31st*. Table: 32-10-0056-01. <https://doi.org/10.25318/3210005601-eng>
- Stephens, P., Clapp, J. & Isakson, J. (2023). Financialisation and sustainable diets. In K. Kevany & P. Prosperi (Eds.), *Routledge Handbook of Sustainable Diets* (Chapter 37). Routledge. <https://doi.org/10.4324/9781003174417>
- The Nutrition Source (2025). *Healthy eating plate*. Harvard T.H. Chan School of Public Health, <https://nutritionsource.hsph.harvard.edu/>
- Weis, T. (2025). Land, industrial livestock, and interspecies relations: The pursuit of scale and the deceits of industrial productivity. In S. M. Borras & J. C. Franco (Eds.), *The Oxford Handbook of Land Politics*. Oxford University Press, pp. 323–50.
- Willett, W., Rockström J., Loken B., Springmann, M., Lang, T., et al. (2019) Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393, 447–492. <https://www.thelancet.com/commissions-do/eat>
- WTO (2018, May 29). Committee on agriculture. G/AG/N/CAN/121. <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/G/AG/NCAN121.pdf>
- Yang, Y., Tilman, D., Jin, Z., Smith, P., Barrett, C., et al. (2024). Climate change exacerbates the environmental impacts of agriculture. *Science* 385, eadn3747. <https://www.science.org/doi/10.1126/science.adn3747>

Appendices

See following pages for Supplementary Material for:

“What do Canadian agricultural policies support?: The need
toprioritize environment, equity, and health”

S.1 Data sources and variables

S.1.1 OECD’s main agricultural support indicators: definitions and examples

OECD (2023) uses a number of indicators that track agricultural support programs in a way that is comparable over time and across countries.

The **producer support estimate** (PSE) is the monetary value of transfers from consumers and taxpayers to agricultural producers due to policies that provide support to agriculture. In Canada, these transfers arise from supply managed production systems, import restrictions, or direct income transfers to farmers.

The **consumer support estimate** (CSE) is the monetary value of transfers to consumers of agricultural commodities. Food subsidies that reduce the cost of agricultural commodity purchases by consumers are included here.

The **general services support estimate** (GSSE) is the monetary value of transfers through privately or publicly-provided services and institutions that primarily support the agricultural sector and that do not involve any direct payments to individual producers or consumers. In Canada, General Services Support is a collection of several programs available to producers and agri-businesses. At the time of the writing, there were a number of [Agricultural Programs and Services](#) (accessed 13 March 2024). For example, two programs listed therein relate to industry “promotion”:

- AgriCommunication Program (federal): non-payable contributions up to \$8 million must support “activities which increase appreciation and pride in the contributions of farmers and the food industry and enhance public trust. The activities will help strengthen public trust about the origin of the food Canadians eat and how it is produced.”
- Agri-Food Trade Services (federal): support the “Canadian food industry and businesses reach international markets.”

Producer, consumer and general services support estimates are annual, gross measures (reverse transfers are not netted out), calculated at the farm gate level (except for GSSE), and can be wide-ranging in terms of their impacts on farm production or income. Whereas producer and consumer support transfers directly affect producer receipts or costs to producers and consumers, general services support transfers do not. OECD (2016) provides a detailed discussion of each of these concepts.

S.1.2 Statistics Canada’s Net Program Payments: examples

We use net program payments reported by Statistics Canada to complement the OECD data and to evaluate the distribution of agricultural support programs across farm types. According to Statistics Canada (personal correspondence, email dated 8 March 2024) the “Revenue - Program payments and insurance proceeds” variable is the sum of the following components:

- Program payments revenues
- Crop insurance

- NISA payments
- Disaster Assistance Program payments
- AgriStability and AgriInvest benefit
- Production insurance premium benefit
- Stabilization payments
- Rebates
- Insurance proceeds

[AgriStability](#) is within the suite of programs that are intended as an income insurance against substantial declines in farming income margins as a result of crop failure, increased costs and changes in market prices. Program payments are linked to a producer-specific historically calculated reference revenues-to-expenses margin and are triggered when the current year’s margin drops below 30 percent of the reference margin. The federally funded [Advance Payments Program](#) pays, for loans up to \$1,000,000 for eligible products, the interest on the first \$100,000 (\$250,000 for 2024) of the loan with a repayment period of up to 18 months for most commodities and up to 24 months for cattle and bison. [Dairy Direct Payment Program](#), intended to support dairy producers who will be affected by the Canada-United States-Mexico Agreement that gave market access to dairy imports earmarked \$1.2 billion over 6 years with \$300 million in 2023-2024, so that “an eligible producer with 80 cows could receive around \$26,500 in 2023-24” (accessed 13 March 2024).

S.1.3 Feed, waste, and dockage

Accounting for dispositions as feed, waste, and dockage is remarkably difficult. In Canada, these dispositions publicly reported as a single item include a residual or an error term. The reason is that this item is based on the following accounting identity:

$$\text{Supply}_t = \text{Use}_t.$$

The above expression holds if independent estimates of supply and use were exactly equal to each other, which is never the case in practice. Due to these statistical discrepancies, it is best to express this relationship as

$$\text{Supply}_t = \text{Use}_t + \text{Statistical discrepancy}_t. \quad (1)$$

Supply over a period t consists of

$$\begin{aligned} \text{Supply}_t &:= \text{Domestic production}_t + \text{Imports}_t - \Delta \text{Stocks}_t \\ &Y_t + M_t - \Delta S_t \end{aligned}$$

where $\Delta S_t := S_t - S_{t-1}$ corresponds to a change in stocks. Use_t consists of

$$Use_t := \underbrace{\text{Domestic use}_t}_{\text{food, industrial, seed, loss, fwd}} + \text{Exports}_t \\ C_t + X_t.$$

In the above expression fwd stands for Feed, Waste and Dockage. AAFC calculates fwd as the difference between Supply and the other components of Use

$$\underbrace{Y_t + M_t - \Delta S_t}_{\text{Supply}} - (\text{Food} + \text{Industrial} + \text{Seed} + \text{Loss})_t - X_t = \underbrace{\text{fwd}_t + \text{Statistical discrepancy}_t}_{\text{“Feed, Waste, Dockage”}}$$

Thus, what the AAFC publications report as “Feed, Waste, Dockage” include statistical discrepancy. Since this discrepancy can be large and can be either negative or positive, it is not unusual to find a negative number reported for Feed, Waste, Dockage. According to expert opinion (email communication by Lina Gordon dated April 16, 2024), a negative number usually indicates an error in production estimate, in part because production estimates are based on Statistic Canada surveys, which are subject to estimation error. On-farm consumption or intra-provincial transfers of grains are also missing. In the case of grain exports to the United States, the data are based on the grain shipped to the United States by licensed companies, but those shipped by unlicensed grain dealers or exported by container are not always accounted for. All such factors contribute the size and direction of the statistical discrepancy. In general, reports by Statistics Canada acknowledge the pervasiveness of “data gaps and the fragmentation of information on food supply chains” (Toor & Hamit-Haggar, 2021).

S.2 Canadian agricultural production support

S.2.1 Total support estimates

(OECD, 2023) data on agricultural production support policies start in 1986 (Figure S.1). Over this time, there has been a decline in Canada’s total agricultural production support in relation to gross farm receipts (GFR) and gross domestic product (GDP). Within the total support estimate (TSE), there has been a relative increase in general services support (GSS), which is a broad category that does not distinguish between the beneficiaries of different programs by farm type, like livestock and vegetable farms. Also, per capita agricultural total support estimates (in constant prices) have declined significantly since 1986, although they remained relatively constant over the period 2013–2022 (Figures S.1 and S.2). The same is true for the producer single commodity transfers (PSCT), which are targeted (Figure S.2). While PSCT for grains, pulses and oilseeds has effectively remained constant in per capita terms since the mid-1990s, the PSCT for animal products more recently (around 2010) started declining in per capita terms. There has thus been a tendency for the policies to maintain a targeted level of financial support to Canadian agriculture adjusted for GDP, inflation, and population

growth.

Another way to assess the importance of Canada's agricultural production support programs is to weigh estimates of their size in relation to the net operating income of farmers, using data that have been released by Statistics Canada since 2015 based on administrative tax records.¹ Over this time, roughly half of the net operating income of Canadian farmers is estimated to have come from total agricultural production support, including the combination of direct transfers from governments (35 percent) and indirect supply management-related transfers from consumers (15 percent) (Figure S.1B). Thus, while the costs of agricultural support programs to both governments and consumers have declined in relative terms, they continue to have a major place in the net operating incomes of farmers and in perpetuating the prevailing agri-food system in Canada.²

Statistics Canada data on net program payments to farm operators provide a complementary but narrower assessment of the total support given to agricultural production than that of the OECD, because they do not incorporate estimates of transfers from consumers to producers (S.1.2). It is also notable that several payments in this assessment have insurance components where farmers are required to pay a premium. In 2015, the net program payments in the Statistics Canada assessment were only about one-third of what the OECD defined as producer single commodity transfers and one sixth of the OECD's estimate of total agricultural production support (Figure S.1D).³ However, this subsequently changed dramatically: by 2022, net program payments exceeded the OECD estimate of producer single commodity transfers, and constituted nearly half of the OECD's estimate of total agricultural production support. In other words, the policies associated with the net program payments are becoming the most significant way that agricultural production in Canada is subsidized.

S.2.2 Concentration: upstream and downstream of farms

Industrial agri-food systems are often visualized as a sort of hourglass, with a very small number of corporations controlling inputs and outputs located between a large number of farmers and a much larger number of consumers. The degree to which farming has been consolidated pales before the extent of consolidation that has taken place across the rest of agri-food supply chains, with economically significant implications for concentration and oligopolistic power. As Qualman and the National Farmers Union (2019) emphasize, most of the total agricultural revenue in Canada flows to a few corporations that control farm machinery, fertilizers, chemicals, seeds, fuels, data, credit, and other materials and services, with as little as 5 percent ending up in the hands of farmers.

The degree of concentration in upstream and downstream of Canadian farms is remarkable. Cur-

¹The limitations of this time series data are compounded by restrictions and programs related to COVID-19 and the supply-chain issues in its aftermath.

²There is cyclical variation in commodity prices. For instance, from 2003 to 2024, crude oil prices saw the highest increase, followed by fertilizer prices, food prices (farm gate), and agricultural raw materials (IMF, 2025). Given the rising input costs, including fuel, fertilizer, chemicals, and seeds, real net farm incomes were not necessarily increasing. It is also important to note that the prices received by farmers at the farm gate deviate considerably from the retail prices paid by consumers, with food processors and retailers controlling a large share of the total value in commodity chains (NFU, 2025).

³Over the period from 2019 to 2022, total NPP averaged \$3.73 billion or 1.5% of average GDP over the same period (Figure S.3A).

rently, about 95% of all beef processing capacity in Canada is owned by just two companies: Cargill and JBS (Nixon & Keldon, 2024).⁴ Seeds of the primary grains (corn) and oilseeds (canola and soybean) that feed beef cattle and other livestock are supplied just by four companies (Bayer-Monsanto, BASF, Corteva, Chem-China-Syngenta). Three firms (EW Group, Hendrix Genetics, and Tyson Foods) effectively control the hatchlings for poultry. Hog processing is slightly less concentrated, with two processors (Maple Leaf Foods and Olymel) accounting for 50% of the market, though the degree of concentration is much higher in Quebec, which contains a significant share of Canadian pigs. As indicated above, a large fraction of total grain produced in Canada is sold in international markets, and a striking 70% of global grain trade is handled by merely four corporations (ADM, Bunge, Cargill and Louis Dreyfus).

The concentration at every turn in the industrial agri-food supply chain in Canada has increased over time, enabled by an interpretation of the anti-trust legislation, by the Competition Bureau Canada (Nixon & Keldon, 2024), that permits high degrees of market concentration and pricing power by a few corporations. Given how much of the total value in agriculture is contained in both input and output supply chains, the taxpayer and consumer transfers associated with Canada's agricultural production support policies should therefore also be understood to be flowing towards the oligopolies.⁵

S.2.3 The polarization of farm incomes

Family farm income Net family income is another significant consideration that also relates to farm debt, net worth, and profitability. Most farm families have been compelled to diversify income through off-farm employment. According to Statistics Canada (2026) in 2023, nearly half of the average income per farm family (\$116,778 of \$216,021) came from off-farm sources, and more than one-fifth of the average net operating income (\$20,258 of \$99,233) came from net program payments. With an average capital cost allowance (amortization of physical assets due to depreciation) amounting to \$54,002, an average family farm had a net market income (after depreciation) of slightly under \$25,000.

Of course, these averages hide significant variations in net farm income across Canada, and the great differences in scale and between commodities. Overall, the picture that emerges from family farm income accounts is consistent with our analysis based on expenses and revenues: while there are a relatively small number of large-scale farms that earn high incomes and are consistently profitable, many small- and medium-scale family farms face significant economic risks and vulnerabilities. This picture also reinforces our conclusion that, on average, the larger the size of a farm operation, the more net program payments they receive.

⁴All the concentration data reported herein come from the excellent study by the Canadian Anti-Monopoly Project (Nixon & Keldon, 2024). It is notable to contrast this with a recent Statistics Canada publication on the beef supply chain (Toor & Hamit-Haggar, 2021), which makes no reference to concentration in the beef supply chain. For a recent study on global concentration in food and farming, see GRAIN (2025).

⁵Estimating the fraction of transfers captured by these oligopolies is beyond the scope of this study. However, about 60% of the farmers express that increased concentration along the supply chain had a negative impact on their incomes (Nixon & Keldon, 2024), with, as we showed above, transfers from taxpayers and consumers being a significant component.

Livestock and crop farm incomes Given the limits of available data, it is difficult to extend our analysis of the polarization of farm incomes to differences across farm types within livestock and crop production. Nevertheless, it is possible to examine some broad patterns, drawing on 2021 data for six types of animal farming (beef cattle, dairy cattle, pigmeat, poultry meat and egg, sheep and goat, and other animals), and five types of crop farming (fruit and tree nut, greenhouse, oilseed and grain, vegetable and melon, and other crops) and considering them across six income classes (Figure S.6A). Among livestock operations, supply managed poultry and egg production had the highest share of farms within the top two income classes (\$100,000 or more). Fruit, tree-nut, greenhouse, vegetable, and melon operators also tend to be those with relatively high incomes, but their numbers are relatively small (Figure S.6B–C). In general, crop production is associated with relatively higher incomes per farm and a relatively higher share of farms within the medium and top operator income classes, and there are similar financial income profiles and distributions across the different crop specializations.

S.3 Supplementary figures and tables

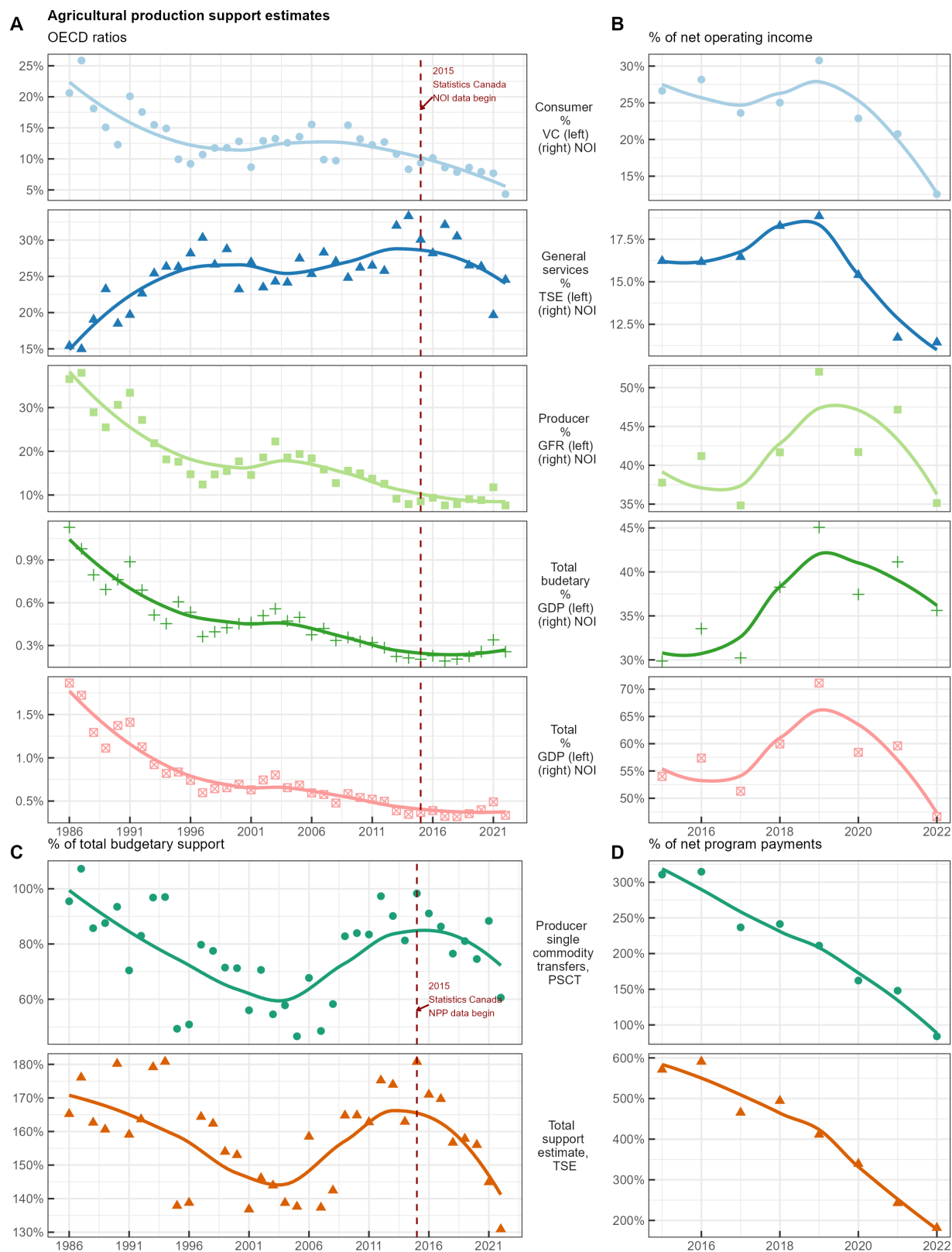


Figure S.1: OECD agricultural production support indicators

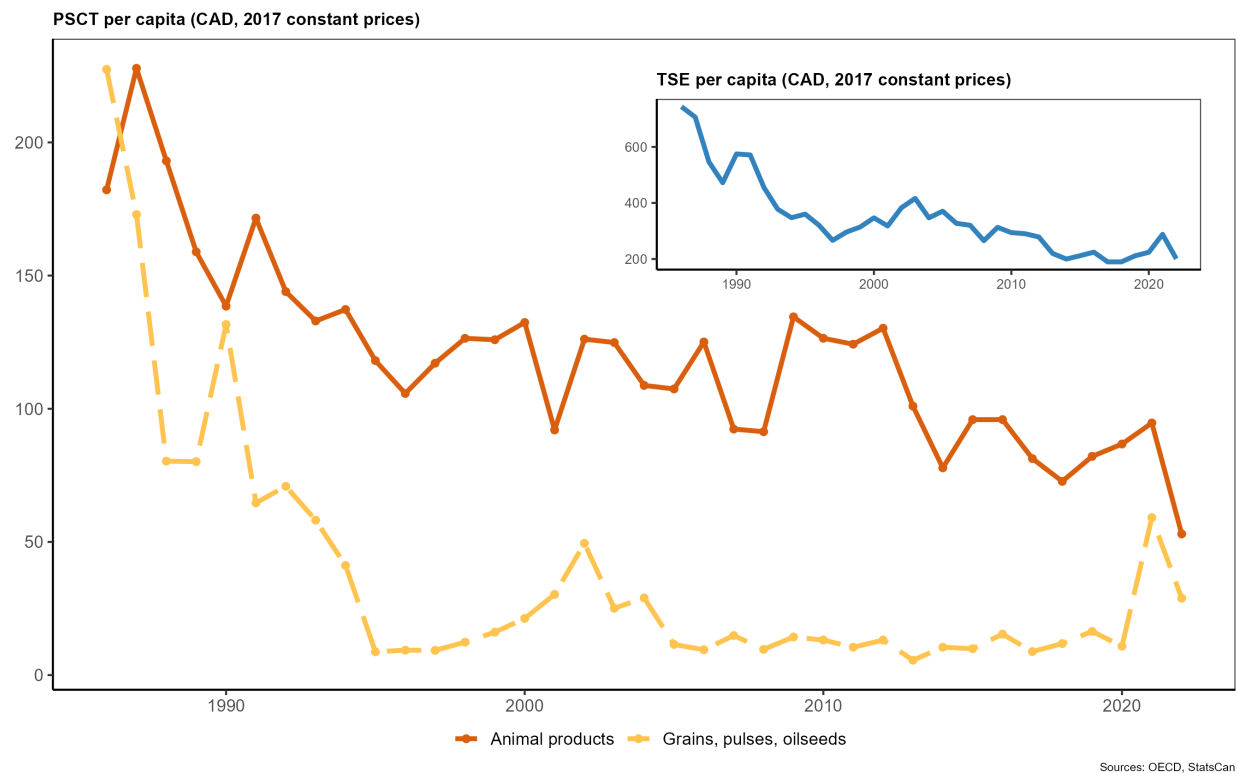


Figure S.2: Agricultural support estimates

Notes: TSE, total support estimate. PSCT, producer single commodity transfers. TSE include program payments that do not necessarily target specific commodities.

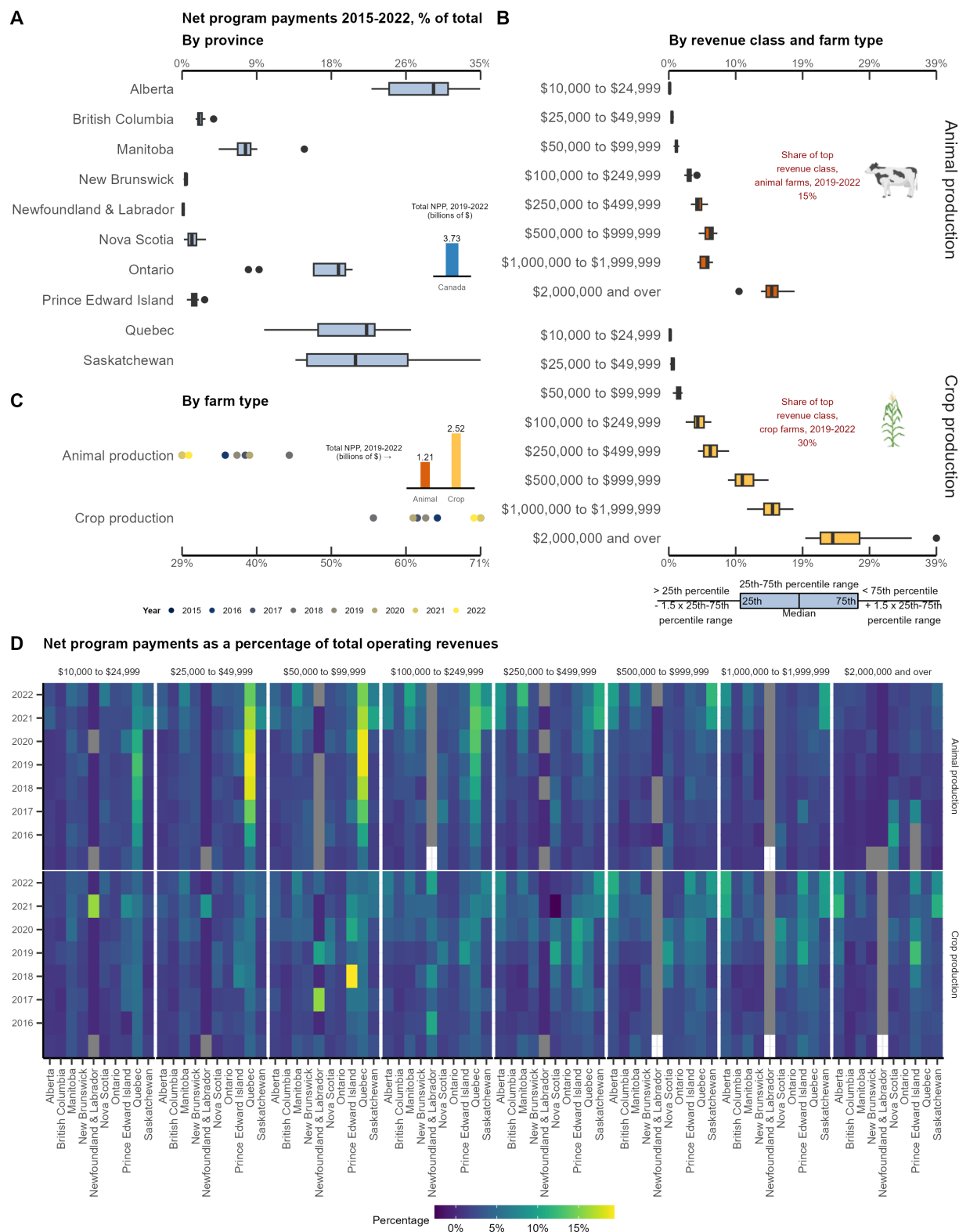


Figure S.3: Net program payments

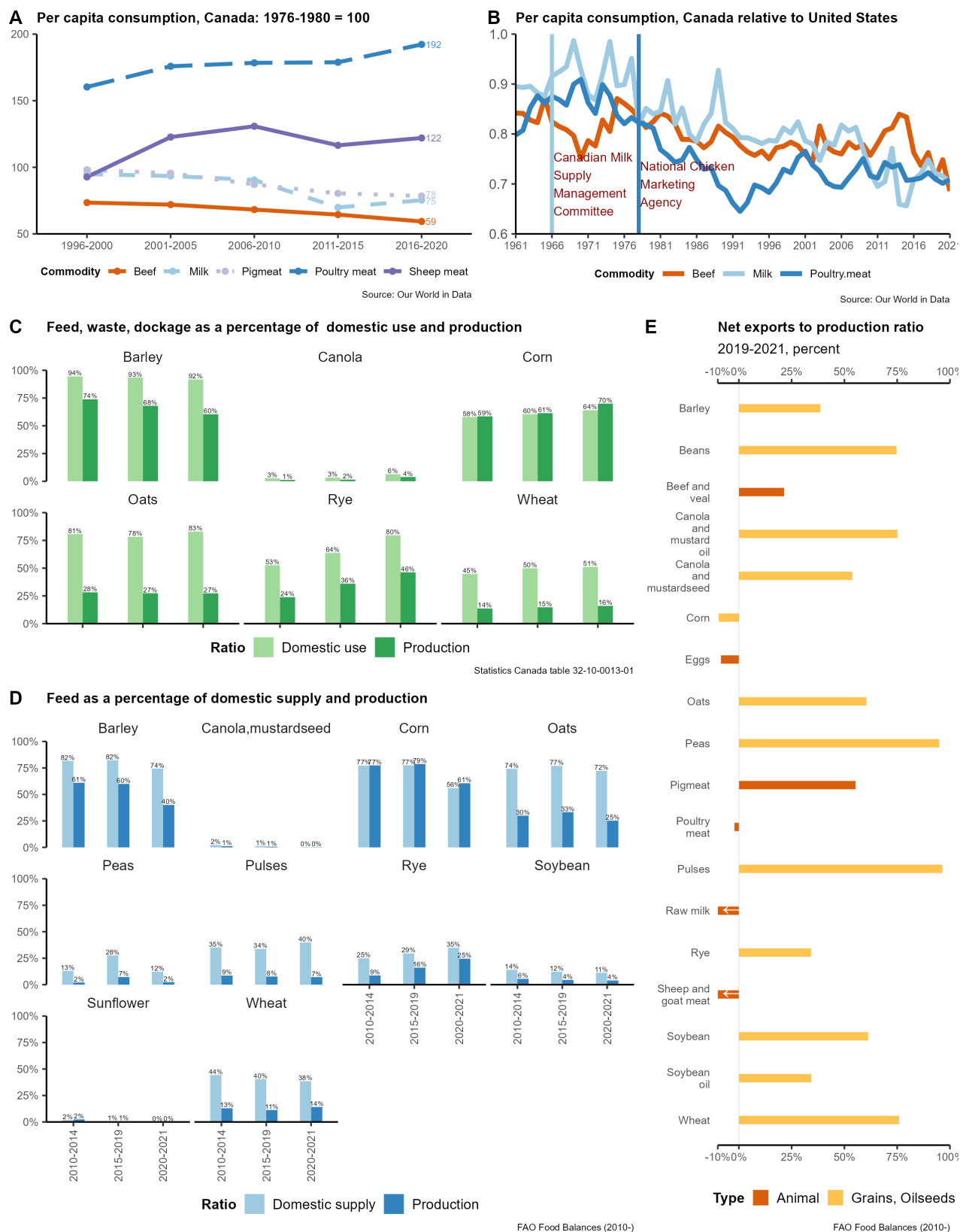


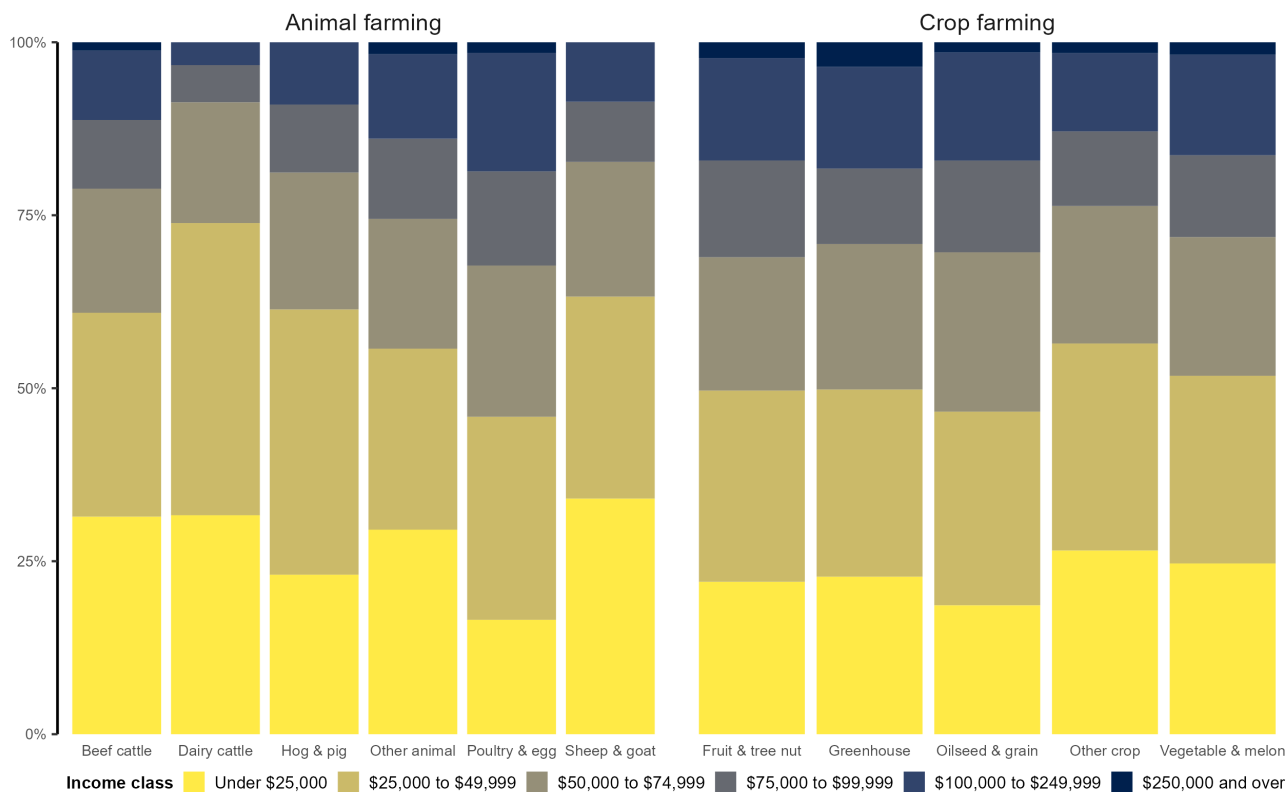
Figure S.4: Consumption and disposition of animal products and crops



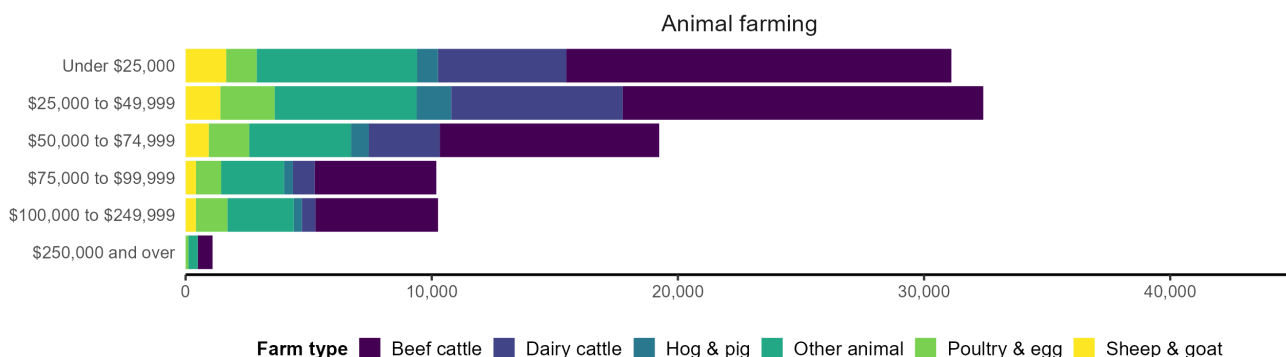
a) ThePowerPlate.org by the Physicians Committee for Responsible Medicine. b) Harvard T.H. Chan School of Public Health, The Nutrition Source. c) Willett et al. (2019), *EAT–Lancet Commission on healthy diets from sustainable food systems*. d) Government of Canada.

Figure S.5: Published healthy diet plate guidelines

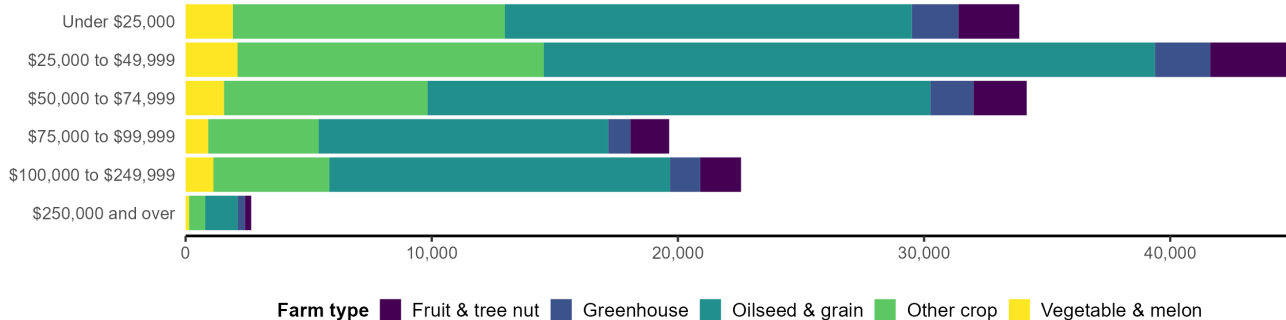
A Farms classified by operator income class, shares by farm type, 2021



B Number of farms classified by farm type and operator income class, 2021



C Farms classified by operator income class, shares by farm type, 2021



Source: Statistics Canada, Table: 32-10-0400-01

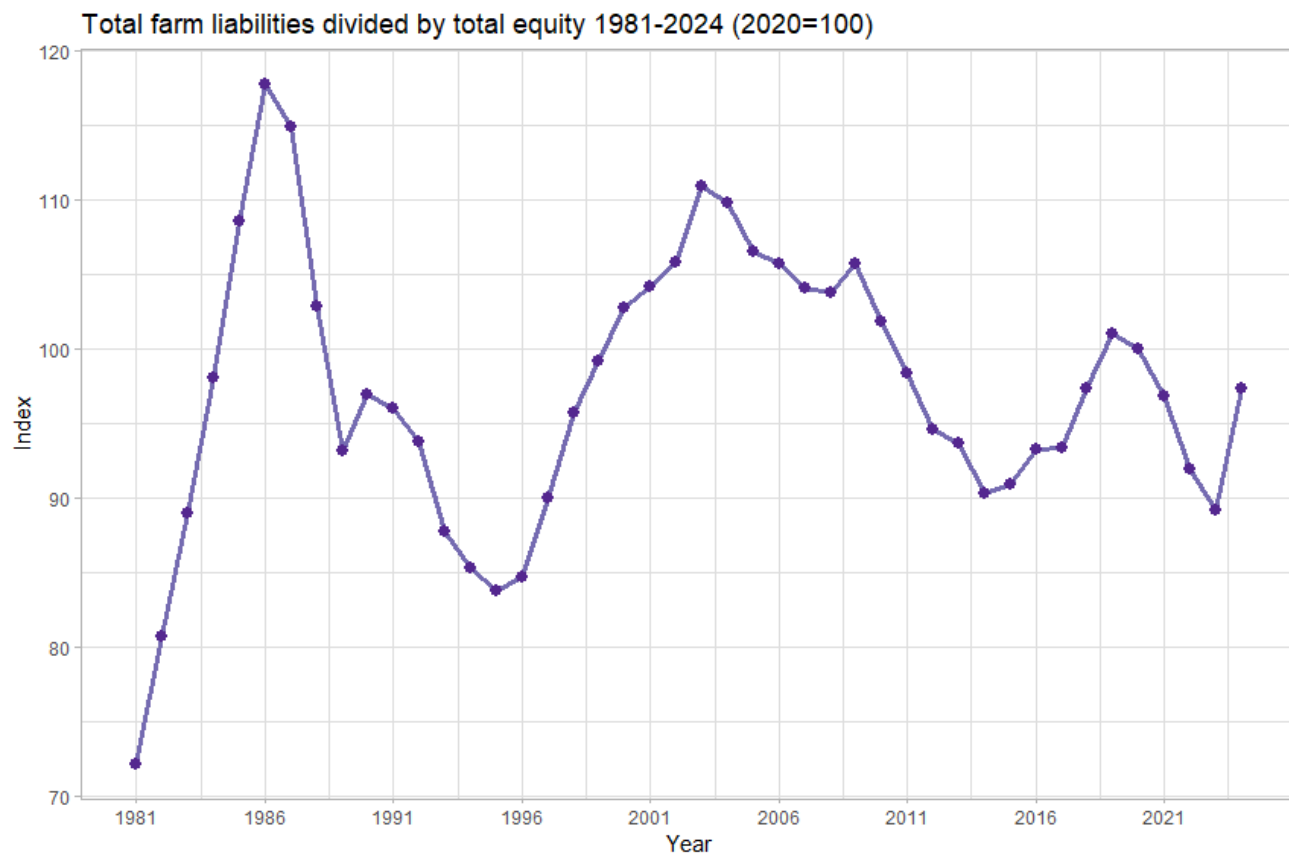


Figure S.7: Farm debt to equity ratio

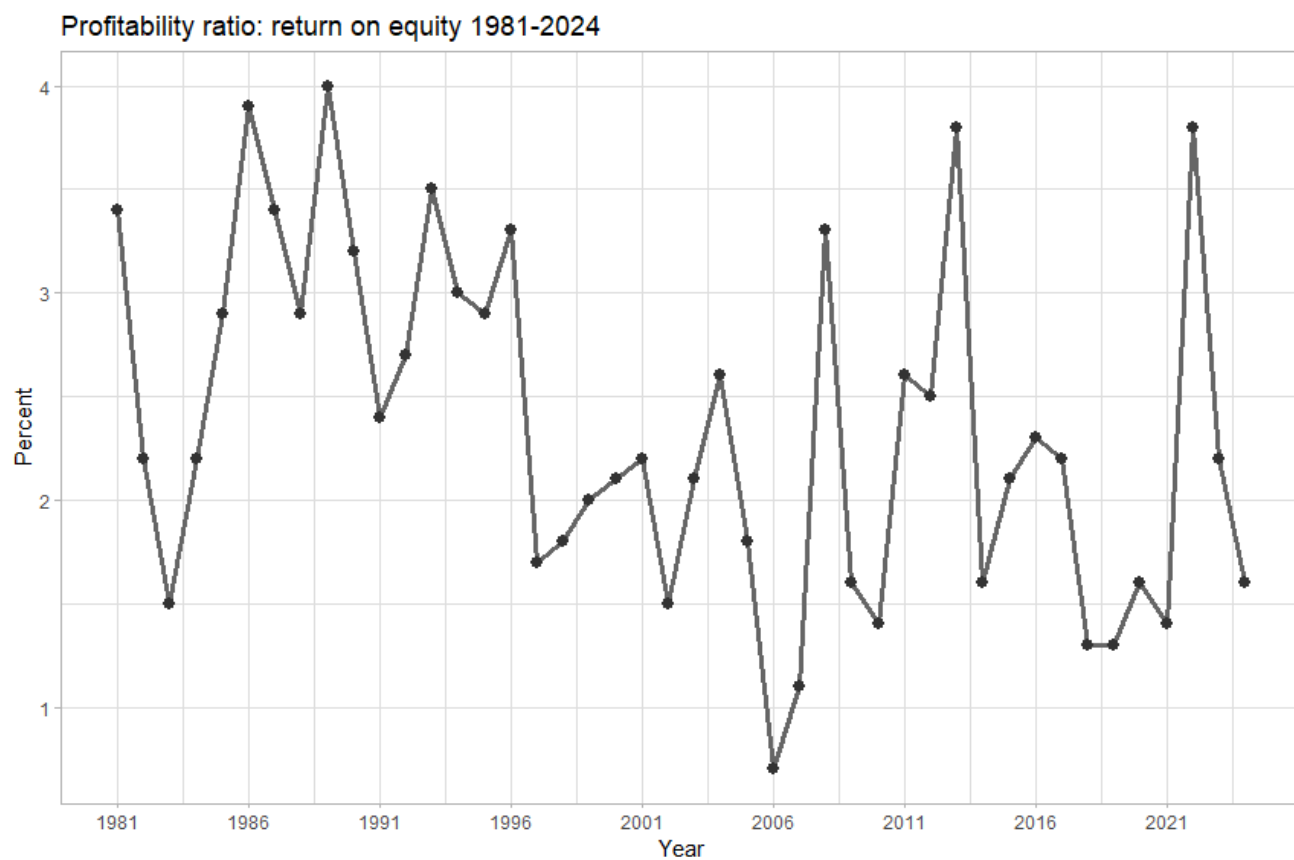


Figure S.8: Farm sector rate of return on equity

S.4 Notes and calculations

Population. Statistics Canada. [Table 17-10-0005-01](#) Population estimates on July 1, by age and gender.

Gross domestic product. Statistics Canada. [Table 36-10-0222-01](#) Gross domestic product, expenditure-based, provincial and territorial, annual ($\times 1,000,000$), at market prices.

NPP as a percent of GDP. Over the period from 2019 to 2022, Canadian GDP at market prices averaged CAD 2,476 billion.



Research Article

Corporate land grabs: Capitalist accumulation of farmland in eastern Ontario and the limits of the financialization hypothesis

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Abstract

This paper argues that some recent examples of land grabbing in Canada are the result of capitalist accumulation by large-scale corporate farms. It details the findings and analysis of a farmland ownership survey of Eastern Ontario, between 2000 and 2017. The study hypothesized that farmland investment firms were driving farmland consolidation in the area, as seen in one comparable study (Desmarais et al. 2015). The land title survey, however, showed a relatively low amount of farmland consolidation by financial firms. It also identified that large-scale, family-owned corporate farms were responsible for the majority of farmland consolidation. The study also included interviews with farmers and farmland investors, which revealed that a handful of corporate farms succeeded in amassing large holdings of farmland through gradual capitalist accumulation of competing farms, assisted by differ-

ential access to market protection. The paper focusses on the inability of the farmland investment firms Walton International and Bonnefield Financial to accumulate any significant amount of farmland in the area. It identifies regulatory and market barriers to farmland financialization, including: land use zoning bylaws that protect prime agricultural areas and the contradictions between farmland values for farming and development. The study's findings show a different set of landed elites and political-economic processes involved in farmland consolidation than the financialization explanation documented in other similar studies. This suggests that the farmland grab phenomena in Canada is also based on land consolidation practices inherent to capitalist agriculture, rather than simply the specific political-economic imperatives of financial capital.

Keywords: farmland, land grabbing, financialization, corporate farms, capitalist accumulation

Résumé

Cet article soutient que certains cas récents d'accaparement des terres au Canada procèdent de l'accumulation capitaliste par de grandes sociétés agricoles. Y sont présentés les résultats et

leur analyse d'une enquête sur la propriété des terres agricoles de l'est de l'Ontario entre 2000 et 2017. L'étude faisait l'hypothèse que des sociétés d'investissement étaient à la source

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d'une concentration foncière dans la région, comme le montre une étude comparable (Desmarais et al., 2015). Néanmoins, l'enquête sur les titres de propriété a révélé que la concentration foncière agricole par des firmes financières y était relativement faible. Il en est plutôt ressorti que des sociétés agricoles familiales à échelle industrielle étaient les principales responsables de la concentration foncière. L'étude comprenait aussi des entretiens avec des personnes agricultrices et des investisseurs du secteur agricole qui ont révélé qu'une poignée de sociétés agricoles ont réussi à acquérir de vastes terres grâce à l'accumulation capitaliste progressive de fermes concurrentes, favorisée par un accès différencié à la protection du marché. L'article se penche sur l'impossibilité, pour les firmes d'investissement du secteur agricole Walton International and Bonnefield Financial,

d'accumuler une quantité importante de terres agricoles dans la région. Il identifie des obstacles réglementaires et commerciaux à la financiarisation, notamment des règlements de zonage sur l'usage des terres qui protègent les principales zones agricoles, et aborde les contradictions entre la valeur accordée aux terres agricoles selon qu'on les destine à l'agriculture ou au développement. Les conclusions de l'étude montrent un ensemble d'élites foncières et de processus économico-politiques en jeu dans la concentration foncière qui diffèrent des explications financières documentées dans des études semblables. Cela suggère que le phénomène d'accaparement des terres au Canada n'est pas seulement basé sur les impératifs économico-politiques du capital financier, mais aussi sur des pratiques inhérentes à l'agriculture capitaliste.

Mots-clés : terres agricoles, accaparement des terres, financiarisation, sociétés agricoles, accumulation capitaliste

Introduction

This paper details the findings of a farmland title survey conducted to investigate the magnitude of, and actors involved in, land grabbing¹ in eastern Ontario between 2000 and 2017. The study sought to understand if farmland grabbing in the region was consistent with the broader trend of financial investors buying large amounts of farmland in other parts of Canada. It identified a similar trend in farmland consolidation consistent with GRAIN's (2008) definition of land grabbing. The study, however, discovered a different set of actors than those involved in other Canadian studies: large-scale corporate farms. It identified two farmland investment firms operating in the region, Walton International and Bonnefield Financial, who struggled to acquire farmland in the region. The farmland they accumulated paled in comparison to the land holdings amassed by corporate farms beginning in the 1990s. This paper therefore argues that there are limits to the financialization hypothesis to explain farmland grabbing in Canada. It suggests that farmland grabbing, in some regions, can also be driven by processes of capitalist accumulation involving large-scale corporate farms. This finding is important because it demonstrates that farmland grab-

bing is a phenomenon rooted in capitalist agriculture itself, and not exclusively driven by the imperatives of financial actors reacting to economic crises. It also contributes some clarity to the theoretical discussion of the financialization hypothesis by demonstrating a case of land grabbing that is not caused by financialization as defined in the Canadian land grab literature. It offers capitalist accumulation as an alternative explanation for comparison to further hone the concept of farmland grabbing.

Research in the fields of agrarian political economy and critical food studies have dedicated a great deal of attention to the land grab phenomenon over the last two decades (Friedmann, 2015; Akram-Lodhi, 2015). The leading theory in this literature explaining the phenomenon is the financialization hypothesis drawn from world systems and regulation theory approaches to critical political economy (French et al., 2011; Bernstein, 2010; Friedmann and McMichael, 1989). Much of the literature on contemporary land grabs argues that the global capitalist class is going through a crisis of financial overaccumulation. Capitalists have accumulated so much wealth that they are having trouble finding new ways to keep increasing the profitable

returns on investments (Fairbairn, 2021; Harvey 2010). This results in financial firms encroaching on the ownership and control of farmland previously held by non-financial capitalists. They do this to offset the risks of other investments or to secure their wealth during times of economic decline (Fairbairn, 2021; Magnan, 2015; Desmarais et al., 2016; Sommerville and Magnan, 2015).

Farmland grabs in Canada are having a negative impact on food sovereignty and the integrity of rural communities. Laforge et al. (2018), Qualman et al. (2018), Wilson and Martorell (2017), Desmarais et al. (2015) and Smythe (2015) demonstrate that limited or insecure access to land tenure connected to recent waves of farmland grabbing present an insurmountable barrier for new farmers seeking secure and just access to land. This limits the ability of people in rural areas to maintain adequate agrarian livelihoods and resilient communities (Desmarais et al., 2015; Holtlander, 2015; Smythe, 2015). This paper identifies a new

set of actors causing similar problems for different reasons, as well as new data and analysis to better understand the contemporary farmland grab phenomenon in Canada. It also offers some insights on barriers that prevent farmland financialization, which can inform the development of policies aimed at better regulating the practice.

Historical land grabs in Eastern Ontario

This paper focusses on farmland tenure distribution in the largest areas of agricultural production that are located in eastern Ontario: the municipalities of Ottawa, Prescott-Russell, and Stormont, Dundas and Glengarry (see Figure 1). These municipalities also correspond to Statistics Canada's census tract divisions for the purpose of analyzing other socio-economic indicators associated with farmland distribution (see Table 1).

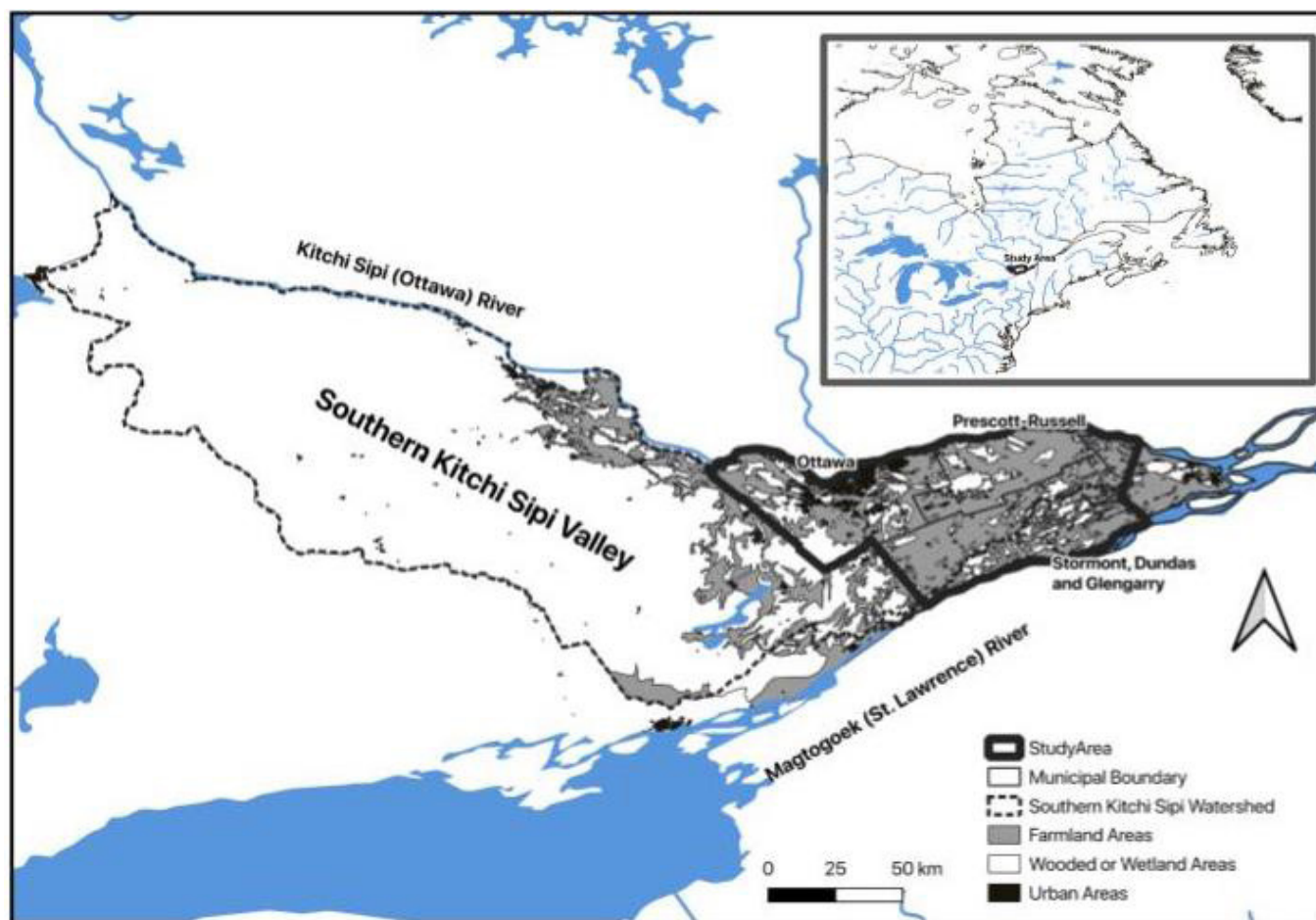


Figure 1: Location of the study area. (Land cover locations from Google Maps, n.d.; Kitchi Sipi watershed from Algonquins of Ontario, 2013)

Census Division	Area of CD (kms)	Area of CD (acres)	Area of Farms (acres)	Pop., in 2016 (persons)	Pop., in 2001 (persons)	Pop. change, 2001 to 2016 (percent)
City of Ottawa	2,790.30	689,498.15	252,423	934,243	774,072	+20.7%
UC Prescott- Russell	2,004.47	495,315.32	306,009	89,333	76,446	+16.9%
UC Stormont- Dundas- Glengarry	3,309.87	817,886.69	475,571	113,429	109,522	+3.6%
Average	2,701.55	667,567.54	344,668	379,001.67	320,013.33	+18.4%
All E. Ont. CDs	28,599.18	7,067,011.3	2,128,143	1,602,006	1,392,376	+15.1%

Table 1: Characteristics of selected census divisions. (Data source: Area and population of Census Divisions: Statistics Canada, 2022a; Area of farms: Statistics Canada, 2016.)

Most of so-called eastern Ontario is the unceded and unsurrendered land belonging to the Omàmiwininiwak (Algonquin-Anishinaabeg) people (Coburn & Moore, 2021; Algonquins of Ontario, 2013; Government of Ontario, 2013; Native Land 2022). Some of the farmland analyzed in this study is located in a thin strip along the Saint Lawrence Valley. This portion of the study area overlaps with the territory of the Kanien'kehá:ka (Mohawk) and Michi Sagig (Mississauga) Nishnaabeg nations.

Neither the British nor the Canadian governments ever extinguished the original Omàmiwininiwak title for much of Eastern Ontario. The British Crown, through the Crawford purchase of 1783, secured an agreement with the Michi Saagiig Nishnaabeg nation for access to the region. Governor General Frederick Haldimand mistakenly assumed that the original title of the entire region belonged to the Michi Saagiig Nishnaabeg nation, contradicting the Royal Proclamation of 1763's recognition of Omàmiwininiwak sovereignty over the Kitchi Sipi (Ottawa) Valley (Gehl, 2014; Jenkins, 1996). He commissioned Captain William Redford Crawford to negotiate a land purchase with Chief Menas of the Michi Saagiig Nishnaabeg near Kingston for access to the territory spanning seventy-two kilometers. The agreement covered the territory just east of Mallorytown to the Bay of Quinte at a depth of one day's travel by foot in exchange for trade goods (Gehl, 2014; Jenkins, 1996). Crawford told

Inspector General of Indian affairs Sir John Johnson that the original title to the land was extinguished for the entire area between the Saint Lawrence and Kitchi Sipi (Ottawa) rivers. Johnson accepted this report as proof of title extinguishment and proceeded to settle British migrants in the area (see Figure 2) (Jenkins, 1996). The result of this historical mistake is that lower portions of the Kitchi Sipi (Ottawa) Valley remain unceded and unsurrendered Omàmiwininiwak territory despite having been granted and settled by the British.

In the late 1700s, British colonial authorities granted the stolen land to military officers and soldiers. Many of them either never settled the land or sold it to other settlers for speculative profits, which hampered the development of the region. Timber barons then clearcut the forests and developed settlement roads throughout the 1800s, which facilitated settlement gradually outward from Ottawa and the Saint Lawrence River. The Rideau Canal also led to a rush of Irish and French-Canadian workers who either squatted or bought marginal land. Settlers inhabited most of the area by the early-1900s, owning the land as freehold farmers. A post-war housing boom furthermore led developers to encroach on the farmland and natural areas surrounding Ottawa to develop suburban subdivisions (Gordon, 2015). Industrialization throughout the 1900s resulted in the development of a large dairy industry in Eastern Ontario (Menzies, 1994).

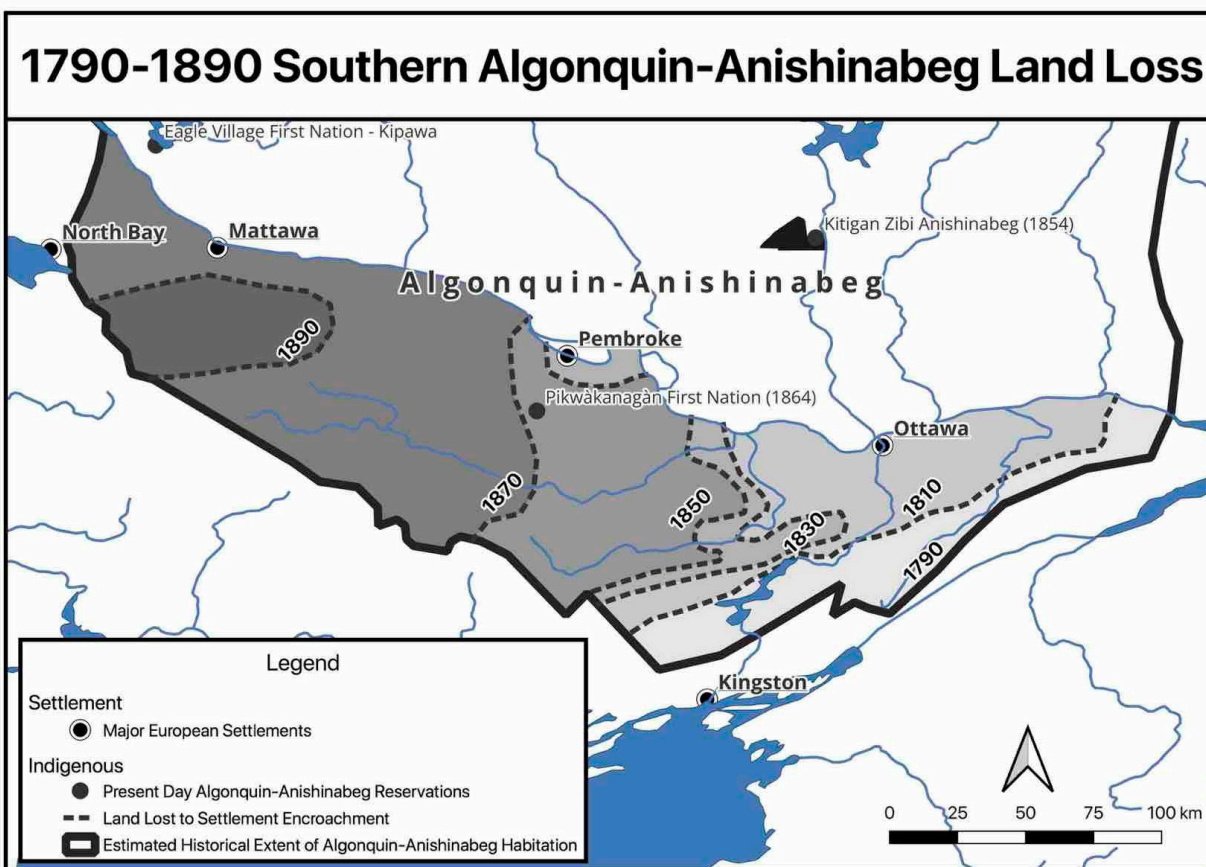


Figure 2: Map of southern Omàmiwininiwak Land Dispossession, 1790 to 1890
(Map is based on NativeLands.ca, 2022; Dean, 1998; Winearls, 1991; Harris and Matthews, 1987)

This industry retained a relative degree of economic stability due to public price stabilization policies (i.e., supply management) despite the precarity of farming throughout the neoliberal reforms and globalization since the 1980s (Muirhead, 2014). Other commodities fared worse. The Bovine Spongiform Encephalopathy (BSE) crisis of the 1990s shut down beef exports to the United States, which bankrupted many small and medium-sized farms (T. Black and M. Black, personal communication, December 6, 2019). Farmland financialization arrived in eastern Ontario under these conditions at the same time as the Global Financial Crisis of 2008 (Brownlee, 2013). These conditions also enabled large-scale corporate dairy farms to outcompete and absorb struggling farms beginning in the 1990s through a process of capitalist accumulation prior to the entry of farmland investment firms.

This recent farmland grab, however, consolidated

land that was still being stolen. The Algonquins of Ontario and the Government of Ontario continue to negotiate a comprehensive land claims agreement to the area to compensate for the Crown's failure to extinguish Omàmiwininiwak title to the land (Algonquins of Ontario, 2013). Many within the Omàmiwininiwak community, however, disagree with either the terms of the agreement or the decision to settle any land claims at all (Canadian Press, 2016). The Crown's title to the land therefore remains unresolved, calling into question the validity of the property rights of the actors involved in subsequent grabs. The contemporary farmland grab is therefore a secondary process of financialization and capitalist accumulation couched within the ongoing colonial grab of Omàmiwininiwak land. This is a fact that must be considered in any potential policy responses addressing the farmland grab problem.

Defining and measuring financial land grabs

Financialization in farmland ownership is a concept that is still developing. The literature on the subject emerged as an analytical concept describing a growing dominance of financial actors within farmland property markets. Epstein (2005) states that, “financialization means the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies”. The scholarship on financialization, however, has also made the case that more work on the phenomenon is needed. Some have pointed out the need to establish its specific characteristics and conceptual limits (Mader et al., 2020; Ouma, 2020; 2016), understand the complexity of contexts in which it takes place (Mader et al., 2020; Lapavistas, 2011), identify actors involved (Visser, 2015), document practices and causal linkages with outcomes (Mader et al., 2020; Krippner, 2005), understand the role and agency of farmers (Ouma, 2020; 2016), and better understand how it can be effectively regulated (Visser, 2015).

Desmarais et al. (2015) describe the financialization of farmland in Canada as a process of farmland assetization that redistributes farmland ownership from private landowners to financial investment firms. It constitutes a change in property relations within the capitalist mode of agrarian production. Property relations therefore transition from serving as a factor of production to an instrument for the extraction of rents and security for accumulated wealth.

The agrarian change literature describes the transition in land distribution from one regime to another as an instance of “land reform” (Bernstein, 2010). Bernstein (2010, p. 98) describes “land reform” as the “redistribution of property rights in land”. He explains that land reform can take many forms in different historical contexts. This paper, therefore, employs the term to describe how financialization of farmland is a form of land reform imposed through consolidation of farmland property markets, described in this paper as a process of “financial land reform”. This financial land reform framework informs a novel analytical approach to the study of land grabs in Canada, which seeks to measure the relative political-economic

power of one regime of landowners operating in farmland property markets over other actors.

Previous land grab studies in Canada measured the extent of farmland consolidation by the top four investment firms. Desmarais et al. (2015) conducted a study surveying landownership to assess the level of farmland consolidation in several rural municipalities in Saskatchewan. They measured the phenomenon of farmland financialization through a metric of ownership consolidation called “ownership by the four largest companies” (CLO4), based on research done on the formation of monopoly power in other economic sectors. Desmarais et al. (2025) argue that if investment companies have accumulated a significant amount of farmland in a survey of farmland property titles then one can conclude that farmland investment companies are succeeding in consolidating farmland.

This indicator, though important for understanding the magnitude of consolidation, does not show the full extent to which a specific group of actors control the overall land base of a given area. This paper refers to the group of institutions and actors who control an area’s land base as a “land regime”. To identify the overall power of a land regime one needs to measure the proportion of the land base that is owned by a particular political-economic group of actors. To this end, this paper presents a new metric termed “proportion of ownership by categories” (POC). The categories used to produce a POC value correspond to the specific political-economic context of land ownership in a study area. The financialization theory at the heart of the farmland grabbing literature in Canada sets up a clear definition of the regime category of focus: financial investment firms. This research therefore hypothesized that farmland in Eastern Ontario was going through a process of land reform surrounding farmland investment firms (Gheller, 2018; Sommerville, 2018; Rotz et al., 2017; Le Billon and Sommerville, 2017; Sommerville and Magnan, 2015; Holtslander, 2015; Magnan, 2015; Martin, 2015).

A land regime becomes dominant if its corresponding landownership category owns the highest proportion of farmland relative to other regime categories. Many other categories of landowners, however, became evident when classifying farmland owners in the study area. Most

notably present within the study area were: proprietary farmland owners, family-owned corporate farms, anonymous numbered corporations, resource extraction firms, real estate developers, conservation groups, and public institutions.

The two indicators analyzed in this study, CLO4 and POC, when combined, provide a more detailed illustration of the political-economic position of a land regime. This paper combines the two indicators into a four-scenario model that can be used to analyze the farmland ownership values for a given location (see Table 2).

	Increasing CLO4	Decreasing CLO4
Dominant new POC	<u>Consolidated Land Reform</u> : Regime category is consolidating and dominating	<u>Dispersed Land Reform</u> : Regime category is dominating but unable to consolidate
Weak new POC	<u>Consolidated Land Entrenchment</u> : Regime category is consolidating but unable to dominate	<u>Dispersed Land Entrenchment</u> : Regime category is unable to consolidate or dominate

Table 2: Land regime scenarios under the land regime framework

The first land regime scenario is “Consolidated Land Reform”, where a new land ownership category dominates, owning the largest proportion of farmland at the same time as the four largest firms are increasing their consolidated farmland holdings. This scenario suggests that land reform is taking place around a dominant new group of actors. This scenario matches the financialization hypothesis as expressed in the Canadian literature on land grabbing.

The second scenario is “Dispersed Land Reform”, which involves a new land ownership category ascending to dominance among a broad plurality of actors. This scenario could involve the dominance of a new land regime involving a diverse set of actors. In the case of financialization, this could entail a rush of many financial investors competing to purchase farmland.

The third scenario is “Consolidated Land Entrenchment”, which involves the failure of a new ownership category to achieve dominance over the land base at the same time as land ownership is being consolidated. This would involve the existing dominant regime consolidat-

ing its holdings, thereby entrenching its power over the land base. In terms of financialization, this would mean that financialization is failing to take place because of the dominance of the legacy regime.

The final scenario is “Dispersed Land Entrenchment”, involving the failure of a new regime to dominate the farmland base at the same time as land becomes owned by a greater diversity of actors. This scenario could involve the dispersal of holdings among the actors of a legacy land regime or several competing regimes, without a new one achieving dominance. In the context of financialization,

this could entail a failure of financialization due to a lack of interest or capacity among investment firms.

This four-scenario model provides a useful approach for analyzing farmland ownership values in eastern Ontario. The study analyzed farmland title data to

identify the land regime scenario that took place in eastern Ontario between 2000 and 2017.

Measuring farmland redistribution

This study used Geographic Information System (GIS) analysis of land title data to calculate CLO4 and POC values for the three census tract areas to test the financialization hypothesis: Ottawa, Prescott-Russell, and Stormont, Dundas and Glengarry.

The study looked at properties zoned for conventional agriculture larger than ten hectares. It omitted properties if they were subdivided or merged into other properties between 2000 and 2017. It only included properties whose titles could be consistently compared over the course of the study period. This resulted in a final sample of 9,858 properties. The study obtained land title information from a third-party private company called Teranet, which is responsible for handling Ontario land

title information. The categories of ownership used in this study are as follows, from most common to the to least common in the study area:

1. Individual, Partnership or Group of Private Owner(s)
2. Farming Corporations
3. Anonymous Numbered Corporations
4. Property Development and Resource Extraction Corporations
5. Waste Management Corporations
6. Farmland Investment Firms
7. Other Corporations
8. Local Government
9. Provincial Government
10. Federal Government
11. Conservation Trust
12. Post-Secondary Institutions
13. Faith-Based Organizations
14. Not-for-Profit Organizations

The study produced CLO4 values by identifying the largest landowners in the region for every year between 2000 and 2017, using the same formula detailed in Desmarais et al. (2015):

$$\text{CLO4 \%} = \frac{\text{Acres owned by four largest firms}}{\text{Total farmland acres}}$$

The research produced POC values as the proportion of total farmland owned by regime categories. It coded the title data based on the fourteen different categories above as they were recorded into the GIS software. The study calculated the total area of farmland owned by each land ownership category by year and then divided it by the total farmland base for each census division area using the following formula:

$$\text{POC \%} = \frac{\text{Total acres of farmland owned by a land regime category}}{\text{Total farmland acres}}$$

The research combined the CLO4 and POC rates of change over the seventeen-year period to identify what land regime scenario took place in the three census division areas between 2000 and 2017. An increase in both the CLO4 and Farmland Investment Firm-POC values would indicate that farmland financialization occurred in the study area between 2000 and 2027.

Research Findings

The study's findings demonstrate that eastern Ontario did not experience farmland financialization during the study period. The region experienced farmland consolidation; however, farmland investment firms did not drive it, as initially hypothesized. Large-scale farm corporations accounted for the greatest amount of farmland consolidation. These findings, when combined, suggest that the study area went through a process of consolidated land entrenchment around corporate farms. In other words, the area's legacy dominant regime strengthened their hold over the agricultural land base of eastern Ontario.

CLO4 – Concentration of land ownership for the four largest farmland owners

The rate of consolidation among the four largest landowners in the study sample increased by a rate of 2.1% between 2000 and 2017 (an increase of 9,228.2 acres). The average CLO4 for the three census areas studied increased from 4.3% of total farmland in 2000 to 6.4% in 2017 (see Table 3).

Consolidation also took place mostly after 2009, when the number of owners in the sample suddenly went from a stable 0.15% rate of growth to a 2.83% rate of decline. Statistics Canada Agricultural Census data consulted for this research indicates that the post-2009

Location	1994	2000	2014	2017	Increase
Saskatchewan Avg. CLO4	8.6%	-	21.0%	-	+12.4%
E. Ontario Avg. CLO4	-	4.3%	-	6.4%	+ 2.1%

Table 3: Average changes in CLO4 for municipalities in Saskatchewan and eastern Ontario (Saskatchewan average CLO4 from Desmarais et al., 2015)

Year	Total CLO4 Acres	CLO4 %	#1 Farmland Owner	#2 Farmland Owner	#3 Farmland Owner	#4 Farmland Owner
2000	7,450.9	4.3%	BRETZLER FARMS LTD	CORNWALL GRAVEL COMPANY	CHARLOTTENGRO FARMS INC	SCHOUTEN CORNER VIEW FARMS
2001	7,759.8	4.3%	BRETZLER FARMS LTD	CORNWALL GRAVEL COMPANY	SCHOUTEN CORNER VIEW FARMS	CHARLOTTENGRO FARMS INC
2002	7,858.5	4.2%	BRETZLER FARMS LTD	CORNWALL GRAVEL COMPANY	SONIBRAND FARM INC	SCHOUTEN CORNER VIEW FARMS
2003	8,667.4	4.6%	BRETZLER FARMS LTD	RIVERSIDE SOUTH DEV CORP	CORNWALL GRAVEL COMPANY	SCHOUTEN CORNER VIEW FARMS
2004	9,613.9	5.0%	BRETZLER FARMS LTD	RIVERSIDE SOUTH DEV CORP	CORNWALL GRAVEL COMPANY	CHARLOTTENGRO FARMS INC
2005	9,613.9	4.9%	BRETZLER FARMS LTD	RIVERSIDE SOUTH DEV CORP	CORNWALL GRAVEL COMPANY	CHARLOTTENGRO FARMS INC
2006	10,231.5	5.0%	BRETZLER FARMS LTD	RIVERSIDE SOUTH DEV CORP	CHARLOTTENGRO FARMS INC	CORNWALL GRAVEL COMPANY
2007	11,033.5	5.1%	BRETZLER FARMS LTD	CHARLOTTENGRO FARMS INC	RIVERSIDE SOUTH DEV CORP	WAHLER FARMS INC.
2008	12,330.9	5.6%	BRETZLER FARMS LTD	WALTON INTERNATIONAL GROUP	CHARLOTTENGRO FARMS INC	WAHLER FARMS INC.
2009	12,693.6	5.7%	BRETZLER FARMS LTD	CHARLOTTENGRO FARMS INC	WALTON INTERNATIONAL GROUP	WAHLER FARMS INC.
2010	13,543.1	6.0%	BRETZLER FARMS LTD	WALTON INTERNATIONAL GROUP	CHARLOTTENGRO FARMS INC	WAHLER FARMS INC.
2011	13,720.1	5.9%	BRETZLER FARMS LTD	WALTON INTERNATIONAL GROUP	CHARLOTTENGRO FARMS INC	WAHLER FARMS INC.
2012	13,978.7	5.9%	BRETZLER FARMS LTD	CHARLOTTENGRO FARMS INC	WALTON INTERNATIONAL GROUP	WAHLER FARMS INC.
2013	14,565.8	6.0%	BRETZLER FARMS LTD	CHARLOTTENGRO FARMS INC	LEDUC, ALAIN; LEDUC, SUSAN	WALTON INTERNATIONAL GROUP
2014	14,971.4	6.0%	BRETZLER FARMS LTD	LEDUC, ALAIN; LEDUC, SUSAN	CHARLOTTENGRO FARMS INC	WALTON INTERNATIONAL GROUP
2015	15,322.8	6.1%	BRETZLER FARMS LTD	LEDUC, ALAIN; LEDUC, SUSAN	CHARLOTTENGRO FARMS INC	WALTON INTERNATIONAL GROUP
2016	15,948.1	6.3%	BRETZLER FARMS LTD	LEDUC, ALAIN; LEDUC, SUSAN	SCHOUTEN CORNER VIEW FARMS	CHARLOTTENGRO FARMS INC
2017	16,679.1	6.4%	BRETZLER FARMS LTD	LEDUC, ALAIN; LEDUC, SUSAN	SCHOUTEN CORNER VIEW FARMS	CHARLOTTENGRO FARMS INC
Change	+9,228.2	+ 2.1%				

Table 4: Concentration of land ownership for the four largest farmland owners in Ottawa, PR, and SDG Between 2000 and 2017

wave of farmer exits in Ontario was composed primarily of mid-sized farms, while the number of smallholder farms remained stable during the same period (Statistics Canada, 2022b).

These findings differ from those of Desmarais et al.'s (2015) similar study on farmland consolidation in Saskatchewan, between 2000 and 2014. They reported a higher rate of farmland consolidation at 12.4%, primarily driven by farmland investment companies. This suggests that, compared to rural Saskatchewan, eastern Ontario saw less farmland consolidation among top landowners.

The top farmland owners captured in the CLO4 analysis were also different from those involved in Desmarais et al. (2015). They were primarily large-scale, family-owned, and diversified corporate farms significantly engaged in dairy production, like Bretzler Farm, Charlottengro Farms Inc., Schouten Corner View Farms and Wahler Farms Inc. This was followed by resource extraction and real estate development corporations like Cornwall Gravel Company, Riverside South Development Corporation, and one financial investment firm: Walton International (see Table 4). This differed from

actors involved in Saskatchewan, which saw farmland concentration primarily driven by financial investment firms.

Development-focussed farmland consolidation took place, predictably, in the peri-urban areas surrounding the City of Ottawa (see Figure 3). Companies involved in resource extraction (i.e., gravel and concrete production) took place in rural areas close to Cornwall. The largest farmland investment firm was Walton International, which held a loose cluster of farmland in the Fallowfield area of Nepean in the southwest of Ottawa just beyond the urban boundary.

Agriculture-focussed farmland consolidation among the top four farmland owners (see Figure 4) took place throughout rural areas in the study area, primarily in locations with the highest concentrations of dairy production. The farmland holdings of these large corporate farms tended to be highly fragmented into loose clusters surrounding the central operations of each farm. The only agriculture-focussed financial investment firm, Bonfield Financial, bought farmland from a handful of families and the former holdings of the Alfred Campus of Guelph University in Prescott-Russell. They did not rank among

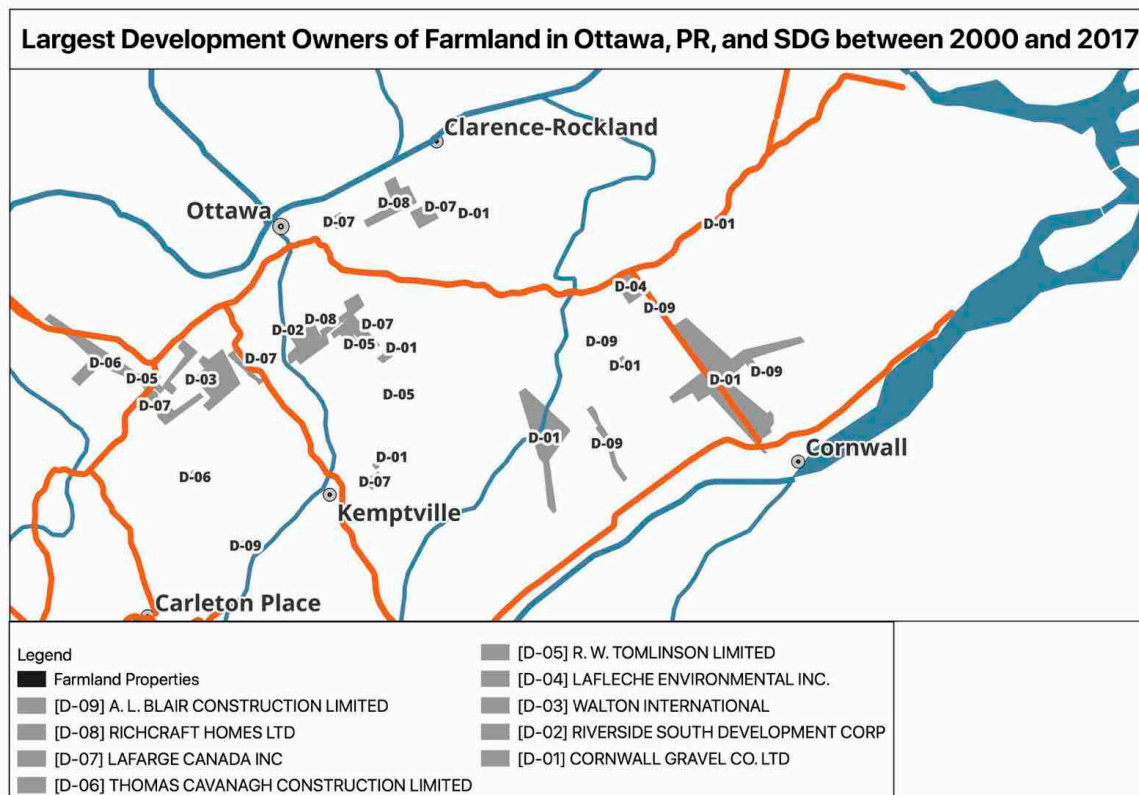


Figure 3: Largest development-focussed farmland owners, 2000 to 2017

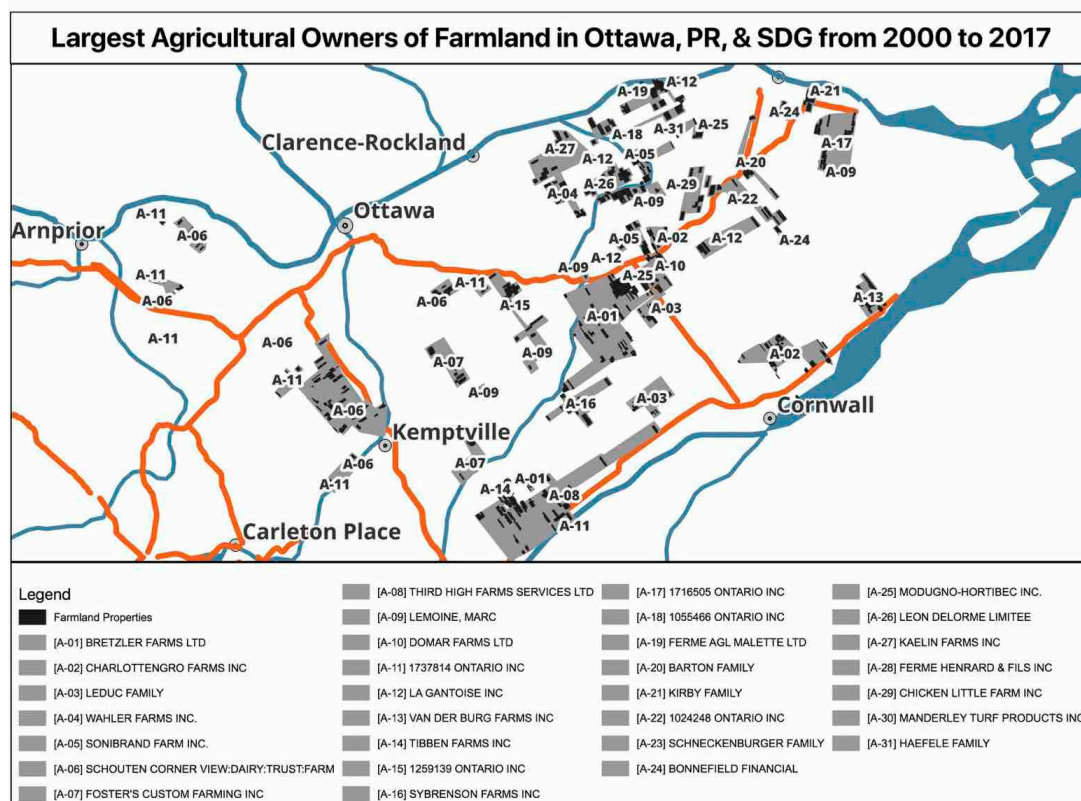


Figure 4: Largest agriculture-focused farmland owners from 2000 to 2017

the top four largest farmland owners in the study. Wally Johnston Bonnefield’s VP of Acquisitions explained in an interview with the author of this paper that, “Eastern Ontario hasn’t really been for us and I’m just not sure why” (W. Johnston and R. Farrer, personal communication, March 6, 2019).

POC - Proportion of ownership by categories

After coding and mapping, the POC analysis presents a mixed and messy picture of farmland ownership actors in the sample area (see Figure 5). But some patterns are discernible when different POC categories are isolated for analysis (see Table 5).

The most apparent finding from the POC analysis is that corporate farmland ownership increased during the study period at the same time as the overall number

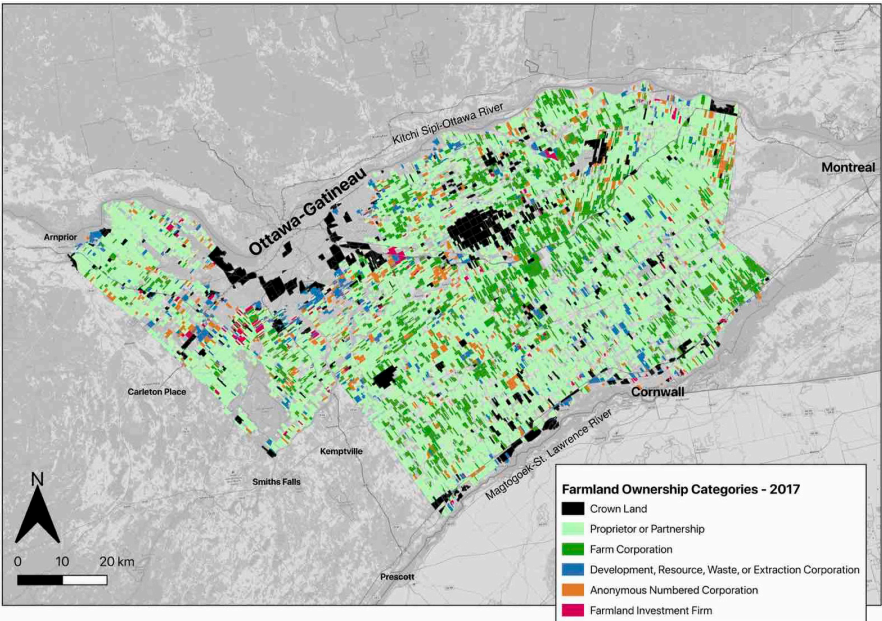


Figure 5: Map of proportion of ownership by regime categories (POC) for southwestern Kitchi Sipi Valley, 2017 (Basemap from: OpenStreetMap)

of owners declined. The analysis found that corporate farmland ownership overall in the sample increased by 46.1%, accounting for an increase of 43,962.89 acres.

Sample Size: n=9,585 properties covering 1,006,643.18 acres														
	Private Owners		All Corp's		Investment Firms		Agricultural Corp's		Dev. Corp's		Numbered Corp's		Other Corp's	
Change: Prop % Acres	-10.0% -74,026.76		+42.1% +68,894.78		+11.1% +922.70		+46.1% +43,962.89		+1.4% +413.32		+109.9% +22,401.46		+10.8% +1,194.41	
2000	739,280.98	73.4%	163,789.15	16.3%	8,280.46	0.8%	95,265.91	9.5%	28,758.47	2.9%	20,390.45	2.0%	11,093.86	1.1%
2001	738,336.85	73.3%	164,723.21	16.4%	8,280.46	0.8%	95,349.72	9.5%	29,093.47	2.9%	20,476.06	2.0%	11,523.50	1.1%
2002	736,080.13	73.1%	167,110.57	16.6%	7,925.57	0.8%	97,456.80	9.7%	29,283.99	2.9%	20,901.15	2.1%	11,543.06	1.1%
2003	734,712.58	73.0%	168,422.58	16.7%	7,952.22	0.8%	98,524.22	9.8%	29,335.28	2.9%	20,968.76	2.1%	11,642.10	1.2%
2004	732,062.35	72.7%	170,980.03	17.0%	7,896.03	0.8%	98,895.32	9.8%	29,828.72	3.0%	22,577.54	2.2%	11,782.42	1.2%
2005	730,046.26	72.5%	173,417.25	17.2%	7,982.55	0.8%	99,717.06	9.9%	30,169.48	3.0%	23,706.16	2.4%	11,842.00	1.2%
2006	727,007.67	72.2%	176,301.90	17.5%	7,987.49	0.8%	100,799.96	10.0%	30,834.84	3.1%	24,905.68	2.5%	11,773.92	1.2%
2007	722,349.70	71.7%	180,813.09	18.0%	9,552.24	0.9%	102,602.29	10.2%	31,196.11	3.1%	25,776.39	2.6%	11,686.07	1.2%
2008	719,533.22	71.4%	183,629.57	18.2%	10,093.89	1.0%	104,878.82	10.4%	30,588.49	3.0%	26,589.42	2.6%	11,478.96	1.1%
2009	716,819.21	71.2%	184,607.45	18.3%	10,200.20	1.0%	106,260.98	10.5%	27,676.86	2.7%	28,702.94	2.8%	11,766.47	1.2%
2010	711,268.85	70.6%	189,911.47	18.9%	9,579.70	1.0%	111,013.69	11.0%	27,558.11	2.7%	29,912.18	3.0%	11,847.79	1.2%
2011	706,616.00	70.1%	194,184.09	19.3%	9,579.70	1.0%	113,737.09	11.3%	27,727.35	2.8%	31,234.90	3.1%	11,905.04	1.2%
2012	702,080.31	69.7%	198,514.61	19.7%	8,787.96	0.9%	116,364.01	11.5%	28,079.30	2.8%	33,364.84	3.3%	11,918.51	1.2%
2013	695,124.57	69.0%	205,636.48	20.4%	8,854.84	0.9%	120,016.40	11.9%	27,969.21	2.8%	37,430.90	3.7%	11,365.13	1.1%
2014	688,078.60	68.3%	212,731.02	21.1%	9,296.67	0.9%	124,786.95	12.4%	27,798.59	2.8%	38,683.89	3.8%	12,164.92	1.2%
2015	682,796.62	67.8%	218,140.73	21.6%	9,318.49	0.9%	128,517.99	12.8%	28,006.36	2.8%	40,092.12	4.0%	12,205.78	1.2%
2016	675,326.76	67.0%	224,578.72	22.3%	9,288.64	0.9%	133,443.01	13.2%	28,251.78	2.8%	41,522.78	4.1%	12,072.51	1.2%
2017	665,254.22	66.0%	232,683.93	23.1%	9,203.16	0.9%	139,228.80	13.8%	29,171.79	2.9%	42,791.91	4.2%	12,288.27	1.2%

Table 5: Farmland owned by different ownership categories in Ottawa, Prescott-Russell, and Stormont, Dundas and Glengarry

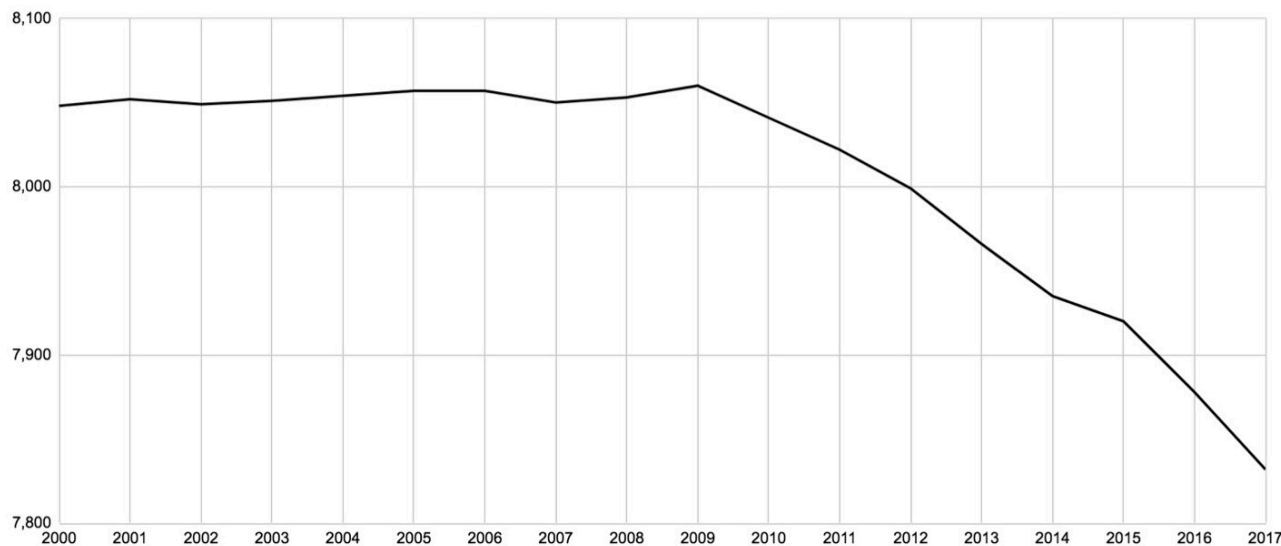


Figure 6: Number of farmland property owners, 2000 to 2017 (Statistics Canada, 2022b)

The amount of farmland owned by sole proprietors or partnerships declined by 10%, accounting for a decrease of 74,026.77 acres.

The total number of farmland owners within the sample (n = 9,585 properties) also declined between 2000 and 2017 by 2.38% (see Figure 6). This decline in the number of owners, however, occurred at the tail end

of the period. The ownership population was relatively stable between 2000 and 2009 (+0.15%), then decreased between 2009 and 2017 (- 2.83%).

The City of Ottawa saw the greatest decline in number of farmland owners (n = 3,885 properties) with a rate of 4.36%. The United Counties of Stormont, Dundas, and Glengarry (n = 3,743 properties) experienced

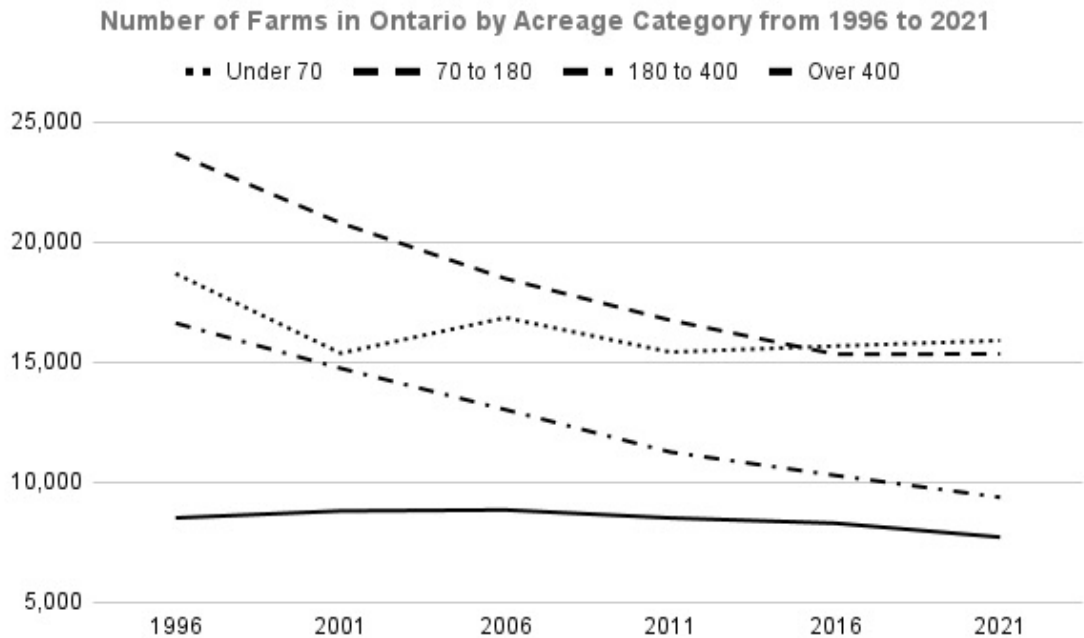


Figure 7: Farms in Ontario by acreage categories, 1996 to 2021 (Statistics Canada 2022b)

less of a decline at a rate of 1.83%. United Counties of Prescott-Russell ($n = 2230$ properties) saw the lowest decline with a rate of 0.98%.

This coincidence of increased corporatization and decreased ownership population suggests that there may be a causal link between farmland corporatization and consolidation. Census of Agriculture data from Statistics Canada on farm sizes for the Province of Ontario offers a theoretical inference that can be made about the characteristics of the decline (Statistics Canada, 2022b). It suggests that the decline in farmland ownership could have impacted medium-sized farms the most, given that the number of farms between 70 and 400 acres experienced the greatest decline (see Figure 7).

The largest (>400 acres) and smallest (<70 acres) farms, by contrast, experienced relative population stability during the same period. This leads one to infer that there is a process in the study area where the largest farms are absorbing medium-sized farms. More qualitative and case study research is needed to test the validity of this explanation. More POC analysis is also needed in other locations to test the theory's broader applicability beyond the study area.

Limited consolidation around farmland investment firms

Farmland investment firms increased their holdings in the sample area by a total of 922.7 acres (+11.1%) between 2000 and 2017 (see Figure 8). Explicit investment firms, the kinds described in Desmarais et al. (2015), were therefore not a significant factor in the consolidation of farmland in the study area between 2000 and 2017.

The farmland investment firms included in the POC analysis reflect the kinds of actors highlighted in the CLO4 analysis: it mostly consists of development-focussed investment firms operating in the peri-urban areas surrounding Ottawa, and a small handful of agriculture-focussed investors operating in the most rural parts of Prescott-Russell and Stormont, Dundas and Glengarry.

Most investor activity took place between 2008 and 2011, with a sharp uptick in 2008 corresponding to the entry of Walton International to the sample area. This was followed by a slight decline and plateau in holdings between 2011 and 2017, which coincided with difficulties faced by Walton International to acquire the entire Fallowfield area that it was hoping to sell off as pre-development land to a corporation seeking to develop residential and commercial subdivisions. The limited success of

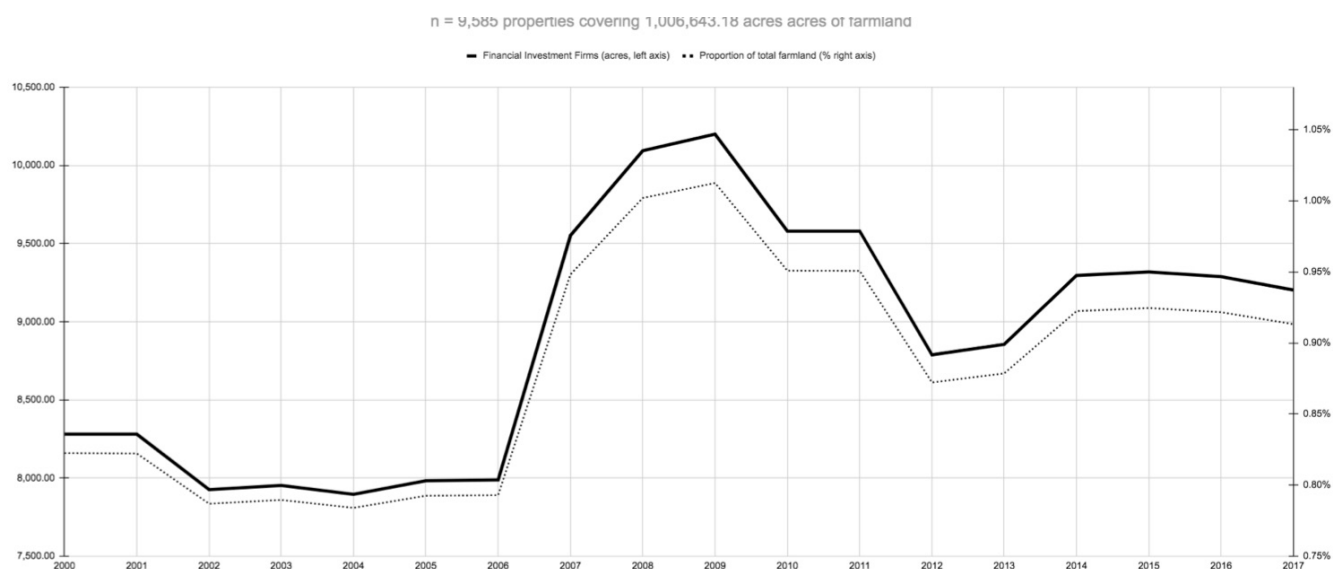


Figure 8: Acres of farmland owned by investment companies, 2000 to 2017

Walton International to expand its farmland holdings accounts for the majority of the rise, decline, and hold of farmland investment firm activity in the study area. This finding demonstrates that the study area did not experience any kind of significant amount of financialization, at least not in the way that it has been defined in the Canadian literature on farmland grabbing.

Land regime scenario

The combination of the study's CLO4 and POC analysis findings indicates the farmland distribution scenario that took place in the study area and during the designated period was one of land entrenchment around corporate farms between 2000 and 2017 (see Table 2). This means that the existing elites—corporate farms—whose interests dominate farmland distribution increased their farmland holdings by absorbing medium and large-scale farms as they exit production. Simple commodity producing farms—selling commodities independently to the market—are therefore likely to be losing farmland to large-scale corporate farms that are better integrated into the global corporate food regime.

Limitations and potential error

There are two ways that error in the data can result from this methodology based on methodological challenges surrounding sampling and identification of landowner activities.

First, sampling problems existed due to the limited availability of cadastral SHP files for each year of the study period. Property owners regularly join and sever properties, which changes the number and configuration of properties. Properties that were modified, removed, or created during the study period therefore had to be removed to produce a consistent sample of farmland properties. Second, there was a series of errors resulting from an inability to identify the identities and intended uses for the sampled farmland properties. The greatest challenge in this regard was the large number of anonymous numbered corporations (ex. 123456 Ontario inc.). Anonymous numbered corporations increased their farmland holdings by 22,401.46 acres, growing at a rate of 109.9% between

2000 and 2017. Some of these property owners could be identified, but not in a consistent enough way to produce usable data on ownership categories.

Discussion

The study's findings suggest that financial investment companies were not a significant factor in the trend of farmland consolidation in southwestern Kitchi Sipi Valley between 2000 and 2017. It introduces an empirical divergence from the findings of the land grab research in Canada, which suggests that land grabs are primarily caused by farmland investment firms. This suggests that there are theoretical limits to the leading financialization hypotheses surrounding farmland consolidation.

This study found that there are several barriers acting against the financialization of farmland in Eastern Ontario.

1. Differential access to market protections between commodity sectors

The first barrier to farmland financialization arises from the finding that farmland consolidation in the study area was mostly the work of a handful of large-scale farm corporations. These corporations originate from a number of aggressively expansionist commercial dairy farmers who arrived in Eastern Ontario from the Netherlands and Switzerland in the 1970s. They settled in the area because they were unable to expand their landholdings back in Europe. They then gradually accumulated large farmland holdings, producing and handling a variety of commodities through different subsidiary branches. These corporate farms, unlike many farmland investment companies, engage in the production of supply-managed commodities like dairy, eggs, broiler hens, and turkeys (T. Black and M. Black, personal communication, December 6, 2019; D. St. Pierre, personal communications, January 17, 2019).

These protected commodities afforded some farmers price stability at a time when non-supply-managed commodities faced high levels of instability, which allowed protected farms the opportunity to acquire farms facing bankruptcy. Farmers who produced beef and pork faced a

higher degree of economic hardship due to price instability experienced around market crises like the closure of the U.S.-Canada border that resulted from a case of Bovine spongiform encephalopathy (BSE) in Alberta in 1993. Farmers in the Nepean area in particular—where Walton International acquired its farmland—had to accept beef prices well below the cost of production, leading to a wave of bankruptcies in the years that followed (T. Black and M. Black, personal communication, December 6, 2019).

The lack of market protections for some commodities set up the conditions for a divergence between the largest and medium-sized farms, and between protected commodities and non-protected commodities. This divergence functions as an accelerated and wide-spread moment in the typical process of capitalist accumulation, which involves competitive firms growing by out-competing other firms and absorbing them as they exit the market. Stable dairy farms held an advantageous market position during the BSE and Subprime Mortgage crises to access financial capital and reinvest their profits into expanding their land holdings to produce on a larger scale. This increased capital and land requirements for smaller farms to enter and remain competitive in the same market resulted in corresponding waves of farm closures, driving the supply of land for expansion by the largest farmland owners.

Families struggling with debt and whose retirement funds were invested in their land holdings can hardly be blamed for accepting multi-million dollar offers for the land from an investor. But these kinds of buyouts place a tremendous amount of strain on rural families and communities bitterly divided by conflict between those who want to receive the generous buy-out and those who want to keep in production the land where their families have lived for generations (E. Haley, personal communication January 29, 2019; T. Black and M. Black, personal communication, December 6, 2019).

2. Land use bylaws that protect agricultural land from development

The second barrier to farmland financialization found in this study involved the City of Ottawa's land use regulations. Farmland protection bylaws proved successful

at disciplining farmland investor imperatives to expand the city's urban footprint. Ottawa's "urban boundary", for instance, was a subject of great debate during the development of the most recent official plan in 2021. The final decision to extend the boundary into some of the Agricultural Land Reserve, however, excluded Walton International's holdings specifically because of the high agricultural value of the land they own (City of Ottawa, 2022; City of Ottawa, 2016; Reevely, 2013).

This case demonstrates that land-use zoning tools, to a limited degree, are effective at preventing companies like Walton International from succeeding to profit from its intentions to bank and sell prime agriculture land for real estate development. These companies, however, expect to hold the land for extended periods of time and gradually influence municipalities to rezone the area to allow for development. Walton International is ultimately able to—as suggested by local farmers T. Black and M. Black (2019)—strategically neglect the land, allowing it to degrade to a level that decreases its agricultural value. This would imply that it may eventually degrade the land to a condition where they could make a case to the City of Ottawa to have it included within the urban boundary for development.

Smythe (2015) and Haley (2013) demonstrate that Walton International attempts to influence regulatory institutions to allow favourable bylaws for its investment activities. In fact, institutions governing land use tend to be vulnerable to regulatory capture by investors and developers. Neoliberal reforms in Ontario in the 1990s and 2000s imposed fiscal austerity on municipalities, making them more reliant on development companies to fund social programs and less able to regulate them due to weak provincial farmland protection policies, as already documented in Albo and Fanelli (2019). These policy reforms resulted in sporadic instances of urban expansion into rural areas like Nepean and Cumberland since the 1990s.

3. Impacts of Urban Expansion on Agricultural Land Values

The third barrier to farmland financialization found in this study was that urban expansion increases farmland

prices to a degree that prevents agriculture-oriented farmland investors like Bonnefield Financial from grabbing large tracts of farmland. Agriculture-focussed investors purchase farmland, organize the ownership into an investable financial asset, and make capital improvements to increase the value of the land. This slowly increases the value of the investment belonging to licensed investors—including many private high net-worth investors and public and private equity funds—who become part-owners of the land in the form of a Limited Partnership (W. Johnston and R. Farrer, personal communication, March 6, 2019).

These investors are looking for the land to increase in value at a higher rate than the overall market over a long period of time. They hold on to the land indefinitely as a financial security. This slow but steady rate of growth offers the ideal level of risk for the investment needs of equity funds. Urban expansion appreciates the value of the farmland beyond its productive value. This makes the land less appealing for companies like Bonnefield Financial to invest in as a financial security. Agriculture-oriented farmland investment has therefore been absent closer to the City of Ottawa because of the upward pressure that urban expansion puts on farmland values (W. Johnston and R. Farrer, personal communication, March 6, 2019).

Conclusion

This paper shared study results that found a limited amount of farmland financialization in eastern Ontario between 2000 and 2017. It also found that large-scale corporate farms conducted most of the farmland consolidation. These findings introduced evidence that diverges from the leading financialization theory of farmland grabbing in Canada. Typical capitalist accumulation in land markets—resembling Karl Kautsky’s (1899) theorization in the Agrarian Question—occurred in the study area while the financialization phenomena occurred in parts of Quebec (Gheller, 2018), Saskatchewan (Desmarais et al., 2015), Alberta (Smythe, 2015), and southwestern Ontario (Rotz et al., 2017; Haley, 2013). The paper furthermore submits an explanation on the limits to farmland financialization involving a series of three barriers involving:

capitalist accumulation among legacy landed elites, successful land-use regulations, and land value dynamics resulting from urban expansion.

The study raised a number of theoretical and methodological questions surrounding the formation, operations, and political-economic activity surrounding large-scale, corporate farms. More research is needed, in eastern Ontario and other areas, to understand the extent of the land holdings of corporate farms and farmland investment firms. Greater discussion is also needed to prevent the occurrence of land grabs and protect rural communities from the deleterious effects of such acquisitions.

Endnote

¹Land grabbing happens when wealthy individuals, private companies, or public institutions take exclusive private property control over significant portions of land inhabited by Indigenous peoples, peasants, or farmers through military, political, or economic means (GRAIN, 2008)

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References

- Akram-Lodhi, A. H. (2015). LGAR—Land grabs, the agrarian question and the corporate food regime. *Canadian Food Studies/La Revue canadienne des études sur l'alimentation*, 2(2), 233–241. <https://doi.org/10.15353/cfs-rcea.v2i2.94>
- Albo, G., & Finelli, C. (2019). Fiscal distress and the local state: Neoliberal urbanism in Canada. In O. Lyubchenko, C. Fanelli, L.F. Vosko, and M.P. Thomas (Eds.) *Change and continuity: Canadian political economy in the new millenium* (pp. 265–296). McGill-Queen's University Press.
- Algonquins of Ontario. (2013). Overview of treaty negotiations. <https://www.tanakiwin.com/our-treaty-negotiations/overview-of-treaty-negotiations>
- Bernstein, H. (2010). *Class dynamics of agrarian change*. Fernwood.
- Black, T., and Black, M. (2019). In-person interview, December 6, 2019.
- Brownlee, M. (2013). “Walton optimistic about opening land for development.” *Ottawa Business Journal*. May 29, 2013. <https://obj.ca/walton-optimistic-about-opening-land-for-development/>
- Canadian Press. (2016). Chiefs say proposed Algonquin land claim deal illegal, fraudulent. <https://www.cbc.ca/news/indigenous/algonquin-land-deal-illegal-1.3475359>
- City of Ottawa. (2003). City of Ottawa official plan: As adopted by City Council.
- City of Ottawa. (2016). Land evaluation and area report (LEAR). Planning, Infrastructure, and Economic Development.
- City of Ottawa. (2022). Official plan, section 9: Rural designations. https://documents.ottawa.ca/sites/default/files/section9_op_en.pdf
- Coburn, V., & Moore, M. (2021). Occupancy, land rights and the Algonquin Anishinaabeg. *Canadian Journal of Political Science*, 55(1), 1–18. <https://doi.org/10.1017/S0008423921000810>
- Dean, W. G. (1998). *Concise historical atlas of Canada*. University of Toronto Press.
- Desmarais, A.A., Qualman, D., Magnan, A., & Wiebe, N. (2015). Land grabbing and land concentration: Mapping changing patterns of farmland ownership in three rural municipalities in Saskatchewan, Canada.” *Canadian Food Studies/La revue canadienne des études sur l'alimentation*, 2(1), 16–47. <https://doi.org/10.15353/cfs-rcea.v2i1.52>
- Desmarais, A.A., Qualman, D., Magnan, A., & Wiebe, N. (2016). Investor ownership or social investment? Changing farmland ownership in Saskatchewan, Canada.” *Agriculture and Human Values*, 34, 149–166. <https://doi.org/10.1007/s10460-016-9704-5>
- Epstein, G.A. (2005). Introduction: Financialization and the world economy. In G.A. Epstein (Ed.) *Financialization and the world economy* (pp. 3–15). Edward Elgar Pub.
- Fairbairn, M. (2021). *Fields of golds: Financing the global land rush*. Cornell University Press.
- French, S., Leyshon, A., & Wainwright, T. (2011). Financializing space, spacing financialization. *Progress in Human Geography*, 35(6). <https://doi.org/10.1177/0309132510396749>
- Friedmann, H. (2015). Governing land and landscapes: Political ecology of enclosures and commons. *Canadian Food Studies/La revue canadienne des études sur l'alimentation* 2(2), pp. 23–31. <https://doi.org/10.15353/cfs-rcea.v2i2.95>
- Friedmann, H.. (2016). Commentary: Food regime analysis and agrarian questions: widening the conversation. *The Journal of Peasant Studies*, 43(3), 671–692. <https://doi.org/10.1080/03066150.2016.1146254>
- Friedmann, H., & McMichael, P. (1989). Agriculture and the state system: The rise and decline of national agricultures, 1870 to the present. *Sociologica Ruralis*, 29(2), 93–117. <https://doi.org/10.1111/j.1467-9523.1989.tb00360.x>
- Gehl, L. (2014). *The Truth the Wampum Tells*. Fernwood.
- Gehl, L. (2017). *Claiming Anishinaabe*. University of Regina Press.

- Gheller, F. (2018). Governing large-scale farmland acquisitions in Québec: The conventional family farm model questioned. *Agriculture and Human Values*, 35, 623–636. <https://doi.org/10.1007/s10460-018-9855-7>
- Google. (n.d.). [Google maps satellite view for eastern Ontario]. <https://maps.app.goo.gl/qKvmt5zBQbZ2yYHY7>
- Gordon, D. (2015). *Town and crown: An illustrated history of Canada's capital*. Invermire.
- Government of Ontario. (2013). The Algonquin land claim. <https://www.ontario.ca/page/algonquin-land-claim>
- GRAIN. (2008). Seized: The 2008 landgrab for food and financial security. <https://grain.org/en/article/93-seized-the-2008-landgrab-for-food-and-financial-security>
- Haley, E. (2013). The plunder of Brant County's foodland. *Alternatives Journal* 39(2), March 1, 2013.
- Haley, E. (2019). In-person interview, January 29, 2019.
- Harris, C., & Matthews, G. J. (1987). *Historical atlas of Canada*. University of Toronto Press.
- Harvey, D. (2010). *The enigma of capital: And the crises of capitalism*. Oxford University Press.
- Holtslander, C. (2015). Losing our grip, 2015 update: How corporate farmland buy-up, rising farm debt, and agribusiness financing of inputs threaten family farms. *National Farmers Union Report*. <https://www.nfu.ca/wp-content/uploads/2018/07/Losing-Our-Grip-2015-Update-Web-Version.pdf>
- Jenkins, P. (1996). *An acre of time*. Macfarlane, Walter and Ross.
- Johnston, W. & Farrer, R. (2019). In-person interview, March 6, 2019.
- Kautsky, K. (1899;1988). *The agrarian question: In two volumes*. Zwan Publications.
- Krippner, G.R. (2005). The financialization of the American economy. *Socio-Economic Review*, 3(2), 173–208. <https://doi.org/10.1093/SER/mwi008>
- Laforge, J., Fenton, A., Lavalée-Picard, V., & McLachlan S. (2018). New farmers and food policies in Canada. *Canadian Food Studies/La revue canadienne des études sur l'alimentation*, 5(3), 128–152. <https://doi.org/10.15353/cfs-rcea.v5i3.288>
- Lapavistas, C. (2011). Theorizing financialization. *Work, Employment and Society*, 25(4), 611–626. <https://doi.org/10.1177/0950017011419708>
- Le Billon, P., & Sommerville, M. (2017). Landing capital and assembling 'Investable Land' in the extractive and agricultural sectors. *Geoforum*, 82, 212–224. <https://doi.org/10.1016/j.geoforum.2016.08.011>
- Mader, P., Mertens, D., & van der Zwan, N. (2020). Financialization: An introduction. In P. Mader, D. Mertens, N. van der Zwan (Eds.) *The Routledge International Handbook of Financialization* (pp. 1–16). Routledge
- Magnan, A. (2015). The financialization of agri-food in Canada and Australia: Corporate farmland and farm ownership in the grains and oilseed sector. *Journal of Rural Studies*, 41, 1–12. <https://doi.org/10.1016/j.jrurstud.2015.06.007>
- Magnan, A. (2016). *When wheat was king: The rise and fall of the Canada-UK grain trade*. University of British Columbia Press.
- Magnan, A. (2017). Farmland investment and financialization in Saskatchewan, 2003–2014: An empirical analysis of farmland transactions. *Journal of Rural Studies*, 49, 92–103. <https://doi.org/10.1016/j.jrurstud.2016.11.007>
- Martin, S.J. (2015). The state of time in this financial moment: Financialization in the food system—Synthesis paper. *Canadian Food Studies/La revue canadienne des études sur l'alimentation*, 2(2), 287–293. <https://doi.org/10.15353/cfs-rcea.v2i2.93>
- Menzies, H. (1994). *By the labour of their hands: The story of Ontario cheddar cheese*. Quarry Press.
- Muirhead, B. (2014). "Crying over spilt milk: The history of dairy supply management and its role in recent trade negotiations." Centre for International Governance Innovation, Cigi Papers Series. <https://www.cigionline.org/publications/crying-over-spilt-milk-history-dairy-supply-management-and-its-role-recent-trade>
- Native Land[AM1.1]. (2022). Omàmìwininiwag (Algonquin). Native-Lands.ca
- Ouma, S. (2016). From financialization to operations of capital: Historicizing and disentangling the finance-farmland-nexus. *Geoforum*, 72, 82–93. <https://doi.org/10.1016/j.geoforum.2016.02.003>
- Ouma, S. (2020). *Farming as financial asset: Global finance and the making of institutional landscapes*. Agenda Publishing.
- Qualman, D., Akram-Lodhi, A. H., Desmarais, A. A., & Srinivasan, S. (2018). Forever young? The crisis of generational renewal on Canada's farms. *Canadian Food Studies/La revue canadienne des études sur l'alimentation*, 5(3), 100–127. <https://doi.org/10.15353/cfs-rcea.v5i3.284>

- Reeveley, D. (2013, March 13). Walton, investors banking on growth: City planners will ask councillors to freeze the southwest Ottawa boundary, but that isn't what everyone wants to hear, writes David Reeveley[AM2.1]. *The Ottawa Citizen* (online).
- Rotz, S., Evan D.G.F., & Martin, R.C. (2017). Situating tenure, capital and finance in farmland relations: Implications for stewardship and agroecological health in Ontario, Canada. *The Journal of Peasant Studies*, 46(1), 142–164. <https://doi.org/10.1080/03066150.2017.1351953>
- Smythe, E.A. (2015). Local food, farmland, and urban development: A case of land grabbing North American style. *Canadian Food Studies/La revue canadienne des études sur l'alimentation*, 2(1), 48–47. <https://doi.org/10.15353/cfs-rcea.v2i1.29>
- Sommerville, M. (2018). Naturalising finance, financialising natives: Indigeneity, race, and 'responsible' agricultural investment in Canada. *Antipode*, 53(3), 643–664. <https://doi.org/10.1111/anti.12395>
- Sommerville, M. & Magnan, A. (2015). 'Pinstripes on the prairies': Examining the financialization of farming systems in the Canadian Prairie Provinces. *The Journal of Peasant Studies*, 42(1), 119–44. <https://doi.org/10.1080/03066150.2014.990894>
- St. Pierre, D. (2019). In-person interview, January 17, 2019.
- Statistics Canada . (2016). Land use, Census of Agriculture, 2011 and 2016. *Census of Agriculture historical data*. Table: 32-10-0406-01 <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=3210040601>
- Statistics Canada. (2022a). Broad age groups, gender and census year: Canada, provinces and territories, census divisions and census subdivisions. Table 98-10-0032-01 <https://doi.org/10.25318/9810003201-eng>
- Statistics Canada . (2022b). Farms classified by total farm area, Census of Agriculture historical data. Table: 32-10-0156-01. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210015601>
- Visser, O. (2015). Finance and the global land rush: Understanding the growing role of investment funds in land deals and large-scale farming. *Canadian Food Studies/La revue canadienne des études sur l'alimentation*, 2(2), 278–86. <https://doi.org/10.15353/cfs-rcea.v2i2.122>
- Visser, O. (2016). "Running out of farmland? Investment discourses, unstable land values and the sluggishness of asset making." *Agriculture and Human Values*, 34, 185–198. <https://doi.org/10.1007/s10460-015-9679-7>
- Wilson, A., & Martorell, H. (2017). Supporting new farmers through agricultural policy. Discussion Paper. FLEdGE: Food: Locally Embedded Globally Engaged) and Food Secure Canada. https://www.fledge-research.ca/wp-content/uploads/2021/07/discussion_paper_supporting_new_farmers_through_agricultural_policy.pdf
- Winearls, J. (1991). *Mapping Upper Canada, 1780-1867: an annotated bibliography of manuscript and printed maps*. University of Toronto Press. <https://doi.org/10.3138/9781442677012>



Research Article

New life cycle database on food consumption: A strategic tool to drive Climate-Smart Action in Québec

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Abstract

Purpose: Food consumption is a major contributor to individual carbon footprint but production conditions, supply-chain configurations, and eating habits vary significantly across regions. A regionalized overview of food consumption patterns and their potential impact on climate change is therefore essential to allowing businesses, governments, and citizens to reach more sustainable food consumption targets.

Methods: We collected and structured data to develop the first life cycle inventory database of food consumption in the province of Québec (Canada) and build a farm-to-fork model covering 58 food categories consumed in 2018. Food intakes are derived from a 24-hour recall survey of 2297 Québec adults conducted in 2015. Consumption markets (domestic and imported) based on the Québec Ministry of Agriculture, Fisheries and Food data, food production processes, food loss and waste rates based

on FAO data, and transportation distances are regionalized. We analyze the main contributors to food consumption carbon footprint across the supply chain and outline the profiles of eight Québec adult archetypes.

Results: The average food consumption carbon footprint in Québec is 2377 kg CO₂eq per capita per year. Gender-and-age-based carbon footprint archetypes range from 1.7 and 2.9 metric tons CO₂eq/adult/year. Meat and dairy contribute to 48%, and food waste contributes 17% to the carbon footprint of purchased food.

Perspectives: This initial diagnostic provides a baseline for identifying the key drivers of Québec's food consumption carbon footprint. While further regionalization and greater granularity are still needed, this initiative offers a solid foundation for stakeholders to shape sustainable food systems and drive climate change mitigation.

Keywords: carbon footprint, GHG emissions, life cycle assessment, Québec, life cycle inventory database, food consumption

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Résumé

Objectif : La consommation alimentaire est un facteur majeur de l'empreinte carbone individuelle, mais les conditions de production, les configurations des chaînes d'approvisionnement et les habitudes alimentaires varient considérablement d'une région à l'autre. Il est donc essentiel d'avoir une vue d'ensemble régionalisée des modes de consommation alimentaire et de leur impact potentiel sur le changement climatique pour permettre aux entreprises, aux pouvoirs publics et aux citoyens d'atteindre des objectifs de consommation alimentaire plus durables.

Méthodes : On a collecté et structuré des données pour développer la première base de données d'inventaire du cycle de vie de la consommation alimentaire dans la province de Québec (Canada) et construire un modèle « de la ferme à l'assiette » couvrant 58 catégories d'aliments consommés en 2018. Les apports alimentaires proviennent d'une enquête de rappel alimentaire sur 24 heures menée en 2015 auprès de 2 297 adultes québécois. Les marchés de consommation (produits locaux et importés), d'après les données du ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec, les processus de production alimentaire, les taux de pertes et de gaspillage

alimentaires d'après les données de la FAO, ainsi que les distances de transport, sont régionalisés. On analyse les principaux facteurs contribuant à l'empreinte carbone de la consommation alimentaire tout au long de la chaîne d'approvisionnement et on dresse le profil de huit archétypes d'adultes québécois.

Résultats : L'empreinte carbone moyenne de la consommation alimentaire au Québec est de 2 377 kg d'équivalent CO₂ par habitant et par an. Les profils d'empreinte carbone, selon le sexe et l'âge, varient entre 1,7 et 2,9 tonnes d'équivalent CO₂ par adulte et par an. La viande et les produits laitiers représentent 48 % de l'empreinte carbone des aliments achetés, tandis que le gaspillage alimentaire en représente 17 %.

Perspectives : Ce premier diagnostic sert de référence pour identifier les principaux facteurs de l'empreinte carbone liée à la consommation alimentaire au Québec. Même s'il faut encore affiner la régionalisation et la granularité des données, cette initiative offre une base solide aux acteurs concernés pour mettre en place des systèmes alimentaires durables et lutter contre le changement climatique.

Mots-clés : empreinte carbone, émissions de GES, analyse du cycle de vie, Québec, base de données sur les inventaires du cycle de vie, consommation alimentaire

Introduction

In order to mitigate climate change, the Québec province of Canada (referred to as Québec) has committed to reaching carbon neutrality by 2050 (Government of Québec, 2024). Greenhouse gas (GHG) emissions contribute to climate change regardless of where they are released around the world. Therefore, achieving carbon neutrality requires not only reducing emissions within Québec's territory but also addressing those generated abroad, such as the production emissions of imported food commodities consumed in Québec. This calls for a consumption-based approach, which accounts for both direct and indirect emissions linked to consumed goods, whether produced locally or imported. This contrasts with the traditional

territorial approach, which only accounts for direct emissions from domestic production and excludes emissions embedded in imports.

Moreover, achieving carbon neutrality requires the identification of effective mitigation actions beyond those that are perceived as effective. Indeed, evidence shows that perceived low-carbon solutions are not always efficient (Hartmann et al., 2021; Macall et al., 2021; Saulais & Espougne, 2024) and this gap between perception and actual impact is especially pronounced for food-related choices (Kause et al., 2019; Saulais & Espougne, 2024). This is also often due to the lack of quantification of GHG emissions reductions and life cycle perspective (to account

for both direct and indirect impacts). There is a strong need to go beyond perceptions and to rely on robust and quantified scientific data to first identify hotspots and then efficient actionable levers to mitigate potential consumption impacts (Cap et al., 2025; Cucurachi et al., 2019; Dubois et al., 2019; ElHaffar et al., 2020; Ivanova et al., 2020).

The food sector is key to reducing the global carbon footprint (Costa et al., 2022; Hadjikakou et al., 2025; Rockström et al., 2025; Te Wierik et al., 2025). If no mitigation measure is taken, on both production and consumption ends, global food consumption alone could add nearly 1°C to global warming by 2100 (Ivanovich et al., 2023). Agrifood systems are responsible for one-third of global GHG emissions (Costa et al., 2022; Crippa et al., 2021; Rockström et al., 2025), with 70 % of GHG emissions associated with crop production and animal breeding, including 30% from land use and land use change activities (LULUC), mainly from deforestation and soil degradation. The remaining 30% is associated with food processing, packaging, distribution and end-of-life (FAO, 2024). The food sector also contributes to biodiversity loss, water stress, land use, and eutrophication (Crenna et al., 2019; Willett et al., 2019), which are exacerbated by climate change (Gosling & Arnell, 2016; Viveros Santos et al., 2023; Yang et al., 2024). Food consumption is one of the highest contributors to consumer carbon footprints in Europe (Alves et al., 2024; Castellani et al., 2019; Notarnicola et al., 2017; Sala & Castellani, 2019), Asia (Adhikari & Prapasongsa, 2019; Zhao & Schroeder, 2010) and North America (Heller et al., 2018; Jennings et al., 2023; Jones & Kammen, 2011; Weber & Matthews, 2008a). In Canada, food consumption represents about 16% of the consumers' carbon footprint, and up to 19% in Québec, following transport and housing (Patouillard et al., n.d.). It is therefore essential to improve the representativity of LCI data in the food sector.

Life cycle inventories (LCI) in the food sector should be regionalized to better reflect domestic production conditions and consumption patterns, which are highly variable among regions (Chaplin-Kramer et al., 2017; Scarborough et al., 2023). Indeed, for the same product, the carbon footprint of food production on farms can

vary up to a factor of 5 (Cao et al., 2026; Halpern et al., 2022; Wang et al., 2026) and depend on many local factors like pedo-climatic conditions (e.g., precipitation, temperature, soil conditions) and agricultural practices (e.g., intensive, organic, no tillage, greenhouse, deforestation) affecting yields, input quantities (e.g., fertilizers, pesticides, energy), or direct GHG emissions (e.g., CH₄, N₂O) (Chapman et al., 2025; Clune et al., 2017; Poore & Nemecek, 2018). In addition, food supply chains are mostly international (Li et al., 2022), especially in high income countries where consumers want to access any type of food at any time of the year (Fan et al., 2022). Therefore, LCIs of food purchased at the retail level should also be regionalized to account for market shares of consumed food produced locally and for international imports with associated transport (Nemecek et al., 2019). Finally, LCIs of ingested food should be regionalized at the diet level to account for food consumption habits (e.g., amount and type of consumed food products, waste rate at the consumer level) that vary greatly from one region to another (Aleksandrowicz et al., 2016; Fan et al., 2022; González-García et al., 2018; Ibarrola-Rivas & Nonhebel, 2022; B. F. Kim et al., 2020). These observations also apply to the food supply sector in Québec, where the context is different from the rest of North America or Canada due to its specific climate conditions and agricultural practices, defined by a high level of specialization in meat and dairy production (Chemins de Transition, 2023; ISQ & MAPAQ, 2021; Le Vallée et al., 2017).

Climate change is a recurrent hotspot of impacts on biodiversity and human health in life cycle assessments (LCA) of food systems (Crenna et al., 2019; Fresán et al., 2025). Moreover, it is a widely considered environmental indicator by decision-makers (Dietz et al., 2018). Hence, we are focussing on the carbon footprint in this study. Many studies assessing carbon footprint of diets have been conducted on various regions (Aguirre-Sánchez et al., 2023; González-García et al., 2018; Heller et al., 2013; Kustar & Patino-Echeverri, 2021; Nabipour Afrouzi et al., 2023), especially in Europe (Germani et al., 2014; Hallström et al., 2022; Mertens et al., 2019; Notarnicola et al., 2017; Rabès et al., 2020; Scarborough et al., 2023; Vieux et al., 2012) and the United States (US)

(D. Kim et al., 2020; Rose et al., 2019). The Institut de la statistique du Québec—Québec provincial institute for statistics—published an estimate of the carbon footprint of food consumption in 2017, equal to 2.2 metric tons CO₂ equivalent per capita (Institut de la Statistique du Québec, 2022). However, this does not account for imports embedded with direct methane and nitrous oxide emissions and GHG emissions from LULUC activities. To our knowledge, only four LCA-based studies have already assessed the carbon footprint of diets in Canada as a whole or in the province of Ontario. Auclair and Burgos (2021) assessed the carbon footprint of self-selected diets in Canada, without any distinction by province. Additionally, this study suffers from two main limitations: 1) GHG emissions per food product are not specific to the Canadian context, but reflect global averages; 2) The lifecycle of food consumption is truncated, mostly accounting for impacts from cradle-to-farm gate (or sometimes for cradle-to-processing gate), and excluding packaging, distribution and consumer stages (e.g., food storage, preparation, and end-of-life). Veeramani et al. (2017) and Topcu et al. (2022) assessed the carbon footprint of self-selected diets in Ontario, differentiated by dietary patterns. They used a LCI regionalized for Ontario with farm-to-fork boundaries excluding some stages like waste management or refrigeration. Topcu et al. (2025) quantified the carbon footprint of eating patterns in ten Canadian provinces, including Québec but with a normalized functional unit of 2000 kilocalories, using the Topcu et al. (2022) database, with its abovementioned limitations. Those studies mention the need for developing a Canada-specific LCI database for the food sector, and not one assesses carbon footprint of diets, considering real quantity of calories ingested and not a standard value, in Québec.

The main objectives of this article are to (i) develop a life cycle inventory database of food consumption in Québec and to (ii) assess the carbon footprint of individual food consumption in Québec. To reach those objectives, we are building a process-based LCI database to assess the carbon footprint of food consumption 1) for the average Québec consumer to identify its main hotspots; 2) for different population archetypes in Québec to explore the associated variability.

Methods

Development of the Life Cycle Inventory Database and food datasets

The life cycle inventory database for consumption in Québec, currently under development, referred to as LCI DB for consumption in Québec, aims to provide a comprehensive life cycle perspective of consumption in Québec, including food, transport, housing, personal care, and digital services. It is built on the Québec LCI database project, developed to reflect the main production industries in Québec and integrated in ecoinvent life cycle inventory database (Lesage & Samson, 2016).

This article focusses on the food consumption axis of the LCI DB for consumption in Québec, describing its structure and datasets developed in version 0.1.7 of the LCI DB (Patouillard et al., 2026). The LCI datasets developed (foreground LCI) are divided into seven dataset groups from “farm to fork” and are interconnected with other LCI databases to complete life cycles (background LCI). It includes food production, manufacturing and distribution, as well as impacts associated with the purchased and consumption of food (transport, storage, cooking, waste management). Data sources and links with other LCI databases are chosen to maximize geographical (Québec province or specific regions for imports when available), temporal (closest to 2018), and technological (closest available technologies) representativeness, to the extent allowed by data availability, accessibility and the time available to authors of this study. Foreground LCI datasets are mainly interconnected to background LCI datasets from the LCI DB ecoinvent v3.11 cut-off (Wernet et al., 2016). The cut-off system model was selected for the background LCI database as it is consistent with the attributional scope of this study, which aims to describe the environmental burdens associated with current food consumption patterns in Québec rather than modeling the consequences of systemic or marginal changes in production. In contrast, the consequential system model is designed to capture market-mediated responses to a change in demand, which is not the objective pursued here, while the APOS system model would be inconsistent with the modeling of food losses and

waste in the foreground system, where lost or wasted food is assumed to carry its full upstream burden rather than being partly reallocated to alternative valorization pathways. Furthermore, the cut-off system model is widely used in food LCA literature, including comparable databases such as AGRIBALYSE, thereby facilitating comparability of results with existing studies. LCI datasets are built in an Excel file and then imported into the Brightway framework (Mutel, 2017). All details regarding foreground LCI datasets are available at <https://doi.org/10.5281/zenodo.18938050>. The following paragraphs present the LCI model developed for food consumption and the main assumptions and data sources used for foreground LCI datasets.

LCI database boundaries. “Farm-to-fork” system boundaries include all activities allowing food consumption: farm production (crops and livestock), food manufacturing and packaging, distribution including transport, consumption, and end of life (EoL). Figure 1 presents the structure of the seven dataset groups. Included and excluded activities and main data sources and modelling assumptions are described below. See Figure 1.

- *Food supply* includes all activities related to food production (from field to farm gate) and food consumption markets in Québec, i.e., shares of consumed food locally produced in Québec and imported from abroad, with their associated transport and food loss and waste (L&W) during agricultural production and postharvest handling and storage.
- *Food manufacturing* represents the transformation of raw food into processed food. It accounts for processing yields and includes the energy and other commodities for food processing, like water, and the food L&W at processing and packaging. When the processing location was not specified it was assumed to be processed in Québec. Canned and frozen goods are not modelled in this database version.
- *Packaging* includes the production, transport and EoL of food primary packaging (i.e. packaging in direct contact with food and intended for the consumer). Secondary and tertiary packaging (used during transport and distribution) are excluded due to data gaps. The primary packaging is modeled for each food category

using datasets from AGRIBALYSE 3.1 (Asselin-Balençon et al., 2022). The background processes of these datasets representing the French context have been adapted for Québec, but the foreground quantities were kept unchanged. Packaging end-of-life is included and modeled as 45% going to sanitary landfill and 55% as recycled (Éco Entreprises Québec & RECYC-QUÉBEC, 2015).

- *Distribution* represents the storage of processed food at retail store. It includes the electricity consumption of retail stores (Energie Plus, 2019), the infrastructure (Petit et al., 2014) and the food L&W occurring at retail (Parfitt et al., 2010). Energy consumption, infrastructures and L&W of distribution centers are excluded due to a lack of data. In the current version of the database, the transports, storage and refrigeration between food manufacturing plants and retail store are excluded due to data gaps.
- *Preparation* includes the transport of purchased food from retail store to the consumer, as well as the cooking and storage i.e. refrigeration, water consumption and soap for washing dishes. All food consumption stages are modeled as if all meals were cooked and consumed at home. Quantities of food consumed through catering services (eat in or take out) are accounted for in the diet but are modeled as food prepared and consumed at home.
- *Food consumption* represents the average yearly diets for an adult in Québec, differentiated by gender and age archetypes. Gender was defined as biological sex (male or female), hereafter referred to as men and women. It distinguishes ingested food, food losses at consumer level, and food waste at consumer level. Purchased food is partitioned along two independent dimensions: whether a fraction is edible or non-edible, and whether the food item is consumed or discarded (Table A3 in SI 1). This yields three mutually exclusive categories:
 - » **Ingested food:** the edible part of food items that are consumed.
 - » **Food losses at consumer level:** the non-edible part of food items that are consumed (e.g., the seeds and core of an eaten apple, peels, bones). Non-edible parts are defined according to the most

common consumer behaviours, acknowledging that practices may vary. Hence, consumer have little control over the losses.

- » **Food waste at consumer level:** purchased food, including both its edible and non-edible parts, that is discarded by the consumer without being consumed. The non-edible fraction of discarded food is accounted for under food waste and is therefore *not* counted as a food loss; conversely, food losses comprise only the non-edible fraction of food that is actually consumed. Excess food intake, which occurs when energy intake exceeds the body's physiological needs (Sundin et al., 2021), is not considered as food waste in this study. The three categories are thus additive and non-overlapping: Purchased food = ingested food + food losses at consumer level + food waste at consumer level.

- *End-of-Life* represents waste treatments, such as composting or landfill, used to handle food L&W all along

the supply chain and at the consumer level. Direct emissions related to digestion and waste treatment of human excretion are excluded, following the recommendations of Muñoz et al. (2010).

Population archetypes. Eight archetypes are defined by dividing men and women across four age categories: 19-30 years old, 31-50 years old, 51-70 years old, 71 years old and older. Children are not considered in the current version of the database due to data gaps.

Diets. Types and quantities of ingested food and food L&W vary from one individual to another. They depend on demographic factors (gender and age), physical factors (e.g., weight, height, physical activity), and other socio-economic factors (e.g., revenue, residency region, level of education, culture). Here we differentiate individuals only on the basis of gender and age, which are two of the main factors explaining the individual variability in Québec (INSPQ, 2009). Therefore, amounts of ingested food are

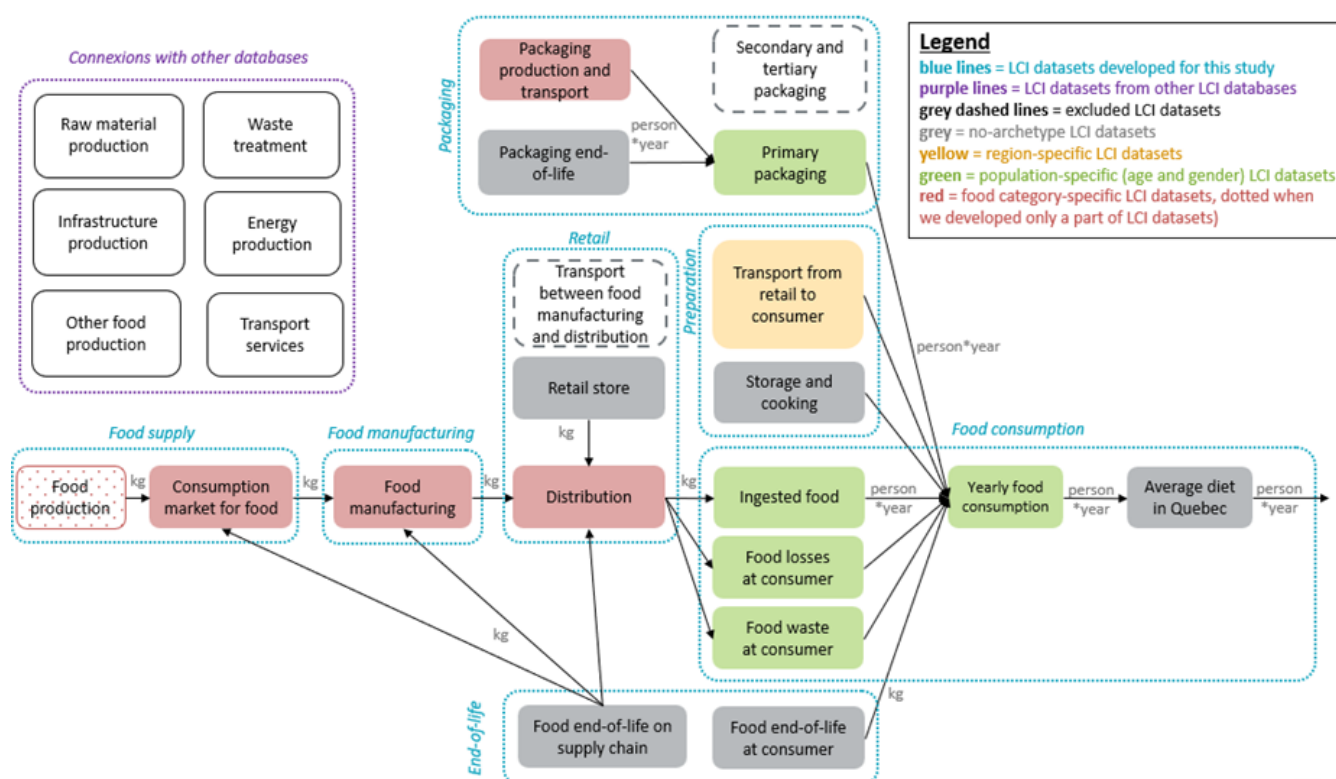


Figure 1: Boundaries of the LCI DB for food consumption in Québec. Blue lines define LCI datasets specifically developed for this project (foreground LCI), which are interconnected with other LCI databases, identified with purple lines, to complete the life cycles (background LCI). Grey dashed lines represent excluded processes. Transport and storages between food manufacturing and retail are excluded.

differentiated for 8 adult gender-and-age-based consumer archetypes (the quantity of calories associated with each archetype is available in Supplementary information file 1). Those amounts are extracted from a 2015 self-reported 24-hour recall survey used to estimate the observed annual food quantities ingested by 2297 adults in Québec (Health Statistics Division, 2023) and are different from the recommendations of Canada's food guide (Government of Canada, 2025). We followed the 2015 Canadian Community Health Survey guidelines (Health Canada, 2018) to derive the weighted average of ingested food per age-and-sex archetype, using the sample weight attributed to each respondent of the survey, as done in previous studies (Ahmed et al., 2021). The average diet for adults in Québec, which is mainly omnivorous, is calculated based on the 2018 distribution of Québec's adult population (Government of Québec, 2019). Specific diets, such as vegetarianism, are not distinguished as a specific diet archetype in this study but are included in the survey and thus in the average diet. The amount of food produced is derived from the average diet and production yields considering food L&W rates along the supply chain from farm to fork.

Food categories. The 156 food products from the 2015 survey are grouped into 58 food categories following the INSPQ (2009) food product classification (see table A.2 of Supplementary information file 1 for the list of the 58 food categories). Each category contains one or several specific food products. A pragmatic approach was adopted to reduce the data collection time. Following Clune et al. (2017), who showed that within-category variability in climate impacts is lower than between categories, we approximated the impact of each food category using the most consumed product within it. As a result, some specific products are not modeled in detail—for example, the category “onion, garlic and leek” is represented by the LCI of onions. This choice limits analysis to categories and leaves some Québec-specific items without a representative LCI or without modeling.

Food production at farm gate. The agricultural production methods represented in the database are conventional only. Alternative methods, like organic or regenerative agriculture, are not modelled yet. It is assumed to be representative of the food market in Québec, since only about 4% of food

consumed in Québec is from organic agriculture (Filière Biologique du Québec, 2025). Regional meat production LCI dataset is modeled as aggregated life cycle GHG emissions (CO_2 , CH_4 and N_2O) from GLEAM model (FAO, 2017), where enteric fermentation emission factors are regionalized. GHG emissions from land use and land use change (LULUC) are regionalized and accounted for as long as they are included in the background ecoinvent 3.11 LCI datasets albeit the approach adopted by ecoinvent is not the object of an international consensus (Lehtilä et al., 2025).

Consumption market for food. Consumption market datasets are built upon imports (corrected trade data accounting for actual country of origin of production) and domestic production net of exports provided by the Québec Ministry of Agriculture, Fisheries and Food (MAPAQ, 2019). The model focuses solely on consumption markets for raw agricultural products at the farm gate (e.g., whole carrots) and does not cover consumption markets for processed food products (e.g., grated carrots). The consumption market share (MS) of a food product f produced in region c exported to region d , such as Québec (QC) province is calculated as per equation 1:

$$MS_{f,c,QC} = \frac{Imports_{f,c,QC}}{Production_{f,QC} - \sum_{d \in IC} Exports_{f,QC,d} + \sum_{c \in EC} Imports_{f,c,QC}} \quad (1)$$

Where IC is the list of all importing countries of food product produced in Québec and EC is the list of all countries exporting food products to Québec.

Transportation between supply chain stages. Transportation distances are calculated as the distance between the center of the exporting region to the city of Montréal (QC) arriving at a retail store using Google Maps for transport by truck and SeaRates online tool for transoceanic ship transport. Return trips are not included due to data gaps on load factor. An average transportation distance for consumption market per food category is calculated using the consumption market share of each region of imported products. Transport between distribution centers and retail store is excluded due to data gaps. Average retail-to-home transport distances are differentiated across Québec regions (Robitaille & Bergeron, 2013).

Preparation at home. We assumed that 1% of per capita water consumption is dedicated to washing dishes and that two grams of soap per liter of water was consumed. We included the carbon footprint of the production and the energy consumption of cooking appliances (Ressources Naturelles Canada, 2016).

Food L&W at consumer level. Amounts of food waste at the consumer level are calculated for each food category based on a mass balance using the following data: 1) amounts of ingested food in Québec per consumer archetype (Health Statistics Division, 2023), 2) food losses at consumer level per food product (Government of Canada, 2016), 3) food L&W at grocery level based on Food and Agriculture Organization (FAO) data for North America (Parfitt et al., 2010), 4) food L&W at grocery level and at consumer level in Canada (Statistics Canada, 2019).

Food L&W along the supply chain. Food L&W are modeled at consumption market, food manufacturing and grocery stages using food L&W rates from FAO (Parfitt et al., 2010), which provides L&W rates, differentiated by supply chain stages, food types, and world regions. Quebec L&W are approximated using North American data (Parfitt et al., 2010).

Food EoL processing pathways. Shares and processes of each food waste processing pathways, i.e., sanitary landfill and composting, are specific to Québec (RECYC-QUÉBEC, 2015).

Carbon footprint assessment method

This section describes the methodology used to assess the carbon footprint of food consumption in Québec.

Functional unit. The carbon footprint results presented in this study are quantified for the functional unit: “to provide the annual food intake of an adult in Québec province in 2018”. The food intake is expressed in kg of ingested food per person per year, because our goal is to represent actual variability in food among the population rather than the intakes recommended by nutritionists for a balanced diet.

Food product classification in inventory. We adopt the food product classification by INSPQ (2009) to facilitate results comparison with a previous version of the LCI database,

which used average age-and-gender specific diet compiled upon a 2004 self-reported 24-hour recall survey. This enables a thorough comparison of the carbon footprint of food consumption in Québec between 2004 and 2015, which is discussed in Supplementary information file 1.

Impact assessment. To evaluate the carbon footprint, GHG emissions are characterized using the 100-year Global Warming Potential (GWP100) from the IPCC AR6 report (Smith et al., 2021). In the IMPACT World+ footprint method (Bulle et al., 2019) version 2.1 (Agez et al., 2024), this characterization corresponds to the midpoint indicator *Climate Change, short-term*. Results are expressed in kg of CO₂ equivalent (kg CO₂eq). The results were generated through Activity Browser, the graphical user interface for Brightway (Steubing et al., 2020).

Results presentations. The carbon footprint of food consumption in Québec is explored using two complementary analyses: 1) identification of hotspots in food consumption for the average Québec consumer and 2) assessment of the carbon footprint of food consumption for different population archetypes. The carbon footprint of food consumption in Québec in 2015 was also compared with that of 2004, based on our previous study using average diet data compiled by INSPQ (2009) from a 2004 self-reported 24-hour recall survey. The results of this comparison are presented in Supplementary information file 1.

Contribution analysis. The hotspot analysis is presented for the main contributors from a consumer perspective, and the different food groups. Food groups were created by aggregating the different food categories based on the classification available in Supplementary information file 1. The carbon footprint of each food group represents the potential impact of food from farm to fork.

Results

Hotspot analysis on the carbon footprint of food consumption for the average Québec consumer

The average carbon footprint of food consumption in Québec is assessed at 2377 kg CO₂eq per capita per year. Figure 2

presents a contribution analysis of the carbon footprint of food consumption. Primary packaging contribution is presented separately from purchased food to show its total contribution. Contribution of food losses (8%) and food waste (14%) at home by consumers is also shown separately to highlight the significant leverage consumers have to reduce their carbon footprint. The contribution of transport between farm and retail store is included in each food category as we adopt a consumer perspective (consumers cannot influence the transport from farm to retail). It is not displayed due to its minor contribution to total carbon footprint.

As displayed in Figure 2, purchased food is the main contributor to the total carbon footprint of food consumption in Québec (81%). Among this 81%, 60% is due to ingested food, 8% to food losses and 14% to food waste at the consumer level. It is to be noted that food L&W at the consumer level contributes 26% of the total carbon footprint of food consumption in Québec (combining the production, transformation, transport and EoL of food lost and waste). The impacts due to waste treatments of food L&W at the consumer level alone accounts for 4% of the total carbon footprint. Finally, the primary packaging,

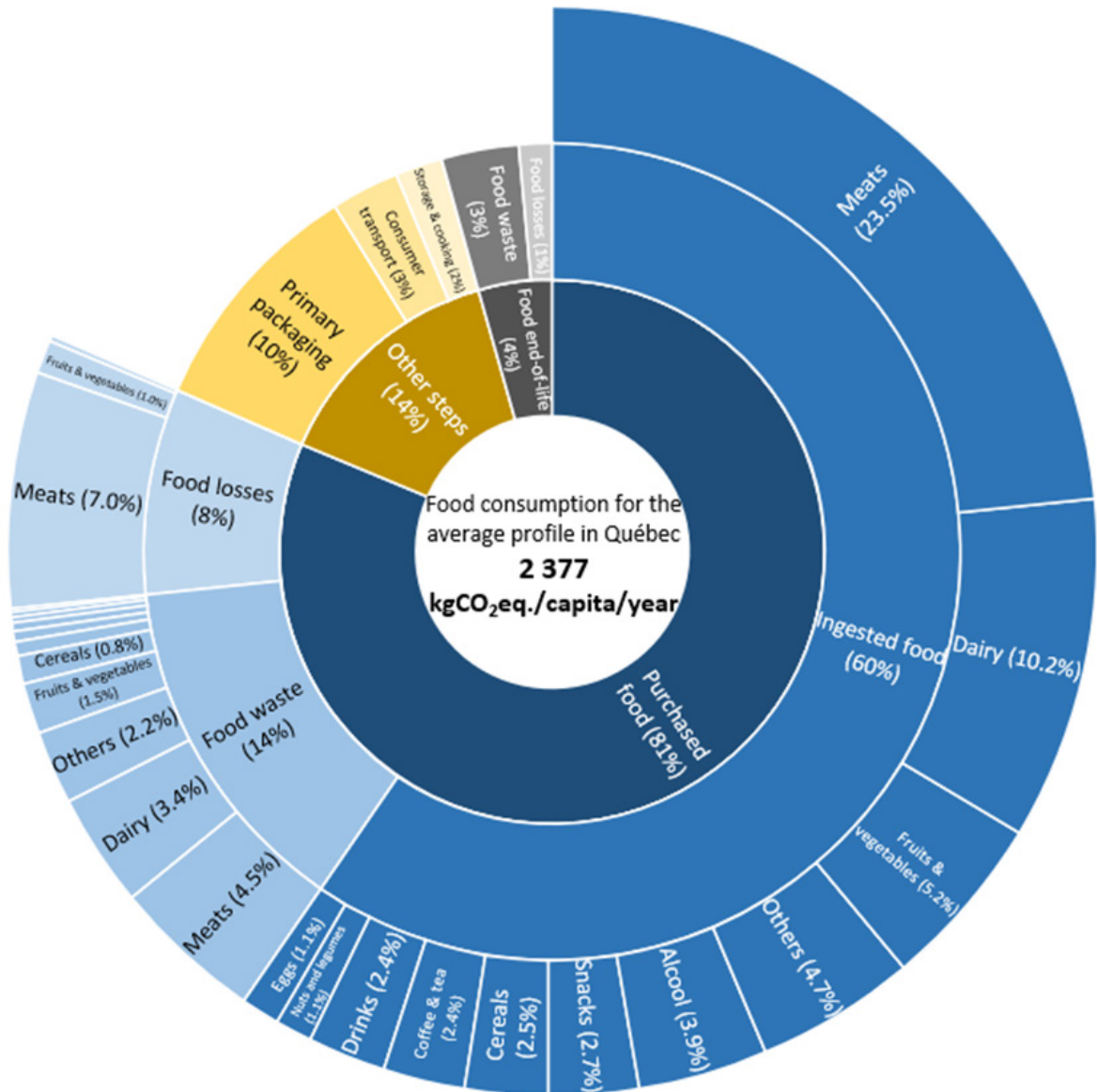


Figure 2: Contributions of life cycle stages and food groups to the average carbon footprint of food consumption in Québec. Potential impacts from distribution, food manufacturing, food supply and all food L&W except at home are embedded into purchased food carbon footprint.

consumer transport for grocery, and storage and cooking represent 10%, 3%, and 2% respectively of the total carbon footprint. This contradicts the perception, among about 20% of Québec consumers, that packaging is the most important contributor to food consumption carbon footprint (Saulais & Espougne, 2024).

In terms of food categories, meats and dairy represent more than half of the impact of ingested food (33.7%), and fruits and vegetables are the third contributor (5.2%). Meats and dairy are also the main contributors to the carbon footprint of food waste at the consumer level (7.9% of the 14%),

and fruits and vegetables are the second contributor (1.5% of the 14%). Although Drinks (mainly water) represent about 40% of the total mass of purchased food (see Figure 5 in section 3.2), it is one of the food groups with the lowest carbon footprint contribution (when not accounting for primary packaging contribution). Conversely, Meats and Dairy represent 19% of food purchased but are responsible for about 50% of the carbon footprint of food consumption in Québec.

As displayed in Figure 3, the contributions of ingested food, food waste at the consumer level, and food losses at

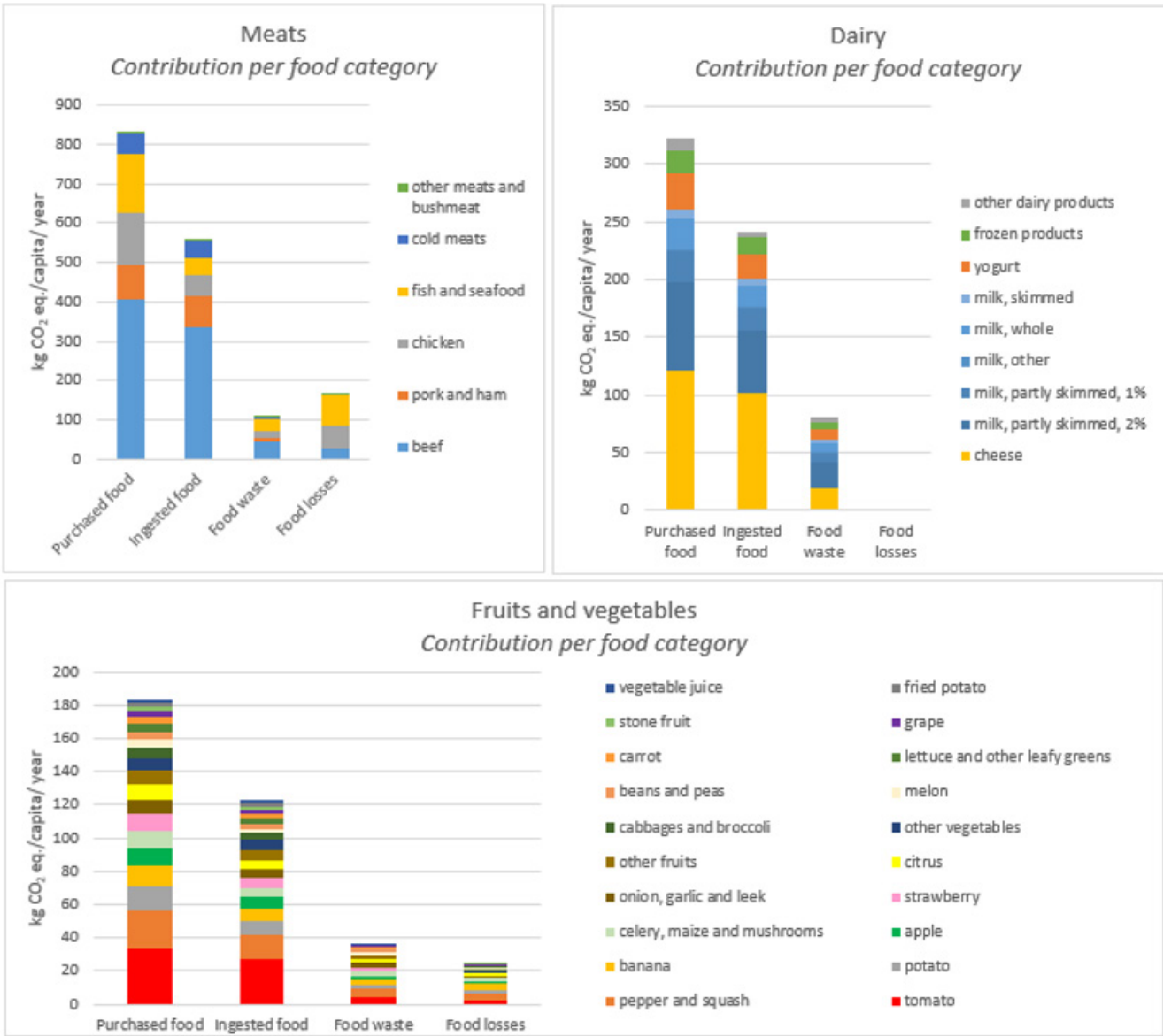


Figure 3: Contribution analysis specific food products to purchased food, ingested food, food waste, and food losses carbon footprint from the food categories Meats (upper left), Dairy (upper right) and Fruits and vegetables (lower)

the consumer level to the carbon footprint depend on the food category. Indeed, rates of food losses and food waste as well as carbon intensities are different for each food category (and are available in supplementary information file 1). The main life cycle contributors are the following:

- The carbon footprint of **Meats** is mainly driven by beef consumption, representing 49% of the purchased meat footprint, although it only represents 26% of the amount of ingested meats. This observation can be explained by CH₄ emissions from cow enteric fermentation (49%), feed production (28%) and CH₄ and N₂O emissions from manure management (13%) (FAO, 2010).
 - The carbon footprint of **Dairy** is mainly linked to processed milk and cheese representing respectively 44% and 37% of the purchased amount. Emissions from enteric fermentation, feed production and manure are the main contributors to the dairy carbon footprint (FAO, 2010).
- Regarding **Fruits and vegetables**, tomatoes, potatoes, and apples represent more than 35% of the ingested amount in our preliminary results. Tomatoes are the greatest contributor to the carbon footprint of purchased fruits and vegetables (18%) as 1) they are the most consumed food of the group in terms of purchased mass, and 2) the carbon intensity of tomato production is relatively high due to the use of fossil fuels in heated greenhouses for local production in Québec.

Figure 2 illustrates that packaging contributes globally to 10% of the total carbon footprint of food consumption. In Figure 4, we present the detailed contribution of primary packaging to the carbon footprint of the different food items. In this figure, we keep the other stages (i.e., food preparation and EoL at the consumer level) apart from the food item footprint. Primary packaging represents 33%, 21%, and 15% of the carbon footprint for Alcohol, Fruits and vegetables, and Cereals food groups, respectively (Figure 4). However, it rep-

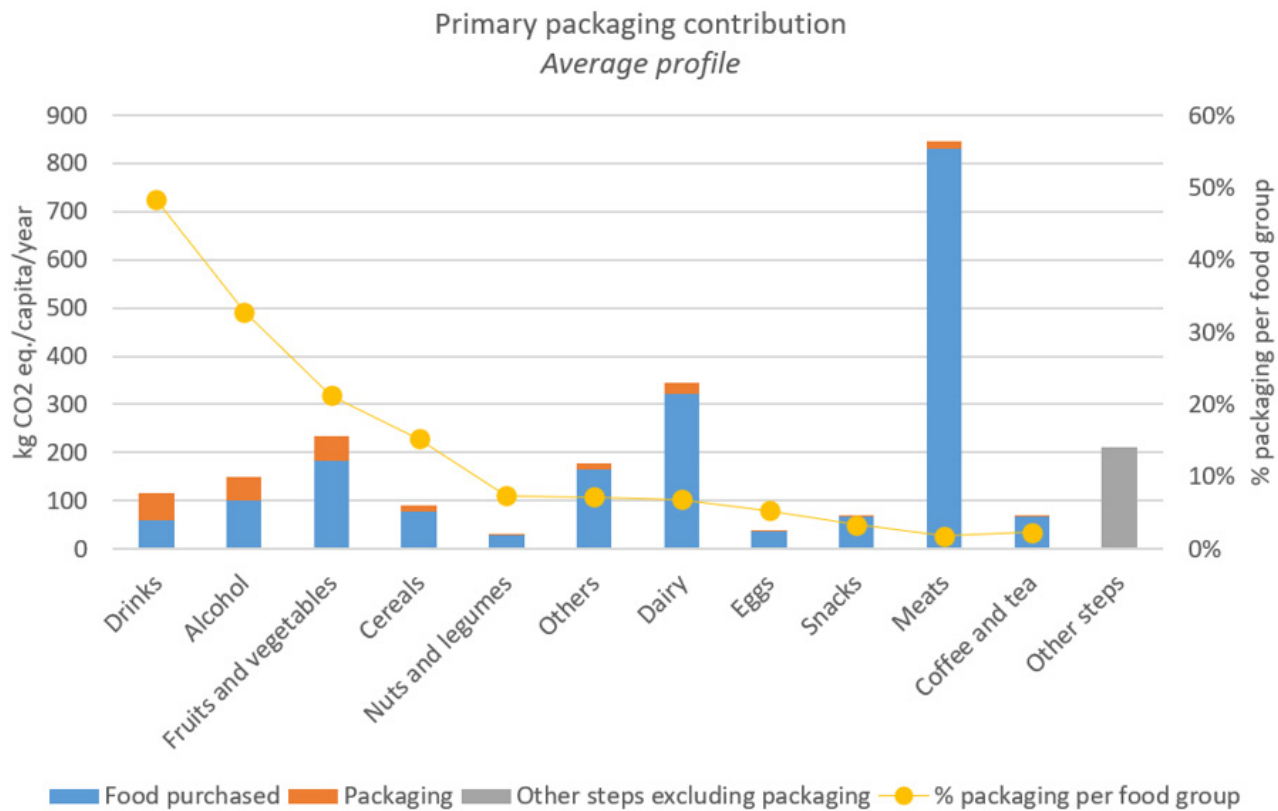


Figure 4: Contribution of primary packaging per food group to the carbon footprint of food purchased for the average Québec consumer. Other stages include food preparation and food EoL at the consumer level.

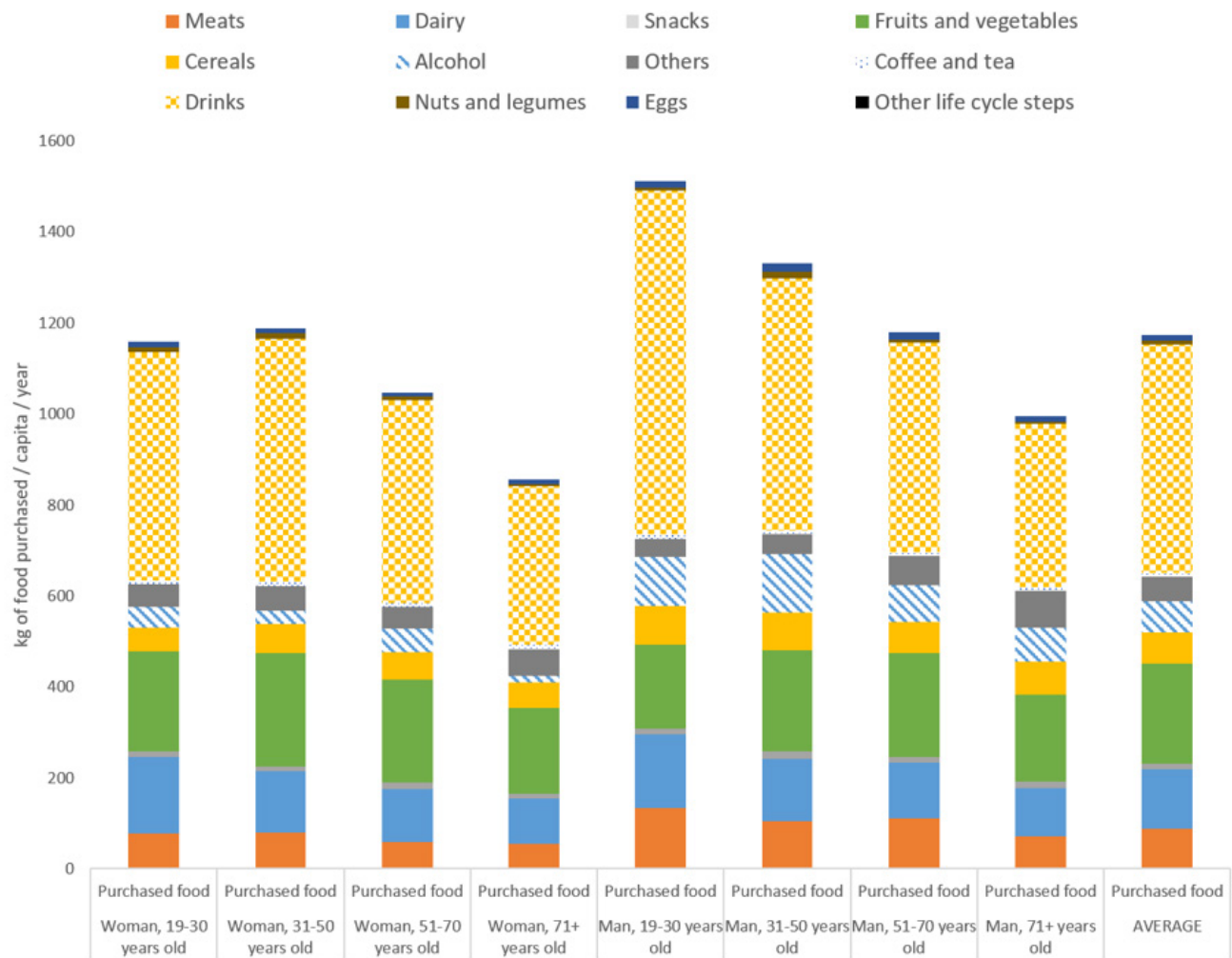


Figure 5: Quantity of purchased food (in kg per capita and per year, except for drinks in litres) for the eight gender-and-age-based archetypes in the adult population and for the average profile.

resents less than 5% of the carbon footprint of eggs, snacks, meats, and coffee and tea. Regarding the Alcohol beverages group, beer and wine are responsible for most of the packaging contribution because of glass production, which is more carbon intensive than the other packaging materials used for this food category. Regarding Fruits and vegetables, tomato, apple and banana are responsible for most of the packaging footprint because of the contribution of the polyethylene packaging film. Finally, the packaging for bread along with pasta and rice are the most important contributors to the carbon footprint of the Cereals food group due to the polyethylene packaging film.

Carbon footprints of food consumption for different population archetypes

Depending on the gender-and-age-based archetype, amounts of purchased food vary from 0.8t to 1.5t per capita per year (Figure 5) and the carbon footprint of food consumption in Québec varies from 1.7t to 2.9t CO₂eq per capita per year (Figure 6). Amounts of purchased food are lower for women compared to men and decrease with age. This is consistent with recommended calorie intakes by population archetype, which also depend on physical activity levels (INSPQ, 2009). The carbon footprint of food consumption follow the same trends as the purchased

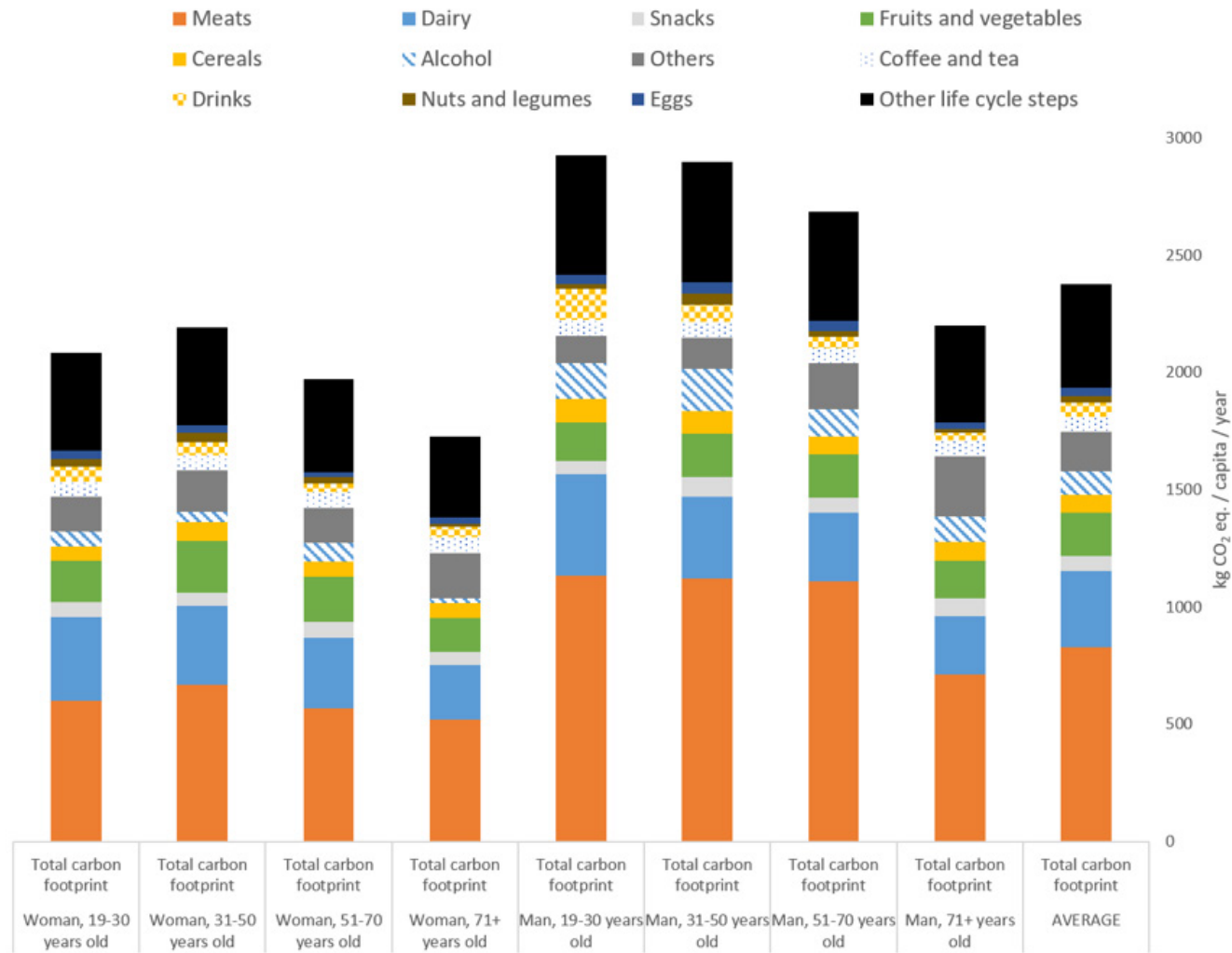


Figure 6: Total carbon footprint of food consumption in Québec (right axis in kg CO₂eq per capita and per year) for the eight gender-and-age-based archetypes in the adult population and for the average profile.

amounts: they are lower for women compared to men and decrease with age from 31 to 71+ years old, which means the lowest carbon footprint is obtained for the archetype representing 71+ year-old women. For women, the Dairy contribution reduces with age, but this reduction does not compensate for the increase in Meat and Fruits and Vegetable contributions observed from 19 to 50 years old. Therefore, 31-to-50-year-olds have the highest carbon footprint of food consumption among women. For men, the reduction of Dairy and Meats contribution from 19 to 50 years old is compensated by the increased contributions of Snacks, Alcohol, and Nuts and legumes.

Therefore, 19-to-30-year-olds and 31-to-50-year-olds almost have the same (and the highest) carbon footprint of food consumption among men.

Finally, considering the share of each archetype in the Québec population, men contribute 57% of the total carbon footprint of food consumption in the province, while women contribute 43% (see Supplementary information file 1). Age groups most contributing to the average profile's footprint are 31-to-50-year-olds (35%) and 51-to-70-year-olds (34%), and the less contributing is the 71+ year-old group (12%).

Discussion

Comparison with existing literature from other regions

As displayed in Figure 7, our result for the average carbon footprint of food consumption per capita per year is in the range of similar published results for various regions worldwide, even though this range is quite large, from 475 kg CO₂eq per capita per year in India to 3540 kg CO₂eq per capita per year in the US for selected studies. Our estimate is comparable to results obtained for Ontario (4% to 9% difference). However, other published results for Canada are 30% to 39% lower than ours, but main contributors (meat and dairy) are consistent. Those differences, as well as the wide range in carbon footprint estimates of food consumption in published studies, could be explained by different system boundaries. All studies cover emissions at least from cradle to farm gate, which cover more than half of carbon footprint of consumption (as per Figure 2), however no study perfectly matches our system boundary. Other sources of variability are discussed below Figure 7.

Diet composition. Food habits per region, i.e., type and amount of food products consumed, are probably one of the most influencing variables explaining the observed world variability. For instance, Indian diets are mainly lacto-ovo vegetarian whereas US or Brazilian diets include a large share of bovine meat, which explains the observable difference in terms of carbon footprint of food consumption (B. F. Kim et al., 2020).

Method for evaluating the annual food intake. First, the type of food intake reporting could influence the results. Indeed, self reported surveys may contain errors but tend to be less biased than food frequency questionnaires (Kipnis, 2003), as discussed in Heller et al. (2018), whereas food intake based on nutritional recommendations are not representative of population behaviours, due to overfeeding in high income countries or underfeeding in middle- and low-income countries. Second, the temporal representativeness of food intake data is important. Surveys based on 24-hour recall used to extrapolate annual food intake assume that selected days are representative of yearly habits,

which indeed can be influenced by other factors like seasonality. Third, the quality of the sample used to represent a population when food intakes are derived from surveys might be important, particularly the inclusion of children in the population. Finally, the calorie adjustment often made to compare different diets ensuring that they fulfill the same energy function can greatly influence the results across regions, as the observed quantity of calories ingested may vary significantly.

Quality of GHG emissions and carbon footprint estimates per food item. First, the definition of the system boundaries may vary from one study to another (González-García et al., 2018; Goossens & Schmidt, 2025). Most studies account for GHG emissions from cradle-to-farm or cradle-to-processing, which means life cycle stages like packaging, distribution, final transport to consumer, storage, preparation, and EoL of food L&W are excluded (Goossens & Schmidt, 2025). In addition, food overproduction due to food L&W along the value chain and at the consumer level is not always accounted for (Sundin et al., 2021). Second, the geographical representativeness of the GHG estimates per food item is often not in line with the consumption region. In fact, most studies use world average markets or assume that all foods consumed are produced locally. Best practices would be to 1) use regional consumption markets for each food product to account for the share of imports and domestic production, and 2) regionalize the LCI datasets of food production by region. Moreover, the level of food products disaggregation can influence the results, by using either generic or more specific data. Finally, the revision of GWP100 values between the IPCC AR5 and AR6 assessments demonstrates that characterization factors are not static. Consequently, future updates may lead to changes in the calculated carbon footprint of food products.

Main limitations of this study and potential improvements

Data representativity and data gaps. Although our study provides the best available estimates for carbon footprint of food consumption in Québec along with regionalized LCI datasets, our LCA model can be improved upon at different levels.

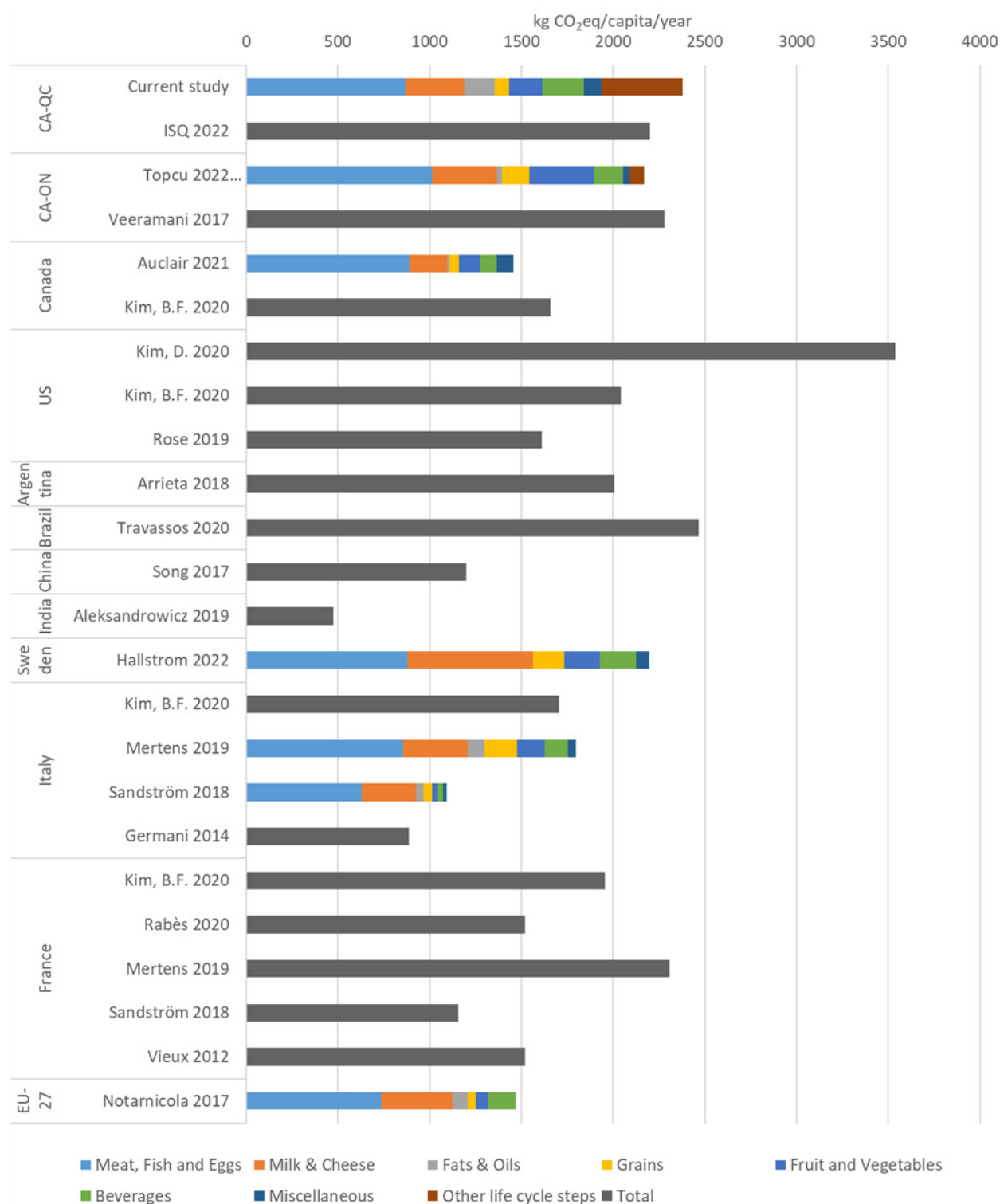


Figure 7: Carbon footprint of food consumption per capita per year for average diets in different regions from selected studies (Aleksandrowicz et al., 2019; Arrieta & González, 2018; Auclair & Burgos, 2021; Germani et al., 2014; Hallström et al., 2022; Institut de la Statistique du Québec, 2022; D. Kim et al., 2020; Mertens et al., 2019; Notarnicola et al., 2017; Rabès et al., 2020; Rose et al., 2019; Sandström et al., 2018; Song et al., 2017; Topcu et al., 2022; Travassos et al., 2020; Veeramani et al., 2017; Vieux et al., 2012). CA-QC: province of Québec, Canada; CA-ON: province of Ontario, Canada.

- Diet composition.** We use a self-reported 24-hour recall survey from 2015 to describe food intake in Québec in 2018 (Health Canada, 2018). Diet composition may have slightly changed between 2015 and 2018, as evidenced by meat and dairy products (Agriculture Canada, 2025; Zarnovican, 2024). Between 2015 and 2025, there has been a decline in red meat and pork consumption (-9%) (Agriculture Canada, 2025; Arsenault et al., 2024) and a growing interest in plant-based proteins (Ngapo, 2022). Between 2012 and 2019, according to MAPAQ (Keable, 2021), while the population increased by 5.3%, retail sales in kilograms rose for several categories, including coffee (+10%) and chocolate (+16%), along with changes in dairy consumption patterns. Fluid milk has been increasingly replaced by cheese and cream, which experienced volume growth of +13% and +22%, respectively. However, no study currently provides a comprehensive overview of these shifts, and the 2015 survey therefore remains the most recent source available for assessing the carbon footprint of food consumption in Quebec. We analyzed that these changes in meat and dairy products consumption would not lead to a drastically different carbon footprint (between 0.8% and 1.9% increase in total). Moreover, the estimated average per capita carbon footprint of food consumption in Québec, using our LCI model with a self-reported 24-hour recall survey from 2005 (Health Canada, 2006) was only 5.7% higher than the estimate using the survey from 2015 (See Supplementary information file 1, Figure A3). This minor change in the carbon footprint of food consumption in Québec over a ten-year period is similar to the 5% to 8.5% change in Ontario between 2004 and 2015 calculated by Topcu et al. (2022). Hence, we estimate that our database slightly underestimates the current food consumption footprint.
- Food consumption.** The current LCA model assumes that all meals are prepared and consumed at home, whereas the 2015 survey on food intake indicates that 21.8% of Canadians consumed food prepared outside the home (e.g., restaurants) (Statistics Canada, 2021). As food management could be quite different between consumers at home and restaurant services (Nabipour Afrouzi et al., 2023), there is a need to develop specific LCI datasets to model restaurant services, especially for food cooking, storage, primary packaging and L&W. In addition, cooking and storage stages might be differentiated by food categories (e.g., some products need to be cooked and refrigerated, and some do not), as they can represent a large part of the carbon footprint of some products (Frankowska et al., 2020; Long et al., 2023).
- Food products.** Food products are aggregated into 58 food categories. Each category encompasses one or several specific food products but is often modeled using only one or two representative food products, depending on the availability of LCI data. Disaggregating these categories to better capture the variability of food products within each food category would provide a more accurate and representative picture (Clark et al., 2022). For instance, the Fish and seafood category is currently only represented by tuna production, whereas blue foods' carbon footprint can vary from 1 to more than 20 kg CO₂eq per kg of edible weight depending on species and origin (farmed or wild-caught) (Gephart et al., 2021).
- Consumption markets.** Some consumption markets require more detailed estimations of market shares (domestic vs. imported production, open field vs. greenhouse production, etc.) and food transport characteristics (distances and modes). Consumption markets could also be defined at the food manufacturing level if data is available: in the current version, consumption markets are defined at the food product level (e.g., beef) as there is no consumption market for processed food, such as ground beef or spiced ground beef.
- Transport between food manufacturing and retail store.** Transportation between food manufacturing plants and distribution is excluded due to a lack of data. If we assume a conservative transport distance by refrigerated truck of 1000km (500 km out and 500 km back empty) between food manufacturing plant and retail store for all food products, we estimate the contribution to total impact for the average consumer would be about 8.6%. This will be included in a future version of the database.

- **Food production.** More LCI datasets need to be developed for missing food products locally produced in Québec or to represent other agricultural practices than the conventional ones. In particular, LCI datasets for beef, chicken and pork production in Québec are now based on an average for North America from GLEAM model (Gerber et al., 2013) which do not reflect Québec specificities in terms of meat production. Instead of using global averages from LCI databases, GHG emissions from LUC can be better estimated by identifying the specific origin of products consumed in Québec associated with a risk of deforestation (e.g., soya, meat, palm oil, cocoa, coffee, chocolate), as made it possible with the TRASE platform (Lathuillière et al., 2021).
- **Food manufacturing.** LCI datasets could be improved by better regionalizing food processing, integrating frozen and canned food products, and adding more derived transformed products, such as ultra-processed foods (e.g., tomato sauce, tomato paste), which represent 46% of calorie intake by Canadian (Polsky et al., 2020).
- **Food packaging.** Material quantities and transportation distances need to be regionalized to better reflect Québec market of food products as the Agribalyse database corresponds to the French market practices in term of food packaging.
- **Food L&W and EoL.** Shares of food L&W at consumer level are extrapolated from different sources but would be improved by relying on better data from a single source distinguishing food losses and food waste based for instance on food product-specific edible and non-edible fraction (Coudard et al., 2025). Shares of food L&W along the value chain from FAO (Parfitt et al., 2010) could be improved by using more specific data per food category and per region (Xue et al., 2017). Instead of using a generic LCI dataset for all L&W EoL, more specific data per type of EoL treatment, per food category and per region could be used.

Structure of the foreground LCI database. This first version of the LCI database needs to be disaggregated and restructured for more flexibility, especially to facili-

tate contribution analysis at various levels: per stage from food production to food distribution; per origin of GHG emissions (domestic vs imported); per transportation stage all along the value chain to better analyze the contribution of transport, sometimes referred as food miles (Avetisyan et al., 2014; Weber & Matthews, 2008b), which accounts for nearly 20% of GHG emissions of the global food system (Li et al., 2022).

Background LCI databases. Our background LCI currently uses ecoinvent v3.11. It could be updated and diversified to better take advantage of new developments in the World Food database (Nemecek et al., 2019), AGRIBALYSE (Asselin-Balençon et al., 2022) and regioinvent (Agez & Majeau-Bettez, 2026).

Population archetypes. We analyzed the carbon footprint of food consumption for 8 population archetypes based on gender and age, as both are important sources of variability among the population and data were available. However, other sources of large variability among individuals are not captured in this study and could be explored to identify more tailored mitigation options. For instance, archetypes based on dietary patterns (e.g., veganism) (Rabès et al., 2020; Topcu et al., 2022; Veeramani et al., 2017) or based on sociodemographic variables (e.g., income levels, place of residence) could be defined. The carbon footprint of food consumption of children could also be explored in a future study.

Perspectives for future work toward sustainable food consumption in Québec

Our study provides a first estimate of the carbon footprint of individual food consumption in Québec, which can be used as a baseline for future assessments. It allows to identify the main hotspots, hence to prioritize mitigation initiatives. Next steps are to define alternative scenarios based on behavioral changes (e.g., change in dietary composition), changes in farming practices (e.g., regenerative agriculture) or other logistical or technical improvements (e.g., change in agricultural practices), to quantify their potential reduction in GHG emissions and guide consumers, businesses, and governments toward efficient mitigation solutions. Those alternative scenarios could be built from expert

knowledge, but also from solutions perceived as efficient from the public (e.g., choosing local food products) to test perceptions and validate their efficiency.

Our LCI model allows us to assess the carbon footprint of average food consumption at the individual level. However, results might not be scalable to assess the total impacts for Québec due to market and physical constraints (e.g., price effects, product availability, land availability). For scenario analysis at the level of the province level (e.g., to test the effect of different mitigation measures), coupling our LCI model with techno-economic models would be required for a better systemic assessment.

Our study is limited to the assessment of climate change impacts from GHG emissions. However, the environmental assessment of food consumption should go beyond climate change by accounting for impacts related to ecosystem quality and human health due to land use, water use, use of toxic substances (e.g., pesticides), eutrophication from fertilizers, etc. As we built an LCI database instead of just extracting precalculated carbon footprints from literature, our LCI datasets can be completed with LCI data (e.g., adding intermediate and elementary flows) to allow the assessment of other relevant impact categories and identify trade-offs between scenarios. A future version of the developed LCI datasets could be fully parametrized to ensure full interoperability and flexibility (Arias et al., 2025).

Finally, to achieve truly sustainable food consumption, environmental aspects of food need to be interconnected with nutritional aspects (Gebara et al., 2025; Willett et al., 2019). This nutritional dimension in relation with environmental aspects has been explored through different angles (Aldaya et al., 2021; Jarmul et al., 2020; Macdiarmid, 2022; Stylianou et al., 2021; Willett et al., 2019). However, research work is still needed to provide robust methods to optimize food consumption from both environmental and human health perspectives (Jolliet, 2022; Scherer et al., 2024).

Conclusion

In this article, we presented the development of the first life cycle inventory database of food consumption in Québec, from food production at farm gate to fork, built

upon a self-reported 24-hour recall survey conducted in 2015 by Health Canada. We evaluated the carbon footprint of food consumption for eight gender-and-age-differentiated archetypes of Québec adults, ranging from 1725 kg CO₂eq per capita per year (women aged 71 and older) to 2928 kg CO₂eq per capita per year (men aged 19 to 30). The average carbon footprint of yearly individual food consumption in Québec is estimated to be 2377 kg CO₂eq. Ingested meats and dairy are responsible for 33.7% of total impact on climate change of food consumption on average, while food loss and waste represent 17% of total potential impact. Primary packaging accounts for 10% of the total potential impact.

This LCI database for food consumption in Québec suffers from several limitations, including limited representativeness (food products, consumption markets, food processing pathways, transportation modes and distances between supply chain stages and cooking modes) and exclusions (ultra-processed food, distribution systems and catering services). Future research should tackle mentioned gaps to enhance the robustness and representativeness of this first version of a life cycle inventory database of food consumption in Québec. Adding natural resource extractions and emissions other than GHGs will be a priority. Despite those limitations, this research work remains the first open-access LCI database of food consumption in Québec, which could be used to guide decision-making for multiple stakeholders, notably involved in policy making and the transition of food systems.

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References

- Adhikari, B., & Prapasongsa, T. (2019). Environmental sustainability of food consumption in Asia. *Sustainability*, 11(20), 5749. <https://doi.org/10.3390/su11205749>
- Agez, M., & Majeau-Bettez, G. (2026). Regioinvent: A regionalized version of ecoinvent integrating detailed trade data. *Journal of Industrial Ecology*, 30(2), 727–742. <https://doi.org/10.1007/s44498-026-00053-9>
- Agez, M., Muller, E., Bulle, C., Debarre, L., Seifudem, G., Viveros Santos, I., & Duval, L. (2024). IMPACT World+ / a globally regionalized method for life cycle impact assessment—Version 2.1. <https://zenodo.org/records/14041258>
- Agriculture Canada. (2025). Consommation de viande et protéine animale [Jeu de données]. <https://agriculture.canada.ca/fr/secteur/production-animale/consommation-viande-proteine-animale#wb-auto-8>

- Aguirre-Sánchez, L., Teschner, R., Lalchandani, N. K., El Maohub, Y., & Suggs, L. S. (2023). Climate change mitigation potential in dietary guidelines: A global review. *Sustainable Production and Consumption*, 40, 558–570. <https://doi.org/10.1016/j.spc.2023.07.015>
- Ahmed, M., (Praneet) Ng, A., & L'Abbe, M. R. (2021). Nutrient intakes of Canadian adults: Results from the Canadian Community Health Survey (CCHS)–2015 Public Use Microdata File. *The American Journal of Clinical Nutrition*, 114(3), 1131–1140. <https://doi.org/10.1093/ajcn/nqab143>
- Aldaya, M. M., Ibañez, F. C., Domínguez-Lacueva, P., Murillo-Arbizu, M. T., Rubio-Varas, M., Soret, B., & Beriain, M. J. (2021). Indicators and recommendations for assessing sustainable healthy diets. *Foods*, 10(5), 999. <https://doi.org/10.3390/foods10050999>
- Aleksandrowicz, L., Green, R., Joy, E. J. M., Harris, F., Hillier, J., Vetter, S. H., Smith, P., Kulkarni, B., Dangour, A. D., & Haines, A. (2019). Environmental impacts of dietary shifts in India : A modelling study using nationally-representative data. *Environment International*, 126, 207–215. <https://doi.org/10.1016/j.envint.2019.02.004>
- Aleksandrowicz, L., Green, R., Joy, E. J. M., Smith, P., & Haines, A. (2016). The impacts of dietary change on greenhouse gas emissions, land use, water use, and health: A systematic review. *PLOS ONE*, 11(11), e0165797. <https://doi.org/10.1371/journal.pone.0165797>
- Alves, R., Perelman, J., Chang, K., & Millett, C. (2024). Environmental impact of dietary patterns in 10 European countries; a cross-sectional analysis of nationally representative dietary surveys. *European Journal of Public Health*, 34(5), 992–1000. <https://doi.org/10.1093/eurpub/ckae088>
- Arias, A., Moreira, M. T., Heijungs, R., & Cucurachi, S. (2025). Advancing parametric life cycle assessment (pa-LCA): A systematic review and methodological roadmap for enhanced sustainability assessments. *Sustainable Production and Consumption*, S235255092500209X. <https://doi.org/10.1016/j.spc.2025.10.016>
- Arrieta, E. M., & González, A. D. (2018). Impact of current, national dietary guidelines and alternative diets on greenhouse gas emissions in Argentina. *Food Policy*, 79, 58–66. <https://doi.org/10.1016/j.foodpol.2018.05.003>
- Arsenault, J. N., Tyedmers, P. H., & Dias, G. M. (2024). Changes in per capita and aggregate apparent consumption of livestock-derived foods in Canada from 1960–2020. *Environmental Research: Food Systems*, 1(2), 025009. <https://doi.org/10.1088/2976-601X/ad7ff2>
- Asselin-Balençon, A., Broekema, R., Teulon, H., Gastaldi, G., Houssier, J., Moutia, A., Rousseau, V., Wermeille, A., Colomb, V., Cornelus, M., Ceccaldi, M., Doucet, M., & Vasselon, H. (2022). AGRIBALYSE 3 : La base de données française d'ICV sur l'Agriculture et l'Alimentation. Methodology for the food products. Initial publication Agribalyse 3.0—2020, update 3.1.
- Auclair, O., & Burgos, S. A. (2021). Carbon footprint of Canadian self-selected diets: Comparing intake of foods, nutrients, and diet quality between low- and high-greenhouse gas emission diets. *Journal of Cleaner Production*, 316, 128245. <https://doi.org/10.1016/j.jclepro.2021.128245>
- Avetisyan, M., Hertel, T., & Sampson, G. (2014). Is local food more environmentally friendly? The GHG emissions impacts of consuming imported versus domestically produced food. *Environmental and Resource Economics*, 58(3), 415–462. <https://doi.org/10.1007/s10640-013-9706-3>
- Bulle, C., Margni, M., Patouillard, L., Boulay, A.-M., Bourgault, G., De Bruille, V., Cao, V., Hauschild, M., Henderson, A., Humbert, S., Kashef-Haghighi, S., Kounina, A., Laurent, A., Levasseur, A., Liard, G., Rosenbaum, R. K., Roy, P.-O., Shaked, S., Fantke, P., & Joliet, O. (2019). IMPACT World+: A globally regionalized life cycle impact assessment method. *The International Journal of Life Cycle Assessment*, 24(9), 1653–1674. <https://doi.org/10.1007/s11367-019-01583-0>
- Cao, S., Wang, L., & Yang, Y. (2026). Vegetable yields and environmental impacts vary widely across types, production technologies, and global regions. *Resources, Conservation and Recycling*, 227, 108735. <https://doi.org/10.1016/j.resconrec.2025.108735>
- Cap, S., Li, S., De Koning, A., Karjalainen, A., Lettenmeier, M., Coscime, L., Tukker, A., & Scherer, L. (2025). Carbon footprint reduction potential of consumption changes in five European countries in 2015, 2030, and 2050. *Sustainable Production and Consumption*, 59, 408–421. <https://doi.org/10.1016/j.spc.2025.08.018>
- Castellani, V., Beylot, A., & Sala, S. (2019). Environmental impacts of household consumption in Europe: Comparing process-based LCA and environmentally extended input-output analysis. *Journal of Cleaner Production*, 240, 117966. <https://doi.org/10.1016/j.jclepro.2019.117966>
- Chaplin-Kramer, R., Sim, S., Hamel, P., Bryant, B., Noe, R., Mueller, C., Rigalsford, G., Kulak, M., Kowal, V., Sharp, R., Clavreul, J., Price, E., Polasky, S., Ruckelshaus, M., & Daily, G. (2017). Life cycle assessment needs predictive spatial modelling for biodiversity and ecosystem services. *Nature Communications*, 8(1), 15065. <https://doi.org/10.1038/ncomms15065>

- Chapman, A. S. A., Green, R., Hadida, G., Kennard, H., Mabhaudhi, T., Scheelbeek, P., & Dalin, C. (2025). Biodiversity pressure from fruit and vegetable consumption in the United Kingdom, India and South Africa varies by product and growing location. *Nature Food*. <https://doi.org/10.1038/s43016-025-01222-y>
- Chemins de Transition. (2023). Défi alimentaire—Comment accélérer ensemble la transition socio-écologique du système alimentaire québécois d'ici 2040 ? Rapport final du défi alimentaire. <https://cheminsde-transition.org/defi-alimentaire.pdf>
- Clark, M., Springmann, M., Rayner, M., Scarborough, P., Hill, J., Tilman, D., Macdiarmid, J. I., Fanzo, J., Bandy, L., & Harrington, R. A. (2022). Estimating the environmental impacts of 57,000 food products. *Proceedings of the National Academy of Sciences*, 119(33), e2120584119. <https://doi.org/10.1073/pnas.2120584119>
- Clune, S., Crossin, E., & Verghese, K. (2017). Systematic review of greenhouse gas emissions for different fresh food categories. *Journal of Cleaner Production*, 140, 766–783. <https://doi.org/10.1016/j.jclepro.2016.04.082>
- Costa, C., Wollenberg, E., Benitez, M., Newman, R., Gardner, N., & Bellone, F. (2022). Roadmap for achieving net-zero emissions in global food systems by 2050. *Scientific Reports*, 12(1), 15064. <https://doi.org/10.1038/s41598-022-18601-1>
- Coudard, A., Szabo-Hemmings, T., Honorine Delval, M., Marriyapilalai Ravisandiran, S., & Mogollón, J. M. (2025). The food commodity composition for waste quantification and valorization opportunities (FOWCUS) Dataset. *Scientific Data*, 12(1), 1553. <https://doi.org/10.1038/s41597-025-05629-x>
- Crenna, E., Sinkko, T., & Sala, S. (2019). Biodiversity impacts due to food consumption in Europe. *Journal of Cleaner Production*, 227, 378–391. <https://doi.org/10.1016/j.jclepro.2019.04.054>
- Crippa, M., Solazzo, E., Guizzardi, D., Monforti-Ferrario, F., Tubiello, F. N., & Leip, A. (2021). Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food*, 2(3), 198–209. <https://doi.org/10.1038/s43016-021-00225-2>
- Cucurachi, S., Scherer, L., Guinée, J., & Tukker, A. (2019). Life cycle assessment of food systems. *One Earth*, 1(3), 292–297. <https://doi.org/10.1016/j.oneear.2019.10.014>
- Dietz, S., Fruitiere, C., Garcia-Manas, C., Irwin, W., Rauis, B., & Sullivan, R. (2018). An assessment of climate action by high-carbon global corporations. *Nature Climate Change*, 8(12), 1072–1075. <https://doi.org/10.1038/s41558-018-0343-2>
- Dubois, G., Sovacool, B., Aall, C., Nilsson, M., Barbier, C., Herrmann, A., Bruyère, S., Andersson, C., Skold, B., Nadaud, F., Dorner, F., Moberg, K. R., Ceron, J. P., Fischer, H., Amelung, D., Baltruszewicz, M., Fischer, J., Benevise, F., Louis, V. R., & Sauerborn, R. (2019). It starts at home? Climate policies targeting household consumption and behavioral decisions are key to low-carbon futures. *Energy Research & Social Science*, 52, 144–158. <https://doi.org/10.1016/j.erss.2019.02.001>
- Éco Entreprises Québec & RECYC-QUÉBEC. (2015). Caractérisation des matières résiduelles du secteur résidentiel 2012-2013. <https://www.recyq-quebec.gouv.qc.ca/sites/default/files/documents/carac-2012-2013-rapport-synthese.pdf>
- ElHaffar, G., Durif, F., & Dubé, L. (2020). Towards closing the attitude-intention-behavior gap in green consumption: A narrative review of the literature and an overview of future research directions. *Journal of Cleaner Production*, 275, 122556. <https://doi.org/10.1016/j.jclepro.2020.122556>
- Energie Plus. (2019). Consommation d'électricité et de combustible des commerces—Energie Plus Le Site. <https://energieplus-lesite.be/donnees/consommations2/consommation-d-energie-par-batiment/consommation-d-electricite-et-de-combustible-des-commerces/>
- Fan, J.-L., Feng, X., Dong, Y., & Zhang, X. (2022). A global comparison of carbon-water-food nexus based on dietary consumption. *Global Environmental Change*, 73, 102489. <https://doi.org/10.1016/j.gloenvcha.2022.102489>
- FAO. (2010). GLOBAL LIVESTOCK ENVIRONMENTAL ASSESSMENT MODEL. https://www.fao.org/fileadmin/user_upload/gleam/docs/GLEAM_2.0_Model_description.pdf
- FAO. (2017). Global Livestock Environmental Assessment Model (GLEAM) [online] [Jeu de données]. <https://www.fao.org/gleam/en/>
- FAO. (2024). Greenhouse gas emissions from agrifood systems—Global, regional and country trends, 2000–2022. <https://openknowledge.fao.org/handle/20.500.14283/cd3167en>
- Filière Biologique du Québec. (2025). Où s'en vont les marchés du bio au Québec ? <https://cetab.bio/wp-content/uploads/marches-bio-alain-rioux-filiere-biologique.pdf>
- Frankowska, A., Rivera, X. S., Bridle, S., Kluczkowski, A. M. R. G., Tereza Da Silva, J., Martins, C. A., Rauber, F., Levy, R. B., Cook, J., & Reynolds, C. (2020). Impacts of home cooking methods and appliances on the GHG emissions of food. *Nature Food*, 1(12), 787–791. <https://doi.org/10.1038/s43016-020-00200-w>
- Fresán, U., Núñez, M., Valls, I., & Rosenbaum, R. K. (2025). Quantifying the environmental human health burden of food demand in Spain: A life cycle assessment study. *Environmental Research*, 284, 122147. <https://doi.org/10.1016/j.envres.2025.122147>

- Gebara, C. H., Berthet, E., Vandenabeele, M. I. D., Jolliet, O., & Laurent, A. (2025). Diets can be consistent with planetary limits and health targets at the individual level. *Nature Food*, 6(5), 466–477. <https://doi.org/10.1038/s43016-025-01133-y>
- Gephart, J. A., Henriksson, P. J. G., Parker, R. W. R., Shepon, A., Gorospe, K. D., Bergman, K., Eshel, G., Golden, C. D., Halpern, B. S., Hornborg, S., Jonell, M., Metian, M., Mifflin, K., Newton, R., Tyedmers, P., Zhang, W., Ziegler, F., & Troell, M. (2021). Environmental performance of blue foods. *Nature*, 597(7876), 360–365. <https://doi.org/10.1038/s41586-021-03889-2>
- Gerber, P. J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., & Tempio, G. (2013). Tackling climate change through livestock—A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations (FAO). <https://www.fao.org/4/i3437e/i3437e.pdf>
- Germani, A., Vitiello, V., Giusti, A. M., Pinto, A., Donini, L. M., & Del Balzo, V. (2014). Environmental and economic sustainability of the Mediterranean diet. *International Journal of Food Sciences and Nutrition*, 65(8), 1008–1012. <https://doi.org/10.3109/09637486.2014.945152>
- González-García, S., Esteve-Llorens, X., Moreira, M. T., & Feijoo, G. (2018). Carbon footprint and nutritional quality of different human dietary choices. *Science of The Total Environment*, 644, 77–94. <https://doi.org/10.1016/j.scitotenv.2018.06.339>
- Goossens, Y., & Schmidt, T. G. (2025). Mind the method ! A systematic literature review of the methodological choices used to assess the environmental impacts of diets. *Cleaner Environmental Systems*, 18, 100289. <https://doi.org/10.1016/j.cesys.2025.100289>
- Gosling, S. N., & Arnell, N. W. (2016). A global assessment of the impact of climate change on water scarcity. *Climatic Change*, 134(3), 371–385. <https://doi.org/10.1007/s10584-013-0853-x>
- Government of Canada. (2016). Fichier canadien sur les éléments nutritifs (FCÉN), 2015. <https://www.canada.ca/fr/sante-canada/services/aliments-nutrition/saine-alimentation/donnees-nutritionnelles/fichier-canadien-elements-nutritifs-fcen-2015.html>
- Government of Canada. (2025). Canada's food guide. <https://food-guide.canada.ca/en/>
- Government of Québec. (2019). Démographie du Québec. http://www.stat.gouv.qc.ca/statistiques/population-demographie/structure/population-quebec-age-sexe.html#tri_pop=10%0A
- Government of Québec. (2024). Québec's commitments in respect of the climate. <https://www.quebec.ca/en/government/policies-orientations/plan-green-economy/understand-climate-change/quebec-commitments>
- Hadjikakou, M., Bowles, N. I., Geyik, O., Conijn, S. J. G., Mogollón, J. M., Bodirsky, B. L., Muller, A., Weindl, I., Moallemi, E. A., Shaikh, M. A., Damerau, K., Davis, K. F., Pfister, S., Springmann, M., Clark, M., Metson, G. S., Rös, E., Bajzelj, B., Graham, N. T., ... Bryan, B. A. (2025). Ambitious food system interventions required to mitigate the risk of exceeding Earth's environmental limits. *One Earth*, 8(9), 101351. <https://doi.org/10.1016/j.oneear.2025.101351>
- Hallström, E., Davis, J., Håkansson, N., Ahlgren, S., Åkesson, A., Wolk, A., & Sonesson, U. (2022). Dietary environmental impacts relative to planetary boundaries for six environmental indicators—A population-based study. *Journal of Cleaner Production*, 373, 133949. <https://doi.org/10.1016/j.jclepro.2022.133949>
- Halpern, B. S., Frazier, M., Verstaen, J., Rayner, P.-E., Clawson, G., Blanchard, J. L., Cottrell, R. S., Froehlich, H. E., Gephart, J. A., Jacobson, N. S., Kuempel, C. D., McIntyre, P. B., Metian, M., Moran, D., Nash, K. L., Többen, J., & Williams, D. R. (2022). The environmental footprint of global food production. *Nature Sustainability*, 5(12), 1027–1039. <https://doi.org/10.1038/s41893-022-00965-x>
- Hartmann, C., Lazzarini, G., Funk, A., & Siegrist, M. (2021). Measuring consumers' knowledge of the environmental impact of foods. *Appetite*, 167, 105622. <https://doi.org/10.1016/j.appet.2021.105622>
- Health Canada. (2006). Canadian Community Health Survey (CCHS) Cycle 3.1 (2005) Public Use Microdata File (PUMF) User Guide. https://www23.statcan.gc.ca/imdb-bmdi/document/3226_D7_T9_V3-eng.pdf
- Health Canada. (2018). 2015 Canadian Community Health Survey (CCHS)—Nutrition—User Guide.
- Health Statistics Division. (2023). Canadian Community Health Survey 2015: Nutrition Component, General health and summary data for 24-hour dietary recall and nutritional supplements (NCI) [Jeu de données]. <https://doi.org/10.5683/SP3/D95NEQ>
- Heller, M. C., Keoleian, G. A., & Willett, W. C. (2013). Toward a life cycle-based, diet-level framework for food environmental impact and nutritional quality assessment: A critical review. *Environmental Science & Technology*, 47(22), 12632–12647. <https://doi.org/10.1021/es4025113>
- Heller, M. C., Willits-Smith, A., Meyer, R., Keoleian, G. A., & Rose, D. (2018). Greenhouse gas emissions and energy use associated with production of individual self-selected US diets. *Environmental Research Letters*, 13(4), 044004. <https://doi.org/10.1088/1748-9326/aab0ac>
- Ibarrola-Rivas, M.-J., & Nonhebel, S. (2022). Regional food preferences influence environmental impacts of diets. *Food Security*, 14(4), 1063–1083. <https://doi.org/10.1007/s12571-022-01270-3>

- INSPQ. (2009). La consommation alimentaire des adultes québécois selon le poids corporel—EXPLORATION DES DONNÉES DE L'ENQUÊTE SUR LA SANTÉ DANS LES COLLECTIVITÉS CANADIENNES 2.2 – NUTRITION. https://www.inspq.qc.ca/sites/default/files/publications/1364_consomalimentadultesquebecois.pdf
- Institut de la Statistique du Québec. (2022). Empreinte carbone des ménages au Québec—Une première estimation basée sur la consommation. <https://statistique.quebec.ca/fr/fichier/empreinte-carbone-menages-quebec-estimation-consommation.pdf>
- ISQ & MAPAQ. (2021). Profil sectoriel de l'industrie bioalimentaire au Québec Édition 2021. <https://statistique.quebec.ca/fr/fichier/profil-sectoriel-industrie-bioalimentaire-quebec-edition-2021.pdf>
- Ivanova, D., Barrett, J., Wiedenhofer, D., Macura, B., Callaghan, M., & Creutzig, F. (2020). Quantifying the potential for climate change mitigation of consumption options. *Environmental Research Letters*, 15(9), 093001. <https://doi.org/10.1088/1748-9326/ab8589>
- Ivanovich, C. C., Sun, T., Gordon, D. R., & Ocko, I. B. (2023). Future warming from global food consumption. *Nature Climate Change*, 13(3), 297–302. <https://doi.org/10.1038/s41558-023-01605-8>
- Jarmul, S., Dangour, A. D., Green, R., Liew, Z., Haines, A., & Scheelbeek, P. F. (2020). Climate change mitigation through dietary change: A systematic review of empirical and modelling studies on the environmental footprints and health effects of 'sustainable diets'. *Environmental Research Letters*, 15(12), 123014. <https://doi.org/10.1088/1748-9326/abc2f7>
- Jennings, R., Henderson, A. D., Phelps, A., Janda, K. M., & Van Den Berg, A. E. (2023). Five U.S. dietary patterns and their relationship to land use, water use, and greenhouse gas emissions: Implications for future food security. *Nutrients*, 15(1), 215. <https://doi.org/10.3390/nu15010215>
- Joliet, O. (2022). Integrating dietary impacts in food life cycle assessment. *Frontiers in Nutrition*, 9, 898180. <https://doi.org/10.3389/fnut.2022.898180>
- Jones, C. M., & Kammen, D. M. (2011). Quantifying carbon footprint reduction opportunities for U.S. households and communities. *Environmental Science & Technology*, 45(9), 4088–4095. <https://doi.org/10.1021/es102221h>
- Kause, A., Bruine De Bruin, W., Millward-Hopkins, J., & Olsson, H. (2019). Public perceptions of how to reduce carbon footprints of consumer food choices. *Environmental Research Letters*, 14(11), 114005. <https://doi.org/10.1088/1748-9326/ab465d>
- Keable, S. (2021). À quoi ressemble l'offre d'aliments dans les allées des supermarchés au Québec ? Quatrième arrêt : Les allées centrales (No 4). https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/agriculture-pecheries-alimentation/publications-adm/bulletins/Bio-clips/2021/BU_Bioclips_Vol29_no4_MAPAQ.pdf
- Kim, B. F., Santo, R. E., Scatterday, A. P., Fry, J. P., Synk, C. M., Cebbron, S. R., Mekonnen, M. M., Hoekstra, A. Y., De Pee, S., Bloem, M. W., Neff, R. A., & Nachman, K. E. (2020). Country-specific dietary shifts to mitigate climate and water crises. *Global Environmental Change*, 62, 101926. <https://doi.org/10.1016/j.gloenvcha.2019.05.010>
- Kim, D., Parajuli, R., & Thoma, G. J. (2020). Life cycle assessment of dietary patterns in the United States: A full food supply chain perspective. *Sustainability*, 12(4), 1586. <https://doi.org/10.3390/su12041586>
- Kipnis, V. (2003). Structure of dietary measurement error: Results of the OPEN Biomarker Study. *American Journal of Epidemiology*, 158(1), 14–21. <https://doi.org/10.1093/aje/kwg091>
- Kustar, A., & Patino-Echeverri, D. (2021). A review of environmental life cycle assessments of diets: Plant-based solutions are truly sustainable, even in the form of fast foods. *Sustainability*, 13(17), 9926. <https://doi.org/10.3390/su13179926>
- Lathuillière, M. J., Patouillard, L., Margni, M., Ayre, B., Löfgren, P., Ribeiro, V., West, C., Gardner, T. A., & Suavet, C. (2021). A commodity supply mix for more regionalized life cycle assessments. *Environmental Science & Technology*, 55(17), 12054–12065. <https://doi.org/10.1021/acs.est.1c03060>
- Le Vallée, J.-C., MacLaine, C., Lalonde, M., & Grant, M. (2017). Canada's food report card 2016: Provincial performance. Ottawa: The Conference Board of Canada. <https://caid.ca/CBoCRRepFood2017.pdf>
- Lehtilä, A., Ghani, H. U., Liu, X., Palosuo, T., Tuomisto, H. L., & Leinonen, I. (2025). Framework for including national-level LULUC emissions and removals in the GWP of agricultural and forestry products in LCA. *Journal of Cleaner Production*, 494, 144999. <https://doi.org/10.1016/j.jclepro.2025.144999>
- Lesage, P., & Samson, R. (2016). The Quebec Life Cycle Inventory Database Project: Using the ecoinvent database to generate, review, integrate, and host regional LCI data. *The International Journal of Life Cycle Assessment*, 21(9), 1282–1289. <https://doi.org/10.1007/s11367-013-0593-1>
- Li, M., Jia, N., Lenzen, M., Malik, A., Wei, L., Jin, Y., & Raubenheimer, D. (2022). Global food-miles account for nearly 20% of total food-systems emissions. *Nature Food*, 3(6), 445–453. <https://doi.org/10.1038/s43016-022-00531-w>

- Long, Y., Huang, L., Fujie, R., He, P., Chen, Z., Xu, X., & Yoshida, Y. (2023). Carbon footprint and embodied nutrition evaluation of 388 recipes. *Scientific Data*, 10(1), 794. <https://doi.org/10.1038/s41597-023-02702-1>
- Macall, D. M., Williams, C., Gleim, S., & Smyth, S. J. (2021). Canadian consumer opinions regarding food purchase decisions. *Journal of Agriculture and Food Research*, 3, 100098. <https://doi.org/10.1016/j.jafr.2020.100098>
- Macdiarmid, J. I. (2022). The food system and climate change Are plant-based diets becoming unhealthy and less environmentally sustainable? *Proceedings of the Nutrition Society*, 81(2), 162–167. <https://doi.org/10.1017/S0029665121003712>
- MAPAQ. (2019). Imports, exports and domestic production data—Personnal Communication with Félicien Hitayezu at MAPAQ. [Jeu de données].
- Mertens, E., Kuijsten, A., Van Zanten, H. He., Kaptijn, G., Dofková, M., Mistura, L., D'Addezio, L., Turrini, A., Dubuisson, C., Havard, S., Trolle, E., Geleijnse, J. M., & Veer, P. V. 'T. (2019). Dietary choices and environmental impact in four European countries. *Journal of Cleaner Production*, 237, 117827. <https://doi.org/10.1016/j.jclepro.2019.117827>
- Muñoz, I., Milà I Canals, L., & Fernández-Alba, A. R. (2010). Life cycle assessment of the average Spanish diet including human excretion. *The International Journal of Life Cycle Assessment*, 15(8), 794–805. <https://doi.org/10.1007/s11367-010-0188-z>
- Mutel, C. (2017). Brightway: An open source framework for life cycle assessment. *The Journal of Open Source Software*, 2(12), 236. <https://doi.org/10.21105/joss.00236>
- Nabipour Afrouzi, H., Ahmed, J., Mobin Siddique, B., Khairuddin, N., & Hassan, A. (2023). A comprehensive review on carbon footprint of regular diet and ways to improving lowered emissions. *Results in Engineering*, 18, 101054. <https://doi.org/10.1016/j.rineng.2023.101054>
- Nemecek, T., Bengoa, X., Lansche, J., Roesch, A., Faist-Emmenegger, M., Rossi, V., & Humbert, S. (2019). World food LCA database—Methodological guidelines for the life cycle inventory of agricultural products. *Quantis and Agroscope*. https://simapro.com/wp-content/uploads/2020/11/WFLDB_MethodologicalGuidelines_v3.5.pdf
- Ngapo, T. M. (2022). Meat analogues, the Canadian meat industry and the Canadian consumer. *Meat Science*, 191, 108846. <https://doi.org/10.1016/j.meatsci.2022.108846>
- Notarnicola, B., Tassielli, G., Renzulli, P. A., Castellani, V., & Sala, S. (2017). Environmental impacts of food consumption in Europe. *Journal of Cleaner Production*, 140, 753–765. <https://doi.org/10.1016/j.jclepro.2016.06.080>
- Parfitt, J., Barthel, M., & Macnaughton, S. (2010). Food waste within food supply chains: Quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1554), 3065–3081. <https://doi.org/10.1098/rstb.2010.0126>
- Patouillard, L., Agez, M., de Bortoli, A., & Bulle, C. (s. d.). Consumption-based carbon footprint of Canadians: Exploring provinces variability based on OpenIO-Canada, a regionalized input-output table with capital endogenization. *Journal of Industrial Ecology*.
- Patouillard, L., Greffe, T., Louineau, E., Houssard, C., & Bulle, C. (2026). Life cycle inventory database for consumption in Québec—Food consumption—v0.1.7 [Jeu de données]. <https://doi.org/10.5281/zenodo.18938050>
- Petit, M.-P., Morissette, L., & Bourhis, A. (2014). Portrait du secteur des magasins d'alimentation au Québec. *Revue Internationale en Cas de Gestion*, 12(1). https://ernest.hec.ca/pedagogie/grh/gerer_une_epicerie/ressources/contexte_portrait_secteur.pdf
- Polsky, J., Garriguet, D., & Moubarac, J.-C. (2020). Consumption of ultra-processed foods in Canada. <https://www150.statcan.gc.ca/n1/en/catalogue/82-003-X202001100001>
- Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science*, 360(6392), 987–992. <https://doi.org/10.1126/science.aag0216>
- Rabès, A., Seconda, L., Langevin, B., Allès, B., Touvier, M., Hercberg, S., Lairon, D., Baudry, J., Pointereau, P., & Kesse-Guyot, E. (2020). Greenhouse gas emissions, energy demand and land use associated with omnivorous, pesco-vegetarian, vegetarian, and vegan diets accounting for farming practices. *Sustainable Production and Consumption*, 22, 138–146. <https://doi.org/10.1016/j.spc.2020.02.010>
- RECYC-QUÉBEC. (2015). Bilan 2015 de la gestion des déchets au Québec. <https://www.recyc-quebec.gouv.qc.ca/sites/default/files/documents/bilan-gmr-2015.pdf>
- Ressources Naturelles Canada. (2016). Consommation d'énergie secondaire et émissions de GES pour les appareils ménagers par type d'appareil ménager. <http://oee.nrcan.gc.ca/organisme/statistiques/bnce/apd/showTable.cfm?type=CP§or=res&juris=qc&rn=13&page=0>
- Robitaille, É., & Bergeron, P. (2013). Accessibilité géographique aux commerces alimentaires au Québec : Analyse de situation et perspectives d'interventions. *Institut national de santé publique du Québec*. https://www.inspq.qc.ca/sites/default/files/publications/1728_access-geocommalimentqc.pdf

- Rockström, J., Thilsted, S. H., Willett, W. C., Gordon, L. J., Herrero, M., Hicks, C. C., Mason-D'Croz, D., Rao, N., Springmann, M., Wright, E. C., Agustina, R., Bajaj, S., Bunge, A. C., Carducci, B., Conti, C., Covic, N., Fanzo, J., Forouhi, N. G., Gibson, M. F., ... DeClerck, F. (2025). The EAT–Lancet Commission on healthy, sustainable, and just food systems. *The Lancet*, S0140673625012012. [https://doi.org/10.1016/S0140-6736\(25\)01201-2](https://doi.org/10.1016/S0140-6736(25)01201-2)
- Rose, D., Heller, M. C., Willits-Smith, A. M., & Meyer, R. J. (2019). Carbon footprint of self-selected US diets: Nutritional, demographic, and behavioral correlates. *The American Journal of Clinical Nutrition*, 109(3), 526–534. <https://doi.org/10.1093/ajcn/nqy327>
- Sala, S., & Castellani, V. (2019). The consumer footprint: Monitoring sustainable development goal 12 with process-based life cycle assessment. *Journal of Cleaner Production*, 240, 118050. <https://doi.org/10.1016/j.jclepro.2019.118050>
- Sandström, V., Valin, H., Krisztin, T., Havlík, P., Herrero, M., & Kastner, T. (2018). The role of trade in the greenhouse gas footprints of EU diets. *Global Food Security*, 19, 48–55. <https://doi.org/10.1016/j.gfs.2018.08.007>
- Saulais, L., & Espougne, B. (2024). Shaping sustainable consumption: Quebec consumers' knowledge and beliefs about the environmental impacts of food. *Appetite*, 203, 107659. <https://doi.org/10.1016/j.appet.2024.107659>
- Scarborough, P., Clark, M., Cobiac, L., Papier, K., Knuppel, A., Lynch, J., Harrington, R., Key, T., & Springmann, M. (2023). Vegans, vegetarians, fish-eaters and meat-eaters in the UK show discrepant environmental impacts. *Nature Food*, 4(7), 565–574. <https://doi.org/10.1038/s43016-023-00795-w>
- Scherer, L., Blackstone, N. T., Conrad, Z., Fulgoni, Iii, V. L., Mathers, J. C., Van Der Pols, J. C., Willett, W., Fantke, P., Pfister, S., Stylianou, K. S., Weidema, B. P., Milà I Canals, L., & Jolliet, O. (2024). Accounting for nutrition-related health impacts in food life cycle assessment: Insights from an expert workshop. *The International Journal of Life Cycle Assessment*, 29(6), 953–966. <https://doi.org/10.1007/s11367-024-02298-7>
- Smith, C., Nicholls, Z. R. J., Armour, K., Collins, W., Forster, P., Meinshausen, M., Palmer, M. D., & Watanabe, M. (2021). The earth's energy budget, climate feedbacks and climate sensitivity supplementary material. In *N Climate Change 2021 The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf
- Song, G., Li, M., Fullana-i-Palmer, P., Williamson, D., & Wang, Y. (2017). Dietary changes to mitigate climate change and benefit public health in China. *Science of The Total Environment*, 577, 289–298. <https://doi.org/10.1016/j.scitotenv.2016.10.184>
- Statistics Canada. (2019). Aliments disponible au Canada—Tableau 32-10-0054-01. https://www150.statcan.gc.ca/t1/tbl1/fr/tv.action?pid=3210005401&request_locale=ca
- Statistics Canada. (2021). Eating away from home in Canada: Impact on dietary intake [Jeu de données]. Government of Canada. <https://doi.org/10.25318/82-003-X202100800003-ENG>
- Steubing, B., De Koning, D., Haas, A., & Mutel, C. L. (2020). The Activity Browser—An open source LCA software building on top of the brightway framework. *Software Impacts*, 3, 100012. <https://doi.org/10.1016/j.simpa.2019.100012>
- Stylianou, K. S., Fulgoni, V. L., & Jolliet, O. (2021). Small targeted dietary changes can yield substantial gains for human health and the environment. *Nature Food*, 2(8), 616–627. <https://doi.org/10.1038/s43016-021-00343-4>
- Sundin, N., Rosell, M., Eriksson, M., Jensen, C., & Bianchi, M. (2021). The climate impact of excess food intake—An avoidable environmental burden. *Resources, Conservation and Recycling*, 174, 105777. <https://doi.org/10.1016/j.resconrec.2021.105777>
- Te Wierik, S., DeClerck, F., Beusen, A., Gerten, D., Maggi, F., Norberg, A., Noone, K., Schulte-Uebbing, L., Springmann, M., Tang, F. H. M., De Vries, W., Van Vuuren, D., Vermeulen, S., & Rockström, J. (2025). Identifying the safe operating space for food systems. *Nature Food*. <https://doi.org/10.1038/s43016-025-01252-6>
- Topcu, B., Dias, G. M., & Mollaei, S. (2022). Ten-year changes in global warming potential of dietary patterns based on food consumption in Ontario, Canada. *Sustainability*, 14(10), 6290. <https://doi.org/10.3390/su14106290>
- Topcu, B., Kirkpatrick, S. I., Wood, M. O., & Dias, G. M. (2025). Life cycle climate impacts of eating patterns of Canadian provinces: Focus on meat and protein intake. *Journal of Cleaner Production*, 525, 146520. <https://doi.org/10.1016/j.jclepro.2025.146520>
- Travassos, G. F., Antônio Da Cunha, D., & Coelho, A. B. (2020). The environmental impact of Brazilian adults' diet. *Journal of Cleaner Production*, 272, 122622. <https://doi.org/10.1016/j.jclepro.2020.122622>
- Veeramani, A., Dias, G. M., & Kirkpatrick, S. I. (2017). Carbon footprint of dietary patterns in Ontario, Canada: A case study based on actual food consumption. *Journal of Cleaner Production*, 162, 1398–1406. <https://doi.org/10.1016/j.jclepro.2017.06.025>
- Vieux, F., Darmon, N., Touazi, D., & Soler, L. G. (2012). Greenhouse gas emissions of self-selected individual diets in France: Changing the diet structure or consuming less? *Ecological Economics*, 75, 91–101. <https://doi.org/10.1016/j.ecolecon.2012.01.003>

Viveros Santos, I., Levasseur, A., Bulle, C., Deschênes, L., & Boulay, A.-M. (2023). Modelling the influence of climate change on characterization factors for copper terrestrial ecotoxicity. *Journal of Cleaner Production*, 414, 137601. <https://doi.org/10.1016/j.jclepro.2023.137601>

Wang, L., Cao, S., & Yang, Y. (2026). Global fruit production: Environmental footprints, regional variability, and sustainability hotspots. *Resources, Environment and Sustainability*, 23, 100295. <https://doi.org/10.1016/j.resenv.2026.100295>

Weber, C. L., & Matthews, H. S. (2008a). Food-miles and the relative climate impacts of food choices in the United States. *Environmental Science & Technology*, 42(10), 3508-3513. <https://doi.org/10.1021/es702969f>

Weber, C. L., & Matthews, H. S. (2008b). Food-miles and the relative climate impacts of food choices in the United States. *Environmental Science & Technology*, 42(10), 3508-3513. <https://doi.org/10.1021/es702969f>

Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., & Weidema, B. (2016). The ecoinvent database version 3 (part I): Overview and methodology. *The International Journal of Life Cycle Assessment*, 21(9), 1218–1230. <https://doi.org/10.1007/s11367-016-1087-8>

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., De Vries, W., Majele Sibanda, L., ... Murray, C. J. L. (2019). Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170), 447-492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)

Xue, L., Liu, G., Parfitt, J., Liu, X., Van Herpen, E., Stenmarck, Å., O'Connor, C., Östergren, K., & Cheng, S. (2017). Missing food, missing data? A critical review of global food losses and food waste data. *Environmental Science & Technology*, 51(12), 6618-6633. <https://doi.org/10.1021/acs.est.7b00401>

Yang, Y., Tilman, D., Jin, Z., Smith, P., Barrett, C. B., Zhu, Y.-G., Burney, J., D'Odorico, P., Fantke, P., Fargione, J., Finlay, J. C., Rulli, M. C., Sloat, L., Jan Van Groenigen, K., West, P. C., Ziska, L., Michalak, A. M., the Clim-Ag Team, Lobell, D. B., ... Zhuang, M. (2024). Climate change exacerbates the environmental impacts of agriculture. *Science*, 385(6713), eadn3747. <https://doi.org/10.1126/science.adn3747>

Zarnovican, M.-H. (2024). Évolution du secteur laitier québécois et des tendances de consommation des produits laitiers depuis 1981. *BioClips, Actualités BioAlimentaire*, 32(21). https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/agriculture-pecherie-alimentation/publications-adm/bulletins/Bioclips/2024/BU_Bioclips_Vol32_no21_MAPAQ.pdf

Zhao, W., & Schroeder, P. (2010). Sustainable consumption and production: Trends, challenges and options for the Asia-Pacific region. *Natural Resources Forum*, 34(1), 4-15. <https://doi.org/10.1111/j.1477-8947.2010.01275.x>

Appendices

See following pages for Supplementary Material.

Supplementary information file 1 for: New life cycle database on food consumption: A strategic tool to drive Climate-Smart Action in Québec

Table A.1 - Amount of calories ingested per population archetype. Source: Authors' calculation following CCHS method (Health Canada, 2018) and energy intake data from 2015 CCHS survey (Health Statistics Division, 2023).

Population archetype	kCal/day (average)
Woman 19-30	1868
Woman 31-50	1845
Woman 51-70	1710
Woman 71+	1384
Man 19-30	2569
Man 31-50	2445
Man 51-70	2191
Man 71+	1820

Table A.2 - Classifications of food categories per food group

Food categories	Classification per food group used in this study	Alternative classification (for comparison with other studies)
beer	Alcool	Beverages
cider	Alcool	Beverages
spirits	Alcool	Beverages
wine	Alcool	Beverages
biscuits and cakes	Cereals	Grains
bread, white	Cereals	Grains
bread, whole	Cereals	Grains
breakfast cereals	Cereals	Grains
flour and grains	Cereals	Grains
other cereal products	Cereals	Grains
pasta and rice	Cereals	Grains
coffee and tea	Coffee and tea	Beverages

cheese	Dairy	Milk & Cheese
frozen products	Dairy	Milk & Cheese
milk, other	Dairy	Milk & Cheese
milk, partly skimmed, 1%	Dairy	Milk & Cheese
milk, partly skimmed, 2%	Dairy	Milk & Cheese
milk, skimmed	Dairy	Milk & Cheese
milk, whole	Dairy	Milk & Cheese
other dairy products	Dairy	Milk & Cheese
yogurt	Dairy	Milk & Cheese
fruit drink	Drinks	Beverages
soft drink, diet	Drinks	Beverages
soft drink, regular	Drinks	Beverages
water	Drinks	Beverages
egg	Eggs	Meat, Fish and Eggs
apple	Fruits and vegetables	Fruits and Vegetables
banana	Fruits and vegetables	Fruits and Vegetables
beans and peas	Fruits and vegetables	Fruits and Vegetables
cabbages and broccoli	Fruits and vegetables	Fruits and Vegetables
carrot	Fruits and vegetables	Fruits and Vegetables
celery, maize and mushrooms	Fruits and vegetables	Fruits and Vegetables
citrus	Fruits and vegetables	Fruits and Vegetables
fried potato	Fruits and vegetables	Fruits and Vegetables
grape	Fruits and vegetables	Fruits and Vegetables
lettuce and other leafy greens	Fruits and vegetables	Fruits and Vegetables
melon	Fruits and vegetables	Fruits and Vegetables
onion, garlic and leek	Fruits and vegetables	Fruits and Vegetables

other fruits	Fruits and vegetables	Fruits and Vegetables
other vegetables	Fruits and vegetables	Fruits and Vegetables
pepper and squash	Fruits and vegetables	Fruits and Vegetables
potato	Fruits and vegetables	Fruits and Vegetables
stone fruit	Fruits and vegetables	Fruits and Vegetables
strawberry	Fruits and vegetables	Fruits and Vegetables
tomato	Fruits and vegetables	Fruits and Vegetables
vegetable juice	Fruits and vegetables	Fruits and Vegetables
beef	Meats	Meat, Fish and Eggs
chicken	Meats	Meat, Fish and Eggs
fish and seafood	Meats	Meat, Fish and Eggs
cold meats	Meats	Meat, Fish and Eggs
other meats and bushmeat	Meats	Meat, Fish and Eggs
pork and ham	Meats	Meat, Fish and Eggs
nuts and legumes	Nuts and legumes	Miscellaneous
canola oil	Others	Fats & Oils
fat	Others	Fats & Oils
sauce and vinaigrette	Others	Fats & Oils
candy and chocolate	Snacks	Miscellaneous
snack	Snacks	Miscellaneous

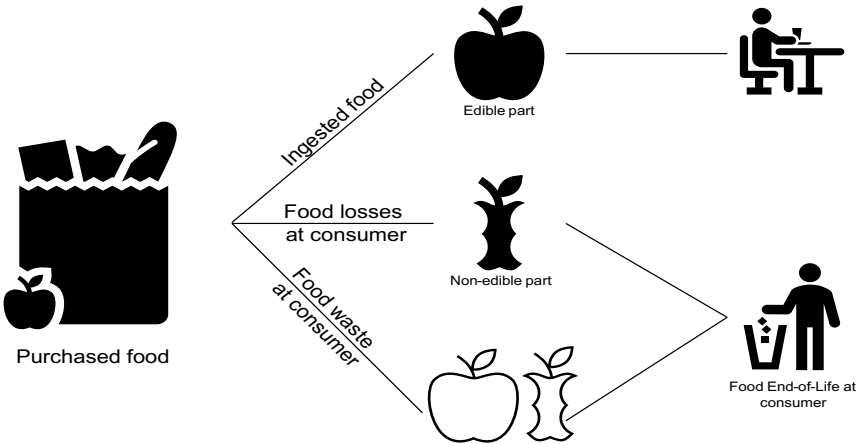


Figure A1 – Definition of purchased food divided into ingested food (edible part), food losses at consumer (non-edible part) and food waste at consumer (edible and non-edible parts).

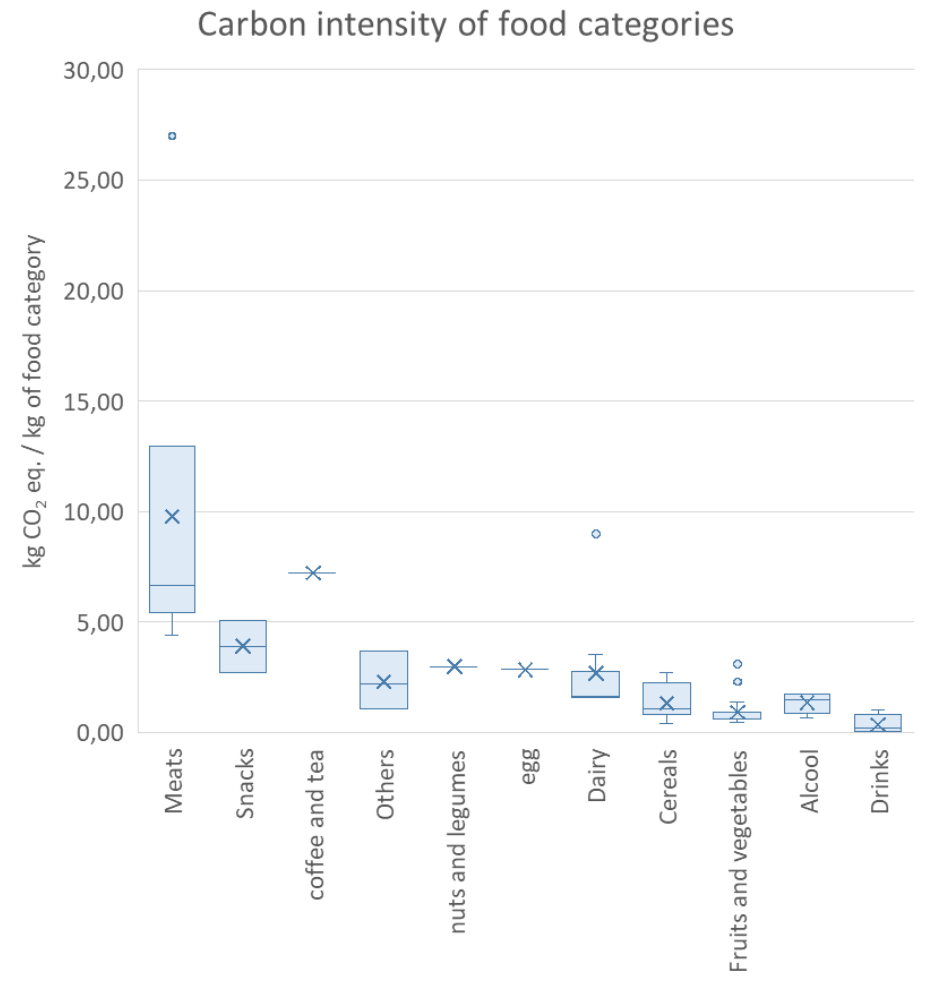


Figure A.2 - Distributions of carbon intensity of food categories per food group

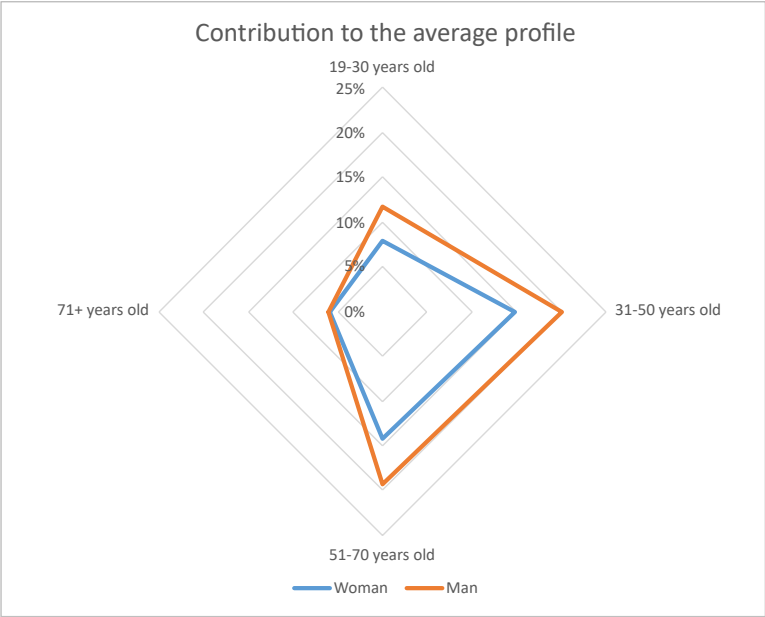


Figure A.3 - Contributions of the different population archetypes to the average profile for the carbon footprint of food consumption in Québec

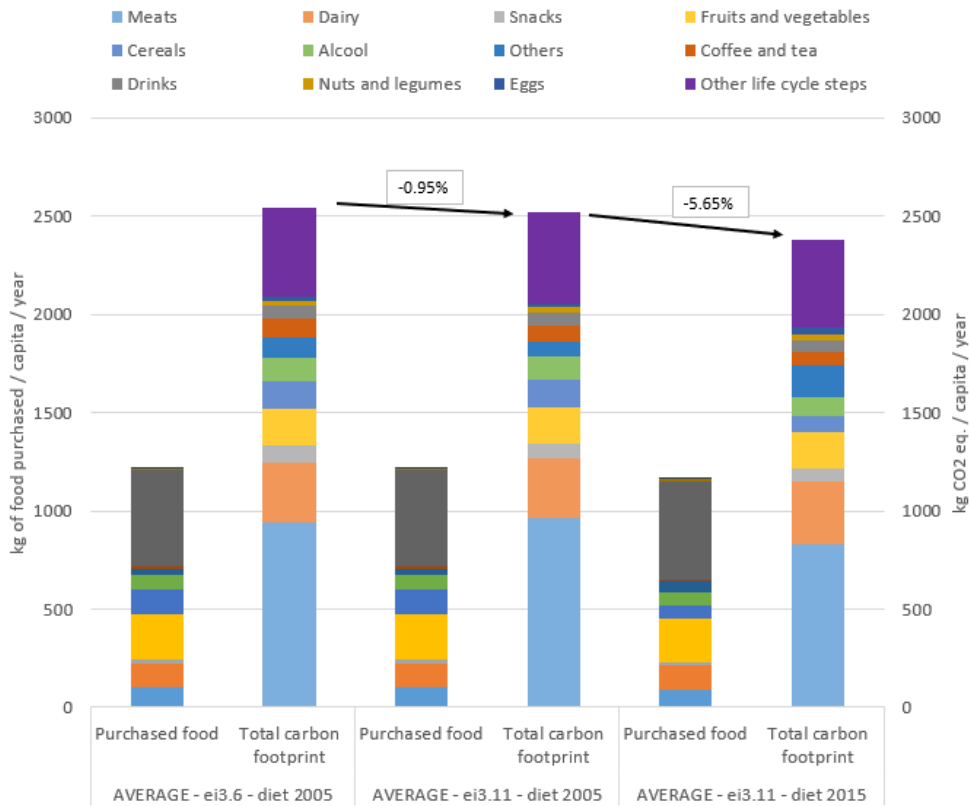


Figure A.4 – Per-capita average purchased food amount and carbon footprint based on 24h recall survey in 2005 and 2015. Left panel present results for reference year 2005 using ecoinvent 3.6 cutoff version (ei3.6). Center panel present results for reference year 2005 using ecoinvent 3.11 cutoff version (ei3.11). Right panel present results for reference year 2015 using ecoinvent 3.11 cutoff version.



Research Article

A realist evaluation of healthy food retailing interventions in small food stores in rural Newfoundland and Labrador, Canada

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Abstract

We aimed to evaluate the core factors affecting feasibility and impact of community-based healthy food retailing interventions in two private food retailers in rural Newfoundland and Labrador. We conducted a case study realist evaluation which investigates the complexities, effects, components, and inner workings population health interventions (i.e. healthy food retailing). We conducted qualitative, semi-structured interviews with stores before (November 2022) and after (February 2024) self-selected healthy food retailing interventions were implemented. Content analysis was used to code interview transcripts and create Context-Mechanisms-Outcome (CMO) statements representing how actions to create healthy food retailing work. Participating stores designed food retailing interventions aimed to increase healthy food availability,

accessibility, affordability, and acceptability through new online ordering and delivery services with healthy food recipes (S1) and changes to store equipment and food packaging (S2). CMO statements highlighted determining factors of (i) community mindedness and feedback, (ii) store status in the food system, (iii) bulk buying, (iv) advertising and communication, and (v) level of establishment. Various concepts of smallness influence the ways in which the outcomes of interventions manifest in the store's operations and its relationship with its customers. Success of healthy food retailing interventions were related to factors beyond the 'food' itself. The potential 'mix' of contextual and mechanistic factors that will generate the ideal outcome must be adequately appreciated to advance healthy food availability, accessibility, affordability, and

Keywords: food, food supply, rural population, community-based participatory research, health promotion, population health intervention

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acceptability in rural food stores and communities. These explanatory findings can inform future design, adoption,

adaptation, and implementation of healthy retailing interventions in NL and Canada.

Résumé

Notre objectif est d'évaluer la faisabilité d'interventions communautaires favorisant la vente d'aliments sains dans deux commerces de détail privés de Terre-Neuve-et-Labrador et d'en déterminer les impacts. Au moyen d'une étude de cas, nous avons mené une évaluation réaliste des difficultés, des effets, des composantes et des mécanismes internes de certaines interventions en matière de santé publique, plus précisément dans la vente au détail d'aliments sains. Nous avons réalisé des entretiens qualitatifs semi-structurés avec les propriétaires des commerces avant (novembre 2022) et après (février 2024) les interventions qu'ils avaient eux-mêmes choisies. Une analyse de contenu a permis de coder les transcriptions d'entretiens et de formuler des énoncés « contexte-mécanismes-résultats » (CMR) qui puissent illustrer le fonctionnement des actions visant à promouvoir la vente d'aliments sains. Les commerces participants ont mené des actions liées à la distribution avec pour but d'accroître la disponibilité, l'accessibilité, l'abordabilité et l'acceptabilité des aliments sains : un nouveau service de commande en ligne et de livraison offrant des recettes santé (S1) et des changements dans les équipements des magasins

et les emballages alimentaires (S2). Les énoncés CMR ont mis en lumière les facteurs déterminants que sont (i) l'ouverture d'esprit et la rétroaction de la communauté, (ii) le statut du magasin dans le système alimentaire, (iii) l'achat en gros, (iv) la publicité et les communications, et (v) le niveau de l'établissement. Les diverses conceptions de la petitesse du commerce influencent la manière dont les résultats des interventions se concrétisent dans son fonctionnement et dans ses relations à la clientèle. Le succès des interventions a été relié à des facteurs qui dépassent la nourriture elle-même. La combinaison potentielle de facteurs contextuels et mécaniques susceptible de produire le résultat idéal doit être soigneusement considérée pour faire progresser la disponibilité, l'abordabilité et l'acceptabilité des aliments sains dans les commerces alimentaires et les communautés des milieux ruraux. Ces explications pourront contribuer aux futures interventions axées sur la santé dans le commerce de détail à Terre-Neuve-et-Labrador et au Canada, que ce soit pour la conception, l'adoption, l'adaptation ou la mise en œuvre.

Mots-clés : alimentation, approvisionnement alimentaire, population rurale, recherche communautaire participative, promotion de la santé, population, intervention en santé

Introduction

Newfoundland and Labrador (NL) has a small but dispersed population of half a million persons (Statistics Canada, 2023). Linked to historical coastal fishing communities, NL maintains a high rural population (Statistics Canada, 2022). Unfortunately, rural communities experience economic, social, and health inequities compared to urban areas. People who live in rural communities in NL have greater risks of chronic disease (Kettle et al. 2005); higher prevalence of disease (Lukewich et al., 2020), and worse disease management (Lukewich et al., 2020). For example, there was a higher

prevalence of diabetes among all age and sex groups in rural communities compared to urban communities in NL, and rural residents living with diabetes had worse HbA1c and LDL cholesterol levels, and higher rates of hospitalization than urban residents living with diabetes (Lukewich et al., 2020). In 2025, total per capita health care costs in NL exceeded all other provinces, except Nova Scotia (Canadian Institute for Health Information, 2025). The cost of dietary intakes misaligned with national dietary guidelines was estimated to be \$15.8 billion in direct and indirect costs

per year in Canada, highly driven by inadequate intakes of healthy foods (whole grains, nuts and seeds, fruit and vegetables) (Loewen et al., 2019).

The causes of diet-related chronic diseases in NL are both economic and social (Health Accord NL, 2022). As such, interventions to reduce dietary risks require population-level actions, beyond individuals, that exist outside the health sector. Food environments, the physical, economic, and communication factors that influence food choices, are recommended targets for population-based interventions to create communities that support and facilitate healthy eating (Raine, 2005). When considering how food stores impact population diets, the International Network for Food and Obesity / Non-communicable Diseases Research, Monitoring and Action Support (INFORMAS) Food Environment and Policy Index (Food-EPI) recommends healthy food promotion and availability (and restrict unhealthy food promotion and availability) in stores as a “good practice” in support of healthy eating (Vanderlee et al., 2023). In 2023, NL ranked “low” in its achievement of this benchmark (Vanderlee et al., 2023).

Food retail interventions for healthy eating promotion are an emerging research area (Hartmann-Boyce et al., 2018; Slapø et al., 2021). Low quality studies (Slapø et al., 2021) and high heterogeneity (Hartmann-Boyce et al., 2018) in retail intervention research create uncertainty around the success of these interventions. A recent systematic review

found success of interventions in simulated settings but not in real life settings (Hartmann-Boyce et al., 2018). Real-life population health interventions that aim to understand the process by which interventions work, and how they work, are needed (Hawe & Potvin, 2009). In particular, high-quality, rural-specific studies are needed to assess the context-dependent impact of such interventions (Slapø et al., 2021). Recent research on food stores in NL has identified multiple, complex factors impacting healthy food retailing in rural communities whereby independent ownership increases capacity to meet community needs but conventional food systems disadvantage small, rural stores (Le Drew et al., 2025). More research is needed to understand how these factors may affect the success of healthy food retailing interventions.

In partnership with Food First NL, a provincial non-profit organization, we conducted a community-based retail intervention project called Great Things in Store (GTiS). Based on community needs, rural food stores participating in GTiS co-designed and implemented healthy food retailing interventions for their own stores, supported by Food First NL. This study aimed to evaluate core factors affecting the feasibility and impacts of GTiS healthy food retailing interventions in food stores in rural communities in NL. We considered the impacts of interventions to be related to storeowner perceptions of food availability, accessibility, acceptability, affordability, consumer attitudes, and purchasing behaviours as per our conceptual model developed with Food First NL (Figure 1).

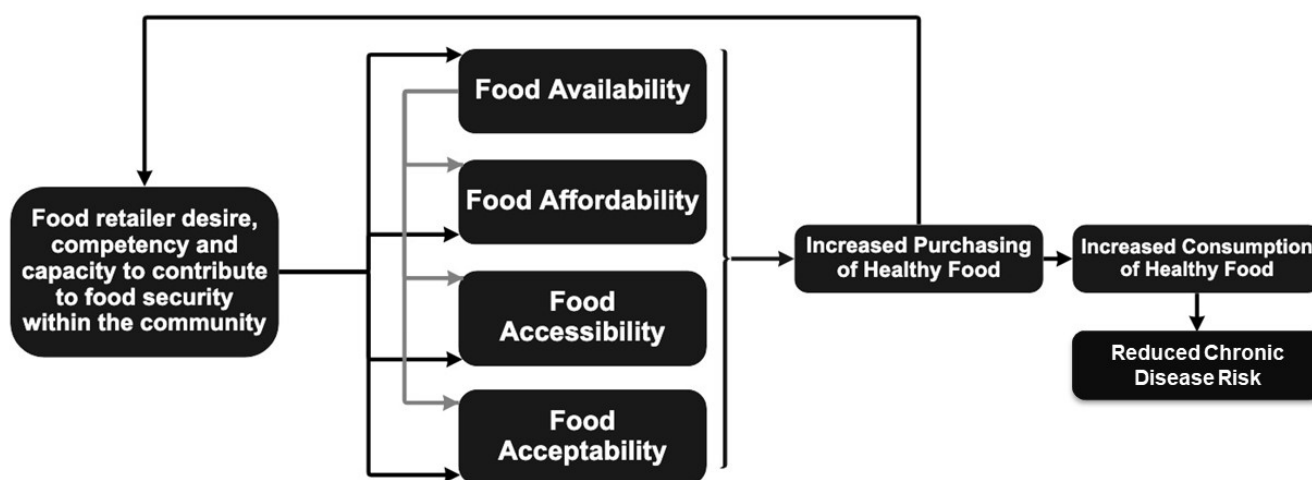


Figure 1: Conceptual Model of Healthy Food Retailing Interventions in Community Food Stores in Rural Newfoundland and Labrador (Stuckless, Wang & Prowse, 2022)

Methods

We conducted a case study realist evaluation of food store interventions within the project. Realist evaluations are valuable for population health intervention research (Hawe & Potvin, 2009) and investigate the complexities (Marchal et al., 2012), effects, components, and inner workings of interventions (Kazi, 2003). This study was approved by the Health Research Ethics Authority of NL (20222741).

Participants and sampling

Food First NL recruited food stores through advertisements on social media, and through email listservs and community networks. A total of 35 retailers applied to participate, of which only eight were considered eligible. The requirements were as follows: sole proprietor of a conventional food store that sold whole, unprepared food and offered a range of food categories, had control over store features and operations, amenable to a healthy food retailing intervention, and located within rural regions. We defined rural as having less than 1000 persons with a low population density (<400 persons per square kilometer) within census subdivision areas according to Statistics Canada (2023), aligning with provincial and national definitions of rurality (Simms & Greenwood, 2021; Statistics Canada, 2022). From these eight, the research team selected three retailers using maximum variation purposive sampling (Palinkas et al., 2015) whereby stores were evaluated based on their store offerings, interest level, goals, location, knowledge of determinants of diet, and awareness of clientele. Consensus decision-making was used with the research team to select three stores that offered variation in location, ownership, and operating style along with high interest and motivation to participate. Two eligible stores in Labrador were not considered due to logistical, financial, and ethical challenges. Stores were first contacted by Food First NL to confirm participation in GTiS and then contacted by the study team to obtain consent to participate in the research study. Stores signed a general study consent form covering all study information and activities; verbal consent was sought prior to each data generating activity.

Study procedures and timelines

The study design, tools, and procedures were co-developed and executed with Food First NL as study partners (Stuckless et al., 2022). Stores were supported by Food First NL staff during the intervention planning and implementation period who provided capacity-building, regular check-ins, and on-demand support. Funding of \$17,500 was provided to each store for necessary purchases and expenses associated with their intervention. The stores were given full control to design a healthy food retailing intervention they felt best supported health in their community. Intervention parameters were minimal as the project intended to support community-based decision making. Goals for intervention were informed by public meetings in each community held with the food store, research team, and Food First NL. At these community meetings, attended by members of the public and local stakeholders, we explored the communities' explanations of factors that make it harder or easier to purchase healthy foods through brainstorming, storytelling, mind maps and a "dotmocracy" priority setting activity. An example of a mind map is provided in Supplemental File 1. If needed, participants were prompted to explore the topics of food availability, accessibility, affordability, and acceptability as per our conceptual model for the project (Figure 1). The participating stores then self-selected actions to improve food-related factors that they felt met their community's needs. Intervention planning took place between January–June 2023, followed by a six-month implementation period (July 2023–January 2024).

Data collection

Storeowners completed semi-structured interviews with a trained research assistant before (November 2022) and after (February 2024) the interventions. Interviews explored the store, its role in the community, relationship with customers, expectations of GTiS, healthy food retailing, most and least successful changes, and factors impacting healthy food retailing (Supplemental File 2). Interviews were conducted in person at baseline and by video at follow-up, and were audio recorded and transcribed verbatim both times. All owners in each store

were interviewed at baseline (two owners in stores one and two, and the singular owner from store three); at follow-up, only the most active owner was interviewed in stores one and two as per participants' decisions. Notes from the project coordinator, team meetings, and baseline community meetings held during intervention planning were included as supplemental qualitative data. One store voluntarily withdrew during the intervention period due to insufficient capacity; all data from that store has been excluded from this analysis.

Data analysis

Qualitative data was managed in NVivo 12 (QSR International) and Microsoft Office. Data were coded by the research team using content analysis to identify concepts relevant to understanding the design, feasibility, implementation, and impact of healthy food retailing in participating stores. Codes were then classified as contexts (C), mechanisms (M), and outcomes (O) and used in collaborative research team discussions to generate CMO configurations. A CMO is a heuristic that is used to explain causation in program theory and helps identify explanatory factors to better understand and describe what works, for whom, and in what circumstances (De Brún & McAuliffe, 2020; De Weger et al., 2020; Slater & Kothari, 2014).

CMOs demonstrate underlying contributors to the choice of healthy food retailing, the feasibility of healthy food retailing interventions, and the impact of interventions. We considered outcomes to be items related to intervention design and feasibility, and storeowners' goals and perceived impact of intervention on food availability, accessibility, acceptability, affordability, consumer attitudes, and purchasing behaviours (Figure 1). Contextual and mechanistic factors were not constrained by any a priori model. The CMO configurations are intended to be useful explanations that can inform future design, adoption, adaptation, and implementation of healthy retailing interventions in NL, Canada, and internationally.

Results

Case descriptions

Store 1 (S1) was located in a community of about 650 people (Statistics Canada, 2023), 60 kilometres from St. John's, the capital city of the province. Established over 100 years ago, it is the largest food store within a half hour drive in either direction and receives considerable business from surrounding communities. S1 implemented two interventions: (1) healthy recipe cards placed throughout the store for six weeks (Sept-Oct 2023) to increase purchases of low-sale vegetables and fruits, and (2) an e-commerce website, developed to offer online ordering of any store items with delivery (within 30 kilometres of the store) and pick-up options, established December 2023.

Store 2 (S2) was located in a community of about 300 people (Statistics Canada, 2023), 140 kilometers from St. John's and was established in 2017. The nearest food retailer is 15 minutes further down the highway in another small community with approximately 1000 people (Statistics Canada, 2023); full-service grocers are another 35 minutes further in a larger city. S2's intervention aimed to increase food accessibility and to reduce food waste with its intervention by purchasing equipment (electric meat saw, commercial vacuum sealer, price computing scale, freezer) to repackage foods into smaller portions for customers. The intervention was launched in November 2023.

(C)ontext, (M)echanism, (O)utcome Configurations

Five CMOs identified core factors affecting feasibility and impact of interventions: (i) community mindedness and feedback, (ii) advertising and communication, (iii) bulk buying, (iv) store status, and (v) level of establishment (Figure 2). In the descriptions below, CMO configurations generalized across cases are denoted with capitalized "C", "M", and "O"; descriptions of CMOs by case study are denoted with lower case "c", "m", "o". Numerical annotations attached to CMOs correspond to Figure 2. Table 1 includes exemplar quotes.

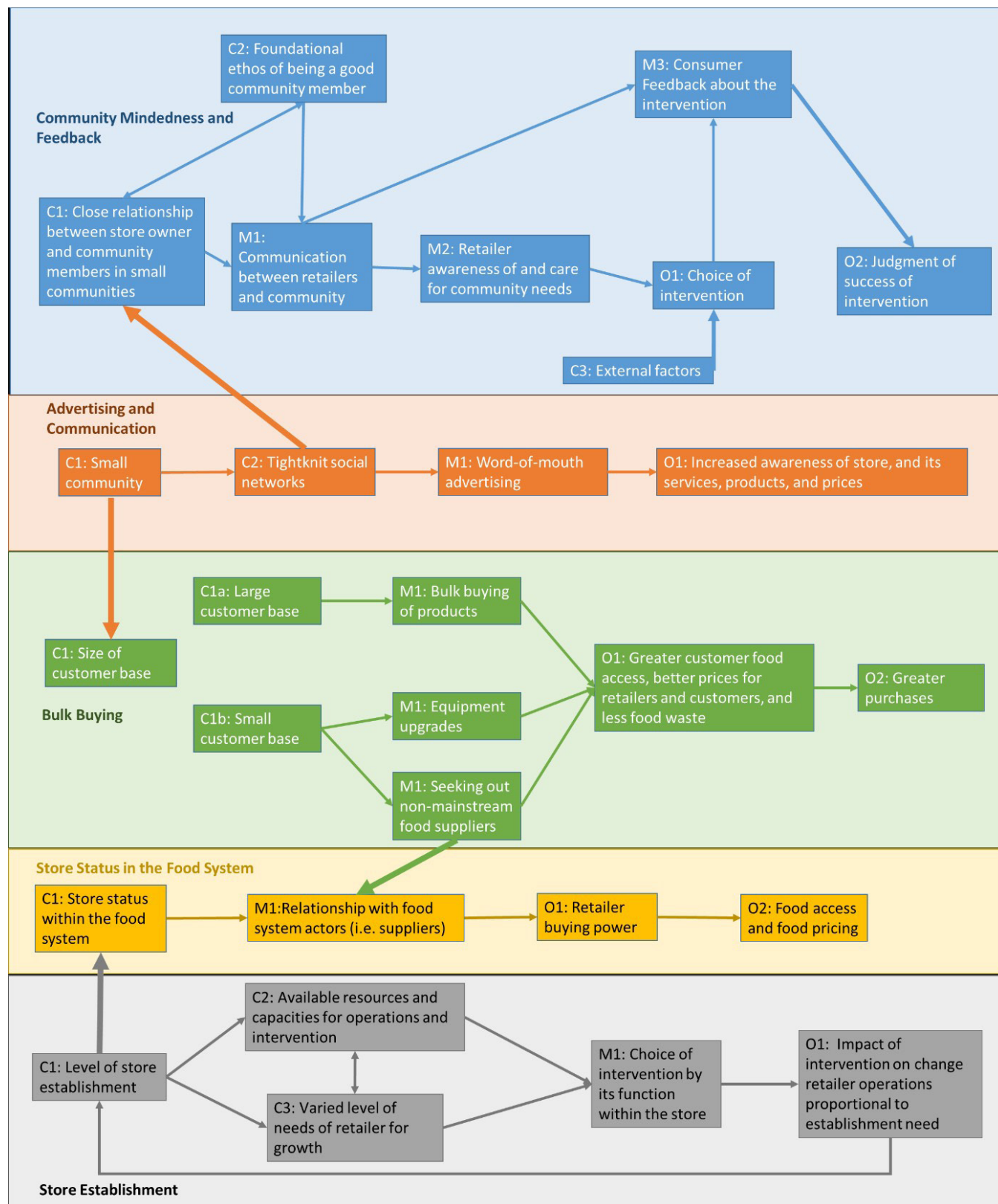


Figure 2: Context-Mechanism-Outcome Configurations Describing the Feasibility and Impact of Healthy Food Retailing in Two Case Study Rural Food Stores in Newfoundland and Labrador (C=context, M=mechanism, O=outcome). Numbers next to C,M,O, denote order of C,M,O factors. Arrows denote theorized relationship between C,M,Os.

Community mindedness and feedback

Stores approached their interventions from a position of community care and valued input from their consumers. Consumer input was weighed against various external factors that impacted business, such as weather, seasonality, and transient consumers. Small stores in small communities meant that owners had greater contact with customers resulting in more customer feedback. Store-owners in small communities had close relationships to community members (C1) and a foundational ethos of being a good community member (C2), which facilitated direct communication between the store and community (M1) leading to store owner awareness of, and care for, community needs (M2), which dictated healthy food retailing intervention choice (O1), moderated by other external limiting factors (space, money, etc.) (C3). After the intervention was implemented, feedback provided by, or solicited from, community members (M3) allowed the stores to judge how successful the intervention was against initial expectations (O2). The storeowners received consumer feedback differently, however. S2 held multiple roles within the community extending beyond the store, providing regular contact with residents. As the manager of a legacy business, S1 had an established role within the community, but not beyond the store.

S1's long history was an apparent function of its ability to adapt in ways to meet community needs. S1 approached GTiS with the desire to be a good community member and judged the success of the intervention on the basis of community input: "...my goal from this whole start was to be a better community member, so it's listening to community and hoping that the community keeps feeding back and keeps giving us ideas if there's something we're not doing...That's the whole point of this". For S1, the storeowner's desire to be a good community member (c) made them open to feedback (m) which they incorporated into store operations, including choice of, and evaluation of, their intervention (m) through the degree of community approval (o).

S1 was aiming to design their recipe intervention based on community feedback: "...you always hear the comment, especially from some of the senior ones, 'I don't know what to cook.'" They felt that the interven-

tion had been well received and slowed declining sales related to inflation. Further, they started a delivery service attached to a new online ordering system after hearing that access to the store was a barrier for some customers, such as seniors. While S1 believed the community welcomed the website, greater use of the website and delivery service was needed to make the return on investment.

Unlike S1 (who stepped into a managerial role in a well-established family business), S2 was driven by their established leadership role in the community and concern for their community; S2 said "that kind of drags us to the store, really... just watching stuff that was leaving the community...listening to so many people say, 'Well, there's nothing in the community, what are we here staying for? We got nothing to keep our children here for'...so then we decided to, we were talking about it one night...from the time we started and got done I think we're, well the time I actually started building the store we were three months had her open. And if I was told, it probably was 5 months altogether by the time we got all the permits and everything in place". Specifically, they were inspired by observed challenges with outmigration from the town and aging populations with growing health and mobility challenges: "I looked at it as, some way we could help the people, and especially I thought about seniors, people with disabilities, ... seems like there's a lot more sick people around than healthy people..." For S2, the storeowner was well known and approachable (c), leading to several individual consumer requests (m), resulting in retailing changes to meet consumer demand (o). S2 also believed that their choice of intervention was guided by community input, which was reinforced by positive feedback.

Advertising and communication

In small communities (C1) where there are tightknit social networks (C2), such networks can be leveraged for word-of-mouth advertising for greater reach beyond conventional advertising (M1) to increase awareness of the store, and its services, products, and prices (O1). Beyond online strategies to inform consumers about their stores' products and services, stores employed more organic communication strategies to reach other individuals.

S1 introduced a new website and appeared to have

been successful in attracting new customers and increasing sales; it has drawn “a couple of new customers to me now that I know of...but they’re new with regards to taking a bit of a bigger order...they probably had been in the store before and...got an item here or there, but...with the website...they can actually see...more in depth as to what we have in stock and pricing, so it allows them to do some shopping and do some comparison to what’s on the go around...”. Despite this success, S1 postulated that non-digital social networks might be a way to increase reach. Seniors were the target population for the delivery intervention, but they were not being reached by traditional advertising channels (e.g. television, radio, social media) (c), leading the storeowner to believe that family networks need to be leveraged (m) to increase awareness and uptake of the intervention (o). As the “webpage is now a part of our business”, S1 hoped that with “a bit more pushing it, a bit more prodding, we’ll hopefully get more and more people taking it”.

In S2, the owner was also concerned with informing their consumers about the store’s offerings, but they took a less direct approach to communication believing in the value of word-of-mouth, which they described as “little fires”. S2 remarked that once they started stocking items like broccoli and cauliflower, customers would come in, saying things like, “I heard you have broccoli!”. They recounted an anecdote about a customer telling another customer in a [nearby community] grocery store that S2 had better prices on meat products, a fact which they believed had led to more people coming in to shop there.

Bulk buying

In the context of creating successful healthy food retailers, bulk buying is a strategy that is used effectively when there are sufficient customers to support the purchases without producing waste: Larger customer base (C1a) leads to buying products in bulk amounts (M1), which supports greater customer access to food and better prices for both retailer and customers without food waste (O1) and leads to greater purchases (O2). Where bulk buying was not possible, retailers turned to less conventional strategies such as cultivating relationships with small-scale local suppliers who furnished them with goods at a reason-

able price and in practical quantities. For S2, the smaller customer base (C1b) led the storeowner to seek out non-mainstream food suppliers that do not have the same minimum purchase requirements (M1) and equipment upgrades to portion and store perishable products (M2). This approach supports greater customer access to food and better prices for retailer and customers and reduces food waste (O1) and increased purchases (O2). The strategies S2 used to overcome minimum purchasing requirements are part of an overall intimate local food system the store participates in where there is a close relationship between retailers and producers.

S1 appeared to have an adequate consumer base to justify bulk buying, boasting “500 rings” (sales) a day. S1’s large customer base supported the development of an online ordering system and pick-up or delivery options, which reinforced their customer base through greater purchases. The interventions seemed to further their capacity to buy more food, and higher quality food: “...there’s more of a demand, especially for fresh produce. I’m bringing in a bit more variety of fresh produce. A better-quality product, too, because I’m able to order a little bit more in bulk, because sales increase of it. So that gives us better quality. And then it also helps us reduce the price of it, too. Buying in bulk is a lot cheaper than buying single pick items.”

The customer base of S2 is much more limited than S1 and perceptions of bulk buying were more negative. S2’s experience with bulk buying through traditional suppliers was challenging due to food waste and associated financial loss, especially with fresh produce. The quality of produce S2 was receiving, particularly fruit, was already quite poor and getting larger quantities just left the store with more spoilage: “...you used to order so much in bulk and then it would spoil on you before you got a chance to sell it all.” S2 was continuously navigating restrictions of minimum purchase orders, which often forced them to buy in bulk even if the demand was not there. A 40lb box of cabbage received at the store one day turned into only 24lbs of sellable cabbage after damaged, wilted, and mouldy cabbage was discarded. During the intervention, in which S2 purchased a vacuum sealer, meat saw, and freezer, they were able to procure meat from a local beef farmer. Here, bulk buying became an advantage: they

bought quarters of beef, cut it up and packaged it, declaring that they were able to secure better prices with that strategy. Further, having the freezer allowed them to reduce waste. The increased capacity of S2 to bring in bulk items appears to be linked to the increase in business due to the equipment upgrades to package and offer single, “perfect portions” to customers.

Store status

Stores’ experiences with procuring supplies depended on their ownership model. A store with a consistent supplier, as is the case with a banner program which is linked to a corporate grocery store (S1), can readily access information, cheaper prices, and greater variety products. Stores without any corporate ties (S2) are neither guaranteed consistent supply nor consistent pricing. In general, store status within the corporate food system (C1) fosters relationships with food system actors (i.e. suppliers) (M1), which have variable impacts on retailer buying power (O1) and food access and pricing (O2).

S1 joined a corporate banner which “allowed independents to come together under one umbrella and give them better buying power”. Their corporate partnership allowed them to choose the items they stock and also allowed them to set their own in-store sale prices. They typically relied on their corporate partner because they received better prices and product variety than with other suppliers. Being part of a corporate banner (c) provides an established supply chain for the retailer (m), which generates buying power and access to produce variety (o1), which leads to improved food availability and in-store pricing (o2).

In S2, the owner noted differences between suppliers pertaining to price, quality, minimum purchasing requirements and even visibility of stock items on the wholesaler website. This resulted in inconsistencies affecting S2’s operations and prompted alternative solutions to increase buying power, such as price shopping between suppliers, networking within the food system, and advocacy. As an independent, rural convenience-style food store (c1), S2 experienced challenges with food availability, prices, quantity, quality, and consistency from suppliers (c2) which encouraged network-building with local food

system actors (m) to increase store buying power to secure food products (o1) and allowed the storeowner to increase access to a greater variety and better priced foods (o2).

While S2 started as a convenience store, stocking primarily those food items that customers typically run out of and need to replace at a moment’s notice, it has been evolving towards carrying a fuller range of groceries. Unfortunately, convenience store status created real or perceived limitations to achieving that goal. S2 cited the example of being unable to bring in a canned good because available stock was reserved for bigger retailers. They also claimed that “[j]ust for being a convenience store, [distributors] charges you more ’cuz they think they can charge you more.” S2 actively cultivated retailer networks and collectively strategized to increase their buying power. With a nearby retailer, S2 agreed to “group buy” certain items, particularly produce, thus, reducing cost and in-store food waste. Working with GTiS gave S2 even more impetus to further their retailer network-building, where the ultimate goal of such a network is to achieve better and more equitable buying power for local and small businesses.

Store establishment

From expanding to evolving: The two stores represent opposite ends of a spectrum: while S1 has operated within the same family since 1886, S2 has existed for less than a decade. The level of store establishment (C1) affected the available resources and capacities of retailers (C2) and needs of retailers for growth (C3). Thus, stores chose interventions by the interventions’ function within the store (M1) and its potential to impact store operations proportional to the level of need (O1). When choosing an intervention, the retailers made decisions based on what would best improve their stores’ operations.

The decision for S1 to develop a website with delivery and pick-up options was influenced by their sense of needing to modernize their well-established business. S1 credited the store’s longevity to an ability to evolve: “We’ve always been willing to change and we’ll always be willing to change...it’s either adapt and move on or stay the same and fall behind.” As an established business, S1, had the advantage of greater resources. Due to their legacy, howev-

er, they also suffered from innovation fatigue and felt that they had limited room left for meaningful growth; S1 felt stagnant: “I guess being around so long for us, we seem, to seem to think that we’ve done it all.” However, being a well-established business offered numerous advantages and opportunities. S1’s intervention, website with online ordering options for delivery or pick-up, appeared to be relatively simple to implement since the store had proof-of-concept of delivery services provided 20-30 years ago, a vehicle, sufficient staff, a fully computerized point of sales system, digitized inventory, and an existing relationship with a company that could integrate these digital features into a website. As a result, they did not have to invest significant resources into the intervention, aside from the cost of web development and monthly hosting fees. As an established store (c), S1 has existing capacity and resources to leverage (m) to implement online ordering systems with pickup and delivery options (o).

As a less established store, S2 was still developing their business model. In this case, interventions effective at building the store’s capacity were as simple as acquiring more equipment. The choice to purchase equipment helped establish the business as a grocery store with more diversified options. S2 described their situation as follows: “[w]e’re expanding, we’re trying to expand right at the moment. More of a demand, first we started out with, like, basically things you might run out of, but now we’re expanding more into a grocery, or trying to go that way.” S2 continuously expressed a number of creative ambitions for the store, including expanding the store to accommodate a mini farmers’ market.

Unfortunately, S2’s ambitions were hampered on several fronts relating to their degree of establishment. Lack of staff and physical space limited their opportunities to operate and expand. Providing a wide selection of healthy food is a top priority for S2; they relayed that customers on numerous occasions have told them that if the store had more stock, they would not leave the community at all to shop. The budget of physically expanding the store is well beyond the scope of GTiS grant, thus, they chose to invest in equipment, including a meat saw, a vacuum sealer and a fridge instead. The small equipment changes through the intervention are believed to have had a major impact on their operations and growth. These increased S2’s capacity to scale up product offering and helped to establish S2 by levelling the playing field of tools and appliances that larger retailers would have as part of their businesses. The rationale behind S2’s intervention choices follows a simple CMO: S2 is building their business (c), therefore, the choices of intervention are focused on establishing the store with features of a conventional retailer (m) which transitions their business towards a full-service grocery retail model (o).

Discussion

This study aimed to evaluate the core factors affecting the feasibility and impact of community-designed healthy food retailing interventions in food stores in small rural communities in NL. Using a case study realist evaluation, we explored contextual and mechanistic factors that give

CMO Statements	Store 1	Store 2
Close relationships to community members (C ₁) + foundational ethos of being a good community member (C ₂) → direct communication (M ₁) → awareness of community needs (M ₂) → healthy food retailing intervention choice (O ₁), moderated by external factors (C ₃). Feedback from community members (M ₃) → storeowner perception of intervention success (O ₂)	“We’ve never been...afraid of change...we’ve been around for 135 years... we’ve changed based on what the community has asked for.” “No trouble for someone, a customer to come up and ask for something or to pass feedback in store too, you know, you gotta be willing to listen and be open to some constructive criticism, so to speak.”	“....this was a good experience of how we work together and trying to figure out the best solutions for people... they still was putting the word around and talking to people in the community about it. As well as people coming into the store and checking on it... It takes a while to get stuff in play and get stuff, introduced to people... Some people were buying into it... I found it good and people found it good.”

Table 1: (C)ontext, (M)echanism, and (O)utcome Configurations and Exemplar Quotes by Store. (*Table continues on following page.*)

CMO Statements	Store 1	Store 2
Tight knit social networks (C ₂) → word-of-mouth advertising (M ₁) → awareness of the store, and its services, products, and prices (O ₁)	"It might be still some, some of the seniors that, uh, we're still not catching for various reasons, but, you know, hopefully with, you know, their family members, you know, it's, it's a tight knit community so, hopefully, their family members will pick up and pass it along." "We're trying to figure out other ways where we can access these people, or get more information in their hands..." "...it's getting the family members to sit down and, and, and bit of patience with them to help them navigate through the website and everything else and how to do it, and stuff like that." "We're looking at other ways where we can get [the website] out... just have a look, you know, you don't have to set up an account [to the website], just have a look. You can go in and you can explore, you can have a look around the web page, and then if you want to place an order, then you can go ahead and set up your account."	"We used to do a little bit on Facebook, but, you know, with the people around...the word of mouth is that some you know, it is good... it's like little fires or something like that, you know, better." "...usually when people sees you're in with something, they're more prone to come to you ...look and see what's there...and then they're talking to their buddies, they're talking to the person down the road and talking to the next community." "...one person come into the store one day. She said she was down in [the nearby city] in the grocery store and there was another lady there. She said, 'get that up to [Store 2]', was bologna it was, and she said 'it's cheaper'. It was cheaper [in Store 2] than what it was down there [in the grocery store]. So then we had them come in looking for the bologna."
Larger customer base (C ₁) → bulk buying (M ₁) → greater customer access to food + better prices without food waste (O ₁) + greater purchases (O ₂)	"Yeah, there's more of a demand, especially for fresh produce. I'm bringing in a bit more of a variety of fresh produce. A better quality product too, because I'm able to order a little bit more in bulk because sales increase of it. So that gives us better quality. And then it also helps us reduce the price of it, too."	"I've been trying to avoid the spoilage and having to bring in so much bulk stuff, trying to find it, trying to find a way to do that." "people like stuff vacuumed up,...like, pork chops. We find fresh pork chops, and then put in, like, 1 or 2 pork chops in the vacuum sealer and vacuum them up. And we found that great too, especially for the workers and stuff. I mean, that worked good, not only for workers, too, but also for people in the community, like the older ones, like, instead of them buying a package of pork chops with four in it or five in it and then it going bad on them. They'll come to the store and buy a couple of pork chops in the vacuum sealer.." "...probably 50% more than it was...more business, more healthy foods and people coming in for the single portions..."

Table 1 (cont'd)

CMO Statements	Store 1	Store 2
Store status within the food system (C_1) → relationships with food system actors (i.e. suppliers) (M_1) → retailer buying power (O_1) and food access and pricing (O_2)	"[national grocer partner] is our main distributor. They don't limit us as to what we can get or can't get...if they don't have it, then we're free to buy from any other distributor that has." "...as part of the [store banner program] we tend to get the better prices..." "...we tend to have a good variety...we always offer a name brand...and a private label...we tend to offer the main brand and a cheaper alternative."	"One of the biggest challenges we have is we're a convenience. We're not treated the same as the big stores." "...I would call up and say, [nearby retailer], how are you doing for your order this week, like with cauliflower and lettuce...And he'll say...I only need probably 5 or 6, and I'll say, well, I only need 5 or 6, so we'll order in 12 and split the cost" "I'm trying to... with the local businesses and the small businesses, convenience stores about getting together and trying to find out why we can't get access to product and why we have to pay so much for a product, as opposed to the big [grocery chain] stores and stuff, right. To me, I think we should be treated fair in the same thing and be able to offer the same prices."
Store establishment (C_1) → available resources and capacities of retailers (C_2) + needs of retailers for growth (C_3) → interventions choice according to function within the store (M_1) → impact store operations proportional to the level of need (O_1)	"we've evolved, obviously, over the years, that's why we're still in business." "It was the challenging at times trying to figure out what to do to help the community, how we can help the community... I guess being around so long for us, we seem to seem to think that we've done it all. It's trying to come up with something new, something different, something that community itself would embrace. So, you know, that, of course is always a challenge."	"[w]e're expanding, we're trying to expand right at the moment. More of a demand, first we started out with, like, basically things you might run out of, but now we're expanding more into a grocery, or trying to go that way." "I'm building on, right, I was going to have to do with some tied in, with my, my fishing and the farmer's market all into one. And I really think that will go over good when people can come in and buy fresh fish, fresh cod, fresh lobster and all fresh fruits and vegetables, right, yeah, getting it off local farmers and that."

Table 1 (cont'd)

rise to outcomes. Five CMOs describe core factors related to the design, feasibility, and impact of retailing interventions: (i) community mindedness and feedback, (ii), advertising and communication, (iii) bulk buying, (iv) store status, and (v) level of establishment.

CMO statements help to answer the question in realist studies of, "what works, for whom, and in what circumstances?" (Slater & Kothari, 2014). Across all CMOs, the size of both the businesses and their respective communities is a common contextual factor that advances our understanding of what intervention strategies were most successful for the individual retailers and why.

There are multiple degrees of smallness revealed in this study—community size, number of sales per day, physical footprint of store, store status, level of establishment, standardized practices and operations—which impact the ways in which the outcomes of interventions manifest in the store's operations and its relationship with its customers and the wider community. While small, rural stores may face numerous challenges, some are better positioned than others to meet those challenges. Smallness is visible throughout the CMOs related to relationships between communities and retailers, and the operations of the store. Displays of smallness in mechanisms and contexts interact

across CMO configurations reinforcing one another and producing outcomes. In Figure 2, arrows that cross one theme into another display how features of smallness (e.g. tightknit social networks, size of customer base, level of establishment) interact with mechanisms (e.g. relationships with food system actors), which subsequently affect product outcomes (e.g. buying power). These factors are evident in other research on business, social enterprises, and communities (Barraket et al. 2019; Frazier & Niehm, 2004; O'Donnell, 2004; Meador, 2019; Siemens, 2010).

Entrepreneurialism has been highlighted as a key component of food retail environments in Canada—important in building local economies and social networks alongside health promotion (Mah et al. 2018). As the retailers strove to make decisions that best serve their customers and build their businesses, they “right-sized” their networking strategies. This entrepreneurial approach is consistent with O'Donnell's (2004) assertion that small-firm networking varies not only according to the owner-manager involved but also according to the individuals with whom they are interacting. His research concluded that owner-managers generally engage in “extensive and proactive” networking and that they modify their approach as required by their circumstances and the needs of their business (O'Donnell, 2004). Following this pattern, our two stores make the “what” (healthy food retailing intervention) work for the “whom” (the stores and their communities) according to their particular circumstances (communities of varying degrees of smallness).

Stores' day-to-day operations were impacted by their physical size and business capabilities, status, and level of establishment. Participating stores, while both small businesses, have differing operational sizes relative to each other yielding a crucial difference in capacities. Further, S1 was established more than a century before S2. Being a smaller, newer store means that S2 may receive a greater benefit from an intervention, as even small changes to its operating capacity should have an outsize impact, relative to its starting point.

Both stores enjoyed the position of being the sole retailers in their communities, but S1 had the further advantage of a formalized relationship with a distributor. This relationship is aligned with what Frazier and Niehm

(2004) term an “Expert” relationship, which gives greater access to resources like customized information and advantageous pricing. S2 may be classified as functioning within a “Merchant” network, comprised of local business owners who exchange information and which creates advantages in terms of cooperation and more effective lobbying efforts (Frazier & Niehm, 2004). The relationships both stores have with Food First NL may be characterized as “Inspiration” and gives them access to customized information and guidance on best practices (Frazier & Niehm, 2004).

The retailers also display evidence of resourcefulness, in line with other research on rural retailers. Barraket et al. (2019) combine notions of networking and resourcefulness in their study of rural social enterprises, citing in particular the practice of bricolage, whereby entrepreneurs draw on a wide variety of available resources to create value in resource-scarce environments. Their research found that access to resources and overall efficacy of these organizations is dependent on local networks and the enterprises' sense of credibility and legitimacy within their respective communities (Barraket et al. 2019). Business owners' mindsets and approaches to meeting challenges are important factors which influence the ways in which they meet their objectives (Siemens, 2010). Rural business owners mitigate many challenges and create value by seeking out resources locally (Siemens, 2010).

In small rural communities, networking is a valuable competency for retailers where residents have stronger primary group relationships and personal ties than in urban areas (Frazier and Niehm, 2004). Retailers leveraged informal interpersonal networks to gain knowledge to improve their operations and marketing approaches. “Grapevine networks” of customers, employees and community residents which can provide valuable guidance in marketing, promotional, and merchandising choices (Frazier & Niehm, 2004), were seen in our cases. Similarly, implicit rural networks, such as those that arise from social interaction and are characterized by reciprocity and trust, are identified as valuable holistic and inclusive tools in community development (Meador, 2019).

Strengths and limitations

As a realist evaluation, this case study deeply examined the factors, mechanisms, and complexity associated with healthy food retailing in rural communities. We ensured quality data through prolonged engagement with the community, member checking, peer debriefing, and memoing (Morse et al., 2002). The nature of this project allowed us to be reflexive and adapt methods to ensure methodological coherence with research purpose and community relevance (Morse et al., 2002). As a project partner, Food First NL contributed invaluable to the design, implementation, and sustainability of the healthy food retailing interventions in this project. The findings of this research have strong practicality and relevance to the NL context.

The loss of one store from the project due to insufficient capacity indicates that not all types of stores are captured in this analysis. Generalizability of the findings may be limited to food retailers with internal capacity, interest, and freedom to invest effort into redesigning their business operations. We did not interview any store staff as part of this project, which may exclude an important perspective. However, since these are small stores, there are few employees (e.g. fewer than five) and owners are highly engaged with staff, minimizing the risk that an important concept or interpretation was missed. The length of the study limits the degree to which impact of interventions could be assessed due to the limited capacity of retailers to design and implement interventions with speed. Most interventions took longer than six months to plan, leaving only a few months for the intervention to be implemented before follow-up. Further, impacts were assessed through storeowners' perceptions; we did not collect objective measures. Although dollars were provided to participating stores, interventions undertaken in this study were restricted by available financial capital; larger interventions may have been desired but were financially unattainable. This factor may have impacted some of the CMO factors and configurations in our study. Financial contributions to stores are important to fund start-up costs and cover any losses during transition or start-up but may not be accessible to small food stores outside of

specialized research or government funding. Additionally, the fit of interventions to goals may have been misaligned in some cases, such as the use of a digital intervention to reach seniors or the use of online grocery shopping, which may have positive or negative impacts on healthy food purchases. It would be wise to consider the strategic alignment of interventions to populations, challenges, and outcomes in future small food store-centered retail activities. Further evaluation that measures the degree of impact of the interventions on outcomes of interest (food availability, food prices, consumer behaviour) would also enhance the understanding of the significance of the contexts and mechanisms.

Conclusions

This study highlights the entrepreneurial drive of independently owned food stores in small rural communities in NL. A commitment to community wellbeing drove storeowners to engage in healthy food retailing interventions. Success in creating and implementing healthy food retailing interventions and impacts on food availability, accessibility, acceptability, and affordability are related to factors beyond the “food” itself. The store's context is crucial to designing feasible, effective healthy food retailing interventions including their historical status, relationship with community members, and engagement in conventional and non-traditional food system. Business practices undertaken by small food stores in rural communities in NL are comprehensive and the potential “mix” of contextual and mechanistic factors that will generate the ideal outcome must be adequately appreciated to advance healthy food retailing among private businesses.

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Conflicts of Interest: None to declare

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References

- Barraket, J., Eversole, R., Luke, B. & Barth, S. (2019). Resourcefulness of locally-oriented social enterprises: Implications for rural community development. *Journal of Rural Studies*, 70, 188–197. <https://doi.org/10.1016/j.jrurstud.2017.12.031>
- Canadian Institute for Health Information. (2025, November 27) NHEX trends — Infographics. <https://www.cihi.ca/en/national-health-expenditure-trends/nhex-trends-infographics>
- De Brún, A., & McAuliffe, E. (2020). Identifying the context, mechanisms and outcomes underlying collective leadership in teams: Building a realist programme theory. *BMC Health Services Research*, 20(1), 261. <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-020-05129-1>
- De Weger, E., Van Vooren, N. J. E., Wong, G., Dalkin, S., Marchal, B., Drewes, H.W. & Baan, C.A. (2020). What's in a realist configuration? Deciding which casual configurations to use, how, and why. *International Journal of Qualitative Methods*, 19, 1-8. <https://doi.org/10.1177/1609406920938577>
- Frazier, B. J., & Niehm, L.S. (2004). Exploring business information networks of small retailers in rural communities. *Journal of Developmental Entrepreneurship*, 9(1), 23–42.
- Hartmann-Boyce, J., Bianchi, F., Piernas, C., Riches, S.P., Frie, K., Nourse, R., & Jebb, S.A. (2018). Grocery store interventions to change food purchasing behaviors: A systematic re-view of randomized controlled trials. *The American Journal of Clinical Nutrition*, 107(6), 1004–1016.
- Hawe P., & Potvin L. (2009). What is population health intervention research? *Canadian Journal of Public Health*, 100(1), I8–I14. <https://doi.org/10.1007/BF03405503>
- Health Accord NL. (2022). *Our province. Our help. Our future. A 10-year health transformation: The summary*. Available at: <https://healthaccordnl.ca/final-reports/> (Accessed on May 29, 2024)
- Kazi M. (2003). Realist evaluation for practice. *British Journal of Social Work*, 33(6), 803–818. <https://doi.org/10.1093/bjsw/33.6.803>
- Kettle, S.M., Roebbothan, B.V., & West, R. (2005). Prevalence of specific cardiovascular disease risk factors in young Newfoundland and Labrador adults living in urban and rural communities. *Canadian Journal of Rural Medicine*, 10(2), 81.
- LeDrew, R., Wang, P., Etchegary, H., Aubrey-Bassler, K., Grynszpan, D., Ashgari, S., Bavani, N.G. & Prowse, R. (2025). Balancing economic and social dual bottom-lines: Qualitative inquiry of healthy food retailing in rural Newfoundland and Labrador. *Canadian Food Studies/La Revue canadienne des études sur l'alimentation*, 12(3), 89–110. <https://doi.org/10.15353/cfs-rcea.v12i3.713>
- Loewen, O. K., Ekwaru, J. P., Ohinmama, A., & Veugelers, P. J. (2019). Economic burden of not complying with Canadian food recommendations in 2018. *Nutrients*, 11(10), 2529. <https://doi.org/10.3390/nu11102529>
- Lukewich, J., Buote, R., Asghari, S., Aubrey-Bassler, K., Knight, J., & Mathews, M. (2020). Adults with diabetes mellitus in Newfoundland and Labrador: A population-based, cross-sectional analysis. *Canadian Medical Association Open Access Journal*. 8(4), e895–901.
- Mah, C.L., Hasdell, R., Minaker, L.M., Soo, S.D., Cook, B., & De-maio, A.R. (2018). Entrepreneurialism and health-promoting retail food environments in Canadian city-regions. *Health Promotion International*, 33(6), 1055–1065. <https://doi.org/10.1093/heapro/dax049>
- Marchal B., Van Belle, S., Van Olmen, J., Hoérée T. & Kegels G. (2012). Is realist evaluation keeping its promise? A review of published empirical studies in the field of health systems research. *Evaluation*, 18(2):192–212. <https://doi.org/10.1177/1356389012442444>
- Meador, J. E. (2019). Reaching rural: Identifying implicit social networks in community development programmes. *Journal of Rural Studies*, 68, 285–295. <https://doi.org/10.1016/j.jrurstud.2018.12.006>
- O'Donnell, A. (2004). The nature of networking in small firms. *Qualitative Market Research: An International Journal*, 7(4): 206–217.
- Morse J.M., Barrett M., Mayan M., Olson K., Spiers J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International Journal of Qualitative Methods*, 1(2):13–22. <https://doi.org/10.1177/160940690200100202>
- Palinkas L.A., Horwitz S.M., Green C.A., Wisdom J.P., Duan N. & Hoagwood K. (September 2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services*, 42(5), 533–44. <https://doi.org/10.1007/s10488-013-0528-y>

Slater K.L., & Kothari A. (2014) Using realist evaluation to open the black box of knowledge translation: A state-of-the-art review. *Implement Science*. 9(1), 1–14. <https://doi.org/10.1186/s13012-014-0115-y>

Siemens, L. (2010). Challenges, responses and available resources: Success in rural small businesses. *Journal of Small Business and Entrepreneurship*, 23(1), 65–80. <https://doi.org/10.1080/08276331.2010.10593474>

Simms, A., & Greenwood, R. (2021). State of Rural Canada Report. 2.10 Newfoundland and Labrador. <https://sorc.crrf.ca/nl/>

Slapø, H., Schjøll, A., Strømgren, B., Sandaker, I., & Lekhal, S. (2021). Efficiency of in-store interventions to impact customers to purchase healthier food and beverage products in real-life grocery stores: A systematic review and meta-analysis. *Foods*, 10(5), 922.

Statistics Canada. (2022). Rural area. [Dictionary, Census of Population, 2021]. <https://www12.statcan.gc.ca/census-recensement/2021/ref/dict/az/Definition-eng.cfm?ID=geo042>

Statistics Canada (2023, November 15) Census Profile: 2021 Census of Population. Statistics Canada Catalogue no. 98-316-X2021001. Ottawa. <https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E>

Stuckless, K. D., Wang, P. P., & Prowse, R. (2022). Primary cancer prevention: Developing multi-level food retailer intervention assessment tools. *Annals of epidemiology*, 75(9). Advance online publication. <https://doi.org/10.1016/j.annepidem.2022.08.037>

Raine K.D. (2005). Determinants of healthy eating in Canada: An overview and synthesis. *Can J Public Health*. 96 Suppl 3, S8–S8–15.

Vanderlee L., McLaughlin A., Vaillancourt C., Olstad D.L., Mah C., & L'Abbé M.R. (2023). Actions to cultivate healthier food environments in Canada: Newfoundland and Labrador policies and progress. <https://www.informascanada.com/food-epi-canada-2023>

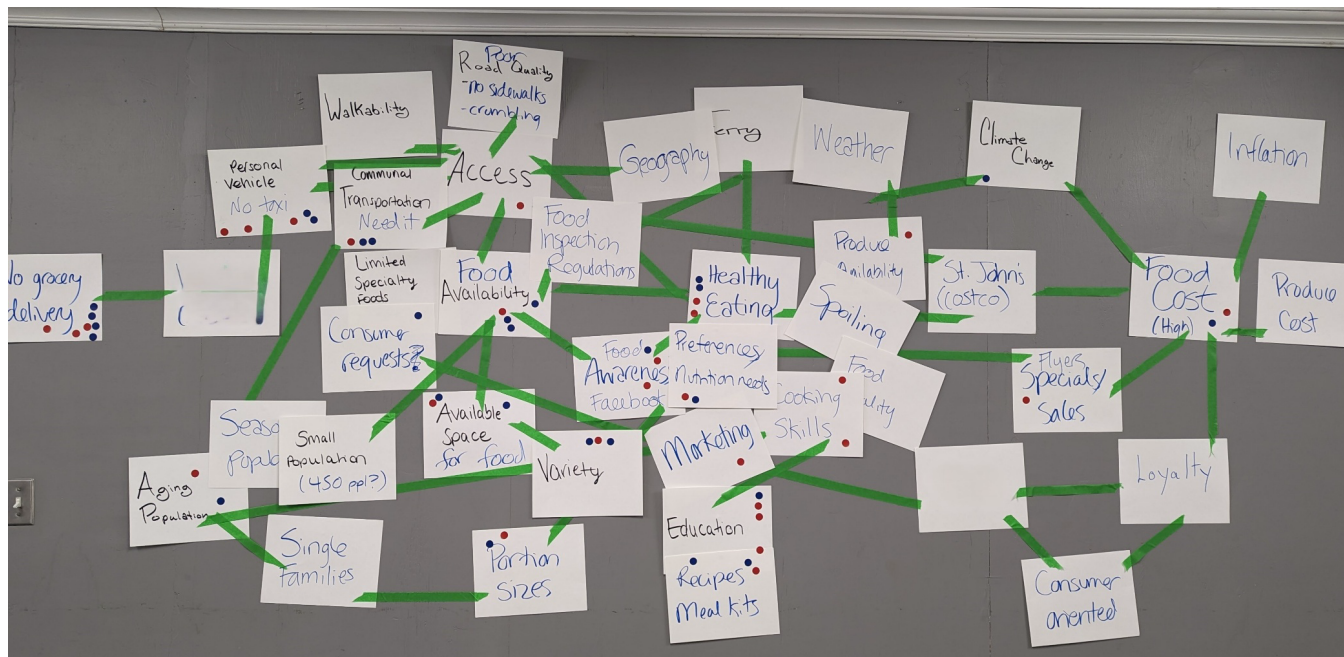
Appendices

See following pages for Supplementary Material for:

“A realist evaluation of healthy food retailing interventions in small food stores in rural Newfoundland and Labrador, Canada”

Supplemental File 1

Example mind map from community meeting to identify the factors that make it easier or harder to purchase healthy food using brainstorming and story telling



Supplemental File 2

Semi-Structured Interview Script

Thank you for agreeing to participate in this interview for our study on healthy eating and food retail in Newfoundland and Labrador. Food stores play a key role in determining food practices of their communities. Your answers to our questions will help us develop an example case study for other researchers and communities to address this issue.

This interview will take approximately an hour to complete. If at any point you would like us to stop, or skip a question, please let us know.

Baseline Interview Questions:

1. Tell me about your [store].
 - a. Probe for types of: ownership model, foods sold, other goods/services offered, customers, community, distributors/suppliers, unique features, rural location, competition
2. What role does your store play in your community?
3. Let's talk about your customers. What attracts customers to shop at your [store]?
 - a. Probe: transportation
4. What factors influence the foods and beverages customers purchase in your [store]?
5. What do you believe healthy food options comprise?
6. What factors make healthy retailing difficult for you?
7. What factors make engaging in healthy retailing easier for you?

Follow-up Interview Questions

1. What would you tell your friends about your experience working with the [BLINDED] project over the last 6 months.
2. What types of changes did you plan to undertake as part of this project? Did you (and how did you) accomplish them?
3. Can you describe how your changes contribute to healthy eating and disease prevention in your community?
4. How would you define the success of your efforts to promote healthy eating?
5. Which changes were the most/least successful? Why?
6. If you had to do things again, what would you do the same/different?
7. What factors were most significant in making it easier or harder for you to implement changes in your business?
8. What's next?
9. Based on this experience, would you volunteer to be a part of other healthy food retailing initiatives in the future?
10. What else would you like to tell me?



Interview

Dumpster diving and apple picking: Dialoguing food justice and food sovereignty in Ontario, Canada

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Abstract

This dual narrative and digital art submission is formatted around a transcript of a Zoom conversation (or co-interview) between the article's co-authors: food justice activist-scholars Dr Jade Crimson Rose Da Costa and Naty Tremblay. The conversation is structured by the same interview guide that Da Costa and Tremblay used for their research project *Exacerbated Hunger*, in which they interviewed racialized and Indigenous food aid users in Central Southern Ontario, alongside food justice activists and food aid providers, about their experiences with racialized food insecurity in the era of COVID-19. As members of their research population, they decided to co-interview each other to reflect on the findings of the project while also exploring their own experiences with food justice and food sovereignty, two salient themes within the research.

In the first part of the transcript, featured below, Da Costa and Tremblay respond to three questions in particular: (1) What is your first memory of food, or the first memory that comes to mind; (2) when, how, and why did you get involved in food justice, with the follow-up question: (3) how do you define food justice (and food sovereignty)? Interspersed throughout the transcript is digital artwork created by Tremblay for *Exacerbated Hunger*'s forthcoming poetry chapbook, *The Genesis of Food*, thereby underscoring the project's multidisciplinary design. They have also attached a glossary with definitions for bolded Food Studies terms within the transcript, but the interview's foci, "food justice" and "food sovereignty," are defined within the transcript itself and through collective dialoguing.

Keywords: critical food studies, sustainable food systems, activist research, Indigenous knowledge, storytelling, digital art, food narratives

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Résumé

Les chercheur-euses militant-es en justice alimentaire Jade Crimson Rose Da Costa et Naty Tremblay offrent ici une contribution alliant récit et art numérique organisée autour de la transcription de leur conversation (ou de leur interview mutuelle) sur Zoom. La conversation est structurée au moyen du guide d'entretien que Da Costa et Tremblay ont utilisé pour leur projet de recherche *Faim aggravée*, dans lequel iels ont interrogé des personnes utilisatrices de l'aide alimentaire autochtones et issues de minorités ethniques dans le Centre-Sud de l'Ontario, ainsi que des activistes en justice alimentaire et des fournisseurs d'aide alimentaire, à propos de leur expérience en matière d'insécurité alimentaire chez les personnes racialisées durant la période de la COVID-19. En tant que membres de la population concernée par leur recherche, iels ont décidé de s'interviewer l'un-e l'autre pour réfléchir aux résultats de leur projet de même qu'à leur propre expérience de la justice alimentaire et

de la souveraineté alimentaire, deux thèmes prépondérants de la recherche. Dans la première partie de la transcription, Da Costa et Tremblay répondent à trois questions : (1) Quel est votre premier souvenir concernant la nourriture ou le premier souvenir qui vous vient à l'esprit ? (2) Quand, comment et pourquoi avez-vous décidé de vous engager pour la justice alimentaire ? (3) Comment définissez-vous la justice alimentaire (et la souveraineté alimentaire) ? La transcription est ponctuée d'œuvres d'art numériques créées par Tremblay pour le prochain recueil de poésie de *Faim aggravée*, intitulé *The Genesis of Food*, soulignant ainsi la dimension multidisciplinaire du projet. Un glossaire fournit également les définitions de termes importants des études sur l'alimentation utilisés dans la conversation ; les objets d'intérêt principaux, la « justice alimentaire » et la « souveraineté alimentaire », sont cependant définis dans la transcription elle-même, au fil du dialogue.

Mots-clés : études critiques sur l'alimentation, systèmes alimentaires durables, recherche militante, savoir autochtone, *storytelling*, art numérique, méthodologie, récits alimentaires

Prelude

Below is a transcript of the first 35 minutes of a Zoom conversation between the article's co-authors: Food justice activist-scholars Dr. Jade Crimson Rose Da Costa and Naty Tremblay. Our conversation is structured around the same interview guides we authored for our SSHRC funded research project¹, *Exacerbated Hunger*, in which we interviewed racialized and Indigenous food aid users and providers in Central Southern Ontario about their experiences with racialized food insecurity in the era of COVID-19. Food aid providers were defined as: (1) food justice activists and organizers, and (2) food bank employees and volunteers (or advocates). We used three interview guides: one for racialized and Indigenous food aid users, one for food justice activists and organizers, and one for food bank advocates, combining them where necessary. In our roles as Principal Investigator (Da Costa) and

Graduate Research Assistant (Tremblay), we interviewed 30 participants across the region. We later invited ten participants to a three-day digital storytelling workshop to produce multimedia videos about their food experiences.

As members of our research population, we later interviewed each other to further reflect on the project's findings and to explore our experiences with food justice and food sovereignty, two salient themes in our research. In the first part of the transcript below, we respond to three questions in particular: (1) What is your first memory of food, or the first memory that comes to mind? (2) When, how, and why did you get involved in food justice? (3) How do you define food justice (and food sovereignty)? Questions one and three were asked of all participants (with food sovereignty mentioned when relevant). In contrast, question two is from the food justice interview

guide and reflects our dual entry point into food aid from a grassroots perspective. Specifically, Da Costa identifies as a disabled, neurodivergent, genderqueer, mixed-race, mixed-classed woman of colour food-justice organizer, and Tremblay as a working-class, mixed-race Indigiqueer farmer, agrarian earth worker, food-justice activist, and former food aid user.



Interspersed throughout the transcript is digital artwork created by Tremblay² for *Exacerbated Hunger*'s forthcoming poetry chapbook, *The Genesis of Food*, thereby underscoring the project's multidisciplinary design. We have also included a glossary of the bolded food studies terms within the transcript. However, our foci, food justice and food sovereignty, are defined within the transcript itself and through our dialogue.

Transcript: Part 1 of *Exacerbated Hunger* Chat on November 28, 2025

Naty Tremblay (NT): So, Jade Da Costa, are you inclined to tell me what your first memory of food is, or the first memory that comes to your mind, from your youth?



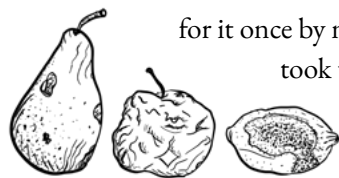
Jade Da Costa (JD): I thought about this a lot during the interview process, when we asked people what their first memories of food were. Most folks, even those who experienced food insecurity, recalled positive food memories, especially of harvesting food, but also eating foods they loved or eating certain foods with people they loved. But for me, the first thing I think of, which isn't even my own memory—it's more like a relayed memory, is something my dad shared with me recently about me not eating. I can't remember why, but he told me that when I was in grade one, maybe grade two, my teacher called him up, all angry, one day and was like—and I'm

quoting him quoting her—"Hey, every time the bell rings at lunch, Jade gets up and runs to their backpack and scarfs down their food. Are you not feeding them breakfast or something?" And my dad was like, to me, "Ever since that moment, I made sure that you never left the house without eating breakfast." It was clearly a memory he has carried with him, and one he's also very ashamed about. But the funny thing is, I didn't remember it at all, and it was interesting for me, because I was like, "Oh, I never actually thought of myself as experiencing food insecurity." But I guess I have, particularly as a function of neglect, but also gender, because my mom was the neglectful parent, and I don't think my dad thought about my breakfast because of gender socialization, right? But as soon as someone chastised him for it, he made sure I ate.

And then a counter to that was another memory, an embodied memory I have, of when my dad would sometimes take us to McDonald's for breakfast on Sundays, and on Fridays, my mom would usually take us there too. Those were, like, such huge moments of joy for me, to the point that I remember one time I didn't get my Diet Coke with my meal, and I literally bawled my eyes out. I think it was because I had such an emotional connection to food, and it was a source of joy for me, particularly coming from this larger place of neglect, like food as love. And I was thinking about how neglect wasn't something our participants talked about. A lot of them did experience **food grief**, where they had really positive memories of food in their youth, and then, as they got older, that was replaced with more scarce realities. But I've almost had the opposite experience: I've built a better relationship with food as I've gotten older.

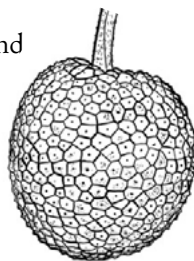
NT: Thank you for sharing that. It's interesting that going to McDonald's was a highlight. I had a similar experience as a kiddo. It was very rare that we went out for food, let alone to McDonald's, but when we did, it was an *event*, a *phenomenon*—even though it's garbage food. It's not nourishing at all, but it's compelling to a child. You get it in the box, and there's a toy, right? It just pops.

JD: That's very true, although I failed to say, I actually ate Big Macs when I was a kid. I remember getting shamed



for it once by my friend when her mom took us through a McDonald's drive-thru, because I was a fat kid. I remember thinking I needed to get something else too, but I am also autistic, and I couldn't fathom eating anything else, right? *That* was the food I ate, so that was the food I got. Related to that, my late grandfather would always take my brother and me for fish and chips when we visited them in Toronto (from London, Ontario). But I wouldn't eat the fish and chips, so he got me a Big Mac instead. It was very accommodating of him, but it was also a family experience I kinda missed out on, because I think he went to that fish-and-chips place because it was one of the first restaurants he went to after my family was expelled from Uganda...but also, now, I [boycott](#) McDonalds, and whenever I want to feel close to my family, I get fish and chips [laughs]. How about you? What's your first memory of food?

NT: The first memory that comes to mind for me is one of my richest and most sensorial memories, and it's of processing apples in the kitchen at our family farm, with my grandmother and all my aunts. I guess it's more like a series of first memories, then, because we would do that every autumn. We'd pick apples in the afternoon and then, in the early eve, we'd boil them, and the sweet smell of apples would just fill the entire house. Then we'd process the apples into applesauce—and I actually have the saucer now. It was my mother's, mother's, mother's, so my great-grandmother's, and it's this beautiful steel machine that's like, five pieces that come together. You put the apples through the top, churn it, and then all the like, funky stuff comes out one end, and you compost that. Then out the other end comes this beautiful applesauce.



And when I was young, we would make like a hundred jars of applesauce and give them out to everybody, and it was just so lovely. I just remember being in the kitchen with my kin, that sweet smell surrounding us, telling stories, playing cards, and taking turns churning the apples. That memory, too, is embedded as, like, an

“agrarian experience” for me, of like, “Oh, you know, autumn is the season for picking apples;” of deciding which apples you want to produce the applesauce with; of making the applesauce; of the collectivism, because the process could take two days if it was just one person, but it only takes an evening when it's all the aunts working together, plus the time it takes to play cards. I'm sure people were smoking cigarettes, too, and cussing, and all of that as well, which is, yeah, pretty nice. And actually, like, a lot of those people in that memory are not alive anymore, so it's got an extra layer of meaning for me today.

NT: Okay, so, when would you say you became involved in food justice activism, and why?

JD: I got involved in food justice activism in response to COVID-19 and through [mutual aid](#). I remember the exact moment, too. It was March 14th, which, actually—thinking of my memories of fish and chips—was my late grandpa's birthday. My immediate family got together at my grandma's place to commemorate him. And I remember my partner was driving us over to my grandma's, and I checked Facebook, and I saw that my friend Ellie posted to the Toronto [CareMongering-TO](#) Facebook group, which started in response to the quarantine, and also inspired similar groups in Mississauga, Guelph, and Kitchener, and eventually sparked the national phenomenon of “[CareMongering](#).” But originally, CareMongering came from social justice activists in Toronto. And Ellie was in this group, and she made a post offering free food to people in the area. I saw it, and remember thinking, “I can do that.” So, I made a post offering free food to people in my area [cities in or near the Greater Toronto Area (GTA)]. A few other people did the same thing, and we all kind of realized, or Ellie realized, we were doing the same thing, and so we consolidated our efforts. A few weeks later, we became [The People's Pantry](#). And that group is still going, which is interesting, because we never meant to form a group. We never intended to organize; we were just people, mostly students, showing up because we could.



And it was a pivotal moment for me, because coming from London and living in the GTA, I didn't know how to get into organizing in Toronto. It can be a very exclusionary, very urban-based space, and I was struggling to get involved. That was the moment things changed for me. So, while a lot of people talk about quarantine as a time of isolation, for me, it was the opposite; it was when I found a community within the GTA... It is interesting, too, because my getting involved in food justice had nothing to do with my experiences of food insecurity, at least, not on the surface. I didn't even know what food justice was. I didn't know what mutual aid was. I didn't realize that was what I was doing until people told me. I thought I was just making food, getting groceries, and delivering them to my neighbours. I didn't know there was a name for it... How about you, Naty, how'd you get involved in food justice?

NT: My family are farmers. They come from a long line of agrarian people. Both my parents are from really big farming families and poor. My mom had 14 siblings, and the youngest, the only woman who went to post-secondary, was my Aunt Sue, and she was really tuned in to environmentalism and the impacts of agricultural pollution, especially the impacts of fertilizers and pesticides. She tried for many years to persuade my dad to go organic (because the rest of us were already on board) and to think about growing food in the context of food justice, specifically. She would say, "Just because you grow soybeans doesn't mean you're feeding people. You're mostly feeding cows and/or contributing to plastic production." So we were having conversations about food justice when I was still in grade school, and we eventually converted to [organic farming](#), when I was in grade nine. It wasn't that we ever heavily used pesticides and fertilizers, but mostly just because we couldn't afford to do that.



All of this is to say that I've been thinking about the relationship between food production, the environment, and nutrition since I was a kiddo. When we became organic farmers, we started [market farming](#), which means

that instead of producing a bunch of grains, for example, to send off to the U.S., we tried to sell food locally, and were confronted with a culture that is not only ignorant of the environmental impacts of [industrial agriculture](#) but also quite intentionally indifferent, you know? For me, food activism as a kiddo also meant talking to people at the farmers' markets about why our peppers cost ten cents more than the store-bought peppers grown in big-company greenhouses, which get subsidies for their electricity and chemicals. Then those costs are further externalized through the lives and bodies of the migrant farm workers who have no status and tend to get cancer by the time they're 40. *That's why! That's why those peppers are cheaper!* And again, people would just tune out. They just didn't care. To me, food justice was also about finding the language to get people to care about where their food comes from, while also working to get healthy food to people that's affordable and accessible. It is seeing all these layers and all these things as interconnected.

But then, in my 20s, I moved to Toronto, and I became a poor student, and an activist, and a frontline worker, and I started using food banks. There is a marked difference between food banks like [The Stop](#), which have an analysis of food justice, and provide fresh produce, and going to a number of food banks where there's a religious or "We're doing you a favour" overtone. You get a little box of canned food, have to stand in line for two hours, and should be *so damn grateful*. And, you know, lots of the people we interviewed spoke about that, too.

JD: I'll say, too, when we started The People's Pantry, food banks always wanted to partner with us, and once we partnered with a food bank in Mississauga, and they just gave us garbage. I don't know how else to describe the food. They just assumed we would want it, no discussion, no dialogue. And it created all this extra work and burden for us because no one wants to waste food. But, we are not in the business of giving people trash, and it put the volunteers and me in an awkward place. It felt like a weird re-responsibilization of [food waste](#) onto the community.

NT: That reminds me, too. In my late 20s, I worked with a bunch of activists and did something similar to

what [Guelph FEWD](#) does now, which is create networks to collect surplus food and repurpose it in interesting ways to eliminate food waste. We did that, plus dumpster diving and all kinds of other fun things. For example, once a week, we would make a big meal or host a potluck or gathering in Kensington Market and redistribute food. Again, like in my youth, this work was as much about repurposing food and feeding people as it was about talking with the community about food and food justice. In some ways, this was *my* entry point into Toronto organizing.

This was back in 2009, maybe 2010, when there was a big push across different communities to establish [community gardens](#), and that came up in a lot of my conversations at Kensington Market. So, being new to Toronto, I felt like, “Oh, my agrarian background and my knowledge of food and organic food are valuable to people.” This also included activists, mind you, who I had previously found to have pretty misinformed understandings of organic food, and who would say things like, “Oh, that’s bougie, and you’re bougie,” and blah blah blah, and I would be like “What the fuck are you talking about? What?” People had been growing organic food really until the [Green Revolution](#) in the 1960s, i.e., the chemical pesticide revolution after the World Wars. That frustrated me. But with community gardens, I saw the opportunity to challenge that thinking in activist spaces and to lend my agricultural, agrarian, earth-working skills to the people.

It also had a different energy than what I had been doing previously, with dumpster diving and chasing around different grocery stores to get a little surplus of lettuce. Instead, we got to grow our own dang food and animate these spaces in beautiful ways. Because, calling back to my first memory of food, it was the collectivism that made these spaces beautiful. It was another way of picking apples together. So, you know, having a community garden; harvesting the food together; making a meal together; having a big picnic or potluck together; these are what invigorates food justice for me, and it feels like this is what the world *could* look like.

JD: I find that striking, because something that really af-

fected me in our research was Nookomis Carol [an Indigenous participant in both phases of *Exacerbated Hunger*] talking about the difference between [food abundance](#) and [food scarcity](#), particularly at our first meeting for the [digital storytelling](#) workshop, where she pointed out that the way everyone was talking about food justice was operating from a place of scarcity, and she said, “I, as an Anishinaabe, come from a place of abundance.” So I can see the difference in how the two of us came to food justice. I operate from a place of scarcity, where food neglect shaped my relationship with food and, in turn, shaped my entry into food justice—yes, I do grassroots organizing, but only in response to the scarcity cultivated by quarantine. But when you talk about food justice, it comes from a place of abundance and a deep-seated notion of collectivity, where it’s not just about dumpster diving, but also about growing and eating food together...and that makes me curious, too, whether you even used the language of food justice when you were a kid? I’m thinking of something else Nookomis said, that “justice is a man’s word, a two-legged word,” and how she used food sovereignty instead. I’ve been thinking about that a lot lately, and I’m wondering what you think.

NT: Good questions. I didn’t, no. I didn’t have access to the language of food justice as a young person. Instead, I think I thought of it very squarely as environmentalism and ecological sustainability, as organic farming and growing community gardens as ways of cultivating and accessing food that were based on a sustainable relationship with the natural world.

And I think it was being in the city that turned me toward the term food justice specifically, because it makes so much more sense in urban spaces. When you’re in different neighbourhoods, you start to see that there are no grocery stores. There’s only a McDonald’s in Parkdale that’s open after nine, and you see how food access is for particular people—it is not for the poor, the newcomers, the immigrants, the racialized. Food justice in cities is very different from that in the country, and it was in my 20s, when I was in the city, that I



started to use the term food justice.

And then, for food sovereignty, I only started to use the term, probably in the last 15 years, through building relationships with Indigenous folx, especially folx at Six Nations who have been telling settlers for decades: We have foodways that we have always had that are sovereign, just like our nation is sovereign, just like our justice systems are sovereign. We don't need anybody to tell us how to grow food. We know how to do it. We've been doing it for thousands of years. We just need to be able to do that. We don't need the Indian Act to say, 'We're not allowed to grow food and then sell it,' for example, or other kinds of impositions that prevent people from benefiting from the surplus of the food they produce.

It also reminds me of what Nookomis said in her interview about how wild rice used to be grown here in the waterways, and it isn't anymore, because settlers love waterways you can boat and swim through without weeds, plants, and mucky muck. Well, rice is a plant that fills the waters, just like bulrushes do, and to grow those things, you have to share the water with them. But settlers don't share. And I think that if there were a push to try to grow wild rice now in the waters, people would resist it. Not to mention that most waterways are deeply polluted by the agricultural industry, especially by animal barns. In that sense, food sovereignty, for me, is recognizing histories and lifeways with food—not just the idea of “Oh, we could have a community garden,” but we can grow wild rice and give Indigenous People access to their hunting territories and trap lines again...

How about you? When did you start using that language, and how do you relate to food justice and food sovereignty?

JD: Yeah, as I said before, I came to food justice through The People's Pantry, and people telling me that what I was doing was food justice. And as someone whose work is informed by my own life, I came to realize what that meant academically. So, I came to the language of food justice through doing it. For a long time, I understood food justice as being able to have, or working toward, universal access to culturally appropriate, nutritious foods in ecological and sustainable ways. I still think that's true,

but through *Exacerbated Hunger*, I have realized that *that* is not the same as food sovereignty. It's part of food sovereignty, yes, but it's also more than that.

And that was in big part because of Nookomis, and also having conversations with you, and also other research participants, who maybe didn't use the language of food sovereignty, but were still very much describing it, and who were often Indigenous to elsewhere in the world, in which food was just a part of their daily landscape. And I think, for me, food sovereignty is honoring Indigenous ways of knowing and being, which I think I know through Anishinaabe, as well as Haudenosaunee worldviews, like Nookomis', but that I think has an Indigenous global quality, too, or at least, it did among the participants we spoke to, and which comes down to the core belief that us and our food, as the earth, are from the same consciousness, and so we need to live with the earth, and cultivate ways of harvesting food that are fundamentally different than big farming.

And I think food sovereignty, in that way, is a cosmological orientation that is inherently ecological. So, like, when you describe food justice as environmental justice, that's more like food sovereignty, right? Because when you think of yourself as part of the consciousness of the world, what you do is going to be ecological, because you're harming yourself if it's not. And through this project, I realized there is an important distinction between food justice and food sovereignty. Food justice, I think, is a response to a symptom [hunger] of colonial capitalist ecological violence, which means it ultimately comes from a place of scarcity, it's a reaction to violence. In contrast, food sovereignty always acts from abundance, which fundamentally shifts how you relate to the world. So, when I think about doing food justice, I think to myself: “How do I get folx food that they want, that they like, and that they need, accessibly?” And that is dignified. But that doesn't necessarily mean I'm also thinking about what I'm eating, where it comes from, and why. It doesn't mean I am thinking of the earth as my kin. It means I'm reacting to violence.

For example, I had this moment while I was writing a

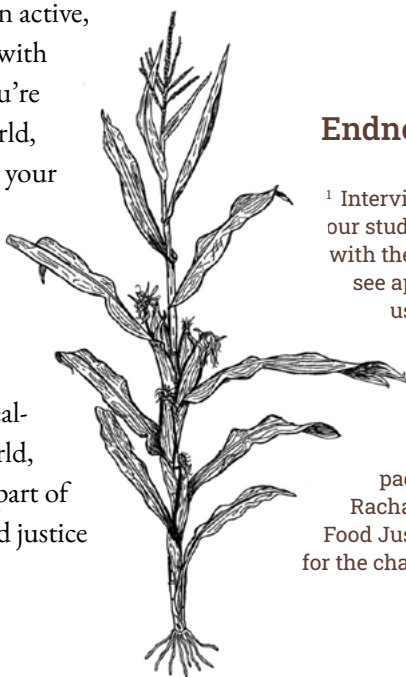


paper about our research, specifically on food abundance and food grief, and I was eating, when a bug came near me, and my instinct was to swat it, but then I was like, “That’s hypocritical! Like, if I actually think about what I’m writing, this bug is not someone I have the right to kill. Nor should I want to kill it.” So, I just let this bug hang out with me, and we became friends...I guess all of this is to say that when you divorce food justice from food sovereignty, you don’t actually shift your thinking from scarcity to abundance. You can always be acting from scarcity because you’re always reacting, and it makes sense in this world to react. But I think we also need to think about how to stop reacting, how to live in abundant ways, and how, from abundance, we can and will thrive. And that’s something that I feel like you, Nookomis, and other folx who were Indigenous to the Global South, really made me think about in ways I hadn’t before. Instead, I had a more ego-centric view and ultimately came from a place of scarcity. And I couldn’t see beyond that until other people really made me think about it and reflect.

NT: Yeah, to riff off that, there’s this idea that all you gotta do is create a channel, a ramp, a bridge, a way for food to reach people who don’t have access to it. But if you just do that, you might end up becoming a conveyor belt for cans of chickpeas, without thinking about your relationship to food. To me, food sovereignty is both thinking about historical relationships to food and an active, everyday practice of building relationships with food and where it comes from. It means you’re building a relationship with the natural world, the seasons, and the bugs, like you did with your bug friend. That, I think, nicely extends to harvesting, with folx asking themselves, “How do bugs actually contribute to my garden? Oh! These bugs here actually eat the critters that otherwise eat my plants,” and then all of a sudden, you realize you’re part of the world, the natural world, and the web of life. I think that is a critical part of food sovereignty. I’d like to believe that food justice as a political framework also leads to that.

I think that when people, like a lot of the Indigenous immigrants and elder participants in our study, talk about food grief, of “I remember being a part of a world where I could move and encounter food,” they are also saying “I remember being a part of a world where I was aware of trees and the plants around me, and I knew them by name. They were kin.” And then, you know, the feeling of deep loss when you exist in a world where you just don’t have access to that. Yes, maybe it’s because you don’t know the plants, but you can learn them. But it’s also that the plants are not there. You live in a place where you’re surrounded by concrete, or you just don’t have access to soil.

JD: Yeah, there is a loss of food sovereignty in that, too, and it is a sacred loss; a grief so deep it makes it hard to feel food abundance, but it is still there, I think, like you say. It’s in our memories and in the world still, even if we have to search tirelessly and wade through all the concrete; even if we have to go dumpster diving to smell the apples [laughs]. It’s like, food sovereignty is just underneath all the trash—food bank donations and the discarded Happy Meals boxes, waiting for us to pay attention—it is like what Nookomis says in her digital story, “creation is still creating.” We start from a place of abundance, always.



Endnotes

¹ Interview guides were created for the purpose of our study, drawing both on our lived experiences with the topic and Da Costa’s past research. Please see appendixes B–D for the three interview guides used for the project. For this article, we used a combination of Appendixes B (Food Justice Activists) and D (Non-white Community Members).

² One exception is the image of a table on page three, created by research participant Rachana Mandal, for her digital story, “A Recipe for Food Justice,” which Tremblay lifted from the story for the chapbook, with permission.

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Naty Tremblay (they/them) is a mixed indigiqueer food justice activist, earth worker, community artist, and PhD candidate in the Social Practice and Transformational Change Program at the University of Guelph. They ran the community arts for social change training program for youth leaders at Sketch Working Arts, formerly directed Rittenhouse, Canada's oldest abolitionist organization, and cofounded the Switch Collective and the Trans Healing Arts Web (TAW). They are the Graduate Research Assistant and workshop facilitator for *Exacerbated Hunger*.

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References

- Cochran, S., & Minaker, L. (2020). The value in community gardens: A return on investment analysis. *Canadian Food Studies/La Revue canadienne des études sur l'alimentation*, 7(1), 154–177. <https://doi.org/10.15353/cfs-rcea.v7i1.332>
- Da Costa, J. (2024). Charity not solidarity: COVID-19 and the non-profitization of mutual aid in Canada. *Journal of Canadian Studies*, 58(1), 79–97. <https://doi.org/10.3138/jcs-2022-0021>
- Da Costa, J. (2026). Food crisis or food grief? Race, hunger, and time under late-stage settler colonialism. Unpublished paper.
- Food Equity With Dignity (FEWD). (n.d.). What is FEWD? <https://sites.google.com/guelphneighbourhoods.org/fewdca/about>
- Food and Agriculture Organization. (n.d.). 2. Defining organic agriculture. <https://www.fao.org/4/ac116e/ac116e02.htm>
- Kone, M., Kipkoge, S., Ncho, S., & Zhou, D. (2025). Market-oriented agriculture and food security: Evidence from vegetable farmers of Korhogo, Northern Côte d'Ivoire. *Foods (Basel, Switzerland)*, 14(11), 1943. <https://doi.org/10.3390/foods14111943>
- Lai, O. (2021, November 22). Explainer: What is food waste? Earth Org, <https://earth.org/what-is-food-waste>
- Levkoe, C., & Wakefield, S. (2011). The community food centre: Creating space for a just, sustainable, and healthy food system. *Journal of Agriculture, Food Systems, and Community Development*, 2(1), 249–268. <https://doi.org/10.5304/jafscd.2011.021.012>
- Natural Resources Defense Council (NRDC). (2020 January 31). Industrial agriculture 101. <https://www.nrdc.org/stories/industrial-agriculture-101>
- Rice, C., & Mündel, I. (2018). Story-making as methodology: Disrupting dominant stories through multimedia storytelling. *Canadian Review of Sociology/Revue canadienne de sociologie*, 55(2), 211–231.
- Soma, T. (2022). Critical food guidance for tackling food waste in Canada: A closed-loop food system alternative to the food recovery hierarchy approach. *Canadian Food Studies/La Revue canadienne des études sur l'alimentation*, 9(1). <https://doi.org/10.15353/cfs-rcea.v9i1.490>
- Spade, D. (2020). *Mutual aid: Building solidarity during this crisis (and the next)*. Verso.
- Wood, L. (2020). Social movements as essential services. OpenDemocracy. <https://www.opendemocracy.net/en/democraciabierta/social-movements-essential-services>
- Wu, F., & Butz, W. P. (2004). The Green Revolution. In *The future of genetically modified crops: Lessons from the Green Revolution* (1st ed., pp. 11–38). RAND Corporation. <https://www.jstor.org/stable/10.7249/mg161rc.13>

Appendices

See following pages for supplementary material for: “Dumpster Diving and Apple Picking: Dialoguing food justice and food sovereignty in Ontario, Canada”.

Appendix A: Glossary

Boycott: When you stop buying or using a company's goods or services in protest of its ethics. Da Costa boycotts McDonald's for providing meals to the genocidal Israeli military.

CareMongering/CareMongering-TO: *CareMongering-TO: TO Community Response* to COVID-19 was an online mutual aid platform formed in response to food hoarding and grocery store overcrowding in Toronto during COVID-19 quarantines, “by providing a counter-culture to COVID-19-based fearmongering. Soon after the group was created, similar Facebook groups started to appear across the GTA and, eventually, all of Canada, thereby sparking the national phenomenon now known as ‘CareMongering’: a mutual aid movement that rapidly spread across Canada in the wake of COVID-19” (Da Costa, 2024, p. 81; also see Wood, 2020).

Community Gardens: Gardens that, “generally occupy underused urban spaces, transforming these places into productive plots of land and yielding social, economic, and environmental returns...providing access to the space (and often tools) necessary for residents to produce their own food” (Cochran & Minaker, 2020, p. 154).

Digital Storytelling: An audiovisual arts methodology that combines personal narrative with digital recordings, visual content, and soundscapes to create short (1-5 minutes) multimedia videos, or digital stories, that critically and meaningfully reflect on the narrator's personal and/or social experiences related to a given cause or issue (Rice & Mündel, 2018).

Food Abundance: Borrowing from Nookomis Carol and the other participants in *Exacerbated Hunger* (Da Costa, 2026), “food abundance” describes (global) Indigenous ways of being that underscore the praxis of food sovereignty. These ways foreground ecocentrism, interdependence, animism, and cyclical divinity, and approach the growing, sharing, and eating of food as a collective, sacred act performed in relation to the land as a living, thinking, feeling being.

Food Grief: A term coined by Da Costa (2026) to describe a persistent yearning for a former state of food abundance (see above), buttressed by an ever-growing feeling of food alienation in the present due to the erasure of food sovereignty under late-stage capitalism and white supremacy.

Food Scarcity: Food scarcity is the diametrical opposite of food abundance and constitutes a negative orientation toward food in which our relationship to food is defined by a sense of lack.

Food Waste: “Food that is intended for human consumption that is wasted and lost, and refers not only to food that consumers don't finish at restaurants and are thrown out at home, but also raw materials and produce that are lost in the farming stage, harvesting processes, during transportation, and storage” (Lai, 2021, para 2); (also see Soma, 2022).

Guelph FEWD: A Guelph-based food justice organization that “offers an equitable, dignified, and nourishing food source for community members, no matter their economic status. It approaches food preparation with the same methods used at celebrated farm-to-table restaurants and food businesses” (FEWD, n.d., para 1). The founder, a longtime friend of Tremblay, was also interviewed by Da Costa for the *Exacerbated Hunger* project.

Industrial Agriculture: A broad term used to describe “the large-scale, intensive production of crops and animals, often involving chemical fertilizers on crops or the routine, harmful use of antibiotics in animals” (NRDC, 2020, para 1).

Market Farming: When farmers efficiently use less space to grow a selection of crops for small-scale production and local purchasing, often relying on manual labour, hand, or low-power tools, and generally sustainable agricultural practices to do so (Kone et al., 2025).

Mutual Aid: The “survival work” that everyday people engage in to support and sustain their communities, including developing bold, novel ways to redistribute resources and uplift their kin, particularly in times of crisis or sustained struggle (Spade, 2020, p. 1).

Organic Farming/Agriculture: Farming without synthetic fertilizers and pesticides and with a focus given to “maintaining and improving the overall health of the individual farm’s soil-microbe-plant-animal system...using inputs (including knowledge) in a way which encourages the biological processes of available nutrients” (Food and Agriculture Organization, n.d., para 1).

The Green Revolution: “The term used to describe the spread of new agricultural technologies that dramatically increased food production in the developing world beginning in the middle of the 20th century, the impact of which is still felt today” (Wu & Butz, 2004, p. 11).

The People’s Pantry: A mutual aid food justice group that offers free home-cooked meals and groceries to food-insecure people in the Greater Toronto-Hamilton Area and Tri-Cities-Guelph, and which was formed in March 2020 in response to the COVID-19 Pandemic (Da Costa, 2024).

The Stop (Community Food Centre): A “nonprofit organization in Toronto, Canada, working to develop a comprehensive approach to addressing multiple challenges within the food system” (Levkoe et al., 2011, p. 250). It was one of the first Canadian food banks founded in the 198

Appendix B. Food Justice Activists Interview Guide

1. What's your first memory of food/the first memory that comes to your mind?
2. When did you become involved in food justice activism and why?
 - a. **Potential probes:** Do you participate in mutual aid or engage in community organizing? Do you go to protests? Donate or fundraise? Write? Create artwork? Do remote actions? Is your work collectivist or more personal?
 - b. **Potential probes:** Are you involved with any specific food justice groups or organizations? (For how long? Within what city or cities?).
3. What does food justice mean to you? (or: How do you define food justice?)
 - a. **Potential probe:** is it collectivist, personal, both?
4. How did COVID-19 impact your understanding of, or experiences with, food justice?
 - a. Are these impacts ongoing and/or have they evolved over time?
 - b. Do you think other things besides COVID contributed to these changes?
5. Has COVID affected non-white communities' experiences with food justice in unique ways? (**Potential probe:** are certain communities more affected than others?)
6. Do you see any problems with the resources available to non-white people who want to access food provision resources within (**their city of residence**) or elsewhere in Canada?
7. Are there changes you feel need to be made to better address food insecurity among non-white communities within (**their city of residence**) or elsewhere in Canada?
 - a. Is there a role you would like to play in this social change work?
8. Is there anything else you would like to share with me that we did not cover?

Appendix C. Foodbank Advocates Interview Guide

1. What's your first memory of food/the first memory that comes to your mind?
2. When did you start working with food banks and why?
 - a. **Potential probes:** What specific food banks have you been involved with and/or are currently involved with now? (**Potential probes:** for how long? Where?)
 - b. Are/were you an employee, manager, or volunteer? Has/did your position change over the years? What kind of labour do you do or did you do?)
3. Why are food banks important to you?
4. Did COVID-19 impact your relationship with, or experiences of, food banks?
 - a. Are these impacts ongoing and/or have they evolved over time?
 - b. Do you think other things besides COVID contributed to these changes?
5. Has COVID affected non-white communities' experiences with food banks in unique ways? (**Potential probe:** are certain communities more affected than others?)
6. Do you see any problems with the resources available to non-white clients trying to access food banks and other such resources in (**residence**) or elsewhere in Canada?
7. Are there changes you feel need to be made to better address food insecurity among non-white communities within (**their city of residence**) or elsewhere in Canada?
 - a. Is there a role you would like to play in this social change work?
8. Is there anything else you would like to share with me that we did not cover?

Appendix D. Non-white Community Members Interview Guide

1. What's your first memory of food/the first memory that comes to your mind?
2. Can you tell me a little bit about yourself and your relationship to food now? (**Probes:** do you associate it with culture or community? Poverty or scarcity? Is it personal, political?)
3. What sort of food provision/aid services do you use, or have used in the past? (**Potential probes:** Mutual aid? Food banks? Coupons? Community Fridges? Soup kitchens?)
4. Why did you start requesting food aid? (**Potential probes:** for how long?)
 - a. What language would you use to describe yourself as someone who accesses food provision or aid? (I.e., a service user? Client? Requester?)
5. *If requesting **before** March 2020:* Have you noticed a change in the quality or consistency of the food aid you received after COVID-19?
 - a. **Probe:** Do any specific examples or memories come to mind?
 - b. **Follow up:** Are these impacts ongoing and/or have they evolved over time?
 - c. **Follow:** Do you think other things besides COVID contributed to these changes?
6. *If requesting **after** March 2020:* Have you noticed a change in the quality or consistency of the food aid you received over the last [x] months **or** years?
 - a. **Probe:** Do any specific examples or memories come to mind?
 - b. **Follow up:** Do you think COVID-19 contributed to these changes?
 - c. **Follow:** Do you think other things besides COVID contributed to these changes?
7. Do you think non-white food aid users, requesters, or clients (*preferred term*) have been impacted by COVID (*if relevant:* and the other things you've named) in unique ways?
8. Do you see any (*other*) problems with the resources available to non-white people trying to access food aid or support within (**their city of residence**) or elsewhere in Canada?
 - a. **If yes:** What changes do you want to see made to address these problems?
9. What's a positive experience you've had with food aid? What made it positive?
10. What steps do you think society can take to eliminate food insecurity?
 - a. Is there a role you would like to play in this social change work?
11. Is there anything else you would like to share with me that we did not cover?



Book Review

Titans of Industrial Agriculture: How a Few Giant Corporations Came to Dominate the Farm Sector and Why it Matters

by Jennifer Clapp

(MIT Press, 2025; 474 pages)

Review by Mindy Jewell Price*

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In *Titans of Industrial Agriculture*, Jennifer Clapp offers food and agriculture studies a comprehensive account of the history and ongoing transformation of consolidation across four agriculture sectors: machinery, fertilizer, seeds, and pesticides. Clapp traces the initial rise of corporate bigness, mid-twentieth century mergers of distress and opportunity, and twenty-first century megamergers that formed the oligopolies we have today. This sweeping and detailed account offers new insights into the deep roots of industrial agriculture as well as the widespread power that entrenches corporate interests in the dominant agriculture system.

Clapp writes that she was inspired to undertake this research after reading US Supreme Court Justice Louis Brandeis' (1914) *Other People's Money and How the Bankers Use It*, in which he wrote, "Size, we are told, is not a crime. But size may, at least, become noxious by reason of means through which it was attained or the uses to which it is put." Brandeis further warned that

concentrated corporate wealth undermines democratic institutions. In *Titans*, Clapp examines how monopoly capitalism shaped Big Ag, and how it threatens—not only agricultural production—but also the functioning of our democracy. Clapp advances three primary arguments.

The first argument has to do with how certain firms gained dominance in the first place. Clapp finds that mergers and acquisitions were not only arranged in the pursuit of efficiency, but occurred through a mix of market, technology, and policy influences. This included not only privileged access to finance, but also state-sponsored research that supported new technologies, first-mover advantages for investor-powered companies, and extended protections on intellectual property. These dynamics reinforced each other, and large firms grew to be giants among few competitors by the mid-twenty-first century. This first argument is where Clapp's archival research really shines, offering new insights into the already-robust literature on agricultural transformation. Take the Green Revolution,

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for example. Critical scholarship tends to focus on the social and ecological impacts of the Green Revolution. Notably, Clapp shifts the discussion from impacts to one of strategic corporate dependency through technological lock-ins that entrenched agribusiness power. Clapp also shows how consolidation and power preexisted the Green Revolution, but solidified and grew because of the imperial-capital-production-technology machine.

The second argument Clapp advances is that bigness begat power, and power begat more bigness. Dominant firms used their power to close out or acquire smaller firms. Big firms shaped new innovation to maximize their own profits and used technological lock-ins, like seed-chemical “packages” to entrench the industrial model of agriculture and their own power. They pursued strategies—aggressively lobbying in national and global governance spaces, co-opting environmental policies, and raising supra-competitive pricing beyond what inflation or material costs require—to influence the market, technology, and policy dynamics that facilitated their dominance in the first place.

The third argument, though a less direct focus of the book, is that corporate consolidation has resulted in wide-ranging social and ecological impacts for both producers and consumers. Social costs include the loss of small farms and farm livelihoods, as well as stymied innovation leading to lesser choice and higher prices for both agricultural inputs and products. Ecological consequences include biodiversity loss, soil degradation, pollution, and major contributions to greenhouse gas emissions. These costs were known as early as the late nineteenth- and early twentieth-century but have been repeatedly ignored by firms who argue that bigness is needed to feed the world through innovation and efficiency.

As a food and agriculture scholar who teaches on, but does not personally research, state and corporate power, I am tempted to suggest that Clapp’s 456 pages of examined archives and grey literature is perhaps *too* much detail. However, reducing the text for brevity would be a missed opportunity to present evidence of corporate pressure and power in industrial agriculture—funding associations left off of journal articles, backdoor discussions of price-collusion, commentary on lawsuits fought.

Titans is a courageous, extraordinary documentation of power. The playbook is laid bare.

To say that Clapp could have edited further is also to miss the excellent teaching opportunity that this book affords. Clapp’s writing is thoughtful and formulaic, neither flourishing, nor dry. The chapters are extractable from the book and useful in undergraduate courses.

Nevertheless, *Titans* is not without limitation. While Clapp signals toward structural forces, as a work that relies heavily on the New Brandeis movement framework, Clapp’s primary focus is market dynamics, rather than capitalism itself. By framing the issue as a problem of concentrated power, her book risks implying that by simply breaking up firms into smaller entities or regulating them better, the food and agriculture system will become sustainable and just. However, as scholars like Philip McMichael (2013) show, there is a more systemic critique to be made, that industrial agriculture is integral to the functioning of global capitalism, which demands cheap food, cheap labour, and endless market expansion. As a complement to *Titans*, readers might turn to Judith Carney’s (2001) *Black Rice*, for a reminder that the global agriculture system was founded on racial capitalism and the violent appropriation of Indigenous land—the system was never innocent, even before the titans arrived.

Relatedly, in prioritizing the stories of “bigness” of agricultural titans over the critique of global capitalism, *Titans* occasionally glosses over the violent realities of how this system takes in land and bodies. In centering the names and logics of megamergers, Clapp risks eliding the intimate details about how and why marginalized bodies and land are required to animate industrial agriculture. Readers looking for these details may supplement *Titans* with Tania Li and Pujo Semedi’s (2021) *Plantation Life* as an example of a grounded account of how corporate plantations transform life and space in Indonesia’s oil palm zone.

In the book’s conclusion, Clapp quotes competition expert Matt Stoller in saying, “Nothing about monopolization is inevitable.” However, the task of dismantling corporate power is exigent. The business-as-usual path will likely lead to more megamergers. But this is not the only path. Though not the stated goal of the book,

Clapp's conclusion offers some guidance for how to begin to fight corporate power, including strengthening competition policies, renewing accountability, and expanding public support for alternative agricultural

models. *Titans's* thorough and detailed account of corporate concentration across two centuries offers a playbook for collecting evidence against oligopolies. How we use it remains to be seen.

Mindy Jewell Price is a political ecologist and human geographer whose research examines the intersections of critical food and agrarian studies, Indigenous environmental studies, and polar geography. Her current project examines how the Northwest Territories, Canada, has emerged as both an imaginative and material frontier for agriculture, and how rural and Indigenous communities negotiate their relationships with land and the state amid shifting climatic and agrarian conditions. Her research and teaching advance food justice through a focus on land sovereignty, gender equity, and ecologically sustainable practices, and she collaborates closely with communities and practitioners in community-engaged ethnographic and archival research.

Conflicts of Interest: None to declare.

References

Brandeis, L. (1914). *Other People's Money and How the Bankers Use It*. Frederick A. Stokes Company Publishers.

Carney, J. (2001). *Black Rice: The African origins of rice cultivation in the Americas*. Harvard University Press.

Li, T. and Semedi, P. (2021). *Plantation Life: corporate occupation in Indonesia's oil palm zone*. Duke University Press.

McMichael, P. (2013). *Food Regimes and Agrarian Questions*. Fernwood Press.



Book Review

Shadow Negotiators: How UN Organizations Shape the Rules of World Trade for Food Security

by Matias Margulis

(Stanford University Press, 2023; 292 pages)

Review by Lucy Hinton*

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Matias Margulis's 2023 book, *Shadow Negotiators: How UN Organizations Shape the Rules of World Trade for Food Security*, makes the case that international organizations (IOs) have been far from passive bystanders in the global governance of food and agriculture at the World Trade Organisation (WTO). The WTO, Margulis notes, makes rules that can "constrain the policy space available for states to intervene in food and agriculture markets"—rules that have significant consequences for world food security (p. 2). WTO authority has expanded rapidly, but through four empirical chapters, Margulis shows that the Food and Agriculture Organization (FAO), World Food Programme (WFP), Office of the High Commissioner for Human Rights (OHCHR) and the Special Rapporteur on the Right to Food (SRRTF) have each inserted themselves into multilateral trade negotiations, deploying a range of strategies that have steered global rule-making in alignment with their social purpose, toward outcomes that protect the world's most vulnerable.

Margulis's background as a former Canadian WTO representative gives the book an insider's lens, yet the theoretical contributions are significant. Margulis effectively corrects the largely unquestioned assumptions in International Relations (IR) that UN organizations don't matter in trade rulemaking, and that they may only act in their own institutional authority space. This book therefore rewrites the dominant authority ascribed to the WTO, by showing how IOs have used different forms of intervention to assert their own mandates in the global food system.

Shadow Negotiators is laid out in eight main chapters, including introduction and conclusion. The first chapters explain the theoretical contribution of the book, including the four forms of intervention. Chapters 3 to 6 focus on the empirical cases that detail and provide evidence of the interventions of the four different IOs at the GATT (General Agreement on Tariffs Trade)/WTO and in the global trade regime in general, through different multilateral trade negotiations. Chapter 3 outlines the context of

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FAO organizational culture and shows how FAO officials intervened in both the GATT Uruguay Round and the WTO Doha Round, out of concern that proposed trade rules would result in higher prices and less accessible food for the world's poor. Chapter 4 shows how the WFP publicly shamed WTO members as a way to block trade rules that could negatively impact international food aid. Chapter 5 focusses on the OHCHR, and its use of international human rights laws to protect the world's most vulnerable from the potentially adverse effects of agricultural trade liberalization. Chapter 6 is the final IO case, examining the way the SRRTF endorsed a bargaining position of some WTO members. Once again, the SRRTF intervened because of concerns around the impacts new global agricultural trade rules could have on rising food insecurity. Aiming to shift the trajectory of trade negotiations, IOs become *shadow negotiators* in the regime itself, especially as they make concrete interventions such as drafting bargaining proposals, steering negotiations agendas, blocking proposals, and mobilizing coalitions of like-minded states.

While Margulis's cases are richly detailed and extremely well researched, I will pay particular attention to the initial chapters detailing the theoretical contribution. Margulis writes in an exceptionally clear fashion, laying out four forms of IO intervention that add up to the designation of shadow negotiations employed by UN organizations. These are: mobilizing states, public shaming, invoking alternative legal frameworks, and taking sides. Importantly, Margulis argues that IOs have developed these strategies because they have no authority over what happens in other parts of a regime complex. One question the book leaves partially open is how IOs come to know when to intervene in the first place—that is, how secretariats monitor decision-making at overlapping organizations well enough to anticipate harmful outcomes. Margulis identifies access to information as a precondition for intervention, but the mechanics of that surveillance across institutional boundaries remain unexplored. The book makes a major contribution to food governance and global governance more generally, offering a nuanced way to think about IO intervention. It will therefore be of use to food studies scholars interested in global rule-making,

as well as IR and global governance scholars. Chapter 2 deserves special mention as a succinct account of the evolution of global food governance, making it particularly useful for teaching. Careful attention to organizational culture and individual leadership enriches the cases considerably and will help readers new to global governance of food better understand the regime complex. The insider's texture surfaces throughout—for example, in connecting for the reader that the EU quietly blocked the WFP Executive Director's reappointment in retaliation for his Hong Kong Ministerial advertisement.

Shadow Negotiators sits alongside the growing body of food governance scholarship relevant for CFS readers—from Clapp's work on financialization and corporate power to McKeon and Duncan's analyses of the Committee for World Food Security (CFS), FAO and civil society—but carves out a distinct contribution by focussing on how IOs protect their social purpose by influencing beyond their mandates. Where much of that literature centres on who dominates global food rule-making, Margulis shows how some contest it.

Shadow Negotiators corrects some long-held assumptions in IR but also contributes significantly to our understanding of the behaviour of IOs in regime complexes. By uncovering IO intervention strategies at the WTO, Matias Margulis has shown that IOs are both aware of possible incursions into their own mandate space and view this as reason to intervene, even where they have not been delegated formal authority. These newly recognized behaviours are especially important as we move into uncertain times in world trade, with volatile tariffs and food prices.

Lucy Hinton is an Assistant Professor of Politics and International Relations at King's University College at Western University. Her research draws on critical international political economy and development theory to examine corporate and neocolonial influence in global food governance, with a particular focus on CARICOM states. Lucy approaches this work as a white settler scholar based in Canada, mindful of power relations embedded in researching postcolonial food systems. Her scholarship is oriented toward reparative approaches to power in global food governance, and she works closely with community partners and research participants to ground this commitment in practice.

Conflicts of Interest: None to declare.



Book Review

La Poutine : Culture et identité d'un pays incertain by Geneviève Sicotte

(Les Presses de l'Université de Montréal, 2025; 240 pages)

Review by Alexia Moyer*

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“On the plate,” writes Geneviève Sicotte, “all appears to be for the best, in the best of all possible worlds” (p. 39). Three ingredients: French fries, cheese curds, sauce. Triadic structures are gustatorily, musically, mystically, mathematically pleasing. Sicotte is more critically attuned than the Dr. Pangloss she cites. When sat in front of the dish, she might very well be drawn in by, but seeks to move beyond, its moreish qualities. She wants to know: Why poutine? Why this dish and not others? and why now?

In this way, the resulting monograph, *La Poutine: Culture et identité d'un pays incertain*, is ideally housed by Les Presses de l'Université de Montréal, and more specifically by its imprint, « La Petite Culture ». This collection, run by Chantal Savoie, is based on the premise that every cultural object deserves our attention and reflection. As a cultural object in its own right, this book about poutine is compact, densely laid out, with margins just large enough for concise notetaking, and fits comfortably in one's hands. On the front cover, an illustrated red-and-white striped paper food tray nestling butter-yellow fries, cloud-white cheese curds and chocolate-brown sauce on a sage-green background gives colour and definition to a dish that is

commonly described as a sea of beige. Here is another stylized representation of poutine, one whose aesthetics perhaps hint at the essay's analytical premise: to bring colour and definition to a seemingly monochromatic subject.

Sicotte would likely agree to this latter description and initially felt scepticism rather than enthusiasm for what she calls “a shapeless, industrial, rudimentary mixture” (p. 7). Not a promising start. And yet the author, who has read her Claude Lévi-Strauss—as evinced by more than just the book's epigraph—sees the dish as so much more than a marketing ploy designed to attract tourists. Rather, poutine is a semiotic device. It, and the wider Quebecois cuisine within which it sits, tells us a great deal about the Quebecois collective: its histories, its tensions, and its contradictions.

Sicotte's offering does not tell us how to make poutine. It does not contain recipes but does read them—and so many other textual and non-textual sources—for clues. A poutine origin story from Joël Bégin's novel *Plessis* keeps company with those recounted in and by *La Presse* and Radio-Canada. Gabrielle Roy's *Bonheur d'Occasion* and the recipe collection *La cuisinière canadienne* are explored

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in view of tracing Quebec's culinary (and by extension political) influences. Andrée Poulin's children's novel *La plus grosse poutine du monde* and the Omnikrom's tune "Danse la poutine" are brought in to illustrate the dish's restorative qualities, not to mention its elements of the carnivalesque. And a narrated visit to a certain presbytery in the village of Sainte-Élizabeth-de-Warwick is a lens through which to consider the cheese curd and the practices that surround it. Sicotte is inquisitively, attentively, deftly tracking the stories that are told about poutine as she seeks to understand what these stories say about those who tell them, disseminate them, buy into them, or not as the case may be. She writes, "It is not simply that poutine reflects identity, but rather that identity is created through it" (p. 11).

The book is divided into seven chapters, plus introduction and conclusion. The first looks at poutine's ingredients: what they are, how they are made, their specific function within the dish. Chapter 2 considers québécoise cuisine in relation to hegemonic cultures: France, Great Britain, and the United States. Sicotte here is as interested in practice—why some ingredients or methods are used and not others—as she is in perception. Québécoise cuisine is a moving target: at times slighted, at others valorized, both politicized and depoliticized. Sicotte is seeking to situate poutine within that evolving perceptual polyphony. Chapter 3 considers other candidates for national dishes, including *fèves au lard*, *la soupe aux pois*, *la tourtière*, and *le pâté chinois*. It is a food battle, one that, at present, poutine appears to have won. Chapter 4 is centered on origin stories, with its emphasis on plurality and myth. Chapter 5, *en un mot* or "in one word" is an etymology lesson on the origins of the word *poutine*. Chapter 7 tracks poutine as accompaniment to, and reason for, celebration.

I leave Chapter 6 until last, based on personal preference. It's called *mon corps qui mange* or "my body that eats." Here, Sicotte walks into her neighbourhood diner, *La Belle Province*, and sits down to eat a poutine. What follows is a detailed description of the investigative terrain: the environs, the dish itself, and the eater's experience of it, from the cephalic phase, to ingestion, to the beginnings of digestion. The author stops short of metabolization and

excretion, which "might offend sensitive souls" (p. 176). Sicotte's sometimes levitous and always elegant prose is rendered that much more compelling by this chapter's underlying methodology. In choosing to eat her subject before translating that experience discursively, she is arguing for an embodied approach. Chapter 6 is a bricolage of "personal anecdote, classical tasting, theoretical digression, food autoethnography, and critical phenomenology" (p. 155), or a liberal interpretation of what David Sutton calls *gustemology*. And the result is as good to eat as it is to think.

This reader may have to order a poutine for herself now, in the interest of science, culture, and appetite. And she may surprise herself by having room for seconds, or thirds. That is, a translation or two of this study so that even more readers can have access to it, would be most welcome.



« Dans l'assiette », écrit Geneviève Sicotte, « tout semble parfait, dans le meilleur des mondes possibles » (p. 39). Trois ingrédients : frites, fromage en grains, sauce. Une structure triadique qui est un régal pour les papilles, une harmonie musicale, qui revêt une dimension mystique, une mathématique. Sicotte est plus critique que le Dr Pangloss qu'elle cite. Assise devant le plat, elle est certes attirée par son aspect irrésistible, mais elle cherche à aller au-delà. Elle veut savoir : pourquoi la poutine ? Pourquoi ce plat et pas un autre ? Et pourquoi maintenant ?

C'est ainsi que la monographie qui en résulte, *La Poutine : Culture et identité d'un pays incertain*, trouve idéalement sa place aux Presses de l'Université de Montréal, et plus précisément dans sa collection « La Petite Culture ». Cette collection, dirigée par Chantal Savoie, repose sur le principe que chaque objet culturel mérite notre attention et notre réflexion. Véritable objet culturel, ce livre sur la poutine est compact, dense, avec des marges juste assez larges pour prendre des notes concises, et tient parfaitement dans la main. Sur la couverture, une illustration d'une barquette en papier rayé rouge et blanc, recueillant des frites jaune-beurre, du fromage en grains blanc-nuage et de la sauce brun-chocolat sur fond vert-sauge, apporte couleur et contraste à un plat souvent décrit comme une

mer de beige. Voici une autre représentation stylisée de la poutine, dont l'esthétique suggère peut-être la thèse analytique de l'essai : donner de la couleur et du contraste à un sujet apparemment monochrome.

Sicotte partagerait sans doute cette dernière description et a d'abord éprouvé du scepticisme plutôt que de l'enthousiasme pour ce qu'elle appelle « un mélange informe, industriel et rudimentaire » (p. 7). Un début peu prometteur. Pourtant, l'auteure, qui a lu Claude Lévi-Strauss—ne serait-ce que par l'épigraphe du livre—perçoit ce plat comme bien plus qu'un simple argument marketing destiné à attirer les touristes. La poutine est plutôt un dispositif sémiotique. Elle, et la cuisine québécoise dans son ensemble, nous en disent long sur le collectif québécois : son histoire, ses tensions et ses contradictions.

L'ouvrage de Sicotte ne nous apprend pas à faire de la poutine. Il ne contient pas de recettes, mais s'appuie sur de nombreuses sources—textuelles et non textuelles—pour y puiser des indices. Le récit des origines de la poutine tiré du roman *Plessis* de Joël Bégin côtoie ceux rapportés par *La Presse* et Radio-Canada. *Bonheur d'Occasion* de Gabrielle Roy et le recueil de recettes *La cuisinière canadienne* sont explorés afin de retracer les influences culinaires (et par extension politiques) du Québec. Le roman jeunesse d'Andrée Poulin, *La plus grosse poutine du monde*, et la chanson « Danse la poutine » d'Omnikrom sont utilisés pour illustrer les vertus réparatrices du plat, sans oublier sa dimension carnavalesque. Une visite commentée d'un presbytère du village de Sainte-Élisabeth-de-Warwick sert de prisme pour examiner le fromage en grains et les pratiques qui l'entourent. Avec curiosité, attention et finesse, Sicotte suit les récits qui circulent sur la poutine, cherchant à comprendre ce qu'ils révèlent sur ceux qui les racontent, les diffusent, y adhèrent ou non. Elle écrit : « Ce n'est pas simplement que la poutine reflète l'identité, mais plutôt que (de) l'identité se crée à travers elle » (p. 11).

L'ouvrage est divisé en sept chapitres, plus une introduction et une conclusion. Le premier chapitre s'intéresse aux ingrédients de la poutine : leur nature, leur préparation et leur rôle précis dans le plat. Le chapitre 2 examine la cuisine québécoise en relation avec les cultures hégémoniques : la France, la Grande-Bretagne et les États-Unis. Sicotte s'intéresse ici autant à la pratique—pourquoi

certain ingrédients ou méthodes sont utilisés et pas d'autres—qu'aux perceptions. La cuisine québécoise est un sujet mouvant : tantôt décriée, tantôt valorisée, à la fois politisée et dépolitisée. Sicotte cherche à situer la poutine au sein de cette polyphonie perceptive en constante évolution. Le chapitre 3 examine d'autres candidats au titre de plat national, comme les fèves au lard, la soupe aux pois, la tourtière et le pâté chinois. C'est une véritable bataille culinaire, que la poutine semble avoir remportée pour le moment. Le chapitre 4 est consacré aux récits d'origine, mettant l'accent sur la pluralité et le mythe. Le chapitre 5, intitulé « en un mot », est une leçon d'étymologie sur les origines du mot « poutine ». Le chapitre 7 explore la poutine comme accompagnement et motif de célébration.

Je garde le chapitre 6 pour la fin, pour le dessert. Il s'intitule « mon corps qui mange ». C'est le moment où Sicotte entre dans son restaurant de quartier, La Belle Province, et s'installe pour déguster une poutine. Ce qui suit est une description détaillée du terrain d'investigation : l'environnement, le plat lui-même et l'expérience du dégustateur, de la phase céphalique à l'ingestion, jusqu'aux prémices de la digestion. L'auteure s'arrête avant d'aborder la métabolisation et l'excrétion, qui pourraient « offusquer les âmes sensibles » (p. 176). Le style tantôt léger, toujours élégant, de Sicotte est rendu d'autant plus captivant par la méthodologie sous-jacente de ce chapitre. En choisissant de goûter son sujet et de traduire cette expérience par le discours, elle plaide pour une approche incarnée, ou bien *embodied*. Le chapitre six est un bricolage d'« anecdotes personnelles, de dégustations classiques, de digressions théoriques, d'autoethnographie culinaire et de phénoménologie critique » (p. 155), soit une interprétation libre de ce que David Sutton appelle la *gustémologie*. Et le résultat est aussi agréable à déguster qu'à lire.

Cette lectrice devra peut-être se commander une poutine, au nom de la science, de la culture et de son appétit. Et elle pourrait bien se surprendre elle-même à en redemander. Autrement dit, une traduction de cette étude en anglais, permettant à un plus grand nombre de lecteurs d'y avoir accès, serait assurément bienvenue ou « welcome ».

Alexia Moyer PhD (she/her), has written about food and literature, runs the editorial collective redline-lignerouge, co-manages the journal *Canadian Food Studies*, and eats her fries with malt vinegar.

Conflicts of Interest: None to declare.

Alexia Moyer, PhD (elle), a écrit sur la nourriture et la littérature, dirige le collectif éditorial redline-lignerouge, cogère *La Revue canadienne des études sur l'alimentation* et préfère orner ses frites avec du vinaigre de malt.

Conflits d'intérêts : Aucun à signaler.



Choux Questionnaire: Megan J. Elias and Alex Ketchum

A riff on the well-riffed [Proust Questionnaire](#), the CFS Choux Questionnaire is meant to elicit a tasty and perhaps surprising experience, framed within a seemingly humble exterior. (And yes, some questions have a bit more craquelin than others.) Straightforward on their own, the queries combined start to form a celebratory pyramid of extravagance. How that composite croquembouche is assembled and taken apart, however, is up to the respondents and readers to determine. Respondents are invited to answer as many questions as they choose.

The final question posed—*What question would you add to this questionnaire?*—prompts each respondent to incorporate their own inquisitive biome into the mix, feeding a forever renewed starter culture for future participants.

Our Choux Questionnaire respondents for this issue are Megan J. Elias and Alex Ketchum. Together, they are Lambda Literary Award Finalists for their work as co-editors of *Queers at the Table: An Illustrated Guide to Queer Food with Recipes* (Arsenal Pulp Press, 2025) and the co-chairs of two editions of the Queer Food Conference. Individually, Megan (she/they) is the [Winiarski Curator of Food and Wine History](#) at the Smithsonian National Museum of American History, as well as the author of five books about food history, editor of the Oxford Bibliographies Online Food Studies articles, and a board member for the Association for the Study of Food and Society. Alex (she/her) is an Associate Professor at McGill University's Institute for Gender, Sexuality, and Feminist Studies (IGSF) and an elected member of the Royal Society of Canada: College of New Scholars. She is also the Director of the [Just Feminist Tech and Scholarship Lab](#) and the author of several books, including *Revolution: A History of Feminist Restaurants, Cafes, and Coffeehouses*, *How to Organize Inclusive Events and Conferences* and the forthcoming *Digital Queers and High Tech Gays: The History of LGBTQ+ Cyber Activism*.

What is your idea of a perfect food?

Megan: crunchy, tangy, salty

Alex: one that can be shared

What word or concept describes an admirable food system?

Alex: one that values people, planet, and community

What word or concept prevents many food systems from becoming admirable?

Alex: extraction

Which food person do you most admire?

Megan: My cousin the organic vegetable farmer. He manages to grow a huge variety of vegetables and fruits for the local food bank and he's a genius at cooking too.

Alex: Megan J. Elias, since they are a great collaborator.

Which food innovation do try to ignore?

Alex: the obsession with protein

What is your greatest gastronomic extravagance?

Megan: cocktails—so unnecessary but so intriguing!

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What is your current state of hunger?

Megan: I'm always interested in seeing the dessert menu.

What do you most dislike about dinner tables?

Alex: When they are too formal and it interrupts being able to connect with others.

What is the quality you most like in a fruit?

Megan: perfume

Alex: When it is so sweet and juicy it drips down your chin.

Which condiments do you most overuse?

Megan: dukkah

Alex: salsa verde

What kinds of gardens make you happiest?

Megan: very wild cottage gardens

Alex: abundant and wild

Which culinary skill would you most like to have?

Megan: breadmaking

Alex: improved knife skills

What do you consider your greatest edible achievement?

Megan: banana butterscotch pie with gingersnap crust

Alex: some of my recent recipe development projects with masa harina

If you were to die and come back as an (edible) animal, vegetable, or mineral, what would you like it to be?

Megan: rainbow chard

Where (and/or when) would you most like to dine?

Megan: I wish I could magic myself into the dinner depicted on the cover of our book. [Blue Delli quanti's illustration](#) looks like the perfect potluck.

When do you have no appetite?

Megan: I am even hungry in my dreams.

What is your most treasured kitchen implement?

Megan: my moka pot

Alex: stand mixer

What is your favourite aroma?

Megan: toast

Alex: pumpkin spice in fall

What do you most value in your friends?

Megan: willingness to share food

Who are your favourite food scholars?

Megan: Alex Ketchum, of course! And SO many others: Meredith Abarca, Lisa Heldke, Hanna Garth, Lori Flores, Mark Padoongpat, Farha Ternikar, Alice Julier...

Alex: Oh, there's so many amazing folks—don't make me pick favourites. I would say I have deep admiration for scholars who think critically about labour, gender (and sexuality!), and class in their scholarship.

Who is your hero of food media?

Megan: Soleil Ho

With which cuisine do you most identify?

Megan: New York—a little of everything!

Alex: Southern/Baja Californian Mexican (the food I grew up with and is my comfort food and favourite style to cook)

What is your most powerful sense?

Megan: smell

What are your favourite agricultural, culinary, or gastronomic words?

Megan: pickle, romesco, sambal, Eccles cake

What is it about composting that you most dislike?

Alex: When cities don't have systems set up—it is wonderful when cities and towns create infrastructure to support it.

What would you eat as your last meal?

Megan: bacon, egg, and cheese from a New York City coffee cart

Alex: charbroiled fish tacos, tortilla chips with guacamole, a frozen lime margarita, and frozen yogurt (vanilla-, chocolate-, and coffee-flavoured) with carob chips and gummy bears

What foodish epitaph would you assign to yourself?

Megan: “Now she can stop trying to make sourdough.”

What question would you add to this questionnaire?

Megan: What non-edible thing do you wish were edible?

Alex: Salty or sweet?

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