°coolfood

City of Toronto Food-Related GHG Emissions

2022 and Q1 to Q3 2023

TORONTO

close the loop

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Executive Summary

In 2019, the City of Toronto (the City) signed the World Resources Institute (WRI)'s Cool Food Pledge (CFP) and committed to decreasing greenhouse gas (GHG) emissions from municipal food procurement by 25 per cent by 2030 relative to 2019 levels. To determine the actions required to meet this goal, the City worked with Close the Loop consultants to calculate the food-related emissions and costs for 2022 and the first three financial quarters (Q1 to Q3) in 2023 for three City divisions: Children Services (CS); Toronto Shelter Support Services (TSSS); and Seniors Services and Long-Term Care (SSLTC). These three City divisions purchase the vast majority of food for the City and were included in the Cool Food Pledge Baseline Report and the 2019 Corporate Consumption-Based Emissions Inventory Report[1]. In addition to the emission and cost calculations, four options were analyzed to present examples of food-related GHG emissions by 25 per cent and how this could be achieved while maintaining similar levels of protein currently offered in meals provided by the City. The financial summary in this report lays the groundwork needed to measure future cost implications of shifting to climate friendly meals.

The following are the key insights from the analysis:

- The City of Toronto purchased approximately 3,207 tonnes of food in 2022, which resulted in about 43,905 t CO_2e, a 3.6 per cent decrease from the 2019 baseline year.
- Food purchases and associated emissions for Q1-Q3 2023 were similar to those in 2022.
- The City's 2022 food-related expenses totalled around $15.14 million, with the highest spending on food types such as milk, various fruits, wheat/rye products, poultry, beef, and assorted vegetables.
- In 2022, the City purchased 87 t of beef which accounted for three per cent of food purchased by weight but 48 per cent of food-related GHGs. One method to meet the CFP goal would be to reduce the amount of beef purchased (by weight) by at least 51 per cent (from the 2022 cost modelling year).
- Four possible beef reduction options were analyzed for their feasibility meeting the CFP target and maintaining comparable protein amounts. The options all replaced 51 per cent of beef but with varying options in protein replacement, from 100 per cent plant-based to blended animal-based dishes to shifting from beef to poultry or fish dishes.

The analysis indicates that a significant reduction in beef purchases is essential for achieving the 2030 emissions reduction targets. The four modelled options balance the need for climate-friendly meals while maintaining cultural and dietary preferences by integrating plant-based proteins without completely eliminating animal-based proteins, thus offering a diverse and nutritious menu. However, it should be noted that there are limitations and challenges to reducing beef by this amount due to the increase in portion size to meet sufficient protein intake. This is a particular concern with children and seniors who may not be able to eat a higher volume of food.

Engaging with culinary experts, Registered Dietitians, City of Toronto clients and their families as well as the broader community is vital in creating environmentally responsible, appealing, and nutritious meals.

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[1] https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/torontos-2019-consumption-based-emissions-inventory/

The City is encouraged to continue exploring innovative food options that further the shift towards more sustainable meals in it's facilities, reinforcing its commitment to sustainability and public health. This multifaceted endeavour, including various plant-based proteins, fresh vegetables, and creative culinary practices, is critical to developing a sustainable food system that aligns with the CFP's vision and the well-being of those served by the City's meal services.

Finally, while this analytical framework is a starting point for developing sustainable meal plans, it is intended to be a supplemental tool rather than a standalone solution. It is crucial to engage with Registered Dieticians in the various City divisions to apply this option effectively, ensuring that the complex nutritional needs of individuals are met and that the nuances of dietary planning are adequately addressed. Their expertise is indispensable in translating these guidelines into practical, healthy, acceptable and environmentally responsible meal plans.

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ACRONYMS USED IN THIS DOCUMENT

CFP	Cool Food Pledge
CS	Children's Services
GHG	Greenhouse Gas
SSLTC	Seniors Services and Long-Term Care
TSSS	Shelter Support and Housing Administration
VRT	Vendor Reporting Tool
WRI	World Resources Institute

INTRODUCTION

The City of Toronto is committed to reducing food-related greenhouse gas (GHG) emissions by 25 per cent by 2030 relative to 2019 as a signatory of the Cool Food Pledge[2] (CFP) and C40 Good Food Cities Declaration[3]. In order to determine what actions are needed to reach the CFP target, the City commissioned this Food-Related GHG Emissions and Analysis report. This report analyses the cost and GHG emissions associated with municipal food procurement in 2022 and the first three quarters of 2023. It outlines four possible menu shift options and associated costs that would lead to a 25 per cent reduction in GHGs by 2030 by 2019.

The CFP is a global initiative that encourages organizations, including cities, companies, and hospitals, to commit to serving delicious food that is also better for the planet. By signing the CFP, the participants aim to reduce food-related GHG emissions by 25 per cent by 2030 relative to a baseline year, aligning with the Paris Climate Agreement's goal to limit global warming to 1.5 degrees Celsius.

The City of Toronto has a long-standing history of environmental and food policy initiatives, dating back to 1991 with the formation of the now dissolved Toronto Food Policy Council. This Council was a pioneer in integrating food considerations into urban planning and public health, establishing Toronto as a global leader in municipal food policy. The City's commitment to the CFP continues this legacy, underscoring its dedication to sustainable practices.

The City is also signatory of the C40 Good Food Cities Declaration as of 2019. By endorsing this declaration, Toronto joins other leading cities worldwide in its commitment to implement policies that make healthy, sustainable, and low-emission food options more accessible to all residents. This commitment involves a multi-faceted approach, including reducing food loss and waste, supporting diverse and nutritious diets, and significantly reducing GHGs from the food procured by the City. Toronto's adherence to the Good Food Cities Declaration reinforces its options to achieve the targets set by the CFP, showcasing its approach to integrating sustainable food policies and climate action.

These commitments not only aid in reducing the City's carbon footprint but also serves as an influential model for sustainable urban food system practices. Toronto's initiatives are integral to meeting its carbon reduction targets, contributing to the global effort to mitigate climate change, and exemplifying its commitment to environmental stewardship and public health.

METHODS

Reporting and Financial Baselines

The baseline year for reporting GHG emissions, as established by the WRI, is typically 2015. However, as detailed in the Cool Food Pledge Baseline Report, the City of Toronto, in agreement with WRI, has set

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[2] https://coolfood.org/pledge/
[3] https://www.c40.org/wp-content/uploads/2022/02/C40-Good-Food-Cities-Declaration_Public-progress-report_Feb-2022.pdf

2019 as their GHG emissions reporting baseline year. This decision was based on the availability of the most recent and comprehensive data for the City of Toronto.

Calculation Scope

Reporting Years
This project analyzed the food-related GHG emissions for the entire year of 2022 and the first three financial quarters (Q1 to Q3) of 2023[4]. It is important to note that the City will not report food-related emissions for 2020 and 2021. This decision is attributed to the unavailability of data during the COVID-19 pandemic.

Divisions
In line with the Cool Food Pledge Baseline Report, the analysis focused on three divisions that account for the majority of food procured by the City of Toronto: Seniors Services and Long-Term Care (SSLTC), Shelter Support and Housing Administration (TSSS) and Children's Service (CS).

Data Collection

Data collection, led by the City's Environment and Climate division, was a collaborative effort involving division leads from CS, TSSS and SSLTC. Similar to the baseline year, CS's food procurement was notably distinct, with nearly all (approximately 97 per cent by weight) of its food in both 2022 and 2023 supplied by a single caterer through catered meals and the rest sourced from a distributor as bulk food items. In contrast, TSSS and SSLTC primarily depended on two distributors providing bulk food items, except for three weeks in 2023 when TSSS received approximately 1 per cent of its food by weight through catered meals.

Bulk-Based Data (Distributors)
Bulk-based or weight-based data refers to itemized purchase data typically supplied by distributors, which includes the various food items, such as individual fruits or packaged foods, along with their respective weights and costs. All three divisions supplied their purchasing data via velocity reports, focused on a single main distributor, accounting for over 80 per cent of all their purchases, measured by weight for both years.

Only cost data for each food item was available for a distributor providing bakery products to the TSSS and SSLTC divisions, with no corresponding weight information. A proxy estimation method was used to address this based on data provided, including the original vendor contract, individual purchase orders, and an analysis of the average cost-to-weight ratios derived from the 2019 baseline data. The proxy estimation involved calculating the average cost per kilogram of wheat/rye in 2019 and then applying this rate to estimate the total wheat/rye food type weight based on the expenditures in 2022 and 2023. Given that the data related to lower-impact food types, such as wheat/rye, accounting for only 3 to 4 per cent of the total food purchased by weight in a year, it was determined that these approximations would not significantly impact the overall findings (see also Figure 7 for the relative contribution of wheat/rye).

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[4] Throughout the remainder of this report, any mention of the year 2023 specifically refers to the period covering the first three financial quarters (Q1 to Q3) of 2023.

Meal-Based Data (Caterer)

Meal-based data refers to the purchases of specific, itemized meals and their quantities, typically supplied by a caterer. For the CS division, the available purchase data primarily consisted of the total number of generic types of catered meals, such as hot lunches served to different age groups, such as toddlers. However, this data lacked detailed information on the number and ingredients of each meal. To address this gap, Close the Loop developed a comprehensive data estimation methodology, similar to the one used in the Cool Food Pledge Baseline Report, that involved the following steps:

1. Meal mapping based on scheduled menus: The initial step involved organizing and analyzing the range of menus as scheduled by CS dietitians to calculate the total number of each type of meal served throughout the year. These menus featured a rotational offering pattern (cycles), alternating throughout the weeks to maintain diversity (as depicted in the example of Figure 1). They corresponded with the academic calendar from 2021 to 2023, though only meals served during the reporting calendar years were considered (January 2022 [Q1] through December 2022 [Q4]; January 2023 [Q1]through Sep). A meticulous manual review was undertaken to verify the accuracy of meal allocation and the frequency of their service. For example, it was noted that menus continued through an entire week, even if a month ended mid-week.

CYCLE 2 MENU 2022
Weeks of: May 16th, June 13th, July 11th, Aug. 8th, Sept. 6th, Oct. 3rd, 31st

Infant – School Age Menu

DAY	A.M. SNACK	LUNCH	P.M. SNACK
MONDAY	Whole Grain Cereal Fresh Fruit Milk	Chicken Mac & Cheese *Spring Mix Salad *Infants/Toddlers: *Green Beans* Fresh Fruit Milk	Multigrain Chia Crisps *Infants/Toddlers: Cracked Wheat Crackers* Corn Salad Milk
TUESDAY	Whole Wheat English Muffin Very Berry Tofu Spread Milk	Baked Pollock Fish Wedge Rainbow Couscous (*bell peppers, *carrots, couscous, *leeks) *Diced Carrots Fresh Fruit Milk	Fresh Fruit Whole Grain Garlic Parmesan Triscuit Thins Milk
WEDNESDAY	Whole Grain Cheese Stuffed Bagel Bite Fresh Fruit Milk	Yummy Vegan Bolognese Cantonese Noodles *Green Salad *Infants/Toddlers: *Broccoli & Cauliflower* Fresh Fruit Milk	Whole Grain Lemon Chia Loaf Peach Twist 100% Fruit Puree Milk
THURSDAY	Coconut Oatmeal Bar Strawberry & Apple 100% Fruit Sauce Milk	Cheese Omelette Whole Wheat Home-Style Bread *Peas & *Carrots Fresh Fruit Milk	Yogurt Multigrain Cinnamon Crunchy Mix Fresh Fruit Milk
FRIDAY	Hard Boiled Egg Everything Morning Crackers Milk	Summer Veggie Chili (black beans, *carrots, corn, kidney beans, onions, red/*green peppers, soy protein, *squash, tomatoes) Whole Wheat Couscous Fresh Fruit Milk	Blueberry Oat Bun Fresh Fruit Milk

FIGURE 1 CS MENU EXAMPLE

2. Ingredient identification: the meal descriptions provided in the menus were used to identify each meal's ingredients (see also next section).

3. Weight estimation: the serving portion sizes provided by CS were initially used to determine ingredient quantities. These portion sizes varied to accommodate different age groups and were categorized into two main ranges: Preschool/Toddler and Kindergarten/School Age. Since serving

portions were offered in mass and volume and different units (e.g. ml, oz, scoops, pieces), the Canada's Dietary Guidelines supplemental information 'Nutrient Value of Some Common Foods'[5] was used to convert these portions into kilograms.

Throughout this process, Close the Loop's approach was comprehensive, ensuring that the estimation of meal-based data was as precise as possible, given the constraints of the available data.

Data Entry and Categorization

CFP Categories

CFP reporting requires signatories to report their food-related purchases under 50 different "Food Categories" or "Food Types" (see Appendix 1 for a detailed category list). These are, in turn, organized into four major food groups, which will be used throughout this report:

- Ruminant meats (e.g., beef, lamb, goat)
- Animal-based proteins (e.g., poultry, pork, dairy)
- Plant proteins (e.g., legumes, grains)
- Other plant-based foods (e.g., fruits, vegetables).

CFP has indicated reporting on categories in the "Other plant-based foods" group as optional. However, it was included in the analysis in line with the Cool Food Pledge Baseline Report.

Vendor Reporting Tool

The collected data were entered in the Vendor Reporting Tool (VRT) developed in MS Excel by Close the Loop in 2022 for the City of Toronto. The VRT streamlines the CFP reporting process by providing vendors with a user-friendly platform to accurately track and report their food purchase data, whether bulk-based or meal-based. Multiple VRT files were used to enter data from different suppliers, City divisions, and reporting years for organized record-keeping and analysis.

Entering bulk-based data in the VRT involved two steps (Figure 2):

1. Listing: Description, weight (kg) and cost ($) of food items were entered in different columns.
2. Categorization: Each food item was divided into its constituent ingredients, with an estimated percentage share for each, and then every ingredient was classified under a corresponding CFP Category.

Step 1: Listing			Step 2: Categorization					
Food Item	Weight (kg)	Cost ($) (Optional)	Local	Total % Check	Ingredient 1	Ingredient 1 (%)	Ingredient 2	Ingredient 2 (%)
Eggs	100	$ 100.00	Yes	100%	Eggs	100%		
Bread	200	$ 200.00		100%	Wheat/Rye (Bread, pasta, baked goods)	100%		
Beef Lasagna	500	$ 1,500.00	Yes	100%	Beef & buffalo meat (BONELESS)	60%	Wheat/Rye (E	40%
Soup	200	$ 1,000.00		60%	Legumes and pulses (misc.)	60%	Corn (Maize)	
				100%		100%		
				100%		100%		

FIGURE 2. SCREENSHOT OF VENDOR REPORTING TOOL FOR BULK-BASED DATA REPORTING

The process for meal-based data was similar (Figure 3):

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[5] https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/fn-an/alt_formats/pdf/nutrition/fiche-nutri-data/nvscf-vnqau-eng.pdf

1. Listing: Description and number of meals were entered in different columns.
2. Categorization: Each meal was divided into its constituent ingredients, with an estimated weight in grams for each, and then every ingredient was classified under a corresponding CFP Category.

Step 1: Listing		Step 2: Categorization						
Menu Item	Number of meals	Local	Total Meal Weight (g)	Entered Ingredient	Ingredient 1	Ingredient 1 (g)	Ingredient 2	Ingredient 2 (g)
Beef Lasagna. Salad	1000	Yes	150	3	Beef & buffalo meat (BONELESS)	60	Wheat/Rye (Bread, pa	40
Beef Lasagna. Salad	500		160	3	Beef & buffalo meat (BONELESS)	100	Wheat/Rye (Bread, pa	60
			0	0				
			0	0				
			0	0				
			0	0				
			0	0				

FIGURE 3. SCREENSHOT OF VENDOR REPORTING TOOL FOR MEAL-BASED DATA REPORTING

Categorization

Each food item or meal ingredient was independently assigned to a unique CFP Category. Close the Loop categorized ingredients from over 400 meal items and 29,000 individual food items for the two reporting years. Table 1 shows some of the guidelines that were used to categorize certain food items consistently.

TABLE 1. CATEGORIZATION GUIDELINES FOR DIFFERENT FOOD ITEMS

Food Items	Assigned CFP Category	Comments
Individual fruits (apples, berries, bananas and citrus fruit)	Assigned to their own CFP food categories where applicable	Citrus fruits include lemon, lime, orange, and grapefruit; Berries include strawberries, blackberries, blueberries, raspberries, etc.
Apple sauce	Fruit (misc.)	Often, mixed fruit used in different flavours and (in some cases) high sugar content
Coconut	Fruit (misc.)	According to the Canada Food Guide[6]
Sauces (i.e., soy sauce, hot sauces, etc.)	Stimulant and spices	Categorized as "seasonings" due to their high sugar and spice content [7]
Tomato sauce	Tomatoes	Assigned to specific CFP category
Dressings	Vegetable Oils	Mostly vegetable oils and herbs/spices
Protein bars	Wheat/grains	Grains/cereals account for most of the weight
Vinegar; soup bases/mixes; carbonated/flat water; freeze pops; carbonated beverages; meal/nutritional supplements; non-alcoholic wines	No Category - Excluded	High water content accounts for the majority of food items' weight
Thickeners; cooking additives (e.g. yeast, baking soda, cream of tartar, food colouring)	No Category - Excluded	Primarily chemical compounds with negligible nutritional value/weight
Miscellaneous mixes (e.g. cake, gravy, crème caramel, instant pudding)	No Category - Excluded	Miscellaneous powders, stabilizers, sweeteners, and chemical compounds – do not fall into CFP categories.

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[6] https://www.canada.ca/en/health-canada/services/publications/food-nutrition/2019-canada-food-guide-food-classification-system-foods-beverages-categories.html

[7] https://health.canada.ca/en/open-data/hpfb

Calculations

After collecting and entering food-related purchase data into the VRT files, Close the Loop utilized an enhanced version of the CFP Reporting Dashboard, developed in 2022 specifically for the City of Toronto. The CFP Reporting Dashboard automatically consolidates all the data from multiple VRT files and compiles them in a format compatible with CFP reporting. Moreover, the dashboard features several panels offering data analytics insights, such as breakdowns by division, vendor, and CFP Category (Figure 4). This enhanced dashboard version integrates the latest CFP Calculator[8] from WRI, enabling automatic calculation of GHG emissions from food-related purchases.
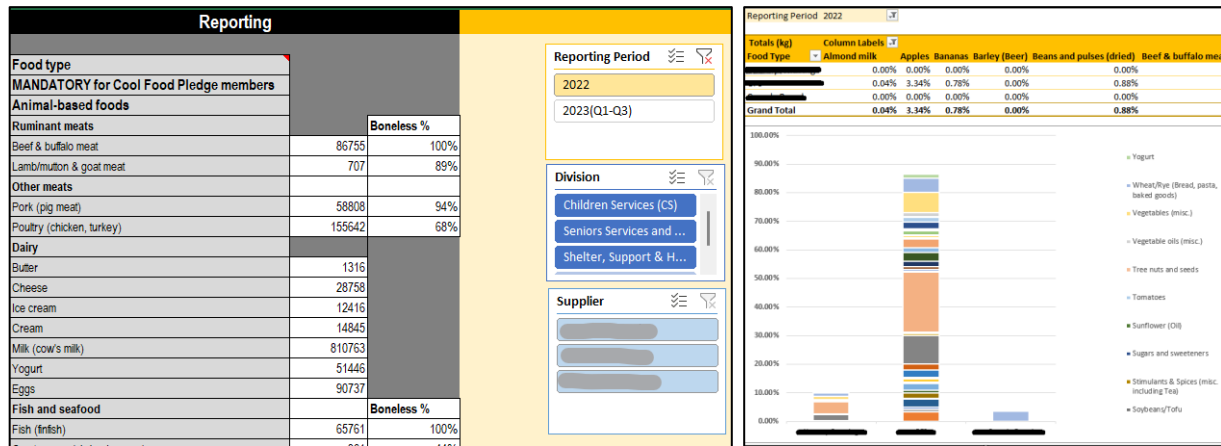

FIGURE 4. SCREENSHOTS FROM THE CFP REPORTING DASHBOARD

For the Financial Analysis, Close the Loop developed a variation of the CFP Reporting Dashboard (CFP Options Analysis) that incorporates the financial model used in this analysis.

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8 https://www.wri.org/research/tracking-progress-toward-cool-food-pledge

RESULTS: FOOD PURCHASES AND GHG EMISSIONS

Metrics

This section presents results using two types of metrics:

- Food Purchases by Food Type (Metric 1 per CFP): This involves tracking food purchases, measured in kilograms or pounds (boneless equivalent), and includes data input provided by the signatory.
- GHG Emissions or "Total food-related carbon costs" according to the CFP which are the sum of:
    - Food-Related GHG Emissions from Agricultural Supply Chains (Metric 2 per CFP): This measures the GHG emissions associated with agricultural supply chains, expressed in tonnes of carbon dioxide equivalent (CO2e).
    - Food-Related Carbon Opportunity Costs (Metric 4 per CFP): This quantifies the carbon opportunity costs associated with food production also in tonnes of CO2e.

    The CFP uses this combined metric to track progress toward the 25 per cent reduction target for 2030.[9]

It should be noted that CFP Metrics 3 and 5 were not included in this report because these metrics are not essential for achieving the City's commitment to the CFP's 25 per cent reduction target. While these metrics were part of WRI's comprehensive package, they are not a core requirement of the CFP. Their inclusion would necessitate additional analysis and potentially complicating the project without significantly contributing to its objectives.

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[9] The CFP calculator also calculates Metric 3 "Food-Related Land Use" and Metric 5, "Normalized Metrics." Although available, these were excluded from this report as they are not directly tied to nor do they support the City's reduction commitment to the CFP.

2022 Reporting Year

Food Purchase Data

Food purchases in 2022 totalled 3,206,673 kg[10] or about 3,207 tonnes (t). Figure 5 shows the breakdown of food type and category by weight. The two largest food types were "Other Plant-Based Foods" at about 42 per cent of the purchases, mainly driven by fruits and vegetables (32 per cent), and "Other Animal-Based Foods" at 40 per cent, of which the majority (29 per cent) was dairy. The third food type was "Plant proteins," at 15 per cent, driven by grains (13 per cent). Ruminant meats (beef and lamb) accounted for only 3 per cent of purchases.
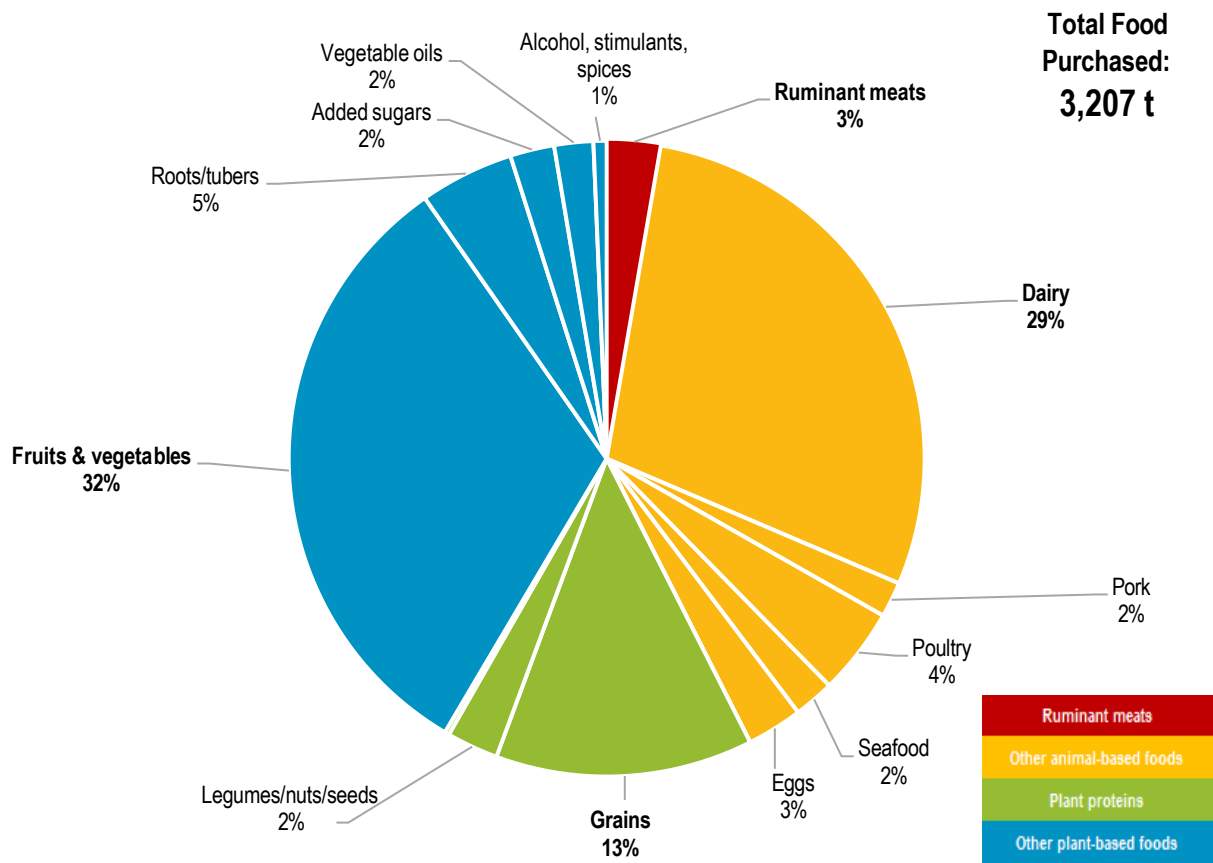
FIGURE 5. CITY OF TORONTO 2022 FOOD PURCHASE DATA

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[10] This refers to the boneless equivalent total, not the actual total, which was slightly higher at 3,221,599 kg.
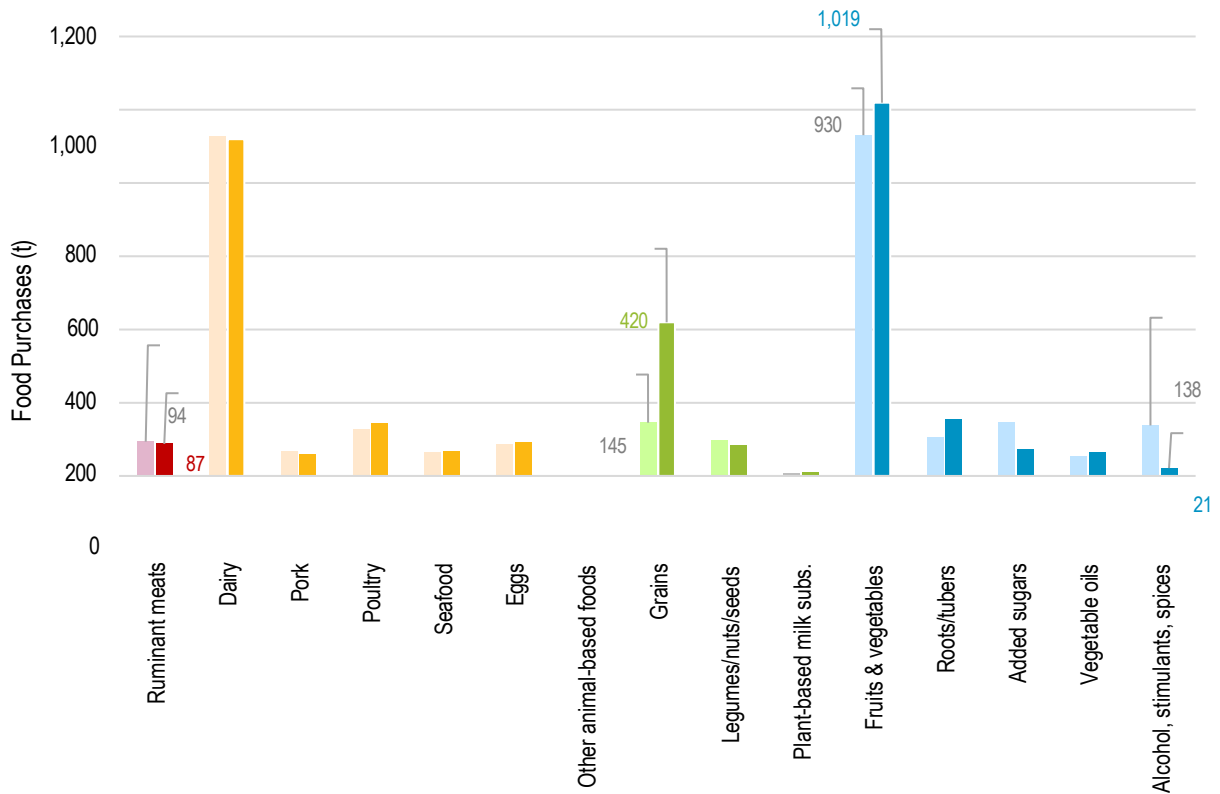
FIGURE 6. COMPARISON OF FOOD PURCHASE DATA: 2022 (RIGHT-DARK COLOUR);
2019 BASELINE (LEFT-LIGHT COLOUR)

Compared to the 2019 baseline reporting year, the City of Toronto purchased 7 per cent more food overall. Figure 6 shows the relative change across different food types between the two years. While most food type purchases remained the same in 2022, there were significant increases primarily driven by grains, which almost tripled. The purchases of fruits, vegetables, roots and tubers also increased. In contrast, added sugars, alcohol, stimulants and spices were significantly reduced, with ruminant meats slightly reduced by 7 tonnes or 7 per cent.

Total GHG Emissions: 43,905 tCO$_2$e

Legend:
- Ruminant meats
- Other animal-based foods
- Plant proteins
- Other plant-based foods

Pie chart labels:
- Ruminant meats 48%
- Dairy 21%
- Pork 4%
- Poultry 6%
- Seafood 3%
- Eggs 3%
- Grains 4%
- Legumes/nuts/seeds 2%
- Fruits & vegetables 3%
- Added sugars 1%
- Vegetable oils 2%
- Alcohol, stimulants, spices 3%
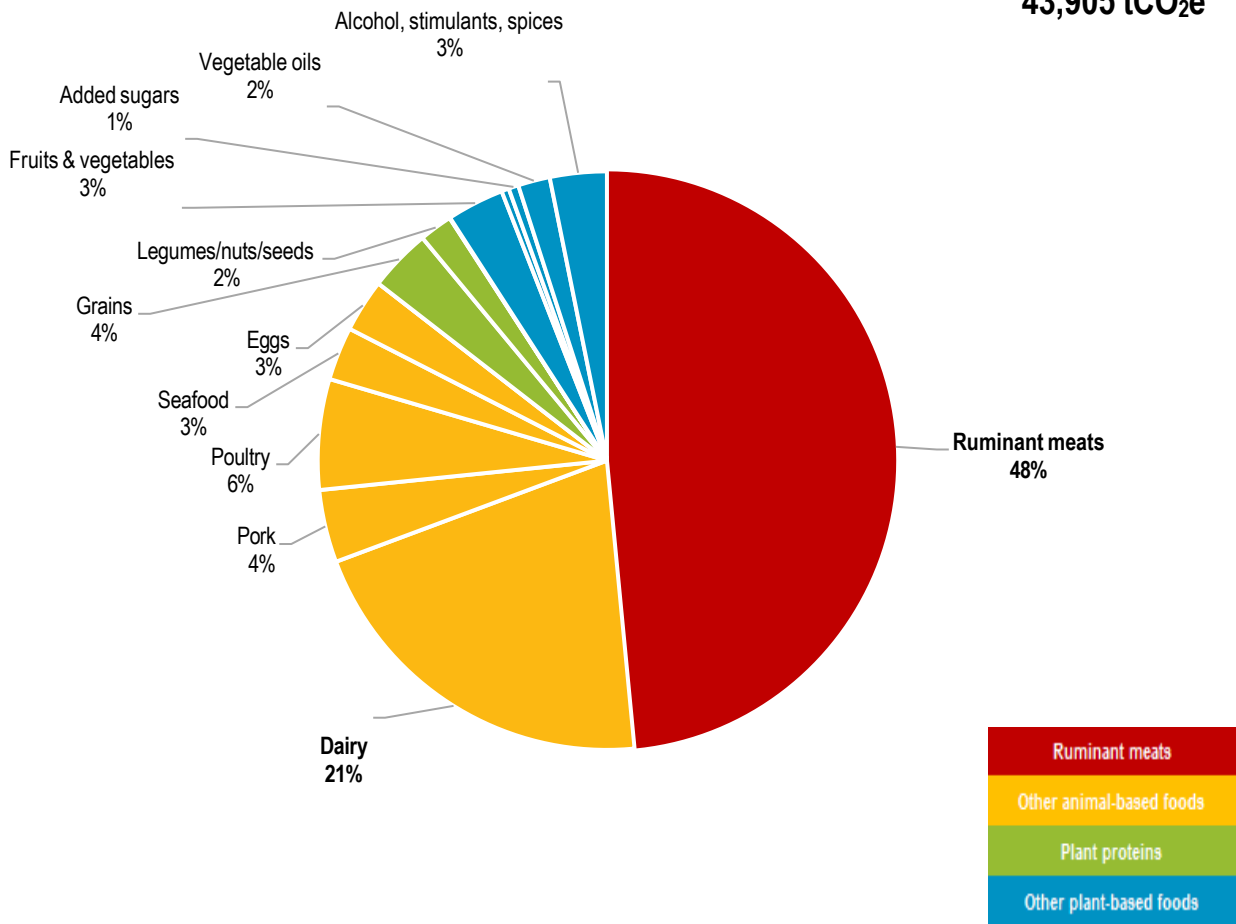
FIGURE 7. CITY OF TORONTO 2022 FOOD-RELATED GHG EMISSIONS

GHG Emissions

The GHG emissions related to the food purchased by the City of Toronto in 2022 totalled 43,905 tCO$_2$e.

Figure 7 shows the breakdown of GHG emissions by CFP food type and category.

- Ruminant meats, which include beef and lamb, are the most significant contributors, accounting for nearly half (48 per cent) of the total emissions.
- Animal-based foods constitute over one-third (37 per cent) of emissions, with dairy products alone responsible for 21 per cent.
- There has been an overall reduction in emissions compared to the 2019 baseline data. The City achieved a decrease of 1,662 tCO2e, which equates to a 3.6 per cent reduction from the previous total of 45,564 tCO2e.
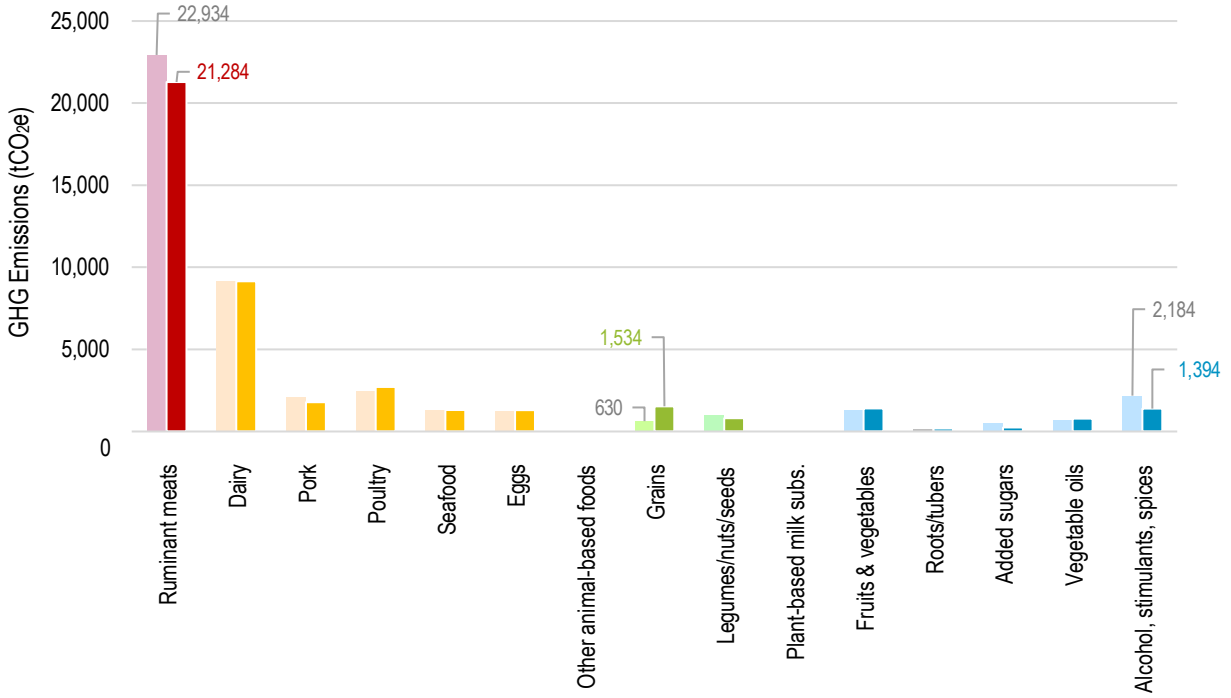
FIGURE 8. COMPARISON OF FOOD-RELATED GHG EMISSIONS: 2022 (RIGHT-DARK COLOUR); 2019 BASELINE (LEFT-LIGHT COLOUR)

Figure 8 presents a comparative analysis between the two reporting years and reveals significant shifts in emissions across various food types. The most substantial decrease in GHG emissions was observed in the ruminant meats food type, with a reduction of approximately 1,650 tonnes. This was closely followed by a reduction of 790 tonnes from alcohol stimulants and spices. While these reductions mark a positive trend towards lower emissions, they were partially counterbalanced by an uptick in emissions associated with grain consumption.

2023 (Q1 to Q3) Reporting Year

Food Purchase Data

Based on the calculation from the food-related purchases data from Q1 to Q3 of 2023 (Figure 9), data projections indicate that the City of Toronto 2023 food-related purchases are similar to 2022. These projections indicate stability in the City's purchasing patterns, reflecting consistent year-over-year procurement practices (in the years after COVID-19).

FIGURE 9. CITY OF TORONTO 2023(Q1 TO Q3) FOOD PURCHASE DATA

GHG Emissions

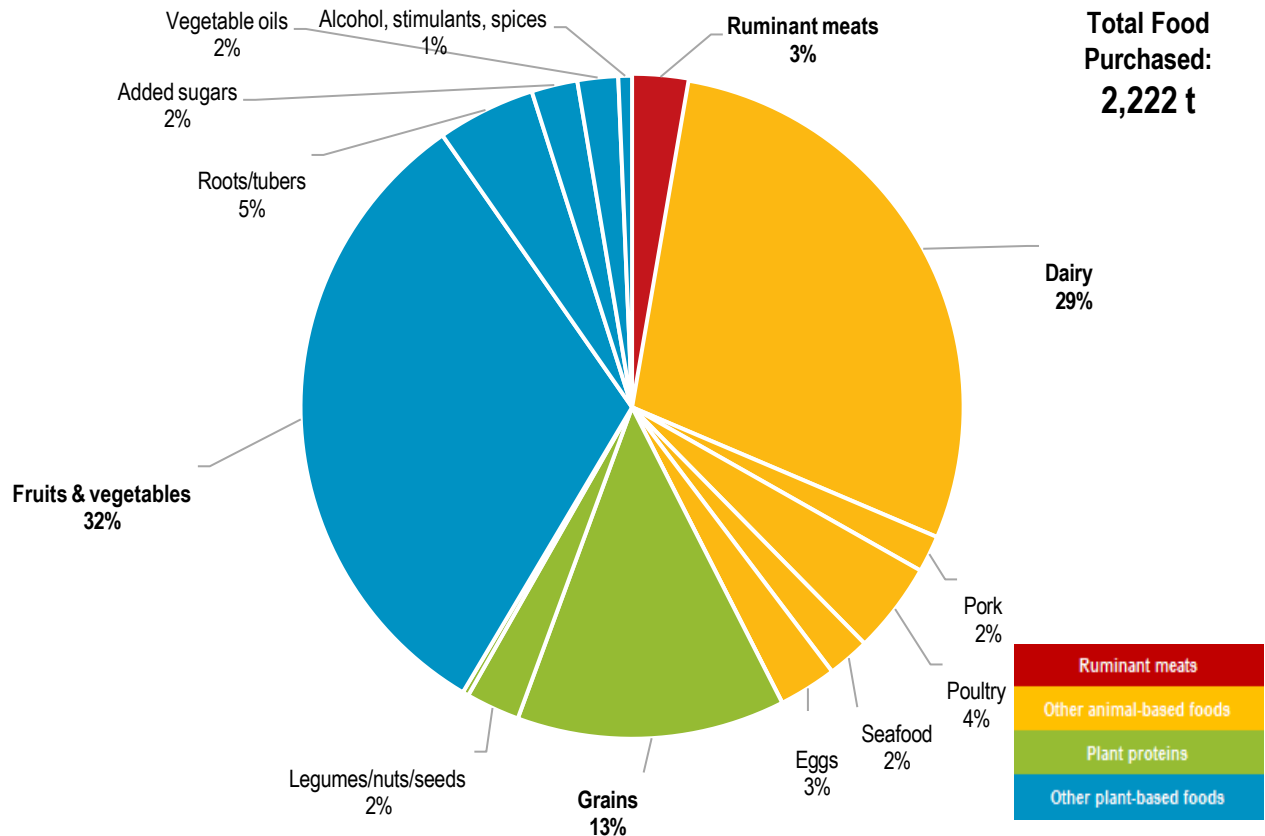The trend in 2023 GHG emissions from food-related purchase data parallels 2022's calculations. As in 2022, ruminant meats accounted for 48 per cent of the food-related GHG emissions, followed by dairy which was responsible for 21 per cent (Figure 10).
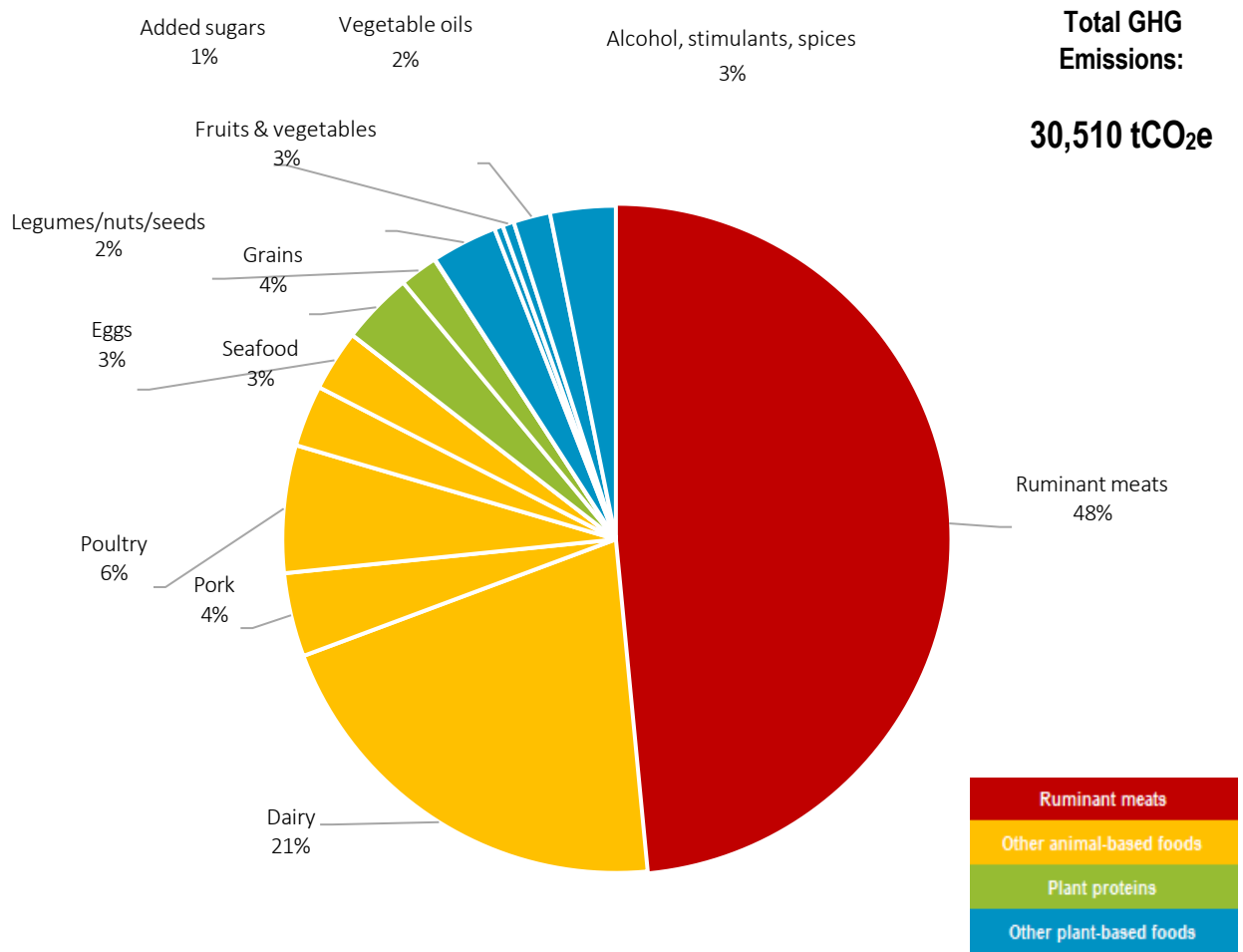
FIGURE 10. CITY OF TORONTO 2023(Q1 TO Q3) FOOD RELATED GHG EMISSIONS

Progress to 2030 Goal

Figure 11 highlights the progress the City of Toronto made in 2022[11] relative to the initial 2019 baseline year and the trending trajectory toward the 2030 goal of a 25 per cent reduction. While a 3.6 per cent reduction was achieved between 2019 and 2022, assuming a linear reduction rate towards the CFP target, greater year over year reductions are required. It is clear that a more aggressive reduction in ruminant meats is required to achieve the CFP target. The options modelled in the dashboard (Error! Reference source not found.) showcase that reducing beef purchases needs to be part of the menu changes in order to meet the CFP target.
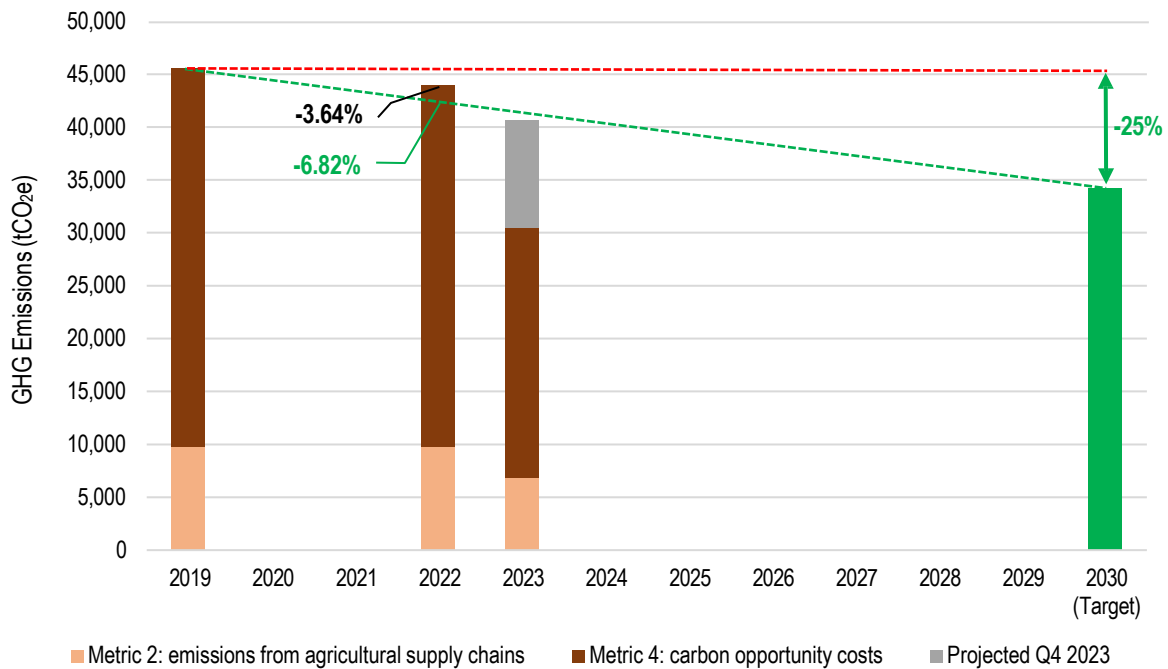
Important Note: Even though 2023 emissions seem lower than the path toward the 2030 goal, this may not be the case since Q4 is likely higher than the other quarters.

FIGURE 11. TOTAL FOOD-RELATED CARBON COSTS OVER TIME, WITH COMPARISON TO A PATHWAY TOWARD A 25 PER CENT REDUCTION TARGET FOR 2030

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[11] Even though more recent, 2023 data were incomplete (Q1 to Q3) and were not considered for this analysis.

RESULTS

Key Challenges and Limitations

Calculating the cost of ingredients in catered meals for CS and during the brief period TSSS used catering (July 17th - Aug 4th, 2023) was deemed impractical due to the complexity of accounting for embedded costs like preparation, delivery, and labour and was therefore excluded from the analysis. This bypassed the need to untangle the costs associated with meal preparation and service, streamlining the evaluation process and allowing Close the Loop to present more high-level scenarios that presented the different options and their versatility more clearly. Catering costs were, however, still included in the calculation of overall food-related expenditures.

The options for shifting to more climate-friendly meals were calculated using the CFP GHG reduction target. Excluding CS meals from the scenarios (due to the complexity of mapping ingredients in prepared meals) allowed for more flexibility in meeting procurement and nutritional requirements.

Finally, while this analytical framework is a starting point for developing sustainable meal plans, it is intended to be a supplemental tool rather than a standalone solution. It is crucial to engage with Registered Dieticians to determine how to shift to climate friendly meals while ensuring that the complex dietary needs and food preferences of individuals are met. Their expertise is indispensable in translating these guidelines into practical, healthy, and environmentally responsible meal plans.

2022 Financial Baseline: Food-Related Spending

The City of Toronto identified 2022 as the financial baseline for food-related spending as it is the most recent year with complete spending data. Totalling approximately $15.14 million, spending by SSLTC accounted for the majority of food-related spending of $10.75 million, followed by TSSS with $2.98 million, and CS at $1.41 million (see also Food Purchases per City Division in Appendix 1).

Figure 12 provides a financial analysis of different CFP food types purchased in 2022 by the City of Toronto from distributors. The food types with the highest total purchase amounts were fruits (misc.), wheat/rye (bread, pasta, baked goods), poultry (chicken, turkey), beef, and milk (cow)(in descending order).
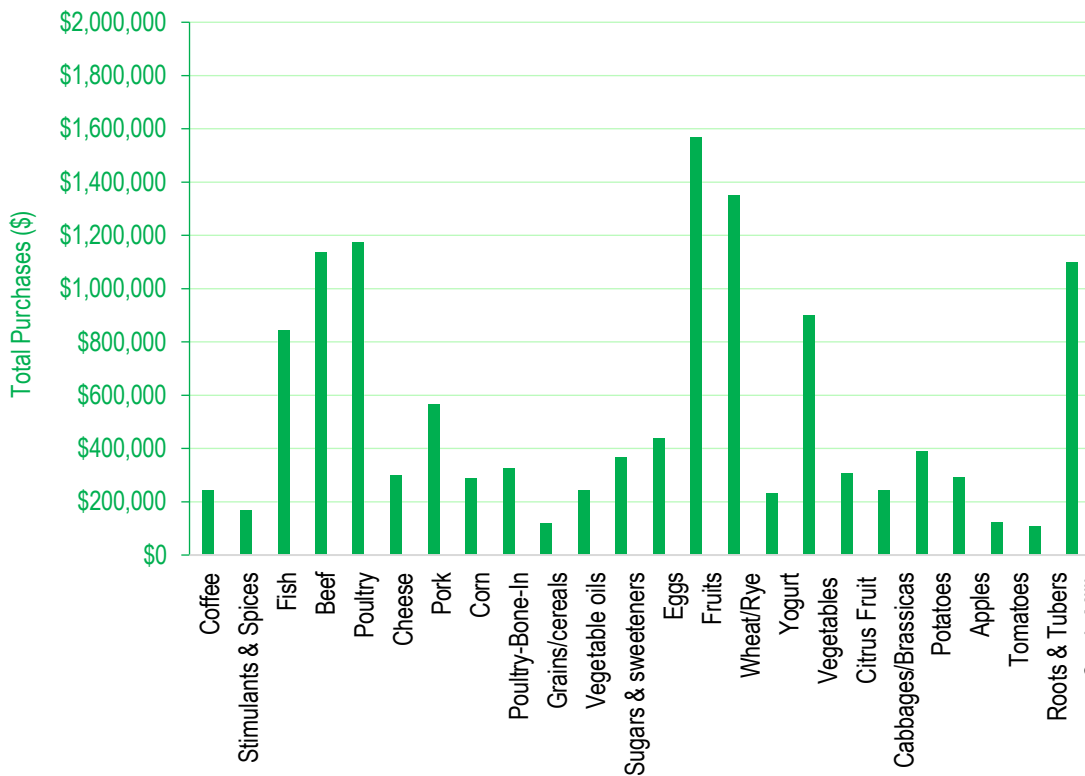
Note: Only food types over $100,000 are shown for simplicity, accounting for 85 per cent of total costs

FIGURE 12. COSTS ANALYSIS OF DIFFERENT FOOD TYPES PROVIDED BY DISTRIBUTORS FOR 2022

Options for shifting to more climate-friendly meals

Building on the four options from the 2019 Baseline Report, Close the Loop modelled four examples that aimed to support reducing GHG emissions to reach the CFP target. These options illustrate potential pathways the City can adopt and combine to achieve its food-related GHG reduction targets. They have been designed to work as templates that are flexible in order to meet the diverse needs and preferences of the City's population while considering the potential resistance to changing established eating habits amongst the various demographics each division supports.

Intensity Analysis
The newly upgraded CFP Complete Reporting Dashboard includes a Strategies Worksheet. This enhancement was pivotal for quickly modelling different scenarios to understand the impact of food type substitutions on essential metrics such as total GHG emissions, distance from the 2030 target, and cost differentials.

The 2022 baseline cost data was initially combined with GHG emission factors and caloric content[12] to understand different food types' GHG, nutritional, and cost intensities. The intensity map (Figure 13) visually breaks down the results. It reveals the following key insights:

- Ruminant meat's GHG and cost impact: Ruminant meats like beef have high GHG emissions and high-cost intensity. They have moderate calorie density, as indicated by medium-sized bubbles on the intensity map, which comes at both a significant carbon-intensive and economic expense.
- Advantages of plant-based protein sources: Plant-based protein sources, such as legumes and pulses, alongside soybeans and tofu, present numerous benefits compared to animal-based protein sources. They are associated with lower GHG emissions and are generally less costly, contributing to improved environmental sustainability outcomes compared to beef.
- Cost-friendly low-emission foods: Legumes, pulses, and vegetables are smaller bubbles, indicating both low GHG emissions and low-cost intensity. They offer a more practical, cost effective, and environmentally sustainable option for increasing plant-based meals.
- Nutrient-dense[13] alternatives: Nuts and seeds (marked by large green bubbles) indicate their high calorie and nutrient content. Despite being more costly than other plant-based foods, they are still much lower in emissions than ruminant meats. Additionally, due to their nutrient-rich density, they can be an integral part of a dietary shift, offering essential fats and protein alternatives.[14] However, it should be noted that all nuts and seeds are excluded from Children Services menus due high incidence of allergies and choking hazards. Additionally, they may present difficulties for seniors due to swallowing difficulties, allergies, and dentition issues.
- Calorie-dense[15] choices: Dairy alternatives[16], such as oat, soy, and other plant-based milks, present a lower-emission and potentially lower-cost substitute for dairy products, which are moderate in GHG emissions and cost intensity. When considering dairy substitutions, the only plant-based dairy substitute approved by CS is unsweetened fortified soy milk.

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[12] Caloric content refers to how much energy results from the food that is consumed. The higher the caloric content, the more energy and is a key metric among others (protein, fat, carbohydrates, etc.) used in nutritional planning.

[13] Nutrient-dense foods are high in nutrients and relatively low in calories. They contain a high ratio of vitamins, minerals, fibre, and/or other beneficial compounds in relation to their energy content. Generally, nutrient dense foods include fruits, vegetables, nuts, seeds, lean proteins including both animal and plant sources, and whole grains.

[14] Drewnowski, A., & Fulgoni, V. L., 3rd (2014). Nutrient density: principles and evaluation tools. *The American journal of clinical nutrition*, *99*(5 Suppl), 1223S–8S. https://doi.org/10.3945/ajcn.113.073395.

[15] Sometimes referred to as "empty-calories", they provide a lot of energy but do not necessarily contribute much to the overall nutrient intake.

[16] While often containing fewer calories than cow's milk (especially unsweetened versions), some plant-based milks contain added sugars, fats, and, in turn, a higher calorie content in comparison.
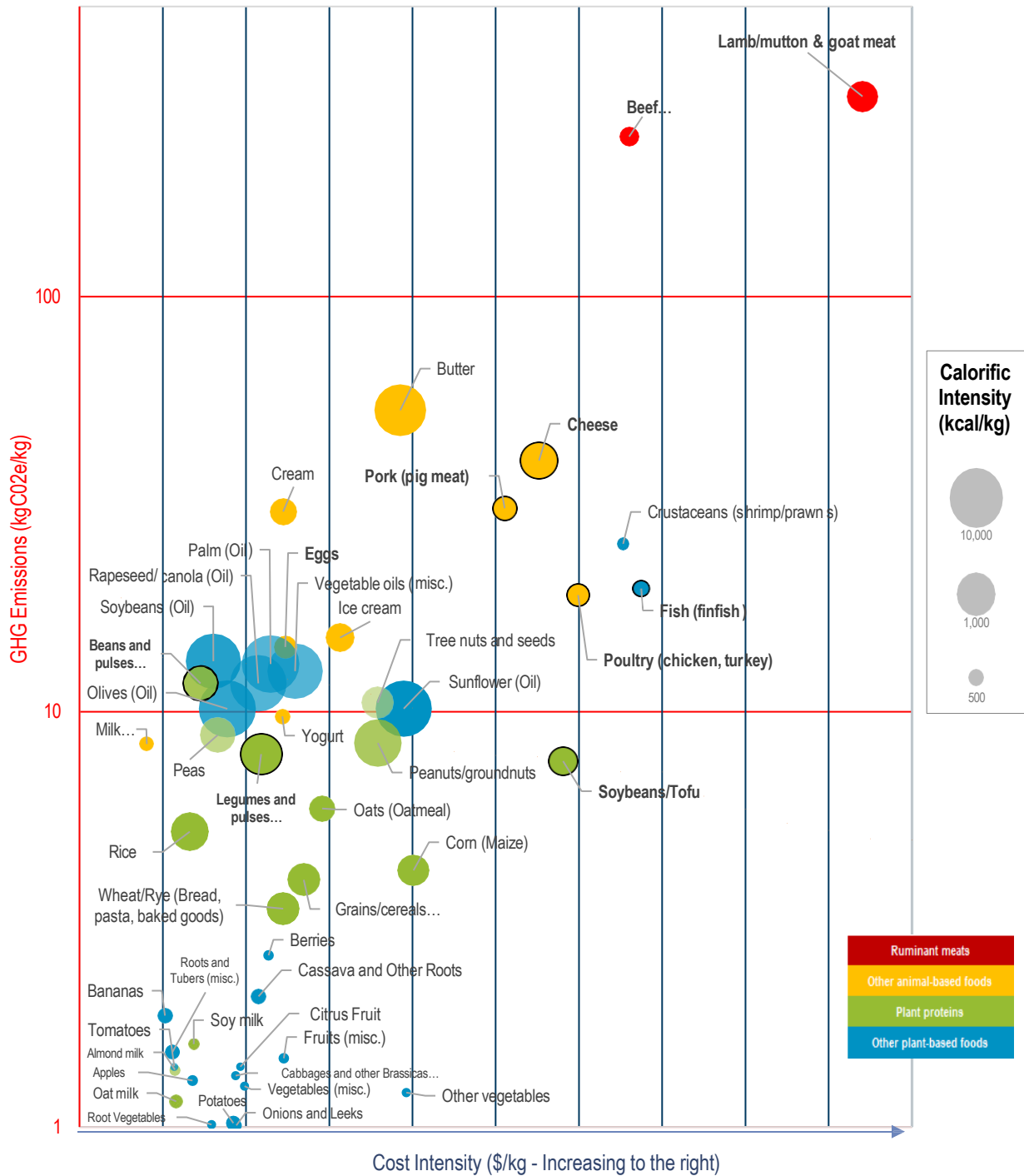
GHG Emission Factors and Caloric intensity are based on the CFP Calculator[17]

FIGURE 13. INTENSITY MAP (GHG-COSTS-CALORIES).

The City can leverage the intensity map as a tool to guide City Registered Dieticians in meal planning, helping them align with the CFP target by selecting nutritious and environmentally sustainable foods. By

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using this visual representation, combined with the insights from the additional options presented below, Registered Dieticians can identify which foods to prioritize for high-nutrient, low-emission meals that can also be cost-effective.

Beef Replacement Approach

The intensity map underscores the need to reduce ruminant meats, especially beef, which makes up over 99 per cent of the City's red meat purchases and accounts for nearly half (48%) of the total food related emissions. For simplicity, each option focused solely on substituting beef with different alternatives such as chicken, fish, tofu, and various legumes and pulses (Table 2). The beef reduction quantity in each option was then calculated so that the option overall would meet the CFP 2030 target. While Registered Dieticians can create many meal plans to meet both nutritional needs and appeal to clients, the aim was to showcase various practical approaches that fulfill the CFP 2030 target.

Instead of caloric content, protein content was used as the proxy for estimating each alternative food type's beef replacement ratios and quantities. Prioritizing protein content is particularly pertinent given beef's traditional role as a primary protein source in many diets and meal plans. As the reduction of beef consumption is prioritized to meet the goals of the CFP, it is essential to ensure that the alternative protein substitutions selected can adequately fulfill the nutritional requirements of each demographic.

TABLE 2. PROTEIN CONTENT AND BEEF REPLACEMENT RATIOS OF ALTERNATIVE FOOD TYPES.

Food Type[18]	Weight (g)	Protein (g)	Protein Content (g/100g)	Beef Replacement Ratio
Beef	75	22	29.3	1.00
Chicken	75	19	25.3	1.16
Fish	75	18	24.0	1.22
Tofu	150	21	14.0	2.10
Legumes (misc.)	-	-	7.4 (average of Beans, Peas and Lentils below)	3.96
Beans	*178*	*10*	*5.6*	*5.22*
Peas	*145*	*12*	*8.3*	*3.53*
Lentils	*163*	*14*	*8.3*	*3.53*

Weight & protein data calculated from the *Nutrient Value of Some Common Foods* (Health Canada)[19]

The benefits of this approach include:

- The ability for the different options to be better modelled against the total reduction targets.
- The ability to efficiently assess ingredient expenses on a cost-per-kilogram basis (cost-intensity).

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[18] *Beef: Ground, lean, crumbled, pan-fried; Chicken: Chicken, broiler, breast, meat and skin, roasted; Fish: Cod, Atlantic, baked or broiled; Haddock, baked or broiled; Pollock, Atlantic, baked or broiled; Salmon, Atlantic, farmed, baked or broiled; Halibut, Atlantic and Pacific, baked or broiled; Tofu: Tofu, regular, firm and extra firm; Beans: Beans, black, canned, not drained; Beans, pinto, canned, not drained; Chickpeas (garbanzo beans), canned, not drained; Peas: Peas, split, boiled; Lentils: Lentils, boiled, salted; Lentils, pink, boiled*

[19] Nutrient Value of Some Common Foods
https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/fn-an/alt_formats/pdf/nutrition/fiche-nutri-data/nvscf-vnqau-eng.pdf

- The flexibility for the City to examine its catering vendor contracts with an underlying understanding of the comparable cost differentials based on the distributor data, including ingredients and prepared meals.

By adopting this approach, the City can explore pathways to more climate-friendly meals that align with the CFP by focusing on the items procured directly from suppliers that align with the deployment of the options to complement one another.

This approach also anticipates and allows for greater adaptability in overcoming the challenges expected during the integration of these changes. The options are designed to be robust, flexible, and collaborative – ensuring that the progress towards sustainable food options remains the clear goal while also being considerate of the reception amongst the diverse demographics and their dietary needs and preferences (whether cultural, health-related or otherwise).

However, it should be noted that there are limitations and challenges to reducing beef by this amount due to the increase in portion size to meet sufficient protein intake. This is a particular concern with children and seniors who may not be able to eat a higher volume of food.

Option 1: Centre-Of-Plate Meals with Plant-based Proteins

Option 1 focuses on substituting 51.5% of beef (by weight relative to 2022) with plant-based proteins, such as veggie burgers or vegan bolognese. This option focuses on how to display plant-based meals. It would involve replacing beef in such a way that if a person looks at the dish it isn't immediately apparent that it is a plant-based dish. This can be a great way to not only introduce healthier and climate friendly options, but also creates an opportunity to engage and educate on the versatility of plant-based proteins overall.

Table 3 details the amounts of alternate proteins needed if 51.5 per cent of beef is replaced with legumes and soybeans/tofu.

TABLE 3. OPTIONS 1 AND 2 BEEF REPLACEMENT WITH PLANT-BASED PROTEINS

Beef Reduction (%)	Beef Reduction (t)	Replacements	Replacement Allocation (%)	Replacement Allocation (t)	Beef Replacement Ratio	Replacement Increases (t)
-51.5%	-44.4	Legumes (misc.)	50%	22.2	3.96	87.9
		Soybeans/Tofu	50%	22.2	2.10	46.5

Option 2: Increasing Vegetables on The Plate

Options 1 and 2 involve different approaches to replacing beef with plant-based proteins, particularly legumes and soybeans/tofu in equal portions (Table 3). Option 2 aims to reduce the amount of meat-based protein on the plate as the main focus and increases protein and nutrient-rich vegetables that are positioned as the centrepiece of the meal itself. However, across both approaches, a 51.5 per cent reduction in beef is required to reach the proposed 2030 target.

Option 3: Blended Meat Dishes

Option 3 involves the replacement of 51.3 per cent beef with an equal combination of chicken, legumes and soybeans/tofu (Table 4). Blended meals are a mix of plant and meat-based proteins such as burgers, meatballs, and lasagna, and have been found to be successful by other Cool Food signatories[20,21]. In addition, supporting the increasing demand for the plant-based protein industry that can be a key element in bridging the transition to more climate friendly meals.

TABLE 4. OPTION 3 BEEF REPLACEMENT WITH BLENDED PROTEINS

Beef Reduction (%)	Beef Reduction (t)	Replacements	Replacement Allocation (%)	Replacement Allocation (t)	Beef Replacement Ratio	Replacement Increases (t)
-51.3%	-44,1	Chicken	33.3%	14.7	1.16	17.0
		Legumes (misc.)	33.3%	14.7	3.96	58.3
		Soybeans/Tofu	33.3%	14.7	2.10	30.8

In practice, Option 3 will likely represent one of the more effective approaches in shifting to more climate-friendly meals as it does not require redesigning existing meals entirely. This approach suggests substituting part of the beef in popular dishes with blended meat options (i.e., 50 per cent beef and 50 per cent plant-based proteins). A key benefit to this approach is that these revamped dishes are likely to be welcomed with less resistance or pushback about dietary changes as they will still appear to be the same dishes for all intents and purposes.

This option is an effective template for re-examining many of the existing beef-centred meals to make meaningful adjustments to the food purchases while maintaining many well-liked dishes across the

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[20] https://files.wri.org/d8/s3fs-public/19_Report_Playbook_Plant-Rich_Diets_final.pdf
[21] https://www.wri.org/insights/flavor-packed-burger-saves-many-emissions-taking-2-million-cars-road

divisions (especially CS and SSLTC). Additionally, the overall blended meat approach aligns with the 51.3 per cent reduction in beef to meet the 2030 target – making it one of the more versatile pathways the City can adopt.

Option 4: Shifting Beef to More Poultry or Fish Dishes

Option 4 involves a 51.2 per cent reduction in beef with a combination of chicken and fish in equal portions (Table 5). This option can be subtly implemented by reworking dishes or changing them for similar profiles like spaghetti and meatballs for chicken penne, or fish tacos instead of beef.

Option 4 showcases an alternative way to shift to more climate-friendly meals that are not necessarily only plant-based by substituting ruminant meat proteins with more sustainable meat-based proteins.

TABLE 5. OPTION 4 BEEF REPLACEMENT WITH CHICKEN OR FISH

Beef Reduction (%)	Beef Reduction (t)	Replacements	Replacement Allocation (%)	Replacement Allocation (t)	Beef Replacement Ratio	Replacement Increases (t)
-51.2%	-44.1	Chicken	50%	25.5	1.16	25.5
		Fish	50%	25.5	1.22	26.9

Overall, these findings showcase how the City and its Registered Dieticians can build a toolkit of approaches that help configure how they can make meaningful strides towards the CFP target while maintaining a positive reception of the new meal plans and ensuring nutritional requirements are adequately met.

Other Findings

Pork procurement

Throughout each of the options and combinations of ruminant meat reductions that were explored, every outcome resulted in no evidence suggesting a need to modify any of the pork already found in the current meals offered by the City. This is not to say that changes in the food category cannot occur, but instead, there were no perceivable benefits to changing it to meet the CFP target or to reduce costs.

Prepared meals: Meat-based vs. plant-based

Cost is a critical factor in transitioning to climate-friendly meals, which requires a shift from meat-based to plant-based dishes. Pre-prepared plant-based meals are often costlier than meat-based ones due to lower production volumes and a developing supply chain. Another factor to consider with prepared plant-based food, like burgers, tend to be high in sodium. However, based on current trends, it appears that prices will decrease as demand increases, and plant-based meals will become more accessible. This would also result in long-term savings in community healthcare expenses and environmental benefits, as plant-

based diets reduce GHG emissions and health risks associated with high meat consumption[22,23]. Therefore, investing in plant-based menus now could have positive financial and environmental impacts in the future. It could also facilitate accepting the change to more climate-friendly meals by the division's recipients [24].

CONCLUSION

In conclusion, because beef accounts for 48 per cent of food-related GHG emissions, reducing the amount of beef the City procures is an essential action in order to meet the CFP target. The analysis underscores that Options 3 and 4, which call for a minimum of 51 per cent reduction in beef purchases, offer a pragmatic yet effective framework for advancing the City's food-related environmental goals.

Implementing a 51 per cent reduction in beef, as outlined in the four options, highlights flexible possibilities that the City may pursue and that do not necessarily require an extensive overhaul of the existing meals. Reducing beef facilitates a transition towards more sustainable meal options, significantly reducing food-related GHG emissions. When plant-based proteins are used as a beef substitute it helps the City meet the C40 Good Food Cities commitment. This balanced approach ensures that the City can continue to provide diverse and nutritious meal options, aligning with the CFP and C40 commitments, while allowing for cultural and dietary preferences.

Shifting a menu towards plant-based food is a multifaceted endeavour that benefits from diverse options. While the four options described in this report can each play a pivotal role in a comprehensive approach, other plant-based substitutions, such as replacing plant-based milks for cows' milk can contribute towards GHG reductions and help realize cost savings.

Engaging with culinary experts, Registered Dieticians, clients and the community is vital in creating environmentally responsible, appealing, and nutritious meals. The City is encouraged to continue exploring innovative food options that further the shift towards more sustainable meals, reinforcing its commitment to environmental sustainability and public health.

Finally, while this analytical framework is a starting point for developing sustainable meal plans, it is intended to be a supplemental tool rather than a standalone solution. It is crucial to engage with Registered Dieticians to apply this option effectively, ensuring that the complex nutritional needs of individuals are met and that the nuances of dietary planning are adequately addressed. Their expertise is indispensable in translating these guidelines into practical, healthy, and environmentally responsible meal plans.

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[22] Pais, D. F., Marques, A. C., & Fuinhas, J. A. (2022). The cost of healthier and more sustainable food choices: Do plant-based consumers spend more on food? *Agricultural and Food Economics*, *10*(1). https://doi.org/10.1186/s40100-022-00224-9

[23] Takacs, B., Stegemann, J., Kalea, A. Z., & Borrion, A. (2022). Comparison of environmental impacts of individual meals - Does it really make a difference to choose plant-based meals instead of meat-based ones? *Journal of Cleaner Production*, *379*, 134782. https://doi.org/10.1016/j.jclepro.2022.134782

[24] https://www.fairr.org/resources/reports/plant-based-profits-investment-risks-opportunities-sustainable-food-systems

APPENDIX 1 – DETAILED FOOD PURCHASE AND GHG EMISSIONS DATA

2022

Total City of Toronto Food Purchases

Food type	Purchases (kg)	
MANDATORY for CFP members		
Animal-based foods		
Ruminant meats		**Boneless per cent**
Beef	86755	100 per cent
Lamb/mutton and goat meat	707	89 per cent
Other meats		
Pork (pig meat)	58808	94 per cent
Poultry (chicken, turkey)	155642	68 per cent
Dairy		
Butter	1316	
Cheese	28758	
Ice cream	12416	
Cream	14845	
Milk (cow's milk)	810763	
Yogurt	51446	
Eggs	90737	
Fish and seafood		**Boneless per cent**
Fish (finfish)	65761	100 per cent
Crustaceans (shrimp/prawns)	361	44 per cent
Mollusks	0	0 per cent
Animal fats	0	
Plant-based foods		
Legumes (misc.)	10169	
Beans and pulses (dried)	28259	
Peas	29800	
Peanuts/groundnuts	3247	
Soybeans/Tofu	7751	
Grains/cereals (except rice)	29162	
Corn (Maize)	35987	
Oats (Oatmeal)	8297	
Wheat/Rye (Bread, pasta, baked goods)	312559	
Rice	33571	
Tree nuts and seeds	5045	

Food type	Purchases (kg)
Plant-based milk substitutes	
Almond milk	1378
Oat milk	35
Rice milk	0
Soy milk	8135
OPTIONAL for CFP members	
Fruits (misc.)	384878
Apples	107602
Bananas	25067
Berries	7333
Citrus Fruit	79442
Vegetables (misc.)	260124
Cabbages and other Brassicas (Broccoli)	66447
Tomatoes	53349
Root Vegetables	10291
Onions and Leeks	23793
Other vegetables	857
Roots and Tubers	47191
Potatoes	104934
Cassava and Other Roots	1645
Sugars and sweeteners	72025
Vegetable oils	47075
Soybeans (Oil)	812
Palm (Oil)	379
Sunflower (Oil)	28
Rapeseed/canola (Oil)	14806
Olives (Oil)	439
Alcohol	0
Barley (Beer)	66
Wine Grapes (Wine)	0
Stimulants	
Cocoa	4719
Coffee	7821
Stimulants and Spices (misc.)	8764
Total	**3,221,599**

Food Purchases per City Division
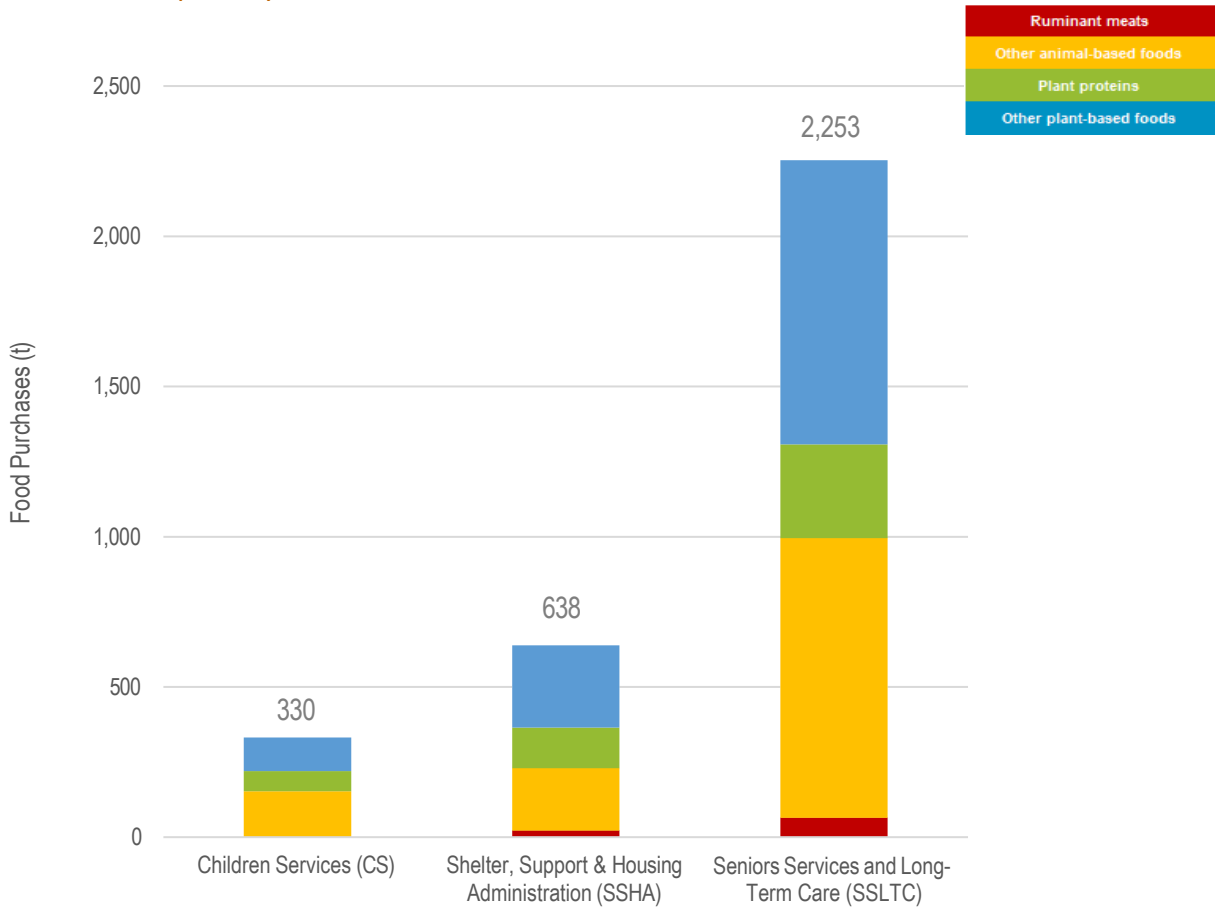
GHG Emissions per City Division
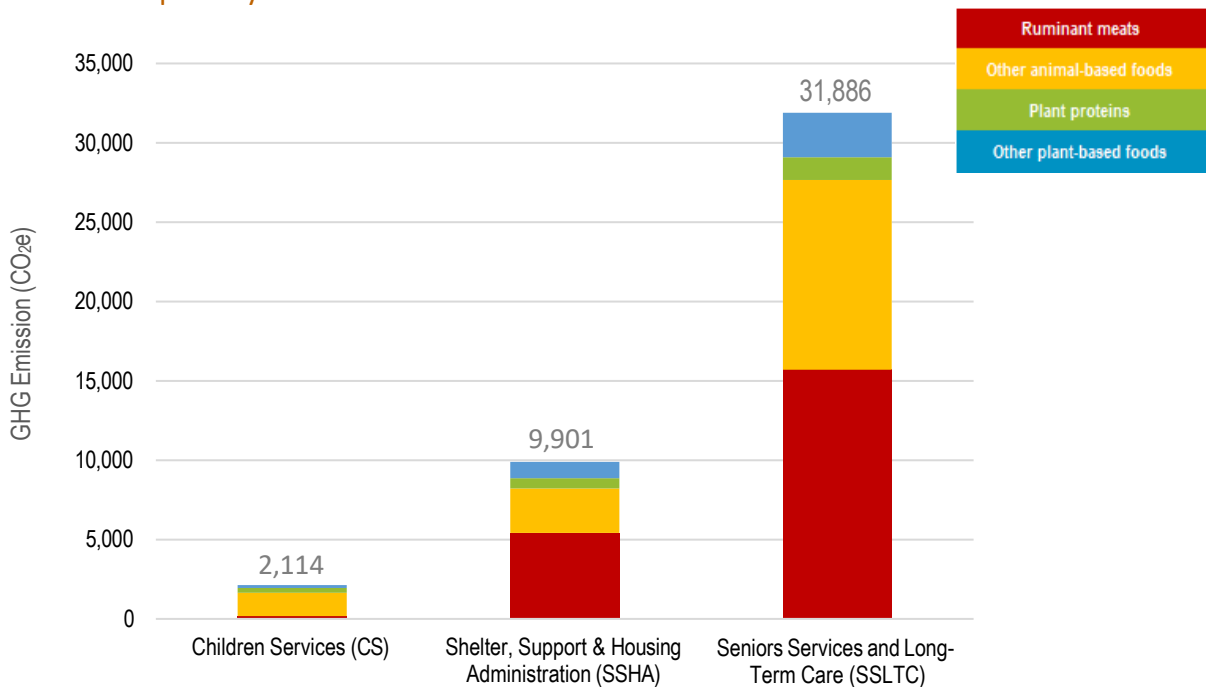
2023(Q1-Q3)

Total City of Toronto Food Purchases

Food type	Purchases (kg)	Boneless per cent
Animal-based foods		
Ruminant meats		
Beef	57376	100 per cent
Lamb/mutton and goat meat	310	100 per cent
Other meats		
Pork (pig meat)	36074	98 per cent
Poultry (chicken, turkey)	105084	70 per cent
Dairy		
Butter	683	
Cheese	24133	
Ice cream	13253	
Cream	26296	
Milk (cow's milk)	617640	
Yogurt	38467	
Eggs	65575	
Fish and seafood		Boneless per cent
Fish (finfish)	44409	100 per cent
Crustaceans (shrimp/prawns)	203	100 per cent
Mollusks	0	0 per cent
Animal fats	0	
Plant-based foods		
Legumes (misc.)	21705	
Beans and pulses (dried)	16408	
Peas	16198	
Peanuts/groundnuts	4801	
Soybeans/Tofu	5174	
Grains/cereals (except rice)	17039	
Corn (Maize)	13016	
Oats (Oatmeal)	17760	
Wheat/Rye (Bread, pasta, baked goods)	210333	
Rice	20112	
Tree nuts and seeds	373	
Plant-based milk substitutes		
Almond milk	1109	
Oat milk	37	

Rice milk	0
Soy milk	5380
OPTIONAL for CFP members	
Fruits (misc.)	199151
Apples	61350
Bananas	72454
Berries	7769
Citrus Fruit	46369
Vegetables (misc.)	156470
Cabbages and other Brassicas (Broccoli)	39709
Tomatoes	43625
Root Vegetables	4173
Onions and Leeks	21095
Other vegetables	2
Roots and Tubers	23561
Potatoes	66888
Cassava and Other Roots	515
Sugars and sweeteners	53699
Vegetable oils	37571
Soybeans (Oil)	944
Palm (Oil)	0
Sunflower (Oil)	0
Rapeseed/canola (Oil)	5427
Olives (Oil)	22
Alcohol	0
Barley (Beer)	54
Wine Grapes (Wine)	35
Stimulants	
Cocoa	2858
Coffee	3319
Stimulants and Spices (misc.)	5231
Total	**2,231,241**

APPENDIX 2: INTENSITY ANALYSIS DATA

Food Type	GHG Emission Intensity (kg CO2e/kg fresh product)	Caloric Intensity (ACTIVE Kcal/kg fresh product)
Lamb/mutton and goat meat	303.65	2537.94
Fish (finfish)	19.78	763.12
Beef	242.99	1010.60
Crustaceans (shrimp/prawns)	25.38	415.72
Poultry (chicken, turkey)	19.10	1432.94
Soybeans/Tofu	7.61	2237.02
Cheese	40.29	3710.00
Pork (pig meat)	30.93	1609.90
Corn (Maize)	4.15	2659.06
Other vegetables	1.21	236.36
Sunflower (Oil)	10.17	8457.78
Butter	53.27	7170.00
Peanuts/groundnuts	8.41	6055.44
Tree nuts and seeds	10.52	2608.51
Ice cream	15.09	2070.00
Oats (Oatmeal)	5.85	1747.05
Grains/cereals (misc. except rice)	3.94	2812.53
Vegetable oils (misc.)	12.53	8232.21
Eggs	14.32	1382.04
Fruits (misc.)	1.46	299.05
Wheat/Rye (Bread, pasta, baked goods)	3.36	2888.47
Cream	30.36	1910.00
Yogurt	9.75	610.00
Palm (Oil)	13.03	8859.22
Berries	2.59	299.00
Legumes and pulses (misc.)	7.91	4645.77
Cassava and Other Roots	2.06	586.14
Rapeseed/canola (Oil)	11.71	8547.05
Vegetables (misc.)	1.25	225.22
Citrus Fruit	1.40	192.41
Onions and Leeks	1.01	321.09
Cabbages and other Brassicas (Broccoli)	1.33	225.00
Potatoes	1.02	586.14
Olives (Oil)	10.17	8730.64
Peas	8.79	3269.62
Soybeans (Oil)	13.24	8157.30
Root Vegetables	1.01	225.22
Beans and pulses (dried)	11.71	3462.82
Apples	1.29	320.67
Rice	5.14	3848.14
Soy milk	1.58	330.00
Almond milk	1.37	330.00
Tomatoes	1.40	174.21
Roots and Tubers (misc.)	1.52	586.14
Bananas	1.85	601.58
Milk (cow's milk)	8.36	526.63
Oat milk	1.15	460.00

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