Decarbonizing Canada's Food Value Chain: Developing Solutions for the Future

Gordon Price, PhD, PAg

Innovative Waste Management Research Program

Summit on Waste and the Climate

March 25, 2024

Dartmouth, Nova Scotia

DALHOUSIE UNIVERSITY

NSERC CRSNG Anthropogenic Greenhouse Gas Research

Development and implementation of tools and strategies to address greenhouse gas emissions in Canada's food system: Decarbonizing Canada's Food Supply Chain

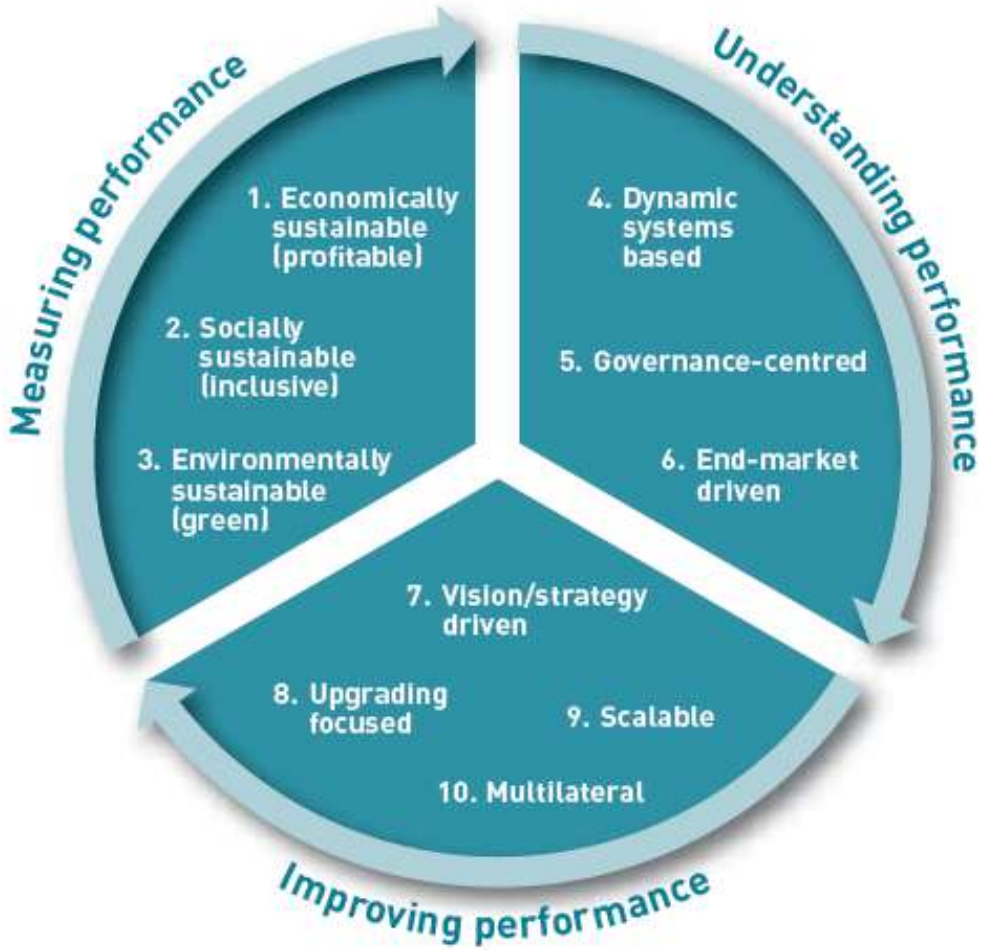
Environment and Climate Change Canada
Environnement et Changement climatique Canada

Climate Action and Awareness Fund

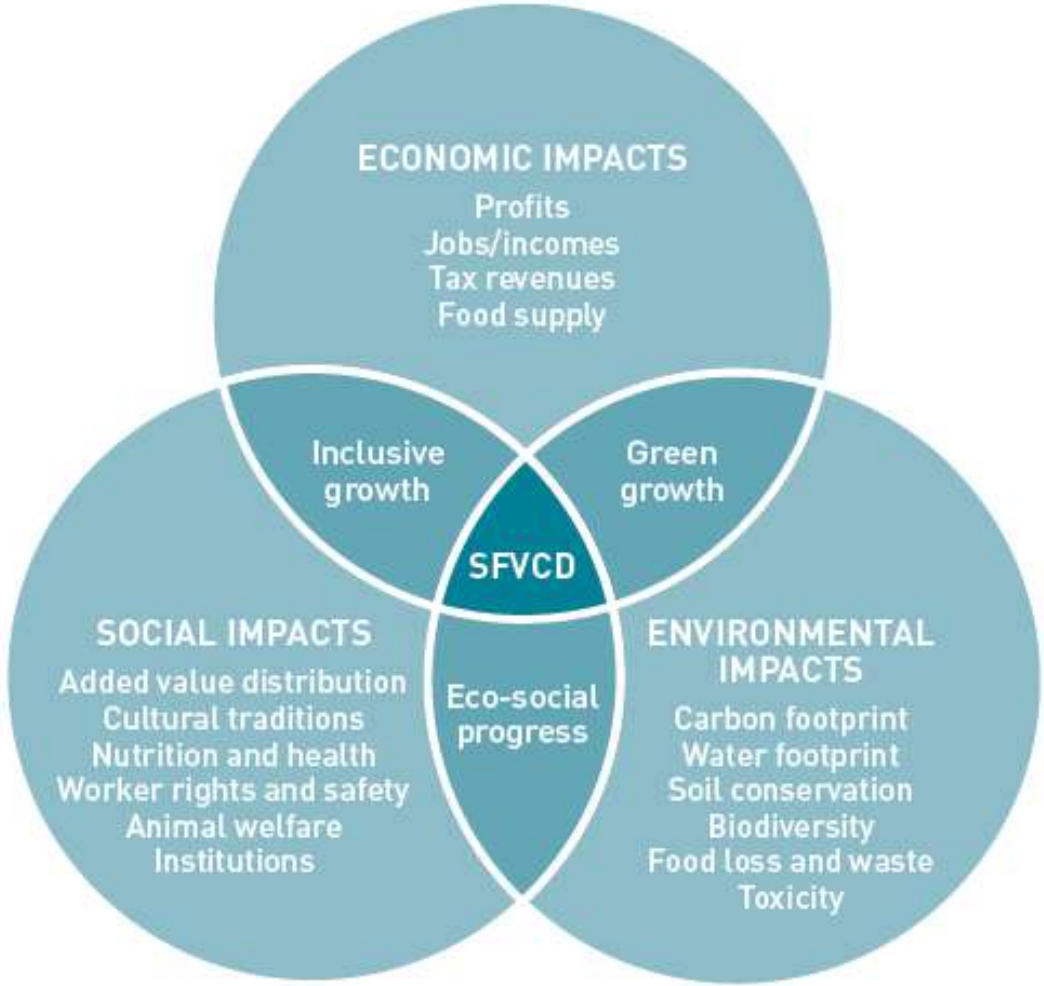
Quantifying the impact of municipal organic waste management strategies on carbon footprints; Measuring and modeling environmental impacts of the circular bioeconomy from waste collection, through processing, to receiving environments

Sustainable and Circular Food Value Chain

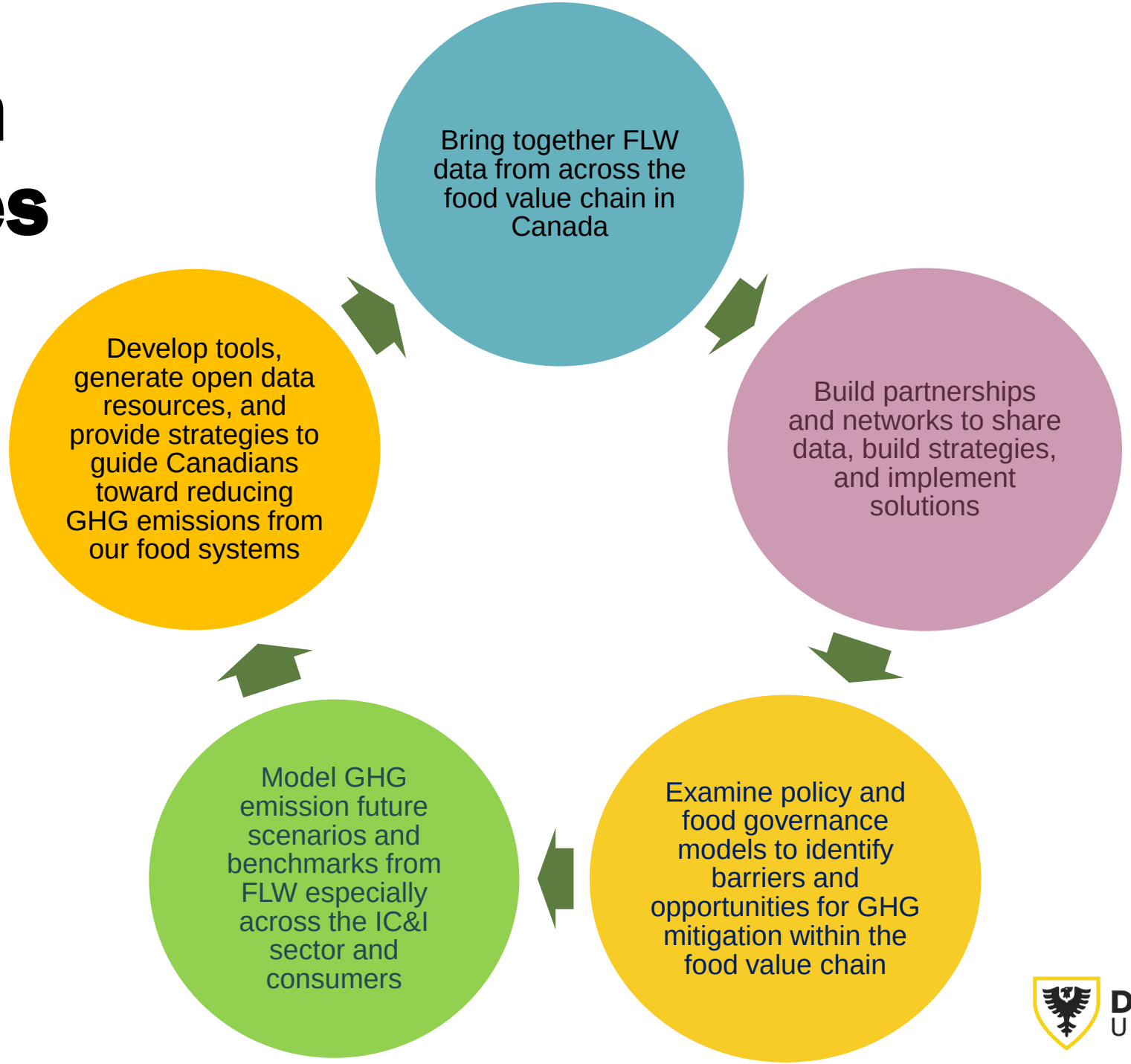
Principles of sustainable food value chain development



Sustainability in food value chain development



Research Objectives

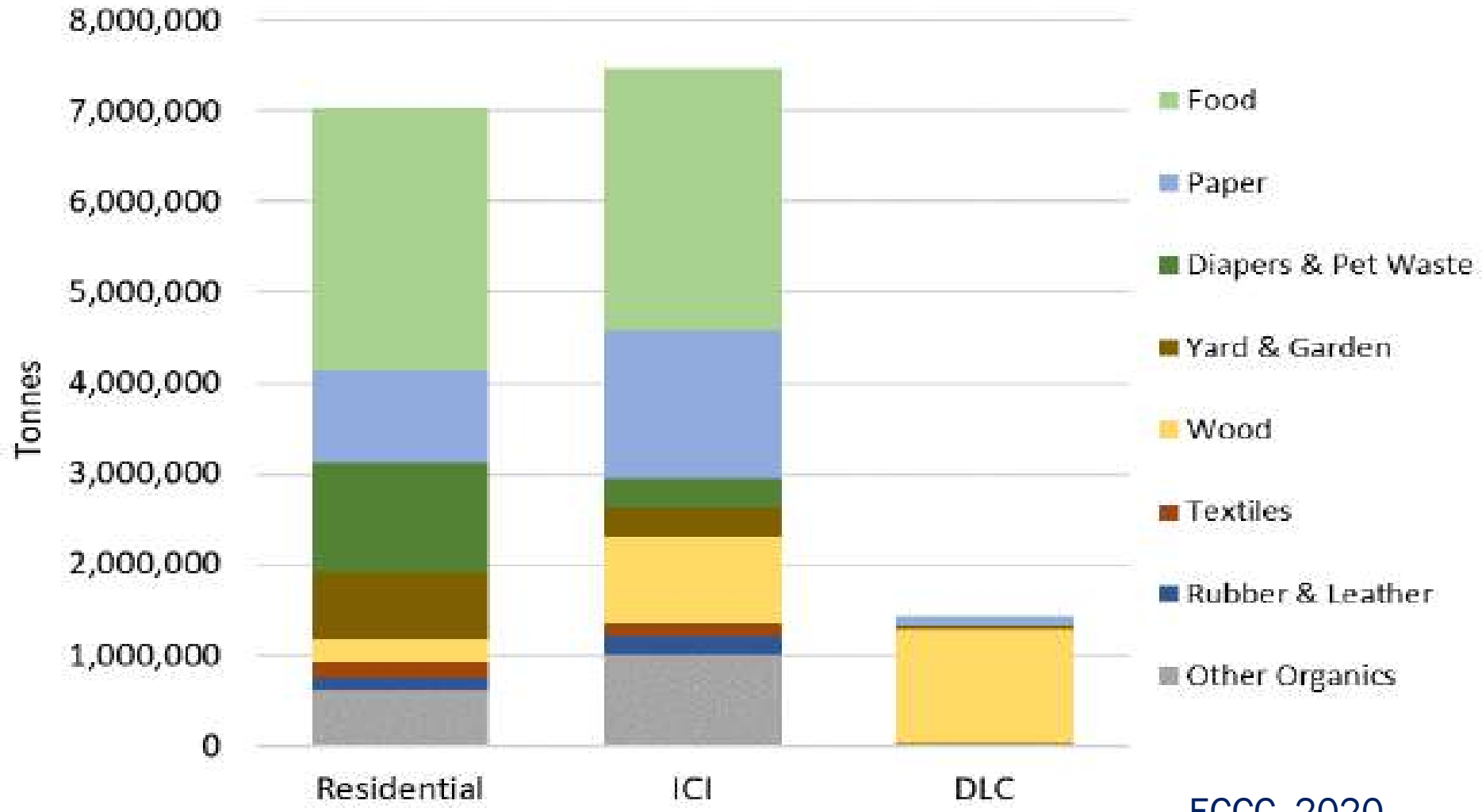


DALHOUSIE UNIVERSITY

NSERC CRSNG

WASTING FOOD IS A CRITICAL ISSUE

Quantities of degradable materials disposed in Canada



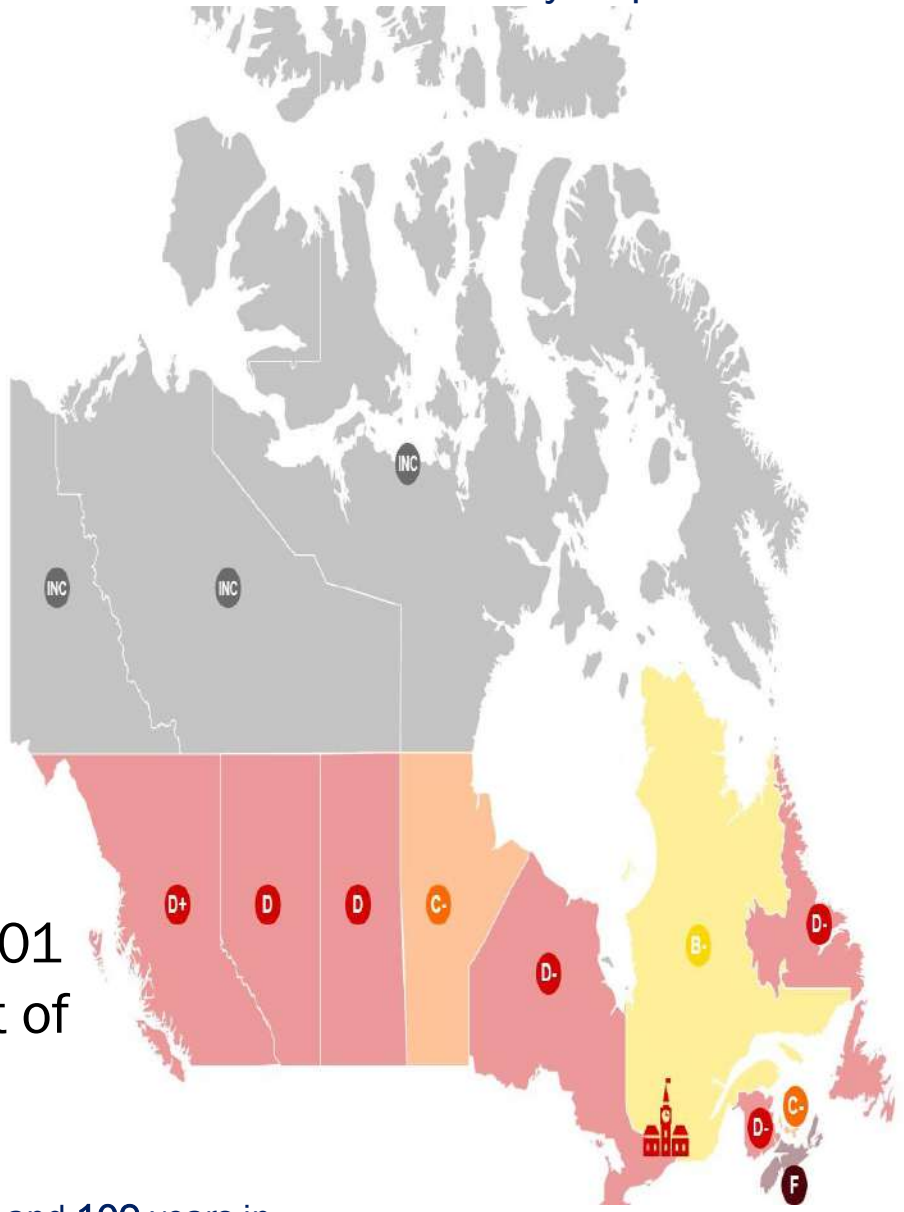
ECCC, 2020

DALHOUSIE UNIVERSITY

Wasted or Lost Food…

Food Banks of Canada Poverty Report Card 2023

- Is estimated to contribute "18 Gt CO_2 equivalent per year globally, representing 34% of total GHG emissions" (Crippa et al., 2021)
- In Canada, represents ~58% of all food produced (35.5 million tons) (Second Harvest, VCMI, 2019)
- Cost of lost food globally, full cost accounting, is estimated at USD $2.6 trillion (FAO, 2014)
- In Canadian households the cost is estimated at $1,766 annually (Second Harvest, 2019)

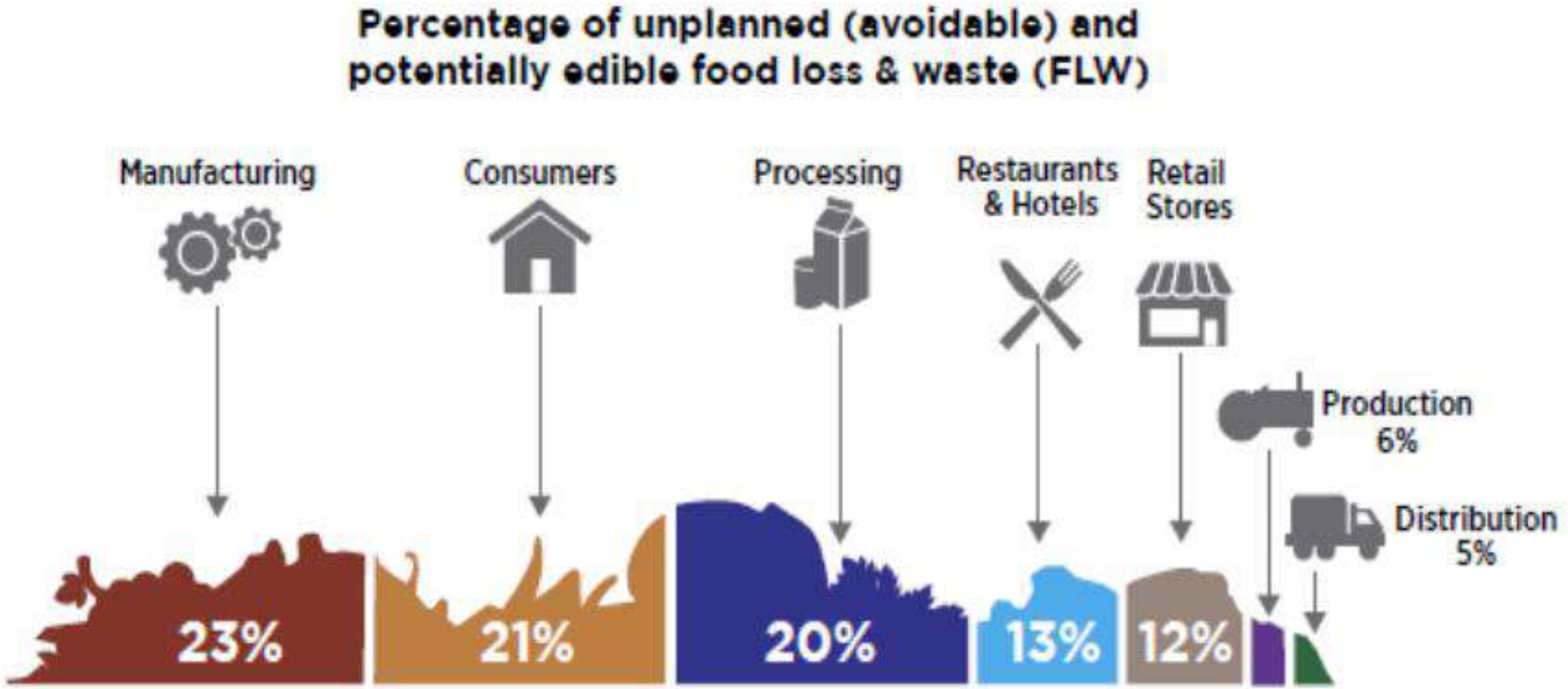


- Canadian landfills emit 23% of total methane (1,401 kilotonnes (kt)), 418 kt were recovered and 885 kt of methane (equivalent to 22 Mt CO2) were emitted.

1 kg of nitrous oxide (N_2O) equals **273** kg of CO_2 equivalents and **109** years in the atmosphere, and the emission of 1 kg of methane (CH_4) is equal to **27-29.8** kg CO_2 equivalents and **11.8** years in atmosphere

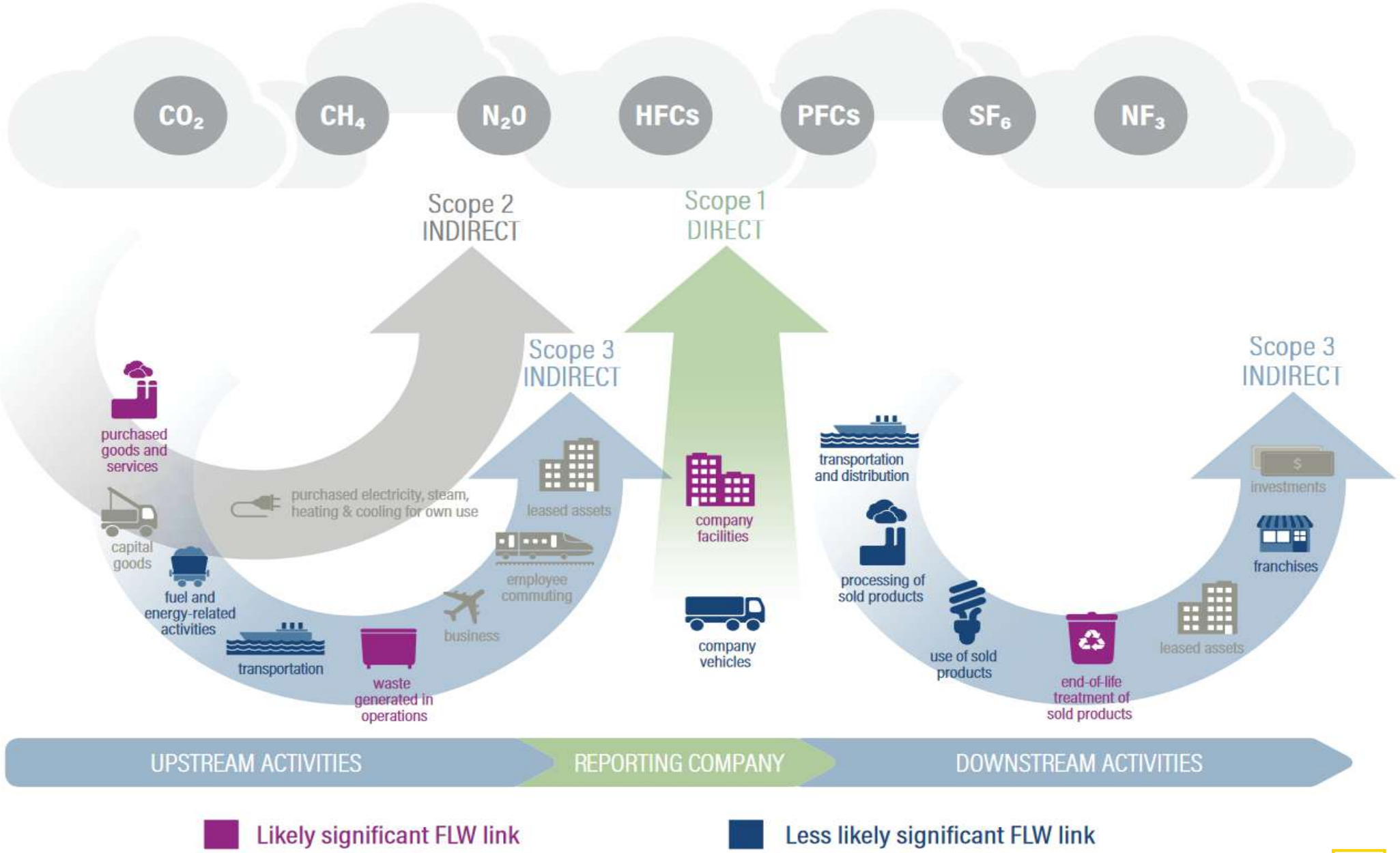
DALHOUSIE UNIVERSITY

Potential or estimated GHG contributions across the food value chain



(Data source: Gooch et al., 2019 and adapted by NZWC).

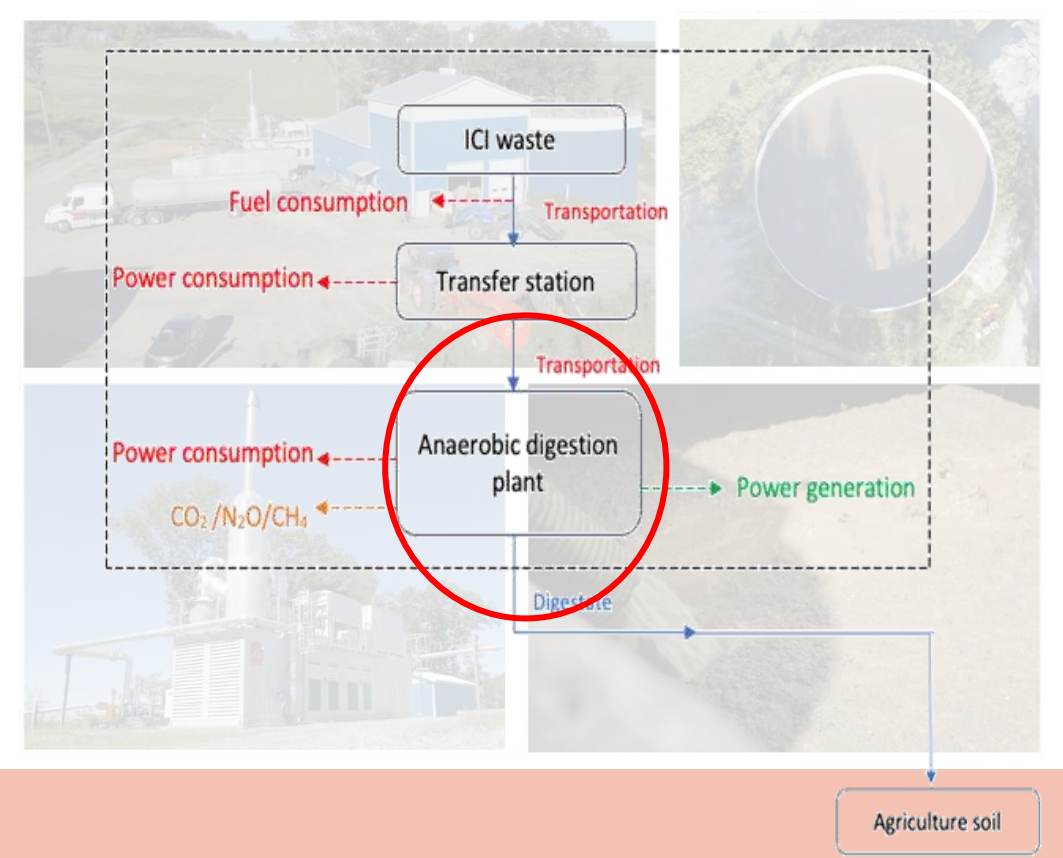
Figure 1 | Where Links to FLW Are Likely to Be Found in a GHG Inventory

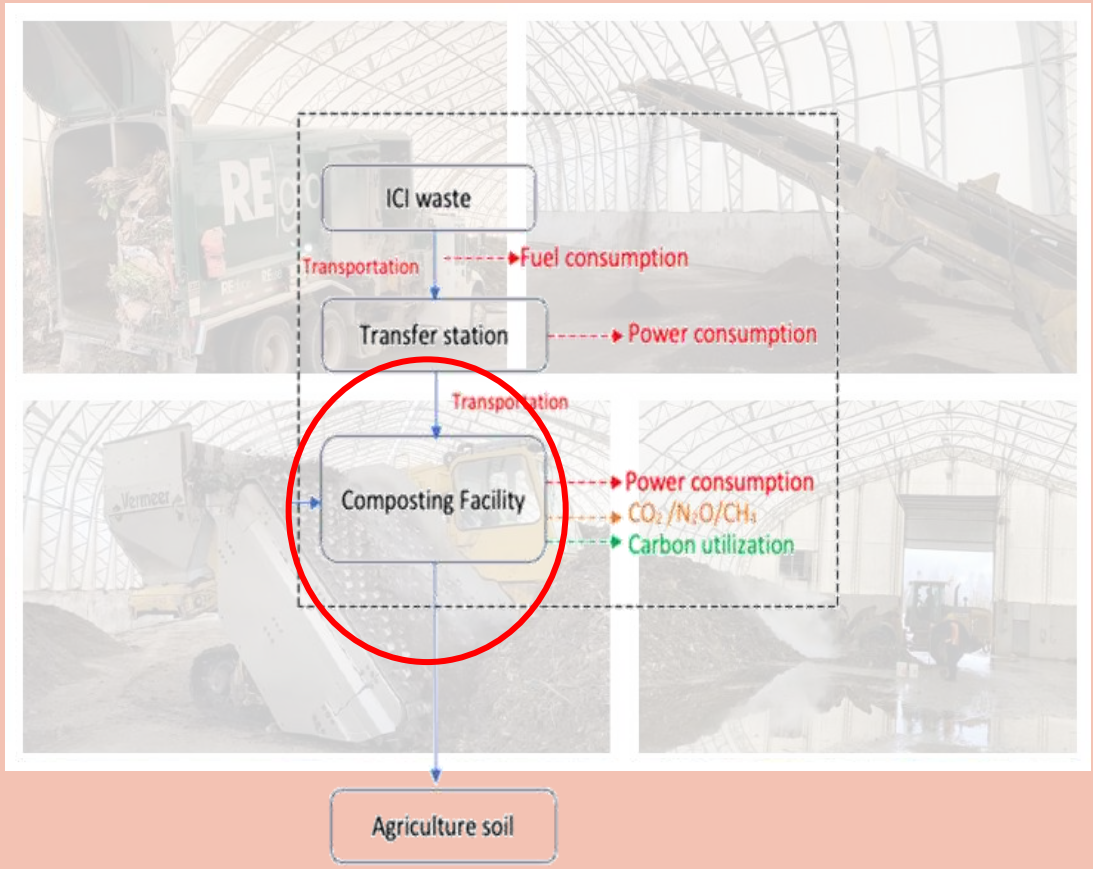


Source: Adapted from WRI and WBCSD (2011a), *Corporate Value Chain (Scope 3) Accounting and Reporting Standard.*

DALHOUSIE UNIVERSITY

Net carbon emissions systems model





Net carbon emissions model

Emissions (CO2e) of operations based on direct measurement and operational data

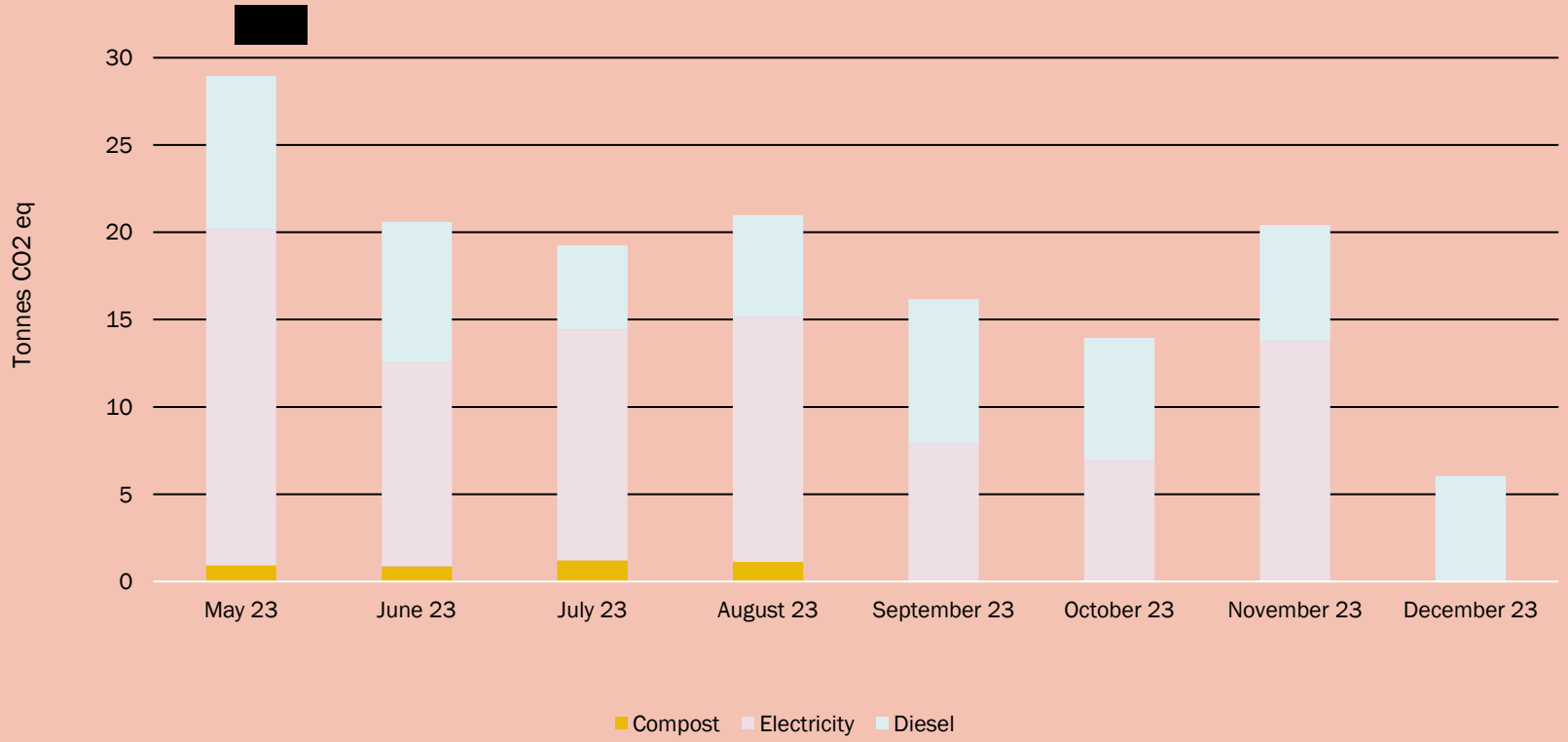
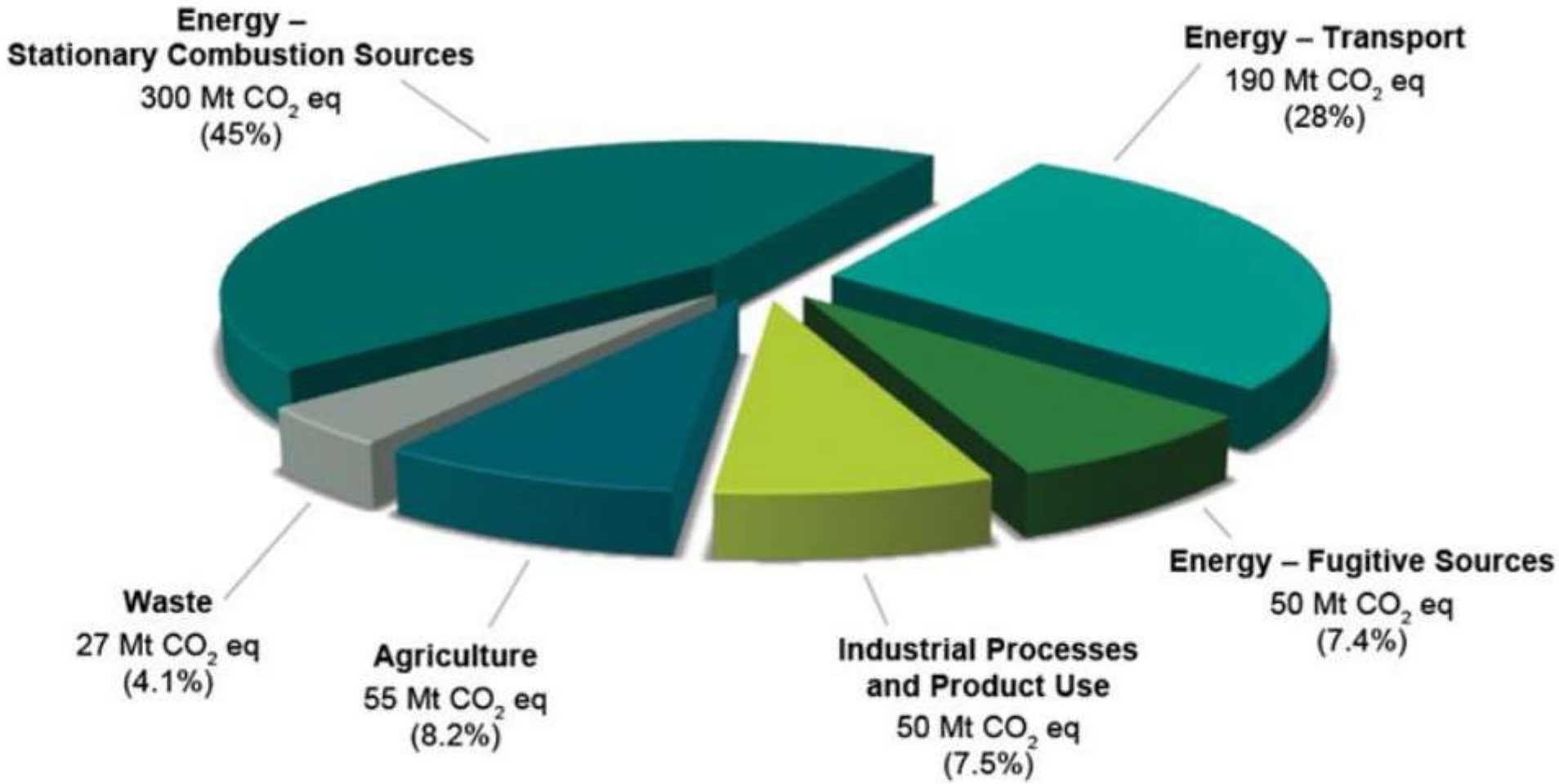


Figure ES–2: Breakdown of Canada's emissions by Intergovernmental Panel on Climate Change sector (2020)



Total: 672 Mt CO_2 eq

Note: Totals may not add up due to rounding.

Who generates data?

GFL

WM

walker

miller WASTE SYSTEMS

sodexo

aramark

Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada

RECYC-QUÉBEC Québec

COIL Circular Opportunity Innovation Launchpad

second harvest

TOO GOOD TO GO

Gordon FOOD SERVICE

Sysco

Second Harvest

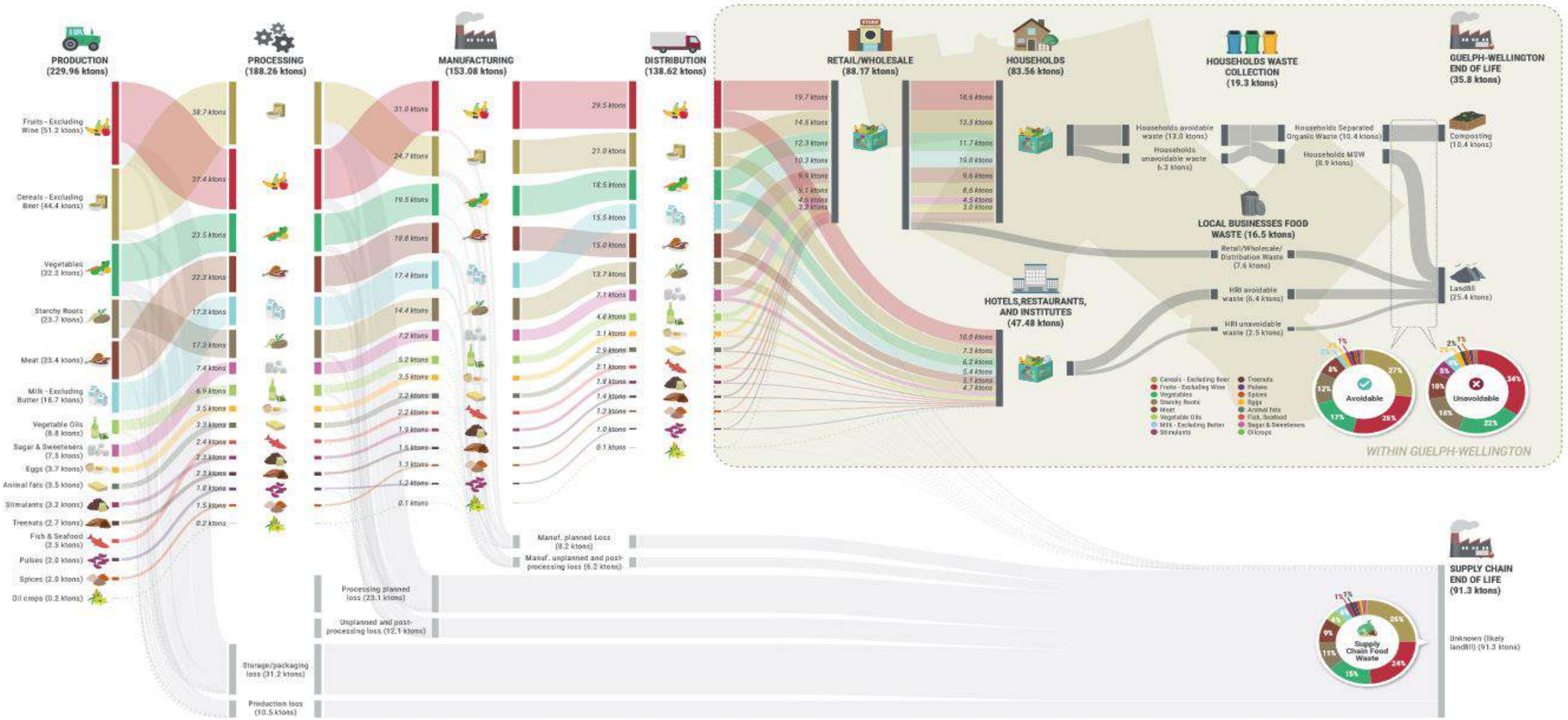
No Waste
No Hunger

We're on a mission to grow our innovative, efficient food recovery network to fuel people and reduce the environmental impact of avoidable food waste.

LET'S FIGHT food waste TOGETHER

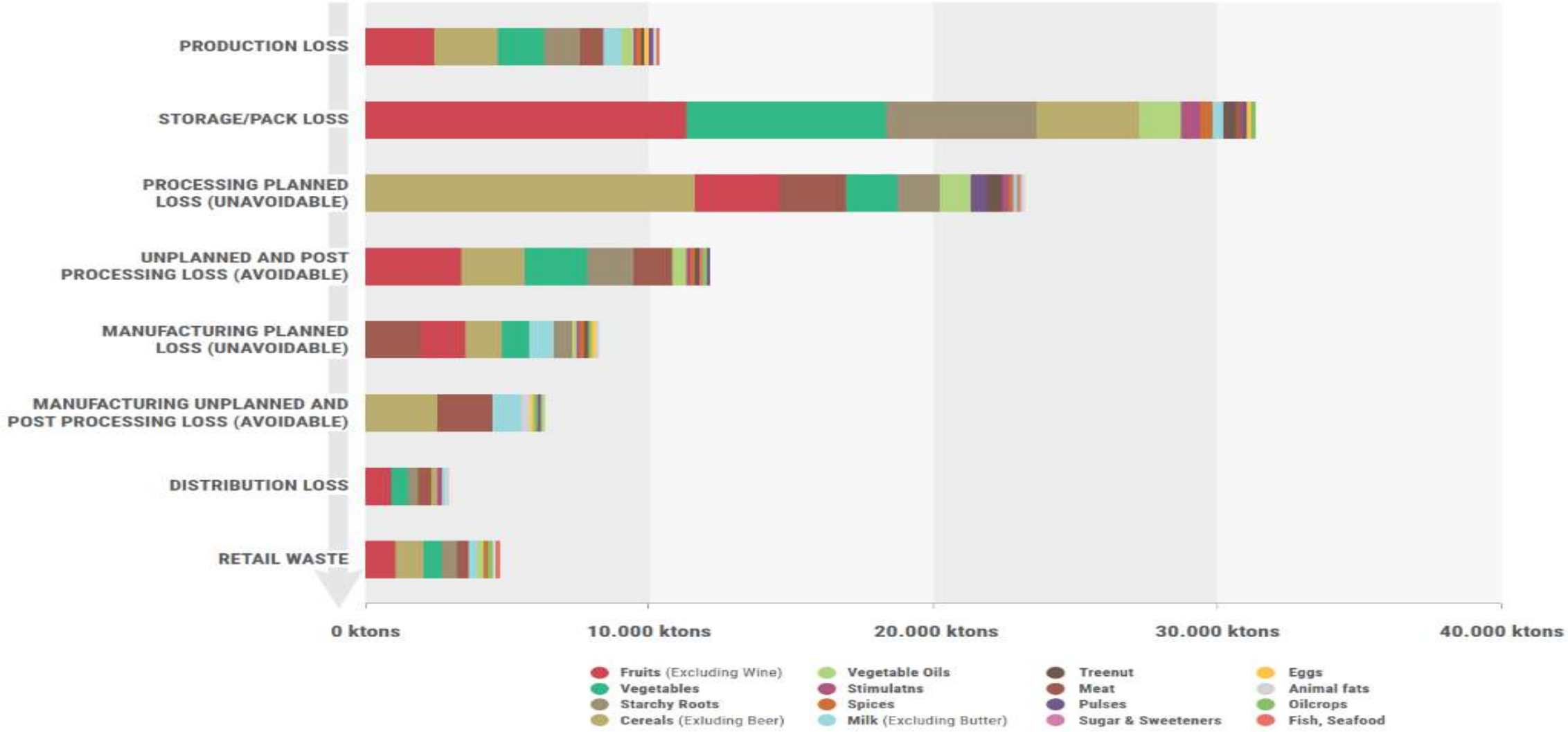
DALHOUSIE UNIVERSITY

Food loss and waste survey City of Guelph and County of Wellington



Dillon Consulting, 2021

Food loss and waste survey City of Guelph and County of Wellington



Graphical Depiction of Food Loss & Waste at Different Areas in the Food Supply Chain Dillon Consulting, 2021

48,134
MEALS RECOVERED

22,317
WEIGHT (KG) OF EDIBLE FOOD RESCUED

$160,900
VALUE OF EDIBLE FOOD RECOVERED

228
TONNES OF CO_2e EMISSIONS AVOIDED: EDIBLE FOOD

13
PARTICIPATING FOOD REDISTRIBUTION CHARITIES

303
TONNES OF ORGANIC WASTE COLLECTED AND DIVERTED

94
CUBIC YARDS OF COMPOST GENERATED FROM ORGANIC WASTE

1,020
EQUIVALENT EMISSIONS AVOIDED FROM CARS OFF ROAD FOR ONE-YEAR

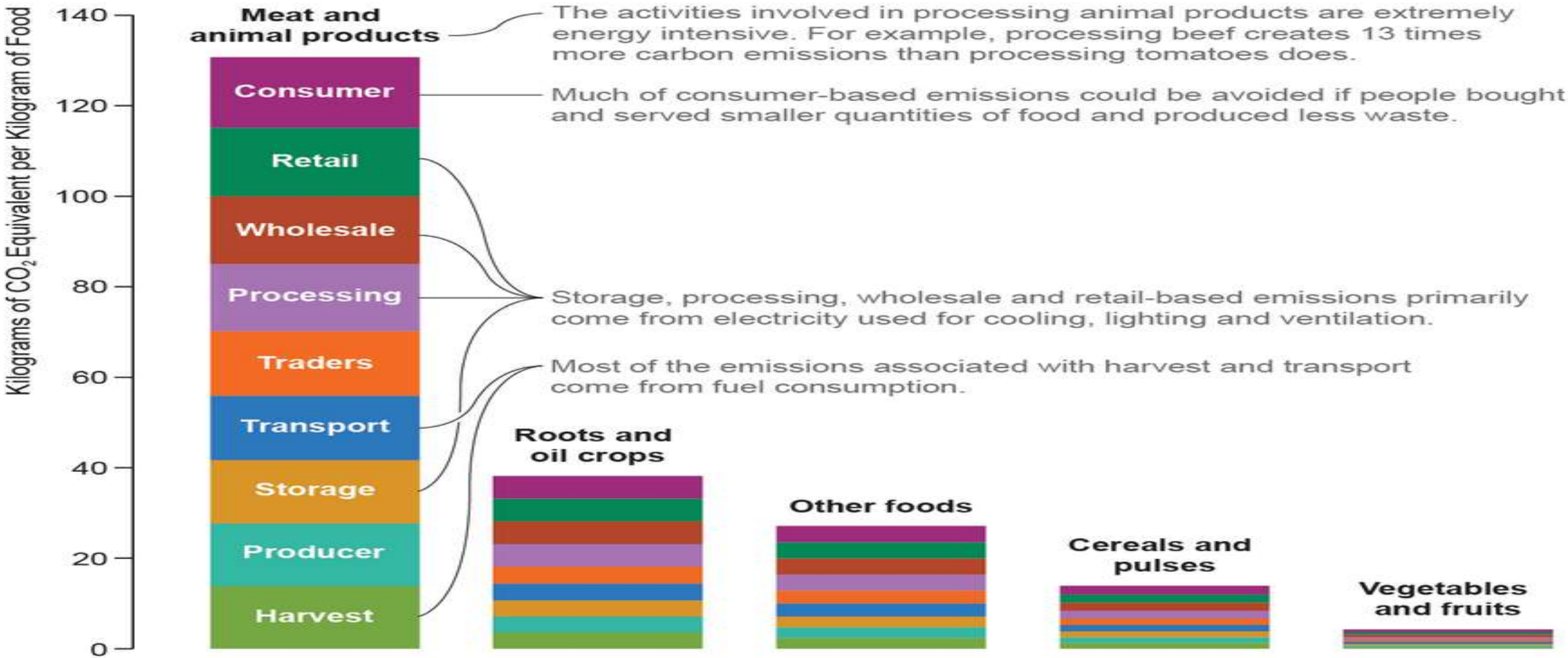
3,098
TONNES OF CO_2e EMISSIONS AVOIDED: ORGANIC WASTE

53
PARTICIPATING IC&I GENERATORS

CIRCULAR INNOVATION COUNCIL

Greenhouse Gas Emissions by Food Type

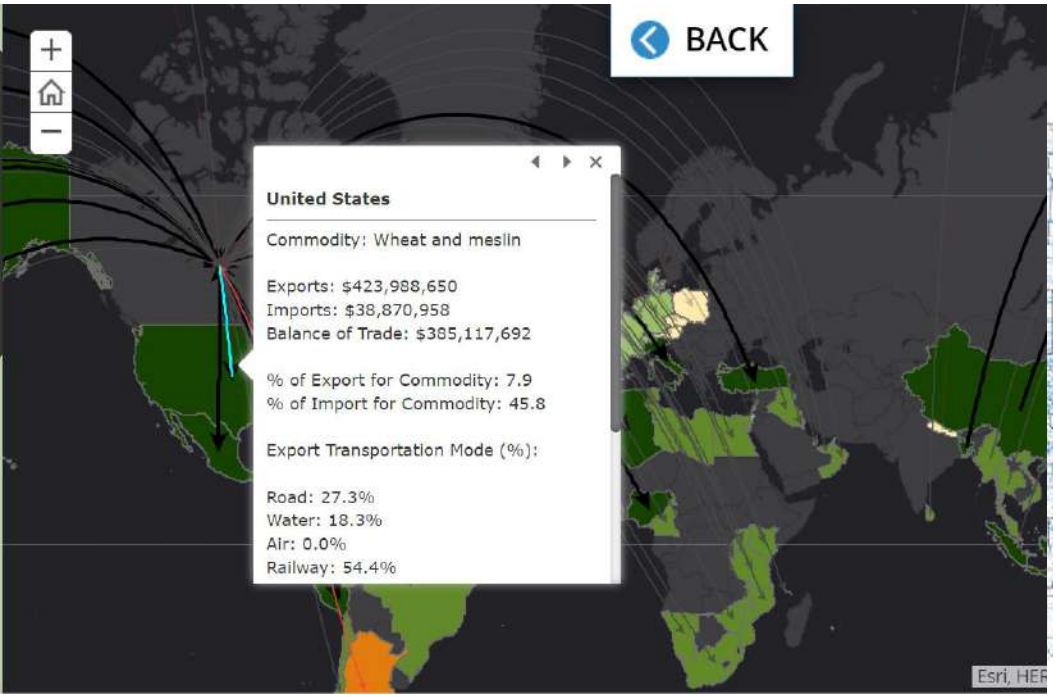
The chart below shows how much greenhouse gas is produced on average during each step of the food supply chain for each category of food commodity. These values apply to the food supply chain as a whole and are not specific to food loss and waste.



Credit: Jade Khatib; Source: "Cradle-to-Grave Emissions from Food Loss and Waste Represent Half of Total Greenhouse Gas Emissions from Food Systems," by Jingyu Zhu et al., in *Nature Food*, Vol. 4; March 2023 (*data*)

DALHOUSIE UNIVERSITY

The power of aggregating data and information from our food value chain



Balance of trade data by commodity and destination (US Balance of trade for wheat shown as an example)

Rail network and crossings

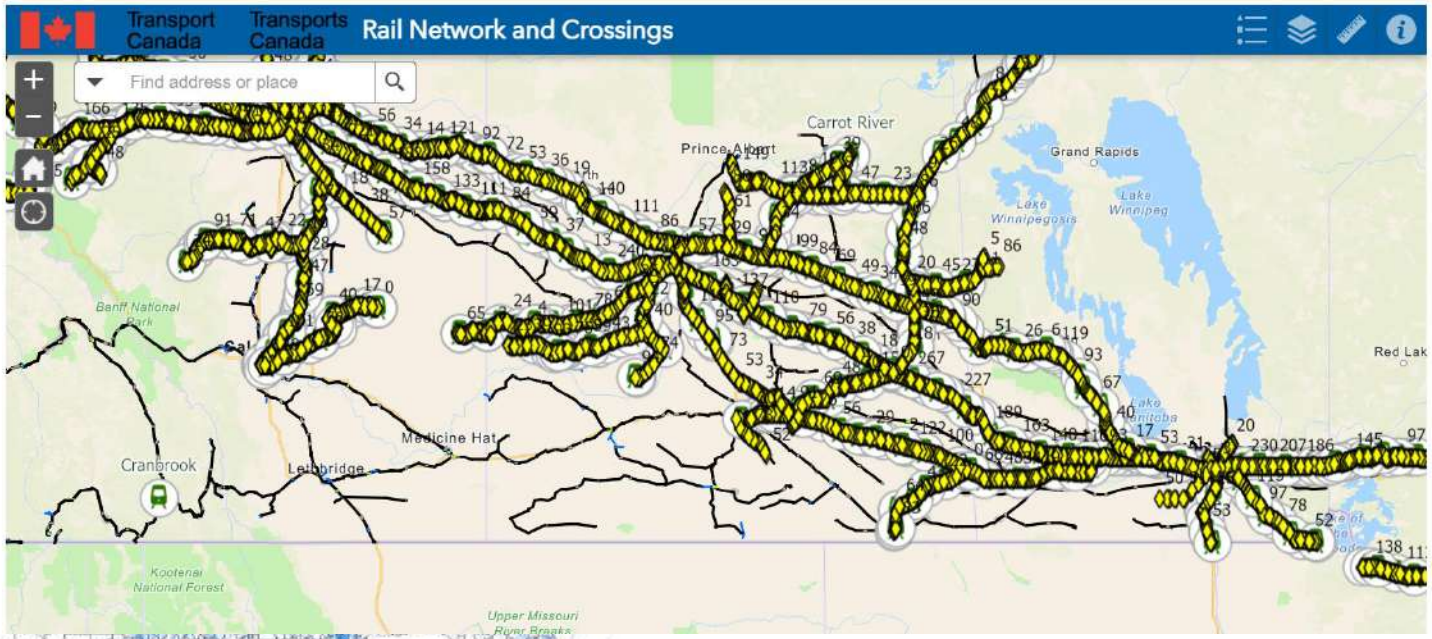


Figure 5. Maps of food flow networks within the United States. Maps depict total food flows (tons) for the (A) FAF and (B) county scale. Links are shown for all FAF data and for the largest 5% of county links.

Open Data and Building Networks

USDA Ag Data Commons
U.S. DEPARTMENT OF AGRICULTURE

Providing Central Access to USDA's Open Research Data

Datasets | Software & Tools | About Us | News | Contact Us | search

Turfgrass Soil Carbon Change

Featured dataset: Meta-analysis of soil carbon sequestration rates from 63 studies. Raw data and code are presented.

Manuresheds: sustainable ag

Classifies US counties by their capacity to supply manure P and N from livestock production or assimilate & remove excess P and

27 yrs grassland livestock

Featured dataset: Effects of stocking rate on livestock performance, Central Grasslands Research Extension Center, ND, 1989-2015

AGRICULTURAL ECONOMICS | FOR | BIOENERGY | ANIMALS & LIVESTOCK

FOOD & NUTRITION | GENOMICS & GENETICS | AGROECOSYSTEMS & ENVIRONMENT | PLANTS & CROPS

DALHOUSIE UNIVERSITY

UNIVERSITY OF GUELPH RESEARCH DATA REPOSITORY

University of Guelph Research Data Repository

Borealis > University of Guelph Research Data Repositories >

Contact | Share

Welcome to the University of Guelph Research Data Repository.

This repository, in conjunction with the Agri-environmental Research Data Repository provide access to, and long-term stewardship of, research data created at or in cooperation with the University of Guelph. The repository was created in 2013 by the University of Guelph Library.

The Library offers either a facilitated or self-deposit with mediation deposit service. **To begin the deposit process, please contact us at: lib.research@uoguelph.ca**

Guidance materials for preparing your research data for sharing and long-term access and instructions on how to deposit your data in the University of Guelph Research Data Repository can be accessed at How to deposit research data in the Agri-environmental Research Data Repository or the University of Guelph Research Data Repository.

College of Arts | College of Biological Science | College of Engineering and Physical Sciences | College of Social and Applied Human Sciences

Search this dataverse | Advanced Search

Dataverses (24)
Datasets (126)
Files (21,417)

Dataverse Category
Department (22)
Organization or Institution (1)
Research Project (1)

Publication Year
2023 (34)
2022 (22)
2021 (19)
2020 (12)
2019 (13)

1 to 10 of 150 Results | Sort

Supplementary material for: "Characterizing how One Health is defined and used within primary research: A scoping review"
Sep 21, 2023 - Department of Population Medicine
Pearce, Sydney, 2023, "Supplementary material for: "Characterizing how One Health is defined and used within primary research: A scoping review"", https://doi.org/10.5683/SP3/2MW6RL, Borealis, V1, UNF:6:FbcqNidNOqjENNGjZhD1A== [fileUNF]
This dataset contains supplementary material for the unpublished paper (as of March 30th, 2023) titled: "Characterizing how One Health is defined and used within primary research: A scoping review". Authors: Sydney D. Pearce, David F. Kelton, Charlotte B. Winder, Jan M. Sargeant,...

Colony Beagle Microbiome Study - Clinical Studies
Sep 8, 2023 - Department of Clinical Studies
Chiu, Olivia, 2023, "Colony Beagle Microbiome Study - Clinical Studies", https://doi.org/10.5683/SP3/0J22XY, Borealis, V1, UNF:6:vZ76JB7J2e7UefUJAKmoew== [fileUNF]
This dataset was used to aid in analyzing the effects sample preservation and handling techniques on the canine fecal microbiota over time.

Summary

Food is not waste

Inedible food can be converted and re-valued. Edible food should not be wasted.

Data becomes information that helps everyone

Data can be measured but doing that alone is costly and…lonely! It's better if we can do that together and share it. Everyone benefits.

Open data does not mean loss of Intellectual Property

Goals is to evaluate our systems, find efficiencies, and promote a more sustainable food value chain.

Food waste results in greenhouse gas emissions

The food value chain relies on every link, beginning from primary production to organics processing. Emissions depend on where it goes, how it is managed.

Acknowledgements

NSERC CRSNG

Environment and Climate Change Canada
Environnement et Changement climatique Canada

We acknowledge the support of the Natural Sciences and Engineering Research Council of Canada (NSERC) Alliance Missions and Environment and Climate Change Canada (CAAF).

Nous remercions le Conseil de recherches en sciences naturelles et en génie du Canada (CRSNG) de son soutien et Environnement et Changement climatique Canada (CAAF).

Support is also provided through many partnerships

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

CIRCULAR INNOVATION COUNCIL

zeroWASTE NATIONAL ZERO WASTE COUNCIL

divert NS Nothing Wasted

Conseil canadien du COMPOST Council of Canada

VM International

Government of Northwest Territories

Colchester be centred here.

Montréal

City of Guelph

CITY OF YELLOWKNIFE

DALHOUSIE UNIVERSITY Inspiring Minds

McGill

University of Guelph

Thank you

Contact Information

gprice@dal.ca

DALHOUSIE UNIVERSITY