Critical Overview of Global/Local Food Systems

Discussion

How is your plant doing?

Did your seed germinate yet?

What were the most interesting highlights from the farm tour?

What fall crops can you plant still?

What You Can Still Plant in the Fall

- Kale
- Spinach
- Lettuce
- Bok Choy
- Swiss Chard
- Mustard and other Asian Greens
- Arugula
- Radish
- Turnip (hakurei)
- Carrots (55 day if lucky)

Farm Tunnels

Cattle Panel

Cold Frame

Plant Garlic

Discussion

- What are the main components of a food system?
- How do industrial food systems differ from local or traditional food systems?
- Who benefits from industrial agriculture, and who bears the costs?
- How are food systems connected to global trade and capitalism?
- How does industrial agriculture shape what foods are available in stores?
- Who works in industrial agriculture, and under what conditions?
- What environmental damage does industrial farming cause?

The Global Industrial Food System is NOT

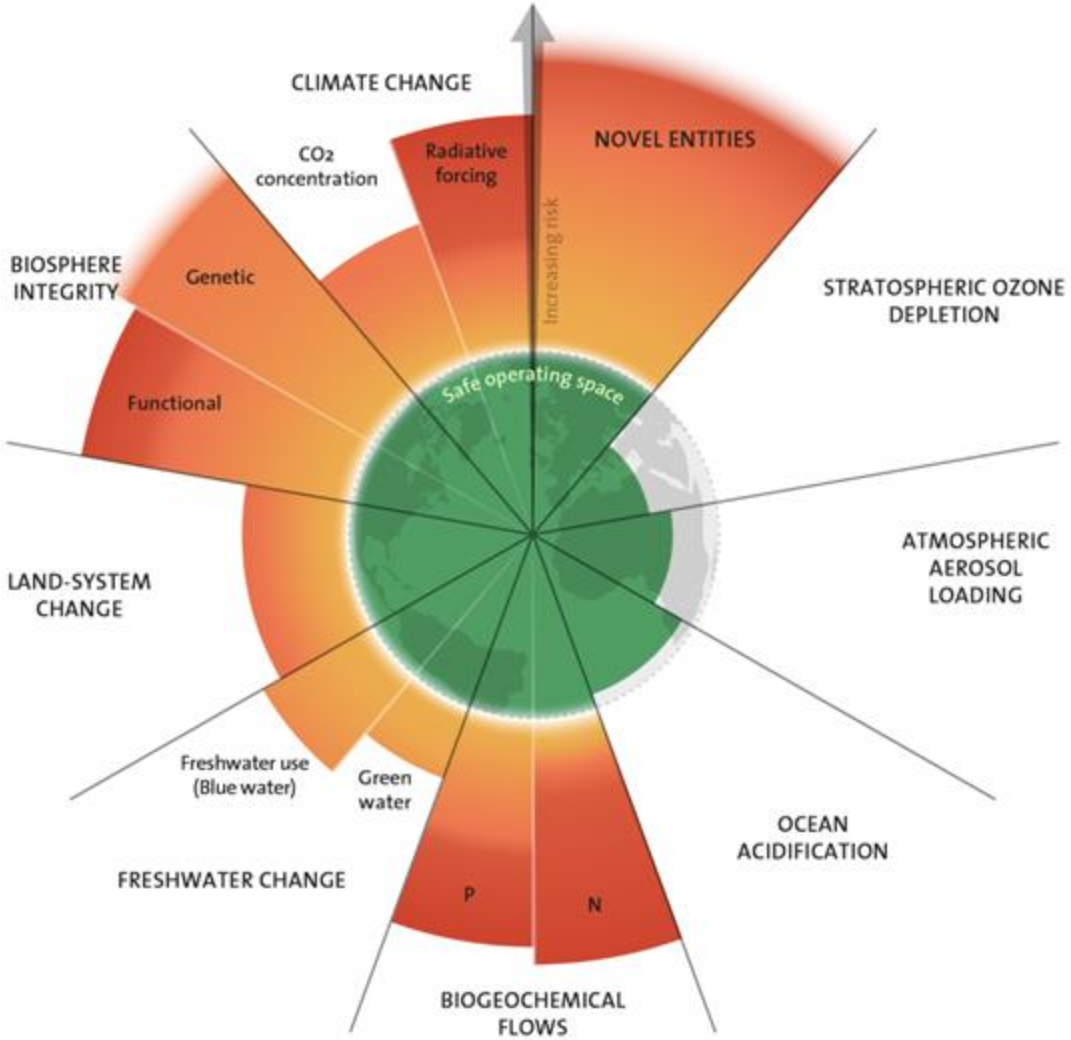
Socially Just
Environmentally Sustainable
Economically Viable

The Global Food System is Not Socially Just

- Food Insecurity
- Lack of Food Sovereignty
- Land Grab
- Non-Equitable
- Unhealthy
- Colonial, Racist, Patriarchal
- Loss of Traditional Knowledge

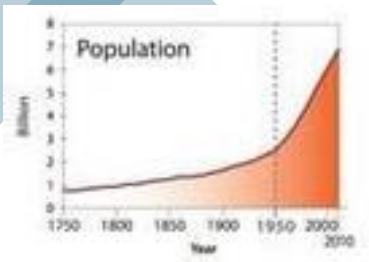
The Global Food System is Not Environmental Sustainability

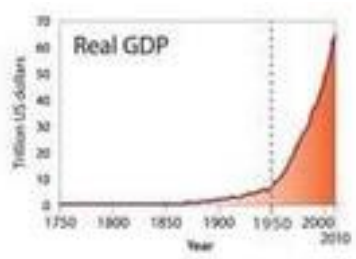
- Planetary Limitations
- Ecological Crises
- Climate Change
- Loss of biodiversity
- Dead Zones
- Loss of Pollinators
- Resistance to Pesticides and Fertilizers
- Loss of Soil Arability

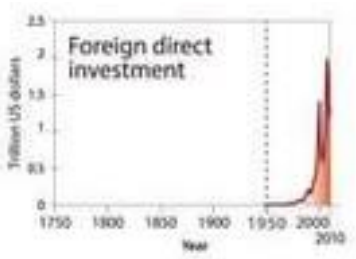


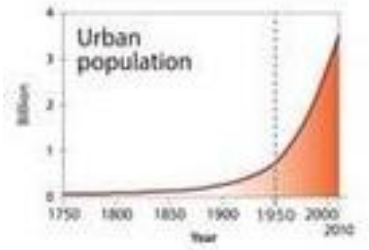
The 2023 update to the Planetary boundaries. Licensed under CC BY-NC-ND 3.0. **Credit:** "Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023". Download the illustration here.

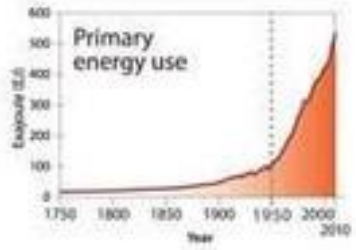
Source

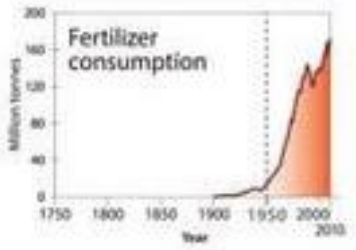

Population
Billion
1750 1800 1850 1900 1950 2000 2010
Year

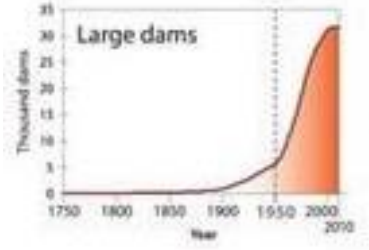

Real GDP
Trillion US dollars
1750 1800 1850 1900 1950 2000 2010
Year

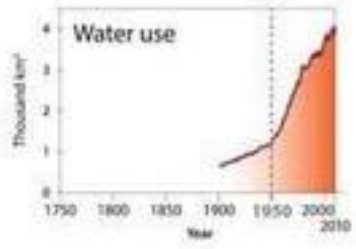

Foreign direct investment
Trillion US dollars
1750 1800 1850 1900 1950 2000 2010
Year

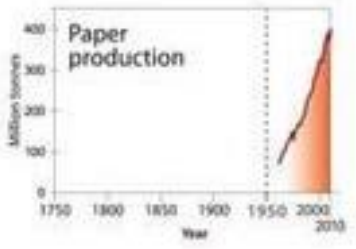

Urban population
Billion
1750 1800 1850 1900 1950 2000 2010
Year

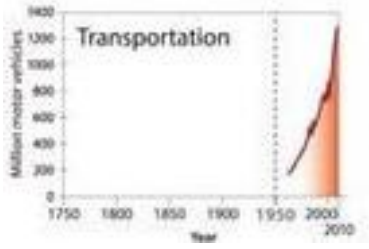

Primary energy use
Exajoule (EJ)
1750 1800 1850 1900 1950 2000 2010
Year

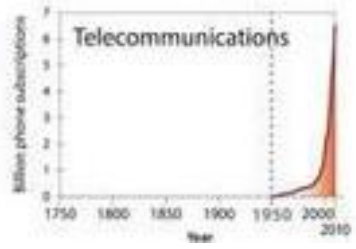

Fertilizer consumption
Million tonnes
1750 1800 1850 1900 1950 2000 2010
Year


Large dams
Thousand dams
1750 1800 1850 1900 1950 2000 2010
Year

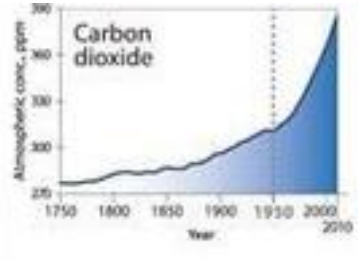

Water use
Thousand km³
1750 1800 1850 1900 1950 2000 2010
Year

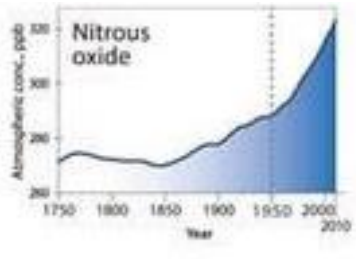

Paper production
Million tonnes
1750 1800 1850 1900 1950 2000 2010
Year

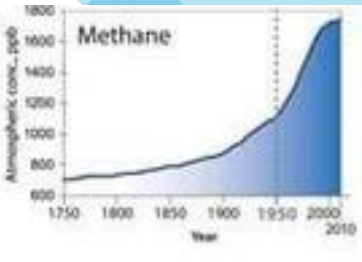

Transportation
Million motor vehicles
1750 1800 1850 1900 1950 2000 2010
Year

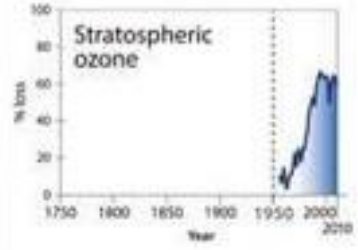

Telecommunications
Billion phone subscriptions
1750 1800 1850 1900 1950 2000 2010
Year

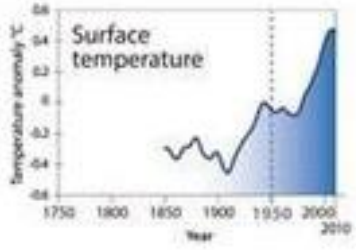

International tourism
Million arrivals
1750 1800 1850 1900 1950 2000 2010
Year

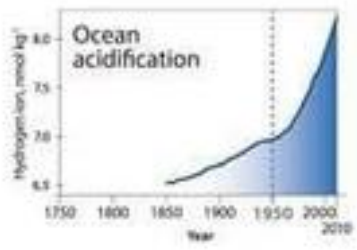

Carbon dioxide
Atmospheric conc., ppm
1750 1800 1850 1900 1950 2000 2010
Year

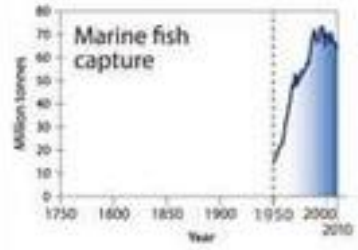

Nitrous oxide
Atmospheric conc., ppb
1750 1800 1850 1900 1950 2000 2010
Year

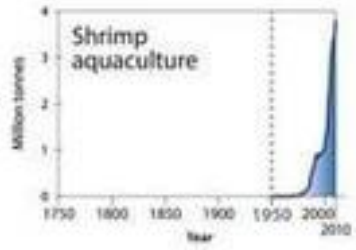

Methane
Atmospheric conc., ppb
1750 1800 1850 1900 1950 2000 2010
Year

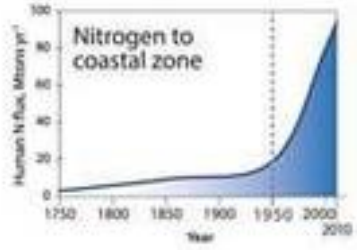

Stratospheric ozone
% loss
1750 1800 1850 1900 1950 2000 2010
Year

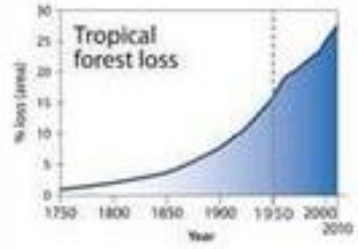

Surface temperature
Temperature anomaly °C
1750 1800 1850 1900 1950 2000 2010
Year

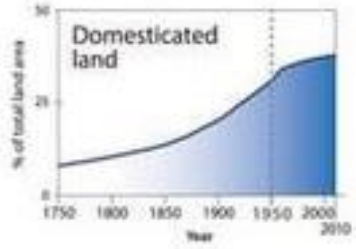

Ocean acidification
1750 1800 1850 1900 1950 2000 2010
Year

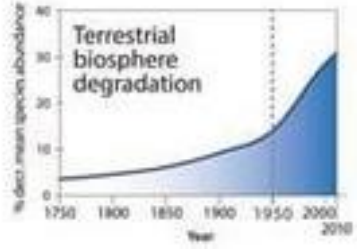

Marine fish capture
Million tonnes
1750 1800 1850 1900 1950 2000 2010
Year


Shrimp aquaculture
Million tonnes
1750 1800 1850 1900 1950 2000 2010
Year


Nitrogen to coastal zone
1750 1800 1850 1900 1950 2000 2010
Year


Tropical forest loss
% loss (area)
1750 1800 1850 1900 1950 2000 2010
Year


Domesticated land
% of total land area
1750 1800 1850 1900 1950 2000 2010
Year

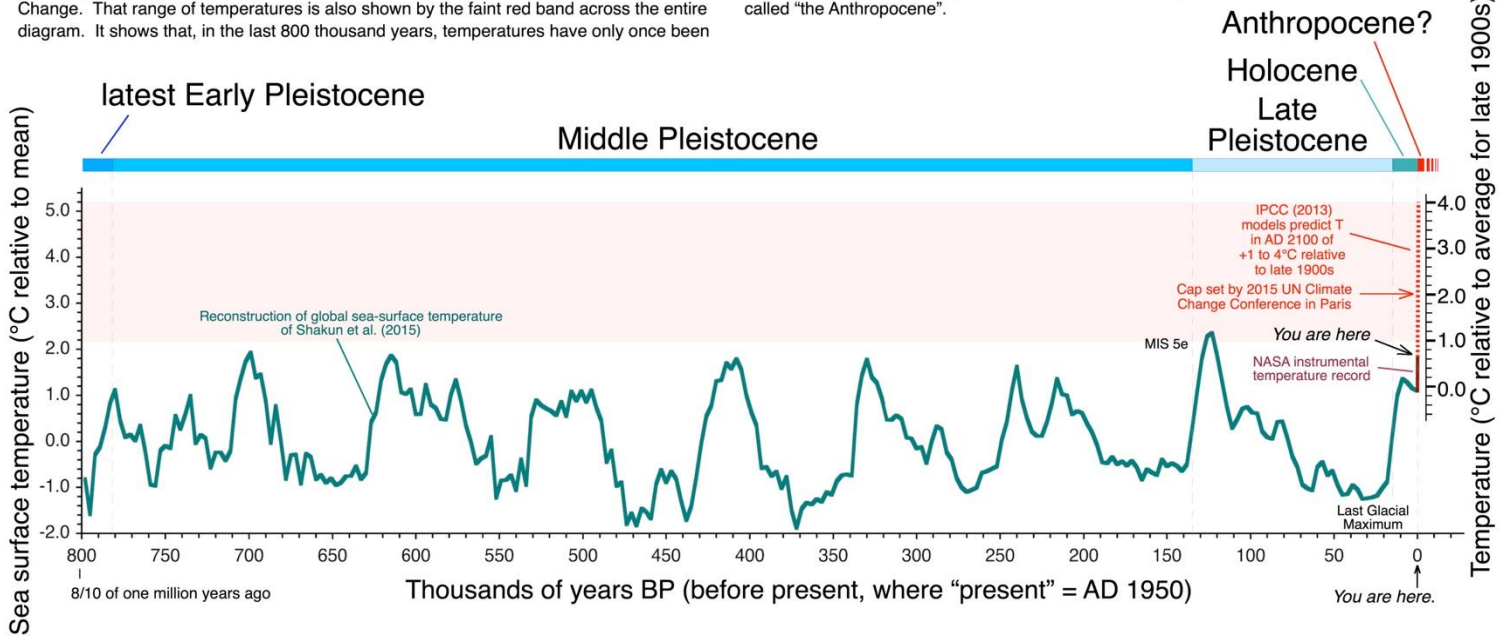

Terrestrial biosphere degradation
1750 1800 1850 1900 1950 2000 2010
Year

Temperatures from the Middle Pleistocene to the future

The diagram below shows in green a reconstruction of sea-surface temperature made from multiple marine sediment sequences, using the Mg/Ca ratios in the calcite ($CaCO_3$) of fossil planktic foraminifera. The record is plotted relative to its mean because temperatures at lower latitude locations were greater than those at high-latitude locations, but all show the same pattern and thus can be "stacked" to give one record of relative temperature.

In the rightmost part of the diagram, in the part representing the last 150 years, a dark red solid curve shows average Earth-surface temperature as derived from multiple thermometer records. A dashed bright red line shows the range of temperatures predicted by modeling reported in the 2013 report of the Intergovernmental Panel on Climate Change. That range of temperatures is also shown by the faint red band across the entire diagram. It shows that, in the last 800 thousand years, temperatures have only once been as high as those expected by AD 2100. That one time was during the last interglacial, the Eemian or MIS 5e, when sea level was at least six meters higher than present.

Another FQS page shows the last 22 thousand years in more detail; it is called "Temperatures from the Last Glacial Maximum to the future". Like this one, it shows that the rate of temperature increase in the last 150 years and the temperatures expected in the coming century are strikingly unlike those of the Holocene and Pleistocene. The changes that have happened and are expected are so great that they merit great concern from a societal standpoint and, from a geological standpoint, merit recognition of a new epoch in the history of the Earth, one commonly called "the Anthropocene".



Sources, from left to right:

Shakun, J. D., Lea, D.W., Lisiecki, L.E., and Raymo, M.E., 2015, An 800-kyr record of global surface ocean $\delta^{18}O$ and implications for ice volume-temperature coupling. Earth and Planetary Science Letters 426, 58-68.

U.S. National Aeronautics and Space Administration (NASA) GISS Surface Temperature Analysis at data.giss.nasa.gov/gistemp/graphs_v3/ accessed 20 December 2015.

Intergovernmental Panel on Climate Change (IPCC), 2013. Summary for Policymakers. In: Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. (Eds.), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

LBR FQS800katoFutureTemps01.odg 12/2015

Railsback's *Fundamentals of Quaternary Science*

Temperatures from the Last Glacial Maximum to the future

This page shows estimates of past variation in global temperature and model predictions of temperature change in the 21st century. Another *FQS* page shows a similar but much longer record, for the last 800 thousand years; that page is called "Temperatures from the Last Glacial Maximum to the future". Both pages show that the predicted warming is unprecedented in recent geologic history.

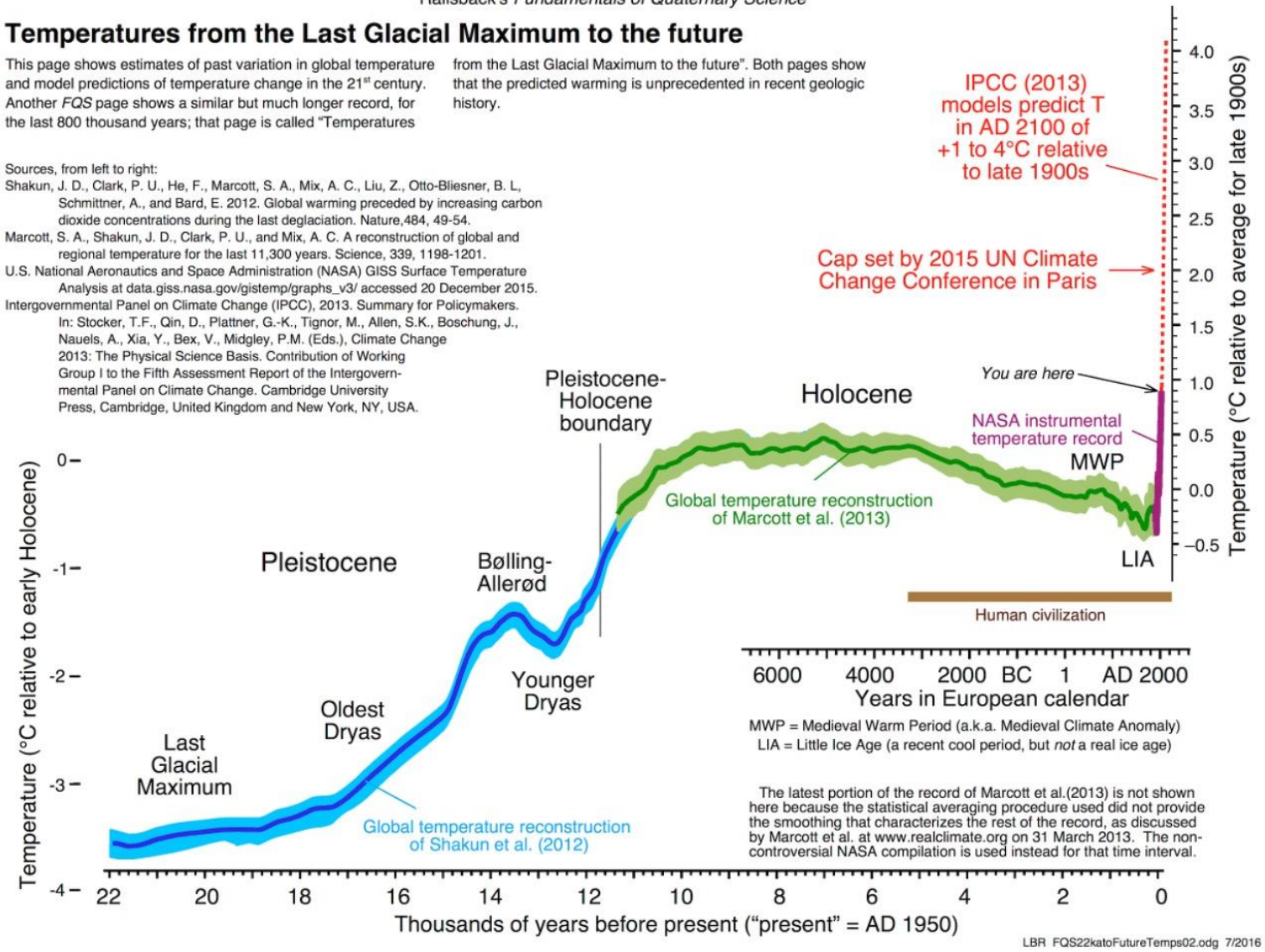
Sources, from left to right:

Shakun, J. D., Clark, P. U., He, F., Marcott, S. A., Mix, A. C., Liu, Z., Otto-Bliesner, B. L, Schmittner, A., and Bard, E. 2012. Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation. Nature,484, 49-54.

Marcott, S. A., Shakun, J. D., Clark, P. U., and Mix, A. C. A reconstruction of global and regional temperature for the last 11,300 years. Science, 339, 1198-1201.

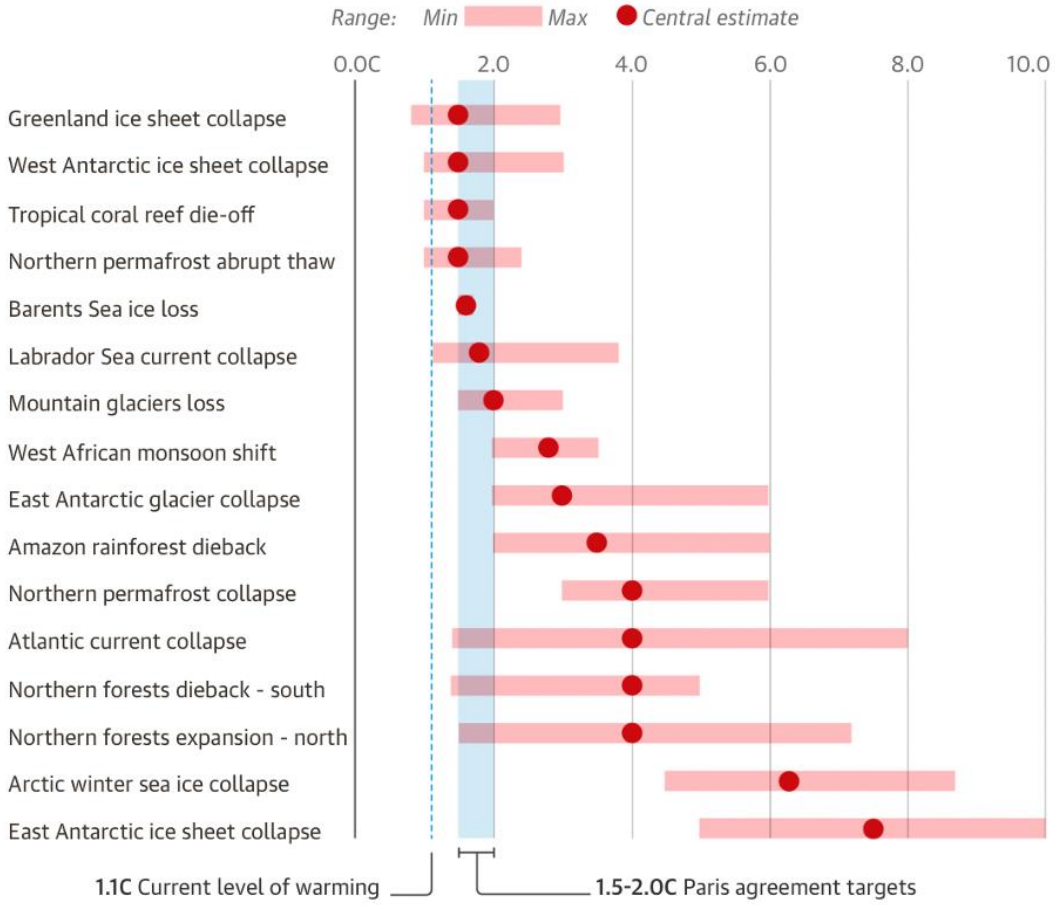
U.S. National Aeronautics and Space Administration (NASA) GISS Surface Temperature Analysis at data.giss.nasa.gov/gistemp/graphs_v3/ accessed 20 December 2015.

Intergovernmental Panel on Climate Change (IPCC), 2013. Summary for Policymakers. In: Stocker, T.F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M. (Eds.), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.



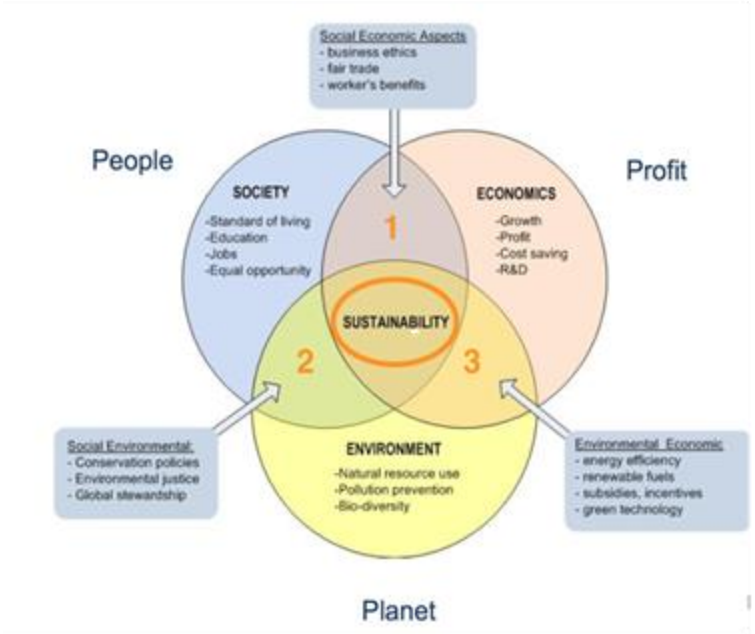
The risk of climate tipping points is rising rapidly as the world heats up

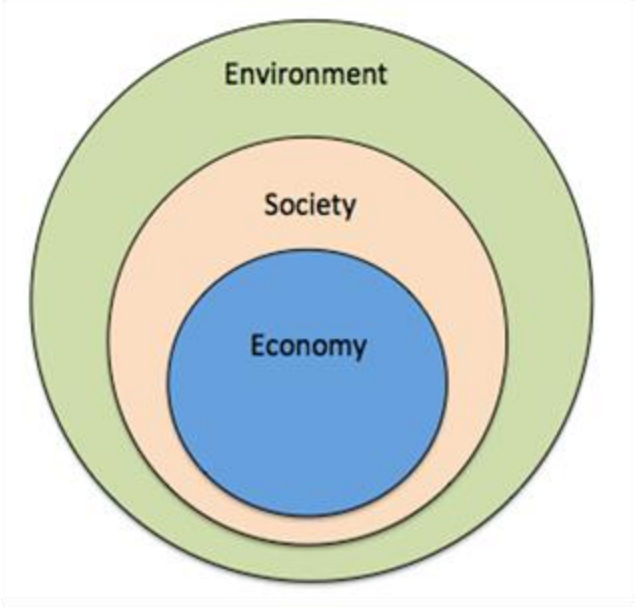
Estimated range of global heating needed to pass tipping point temperature



Guardian graphic. Source: Armstrong McKay et al, Science, 2022. Note: Current global heating temperature rise 1.1C
Paris agreement targets 1.5-2.0C

GO BEYOND WEAK SUSTAINABILITY MODELS





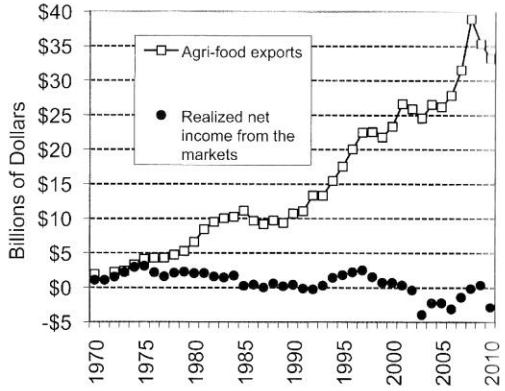
The Global Food System is Not Economically Viable

- Farmers Livelihoods
- Grocery Store (sellers) Inflation
- Wage Stagnation
- Corporate Greed
- Privatization
- Consolidation

WHO BENEFITS?

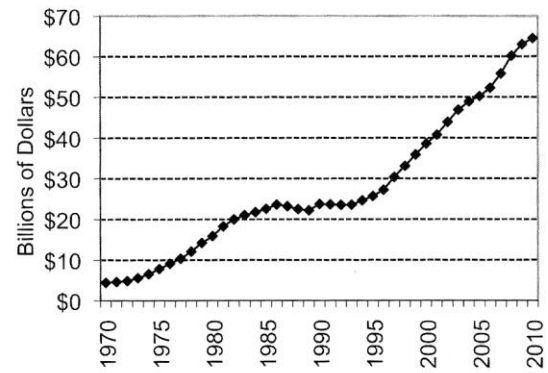
- Qualman, D. (2011) Advancing Agriculture by Destroying Farms? The State of Agriculture in Canada, pp. 20 – 42. In, Wittman, H., Desmarais, A. A., & Wiebe, N. (2011) Food Sovereignty in Canada: Creating Just and Sustainable Food Systems, Fernwood Publishing

Figure 2-5 Canadian Agri-Food Exports and Realized Net Income from the Markets: 1970–2010



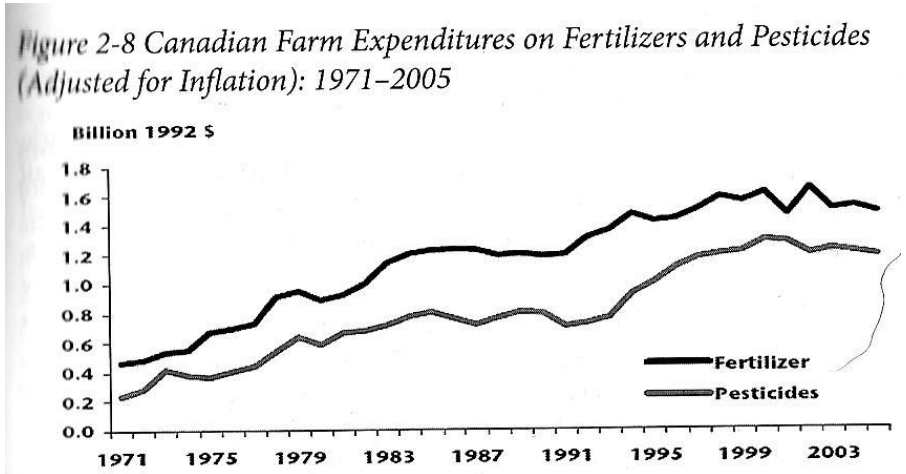
Sources: Export data provided upon request from Agriculture and Agri-Food Canada; AAFC, Agri-Food Trade Service <www.ats-sea.agr.gc.ca>; AAFC, *Medium Term Outlook for Canadian Agriculture: International and Domestic Markets*, January 2010. Income data from Statistics Canada, 2002, *Agricultural Economic Statistics*, Cat. No. 21-603-E May, Ottawa: Statistics Canada; Statistics Canada, 2010c, *Net Farm Income–Agriculture Economic Statistics*, Cat. No. 21-010-X, May, Ottawa: Statistics Canada.

Figure 2-6 Canadian Farm Debt: 1970–2010



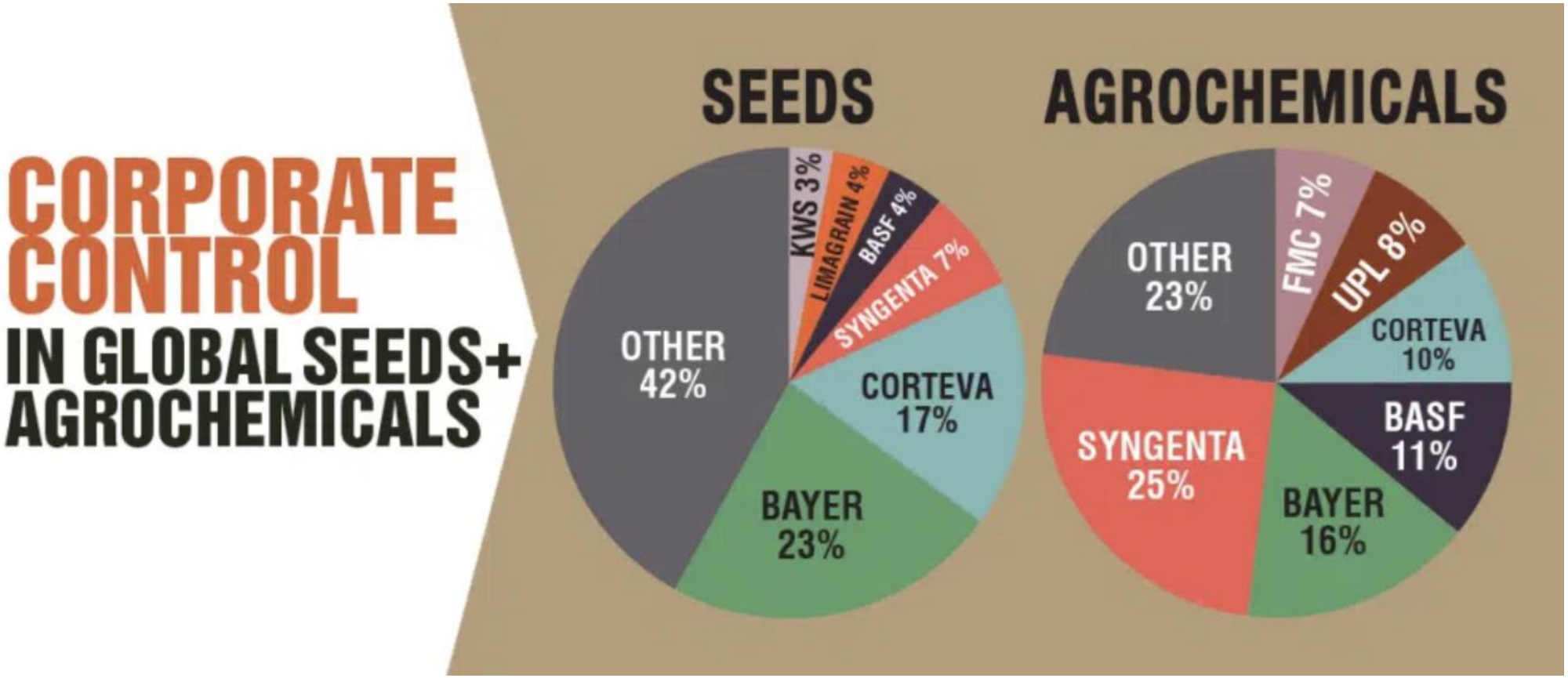
Source: Statistics Canada, 2010b, *Farm Debt Outstanding*, Cat. No. 21-014-X, November, Ottawa: Statistics Canada.

Figure 2-8 Canadian Farm Expenditures on Fertilizers and Pesticides (Adjusted for Inflation): 1971–2005



Sources: Agriculture and Agri-Food Canada, *An Overview of the Canadian Agriculture and Agri-Food System: 2007*, p. 124.

WHO BENEFITS?



Source

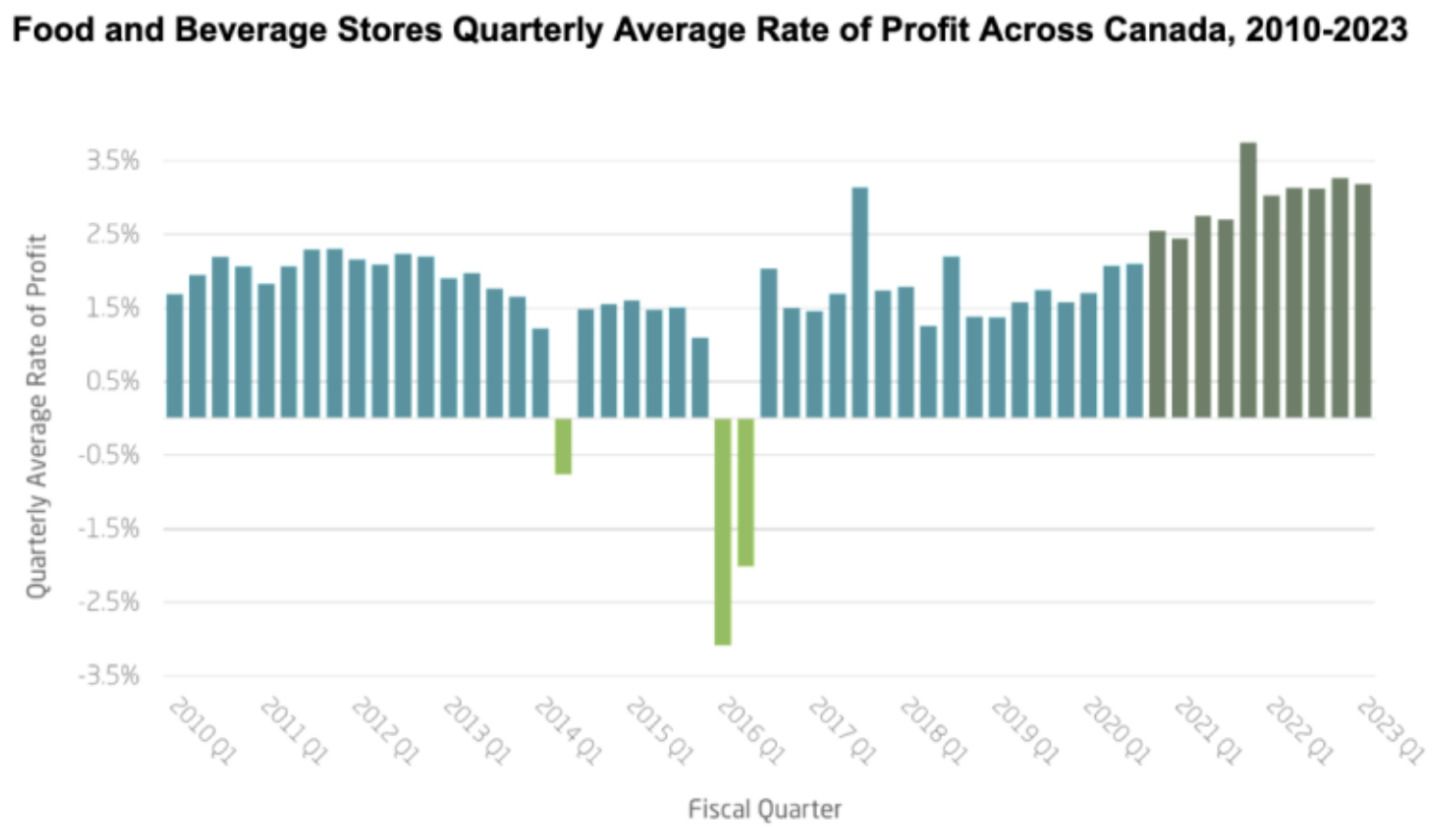
Source

Companies of War, Destruction and Death

These are a few examples:

- Monsanto still uses chemicals that were used to kill people, but in our food
  - Monsanto Ghostwriting Academic Papers
  - Is Round-Up safe to drink?
  - Farmer won lawsuit against Monsanto – Glyphosate causes cancer
  - The World According to Monsanto
  - Monsanto is now owned by Bayer who used to be part of I.G. Farben, manufacturing poisonous gas (Zyklon B) for concentration camps during the World War.
- BASF was also part of IG Farben a company who worked with the Nazis and tested chemicals and drugs on people including Zyklon B
- Dow Chemical Invented Agent Orange
- Dow Chemical now owns Union Carbide who was responsible for a large devastating explosion in Bhopal, India:
  - The Bhopal disaster: Toxic legacy
  - One Night in Bhopal
  - The Bhopal Disaster

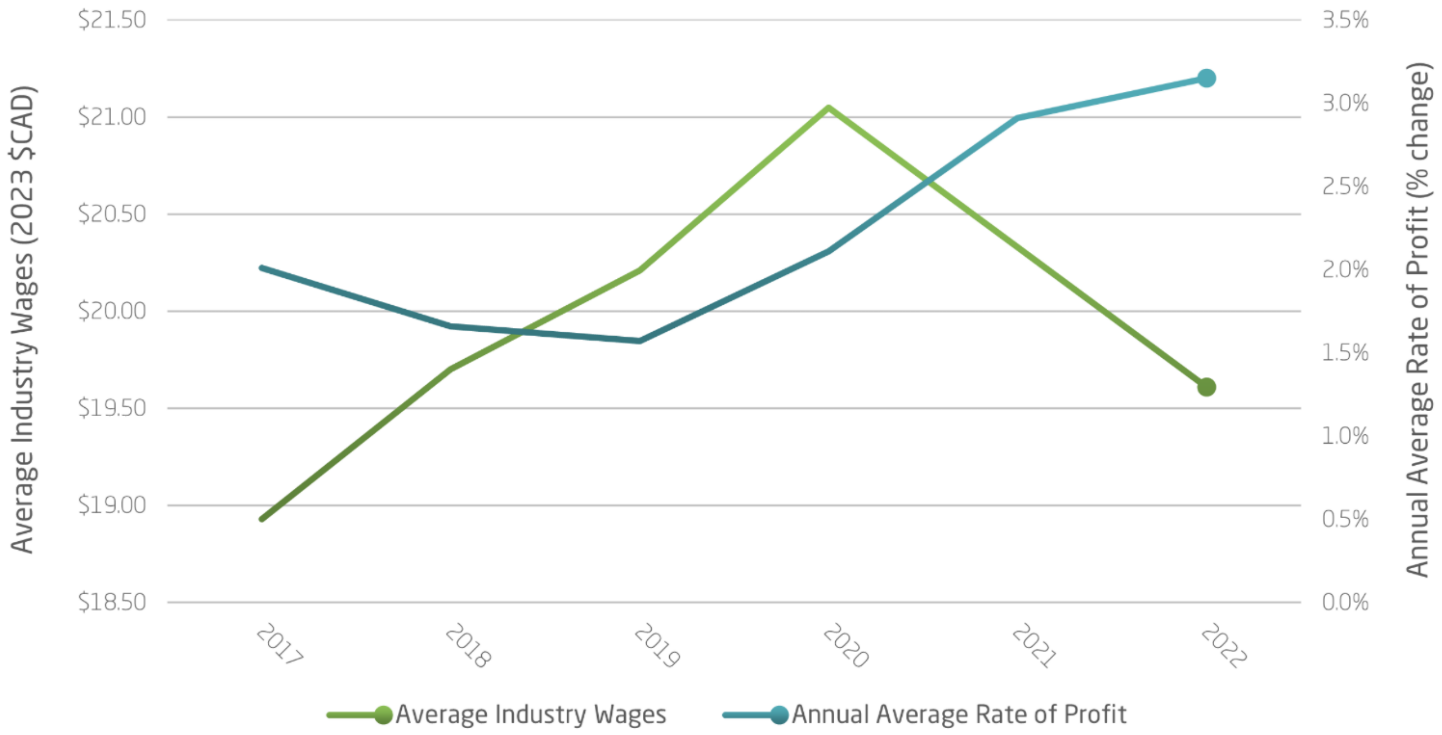
FOOD PRICE INFLATION



Statistics Canada. Table 33-10-0225-01 quarterly balance sheet, income statement and selected financial ratios, by non-financial industries, non seasonally adjusted (x 1,000,000). Chart from *Canadian Grocery Profitability: Inflation, Wages and Financialization*, Broadbent Institute, 2023.

FOOD PRICE INFLATION

Chart 3 – Food and Beverage Stores: Annual Real Wages (2023 $CAD) vs. Annual Rate of Firm Profits Across Canada, 2018-2022



Statistics Canada. Table 14-10-0209-01 Average hourly earnings (including overtime) for salaried employees, by industry, monthly, unadjusted for seasonality; Statistics Canada. Table 18-10-0004-13 Consumer Price Index by product group, monthly, percentage change, not seasonally adjusted, Canada, provinces, Whitehorse, Yellowknife and Iqaluit; Statistics Canada. Table 33-10-0225-01 Quarterly balance sheet, income statement and selected financial ratios, by non-financial industries, non seasonally adjusted (x 1.000.000)

Figure 2.1

Real Average Canadian Hourly Wage in 2015 dollars 1914-2000

CANSIM ii V I603501 ; Urquhart et al "Historical Statistics of Canada"

Sources: Statistics Canada, CANSIM ii V I603501 and Urquhart et al., "Historical Statistics of Canada."

Table 2.1

Hourly Real Wage among Full-Time Workers (2015$)

	Average	10th Percentile	50th	90th	99th	99.9th	$GAP 99.9th -50th
1980	25.73	11.64	23.37	41.50	71.93	150.99	127.61
1985	25.15	10.23	22.97	41.22	71.19	156.2	133.23
1990	25.64	10.16	23.29	42.24	75.69	170.47	147.18
1995	25.21	9.64	22.65	41.69	76.19	190.52	167.87
2000	26.52	9.79	22.97	44.03	91.87	265.53	242.56
2005	28.31	10.31	23.67	46.64	102.64	372.16	348.49
2010	31.00	11.40	26.07	52.06	112.04	340.52	314.45
Compound annual growth rates							
1980-2010	0.62%	-0.07%	0.36%	0.76%	1.48%	2.71%	3.01%
1980-2000	0.15%	-0.87%	-0.09%	0.30%	1.22%	2.82%	3.21%
2000-2010	1.56%	1.52%	1.27%	1.68%	1.98%	2.49%	4.81%

Source: Duclos and Pellerin (2016-Table 3) plus author's calculations

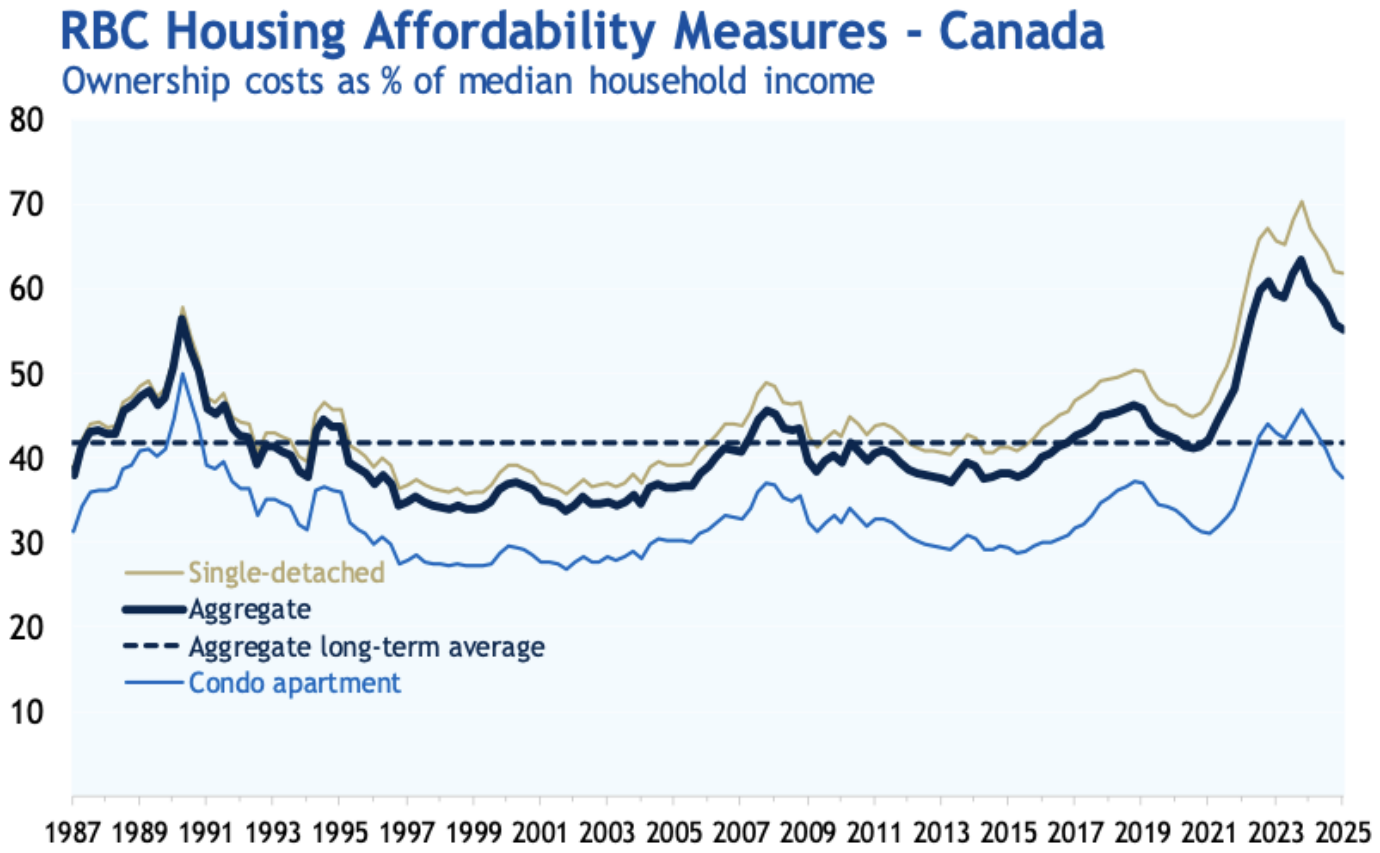
CONNECTING TO THE BIGGER PICTURE

CONNECTING TO THE BIGGER PICTURE

The share of income a household would need to cover ownership costs (%)

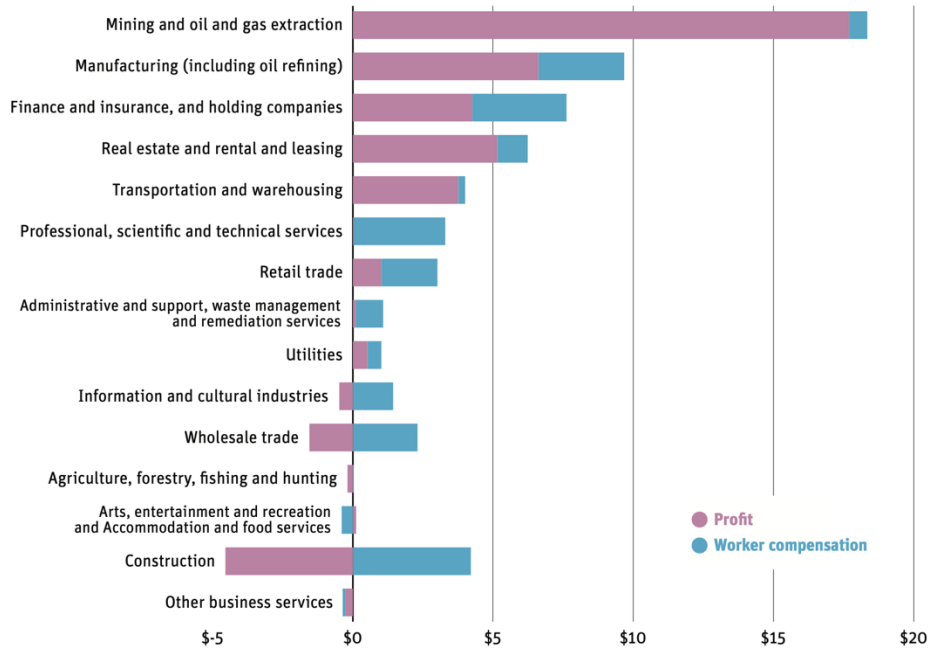
Canada	Vancouver	Calgary	Edmonton	Toronto	Ottawa	Montreal
55.1	92.7	42.3	33.0	68.3	44.3	49.5

Q1 2025



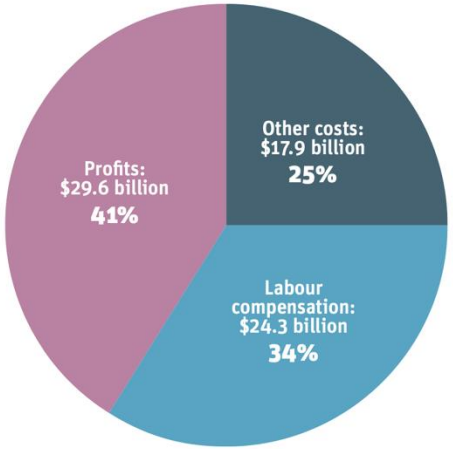
Source

FIGURE 4 Where inflation dollars in third quarter 2022 ended up, by industry and type ($bil, Q3 2020 vs Q3 2022)



Source See Table 2 for Statistics Canada table sources and the methodology section for calculations.

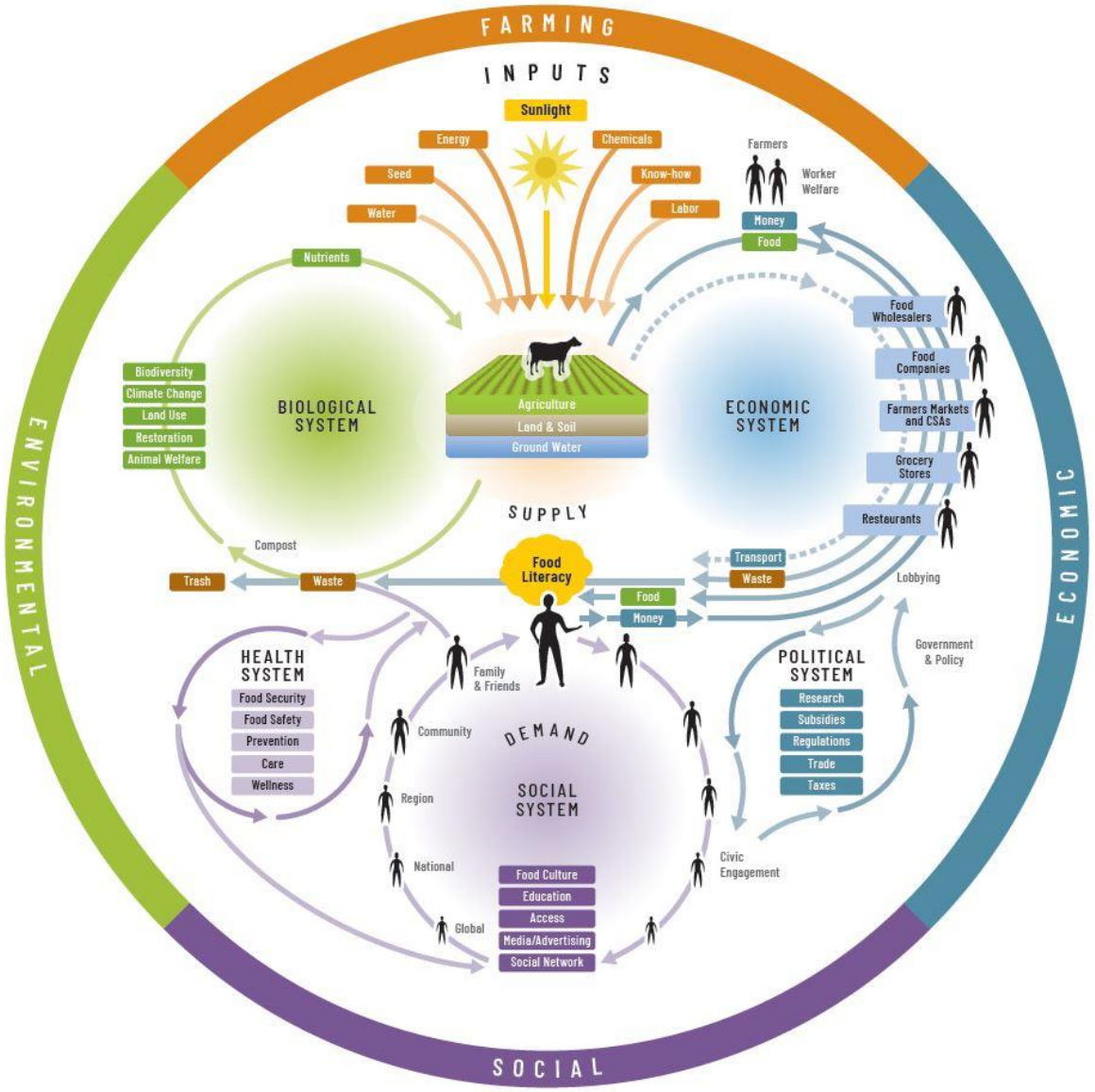
FIGURE 2 Where inflation dollars paid to the corporate sector went ($bil, Q3 2020 vs Q3 2022)

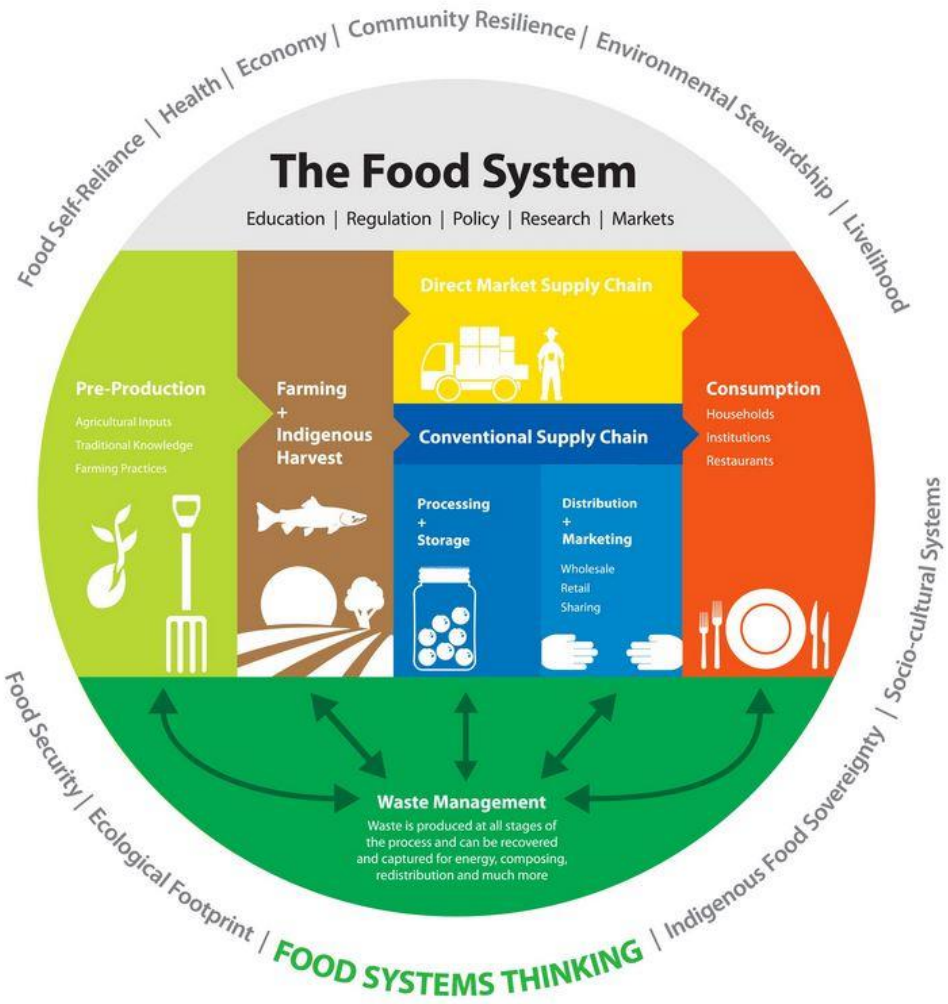


Notes Includes only the business sector. Represents the increase in costs in each category after adjusting for real GDP growth in the business sector through the creation of unit labour costs, unit profits and unit other costs. See the methodology section. Dollar figures represent the cumulative percentage change in prices on a quarterly basis. Time frame goes from the third quarter 2020 through to the third quarter 2022.
Source See Table 2 for Statistics Canada table sources and the methodology section for calculations.

CONNECTING TO THE BIGGER PICTURE

Figure 1. Food System Sectors


FARMING
INPUTS
Sunlight
Energy
Chemicals
Seed
Know-how
Water
Labor
Nutrients
Farmers
Worker Welfare
Money
Food
Biodiversity
Climate Change
Land Use
Restoration
Animal Welfare
BIOLOGICAL SYSTEM
Agriculture
Land & Soil
Ground Water
ECONOMIC SYSTEM
Food Wholesalers
Food Companies
Farmers Markets and CSAs
Grocery Stores
Restaurants
SUPPLY
Compost
Trash
Waste
Food Literacy
Transport
Waste
Food
Money
Lobbying
Government & Policy
HEALTH SYSTEM
Food Security
Food Safety
Prevention
Care
Wellness
Family & Friends
POLITICAL SYSTEM
Research
Subsidies
Regulations
Trade
Taxes
Community
DEMAND
Region
SOCIAL SYSTEM
National
Global
Civic Engagement
Food Culture
Education
Access
Media/Advertising
Social Network
ENVIRONMENTAL
ECONOMIC
SOCIAL


Food Self-Reliance | Health | Economy | Community Resilience | Environmental Stewardship | Livelihood
The Food System
Education | Regulation | Policy | Research | Markets
Pre-Production
Agricultural Inputs
Traditional Knowledge
Farming Practices
Farming
+
Indigenous
Harvest
Direct Market Supply Chain
Conventional Supply Chain
Processing
+
Storage
Distribution
+
Marketing
Wholesale
Retail
Sharing
Consumption
Households
Institutions
Restaurants
Waste Management
Waste is produced at all stages of the process and can be recovered and captured for energy, composing, redistribution and much more
Food Security | Ecological Footprint | FOOD SYSTEMS THINKING | Indigenous Food Sovereignty | Socio-cultural Systems

Discussion

What interventions in the food system could help reduce social, ecological, and economic problems?

Snap-Shot of the Student-Run Food System at Concordia

NOVEMBER 2018

SUPPORT & ADVOCACY

- Sustainable Concordia
- Sustainable Action Fund
- Concordia Student Union
- Graduate Student Association
- Concordia Food Coalition
- Centre for Gender Advocacy
- Q-PIRG Concordia
- Food Autonomy Campaign

PRODUCTION

FOOD

GROWING FOOD ON CAMPUS

- Concordia Greenhouse
- City Farm School
- Campus Potager
- HydroFlora
- People's Potato Garden

GROWING FOOD OFF CAMPUS

- *City Farm School (Green Club) ***
- *Hudson Land Trust Project ***

FORAGING

- Sensorium

KNOWLEDGE

EDUCATIONAL ACTIVITIES

- Concordia Greenhouse
- City Farm School
- Season Jars
- HydroFlora
- Coop les brasseurs illuminés
- le Frigo Vert
- Waste Not, Want Not Compost
- Sprouting Minds
- Cooking at Concordia

CONFERENCES

- Bite Me! Food Week
- Concordia Transitions

PROCESSING

FOOD TRANSFORMATION

- Cooking at Concordia
- People's Potato
- Hive Café Solidarity Coop
- Hive Free Lunch
- Reggies Coop
- Season Jars
- Coop les brasseurs illuminés
- Mother Hubbard's Cupboard
- Food Against Fascism
- *Burritoville **

DISTRIBUTION

CAFÉ / RESTO / CAFETERIA

MARKET BASED

- Hive Café Solidarity Coop
- Reggies Coop
- *Café X **
- *G Lounge **
- *Burritoville **

NON-MARKET BASED

- People's Potato
- Hive Free Lunch
- Hive Café (pay it forward)
- Mother Hubbard's Cupboard
- Food Against Fascism

PRODUCE / GROCERY OUTLETS

MARKET BASED

- Greenhouse (Seedling sale)
- City Farm School Market
- Concordia Farmers' Market
- Campus Potager Pop-Up Market
- le Frigo Vert

NON-MARKET BASED

- Greenhouse (seedling donations)
- People's Potato (food bank)
- Mother Hubbard's (vouchers)
- City Farm School (NDG Food Depot)

WASTE MANAGEMENT

INITIATIVES

EDUCATION / COMPOSTING

- Waste Not, Want Not Compost
- City Farm School
- Concordia Greenhouse
- Vermicycle

REUSABLE DISHES

- R4 Dish Project
- People's Potato
- Hive Free Lunch
- Hive Café Solidarity Coop
- Mother Hubbard's Cupboard
- Concordia Greenhouse
- Food Against Fascism

COMPOSTABLE PACKAGING

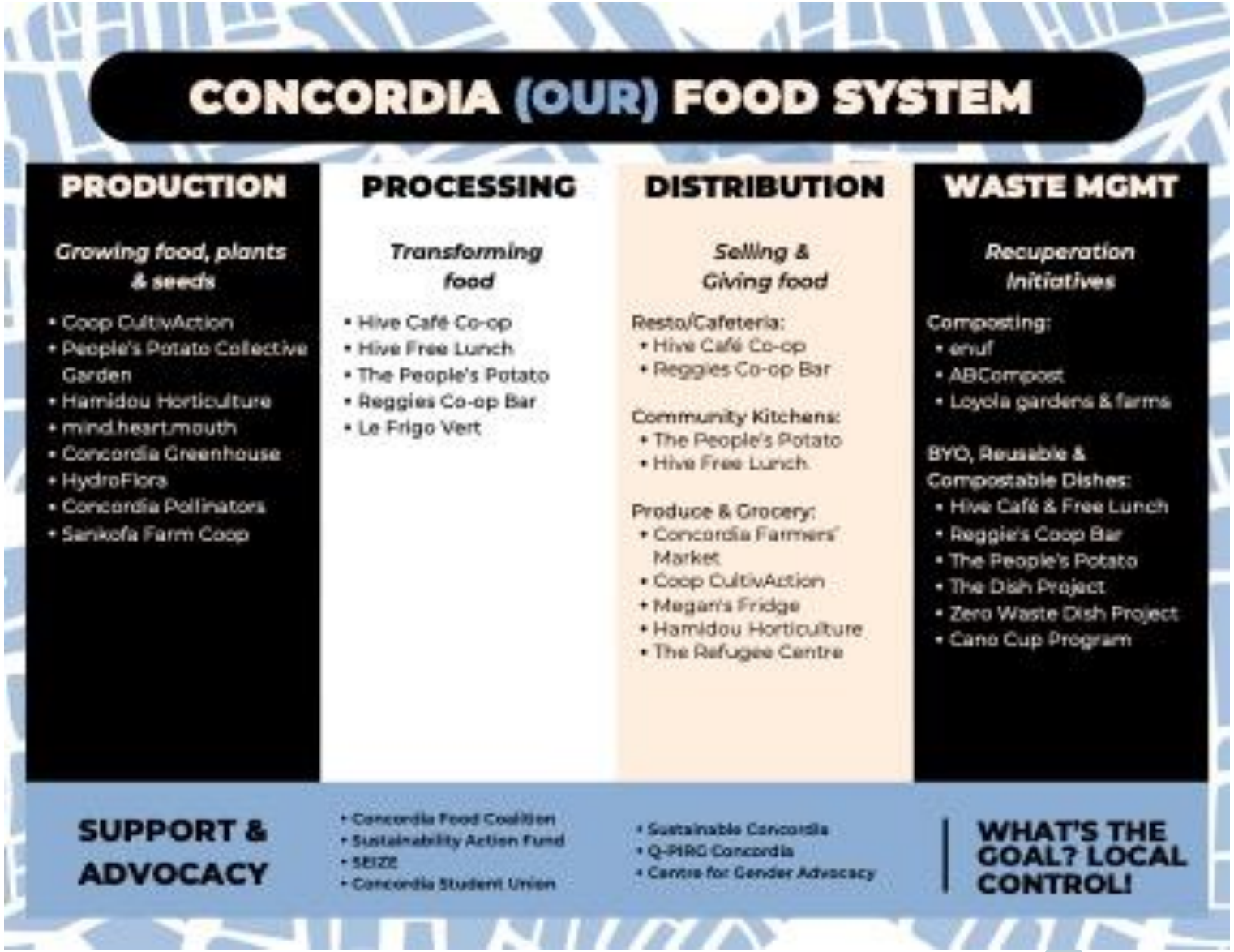
- Hive Café Coop

B.Y.O. DISH INCENTIVES

- People's Potato
- Hive Café Solidarity Coop
- Waste Not, Want Not Compost
- le Frigo Vert
- Food Against Fascism

** No longer in operation*

** * Now independent community project*


CONCORDIA (OUR) FOOD SYSTEM
PRODUCTION
Growing food, plants & seeds
• Coop CultivAction
• People's Potato Collective Garden
• Hamidou Horticulture
• mind.heart.mouth
• Concordia Greenhouse
• HydroFlora
• Concordia Pollinators
• Sankofa Farm Coop
PROCESSING
Transforming food
• Hive Café Co-op
• Hive Free Lunch
• The People's Potato
• Reggies Co-op Bar
• Le Frigo Vert
DISTRIBUTION
Selling & Giving food
Resto/Cafeteria:
• Hive Café Co-op
• Reggies Co-op Bar
Community Kitchens:
• The People's Potato
• Hive Free Lunch
Produce & Grocery:
• Concordia Farmers' Market
• Coop CultivAction
• Megan's Fridge
• Hamidou Horticulture
• The Refugee Centre
WASTE MGMT
Recuperation Initiatives
Composting:
• enuf
• ABCompost
• Loyola gardens & farms
BYO, Reusable & Compostable Dishes:
• Hive Café & Free Lunch
• Reggie's Coop Bar
• The People's Potato
• The Dish Project
• Zero Waste Dish Project
• Cano Cup Program
SUPPORT & ADVOCACY
• Concordia Food Coalition
• Sustainability Action Fund
• SEIZE
• Concordia Student Union
• Sustainable Concordia
• Q-PIRG Concordia
• Centre for Gender Advocacy
WHAT'S THE GOAL? LOCAL CONTROL!

Take back the Economy

Gibson-Graham, J.K., Cameron, J., Healy, S. (2013) Take Back the Economy: An Ethical Guide for Transforming Communities, University of Minnesota Press

LABOR	TRANSACTIONS	PROPERTY	ENTERPRISE	FINANCE
Wage	Market	Private	Capitalist	Mainstream Markets
ALTERNATIVE PAID Self-employed Reciprocal labor In-kind Work for welfare	ALTERNATIVE MARKET Fair trade Alternative currencies Underground market Barter	ALTERNATIVE PRIVATE State-managed assets Customary (clan) land Community land trusts Indigenous knowledge (Intellectual Property)	ALTERNATIVE CAPITALIST State owned Environmentally responsible Socially responsible Non-profit	ALTERNATIVE MARKET Cooperative Banks Credit unions Community-based financial institutions Micro-finance
UNPAID Housework Volunteer Self-provisioning Slave labor	NON-MARKET Household sharing Gift giving Hunting, fishing, gathering Theft, piracy, poaching	OPEN ACCESS Atmosphere International Waters Open source IP Outer Space	NON-CAPITALIST Worker cooperatives Sole proprietorships Community enterprise Feudal Slave	NON-MARKET Sweat equity Family lending Donations Interest-free loans

Mapping Community Food Systems				
PRODUCTION	PROCESSING	DISTRIBUTION	WASTE MANAGEMENT	SUPPORT
Food	Cook	Market	Compost - Soil Building	Funding
Tools	Prepare	Redistribution	Water saving - Irrigation	Space
Knowledge	Ferment	Reciprocity	Seed Saving - Seed Sewing	Labour
Social Capital	Preserve	Self/community provisioning	Re-purpose food	
	Transform			
	Freeze/store			
	Dehydrate			
	Can			

Ecological Cycles

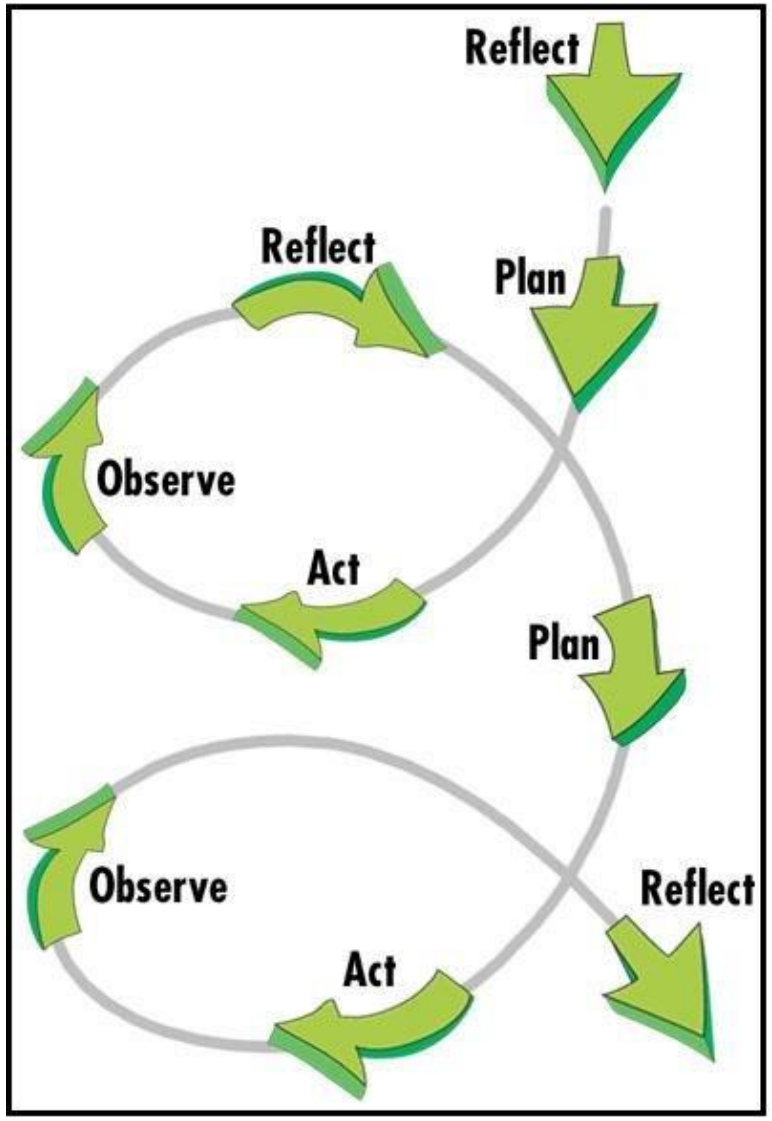
- Seasons & Planting Calendar
  - Planting Calendar – For Montreal (Great Resource)
  - Planting Chart – West Coast Seeds
- Seed saving/sewing
- Building soil/nutrient replenishing
- Running water
- Harvesting/culling
- Succession planting
- Attracting pollinators/beneficial insects
- Crop rotations
- Balance and biodiversity

What other cycles can you think of?

Polycultures

How to create polycultures (Hemenway)

- 1 – Seed several varieties of each species
- 2 – Don’t sew seeds too thickly
- 3 – Begin harvest early
- 4 – Mix plant families, not just species
- 5 – Include many seeds of fast-growing, shallow-rooted species
- 6 – Overlap harvests
- 7 – Avoid root and light competition
- 8 – Harvest whole plants
- 9 – Save a few plants for seed
- 10 – Examine your polyculture every day



Designing an Ecological Garden

- Observation
- Visioning
- Planning
  - Conceptual design
  - Schematic design
- Development
- Implementation

What do the following terms (phrases) mean?

1 - Diverse economies
2 - Ecological economics
3 - Strong (transformative) sustainability
4 - Triple Bottom Line Sustainability (weak sustainability)
5 – Agroecology
6 – Permaculture
7 - Perennial plants
8 - Plant hardiness zones
9 – Mycelium
10 - Food system (what are the components)
11 - Food security
12 - Food sovereignty
13 - Food justice
14 - GMO vs Seed breeding
15 - N-P-K
16 - Planting successions
17 - SPIN Farming
18 – Biodiversity
19 - Food regimes
20 - Root causes of global food issues

Thanks!

Questions, Concerns, Comments?