Canadian Animal Agriculture in a World in Disarray

CAPI
THE CANADIAN AGRI-FOOD POLICY INSTITUTE

Canada's agriculture and agri-food policy think tank & think network

Al Mussell
Research Director

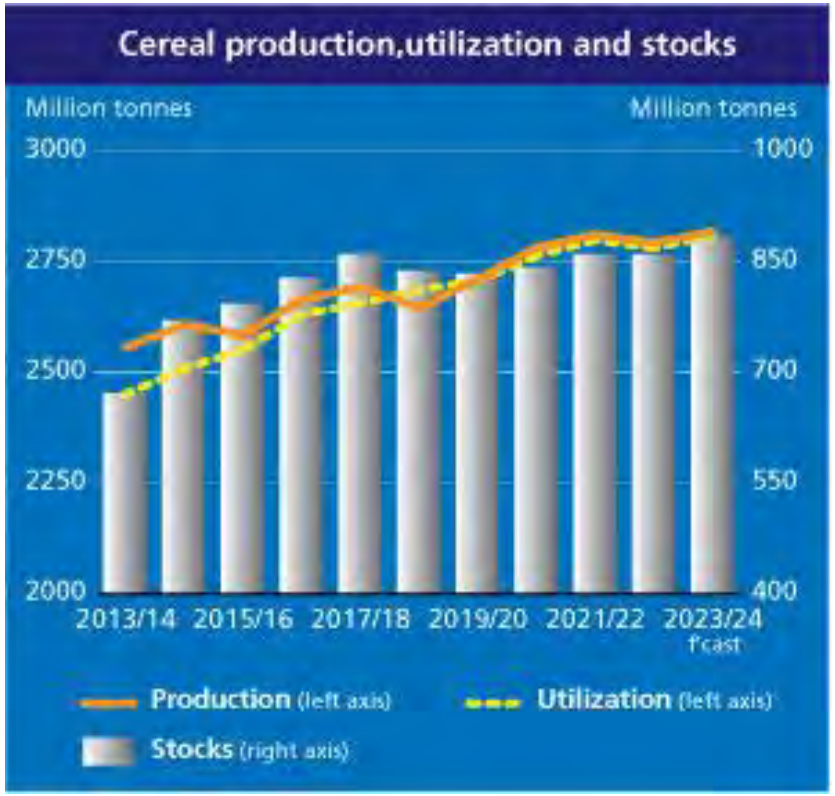
Food in a World Experiencing Dissarray

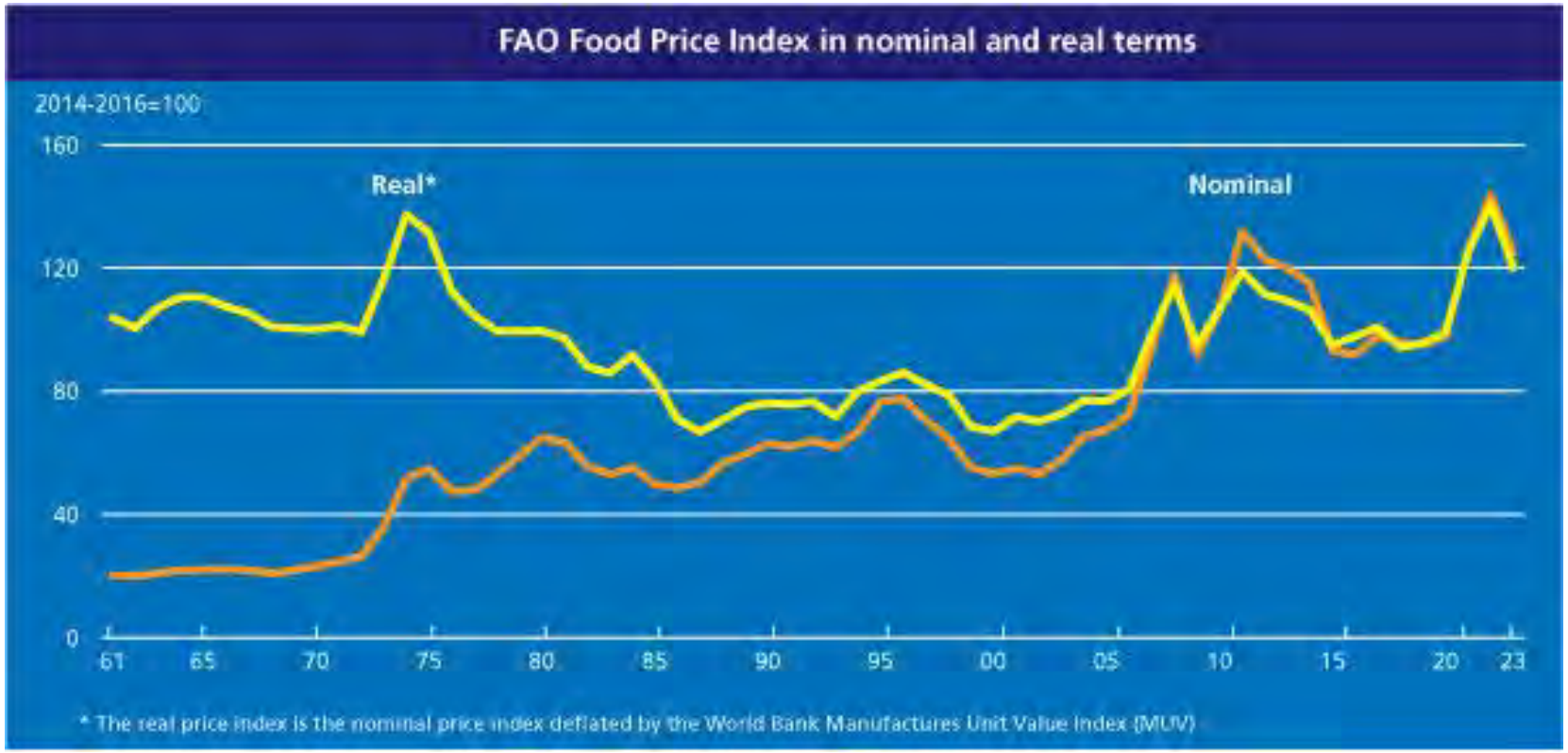
Global situation framing food security

A White Paper on Animal Agriculture in Canada

What are the needs of animal industries from agricultural policy?

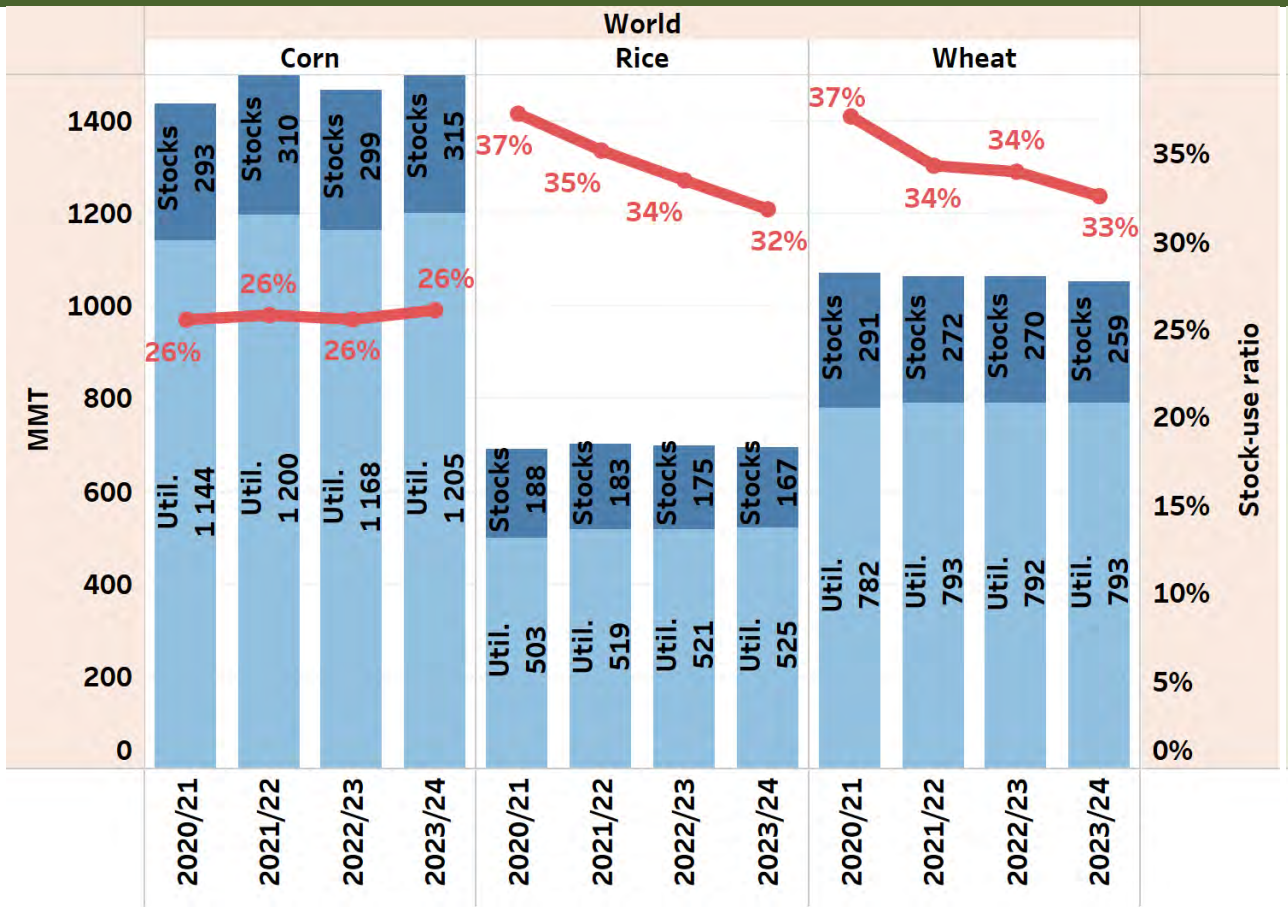
Global situation- Cereals and Food prices

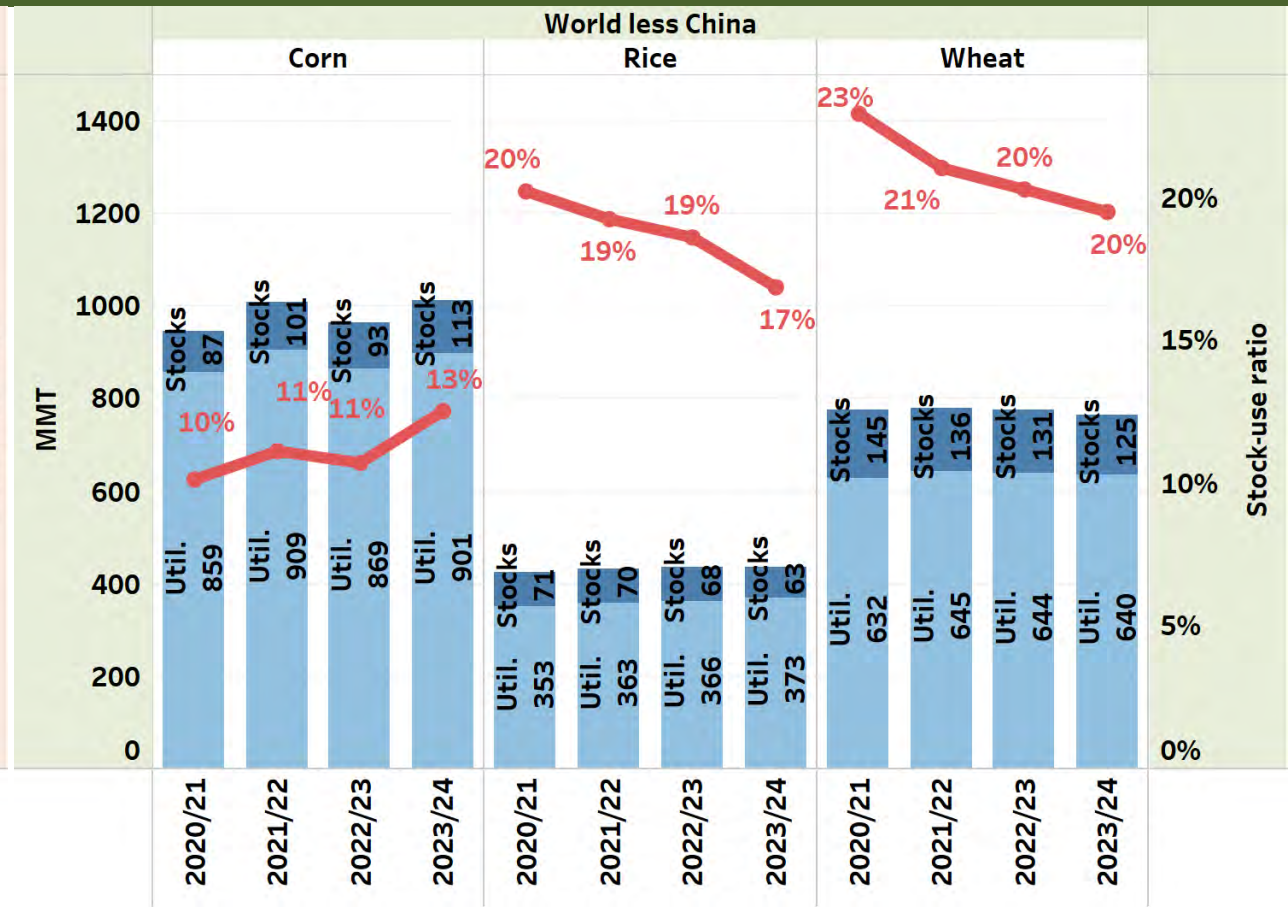




Source: UN-FAO

Global Grain Stocks and Utilization

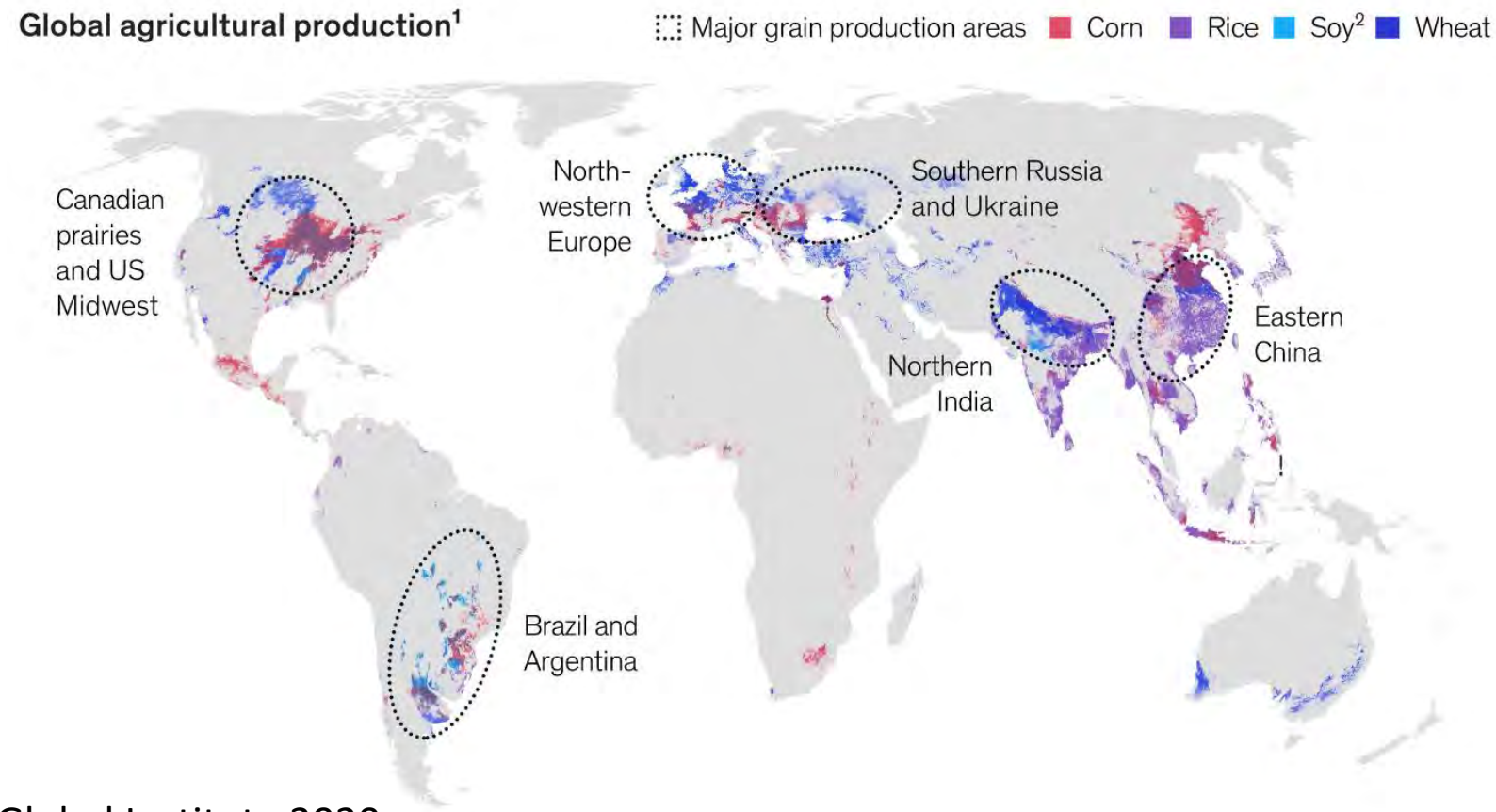




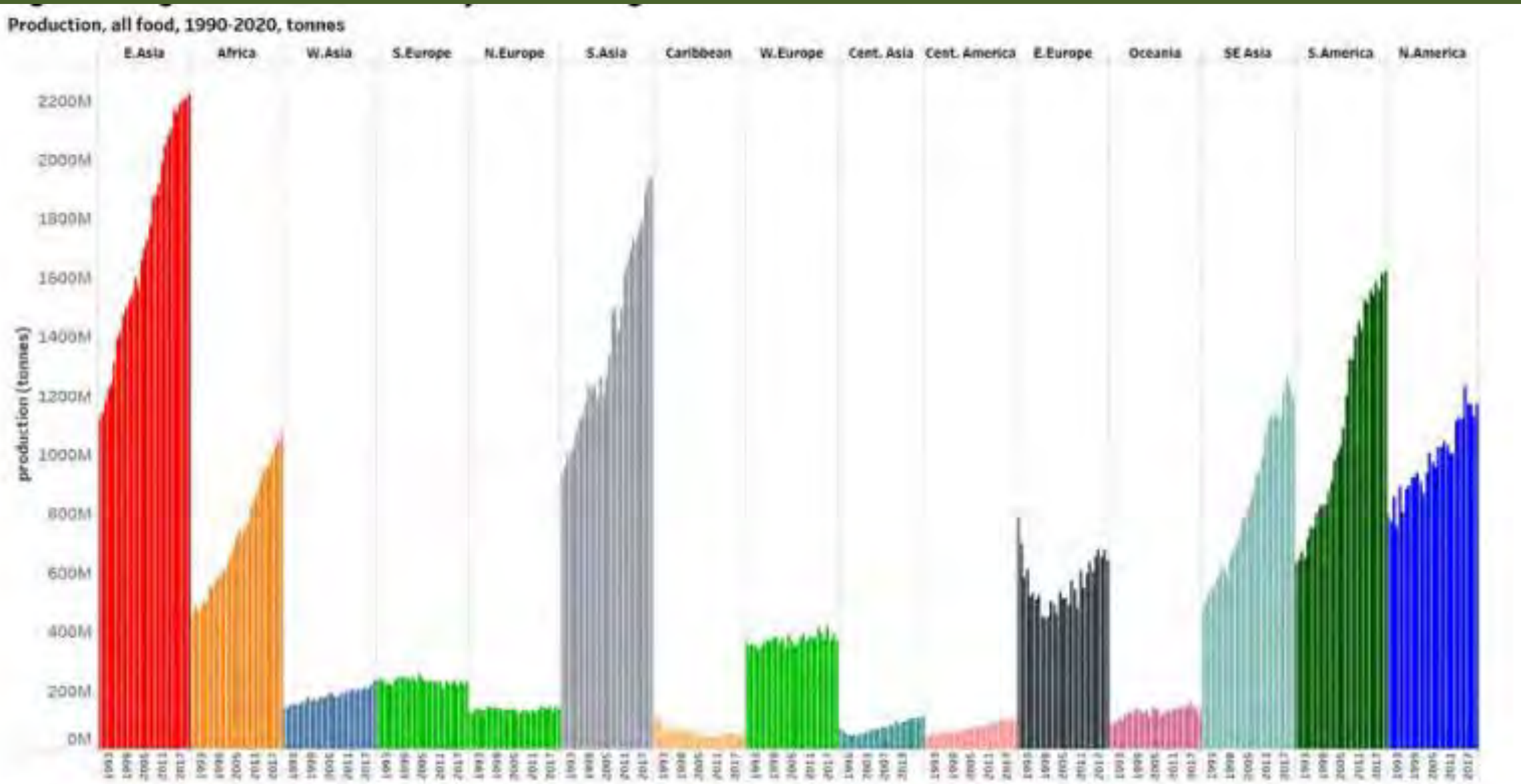
Source: USDA-WASDE updated to Nov 2023

Where is Agricultural Capacity?

Production of the world's major grains is highly concentrated in a few growing regions.

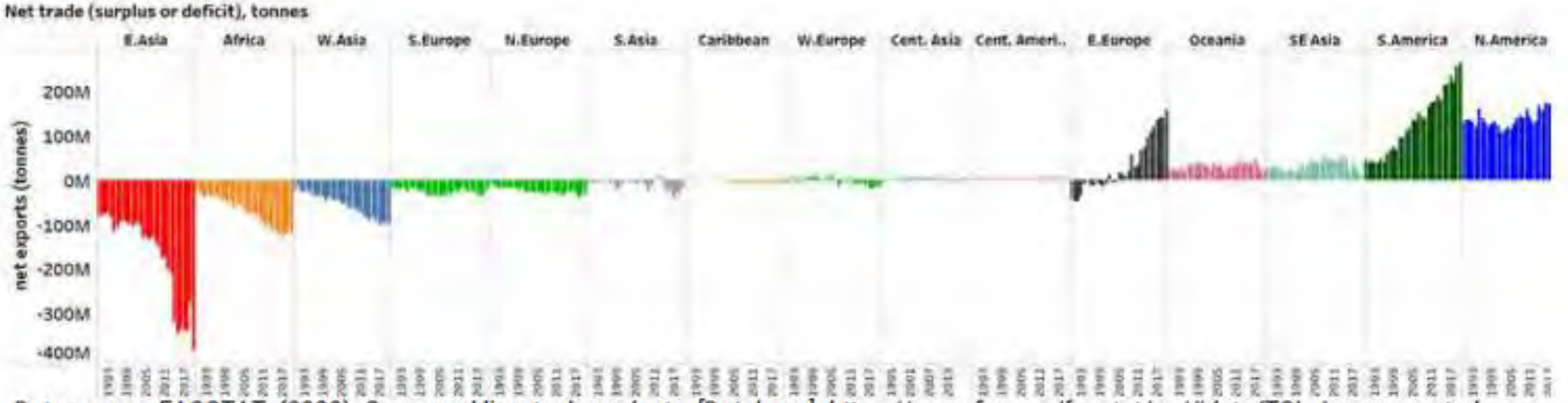


Source: McKinsey Global Institute 2020



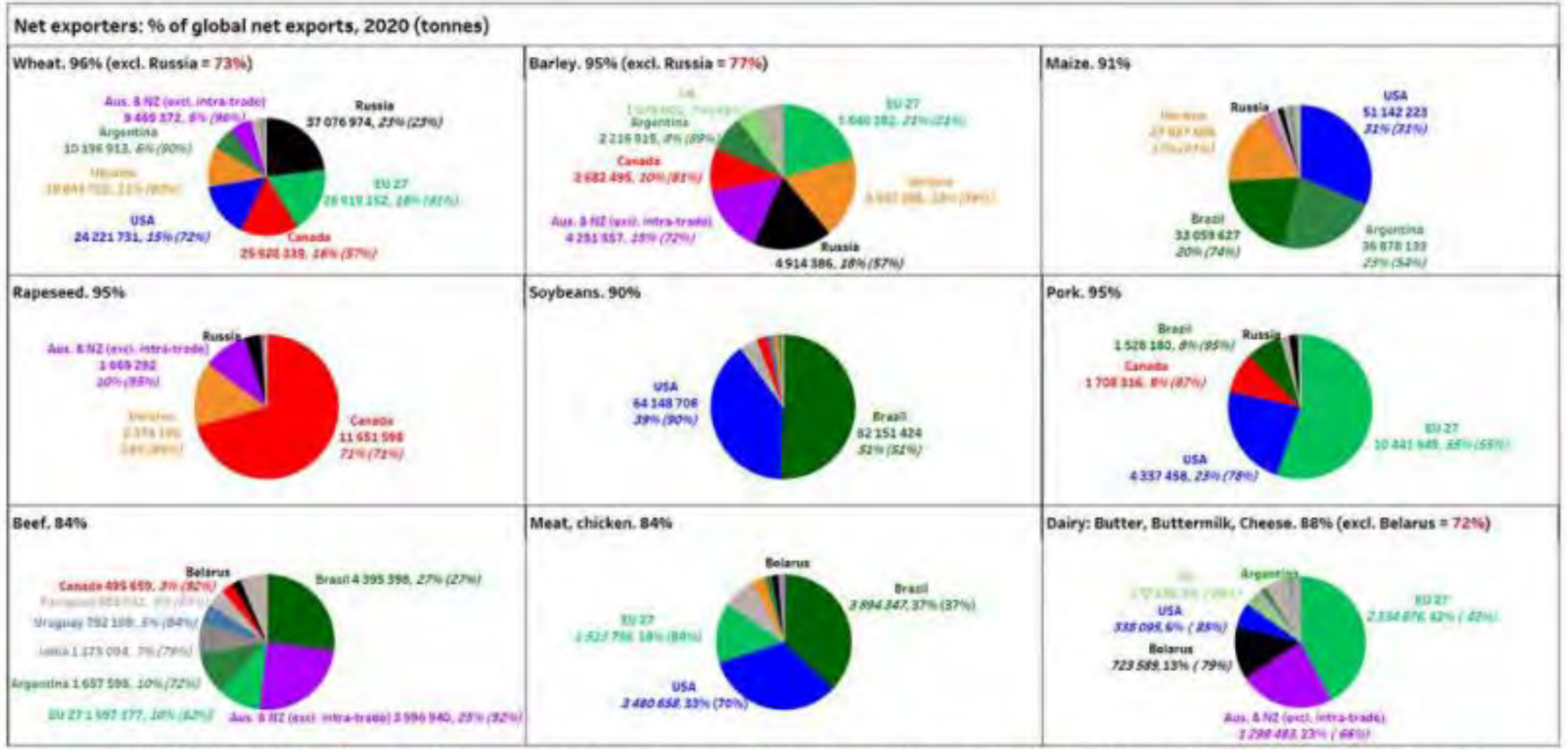
Data source: FAOSTAT. (2020). Crops and livestock products. [Database]. https://www.fao.org/faostat/en/#data/TCL. Image created internally.

Understanding Trade Surpluses



Data source: FAOSTAT. (2020). Crops and livestock products. [Database]. https://www.fao.org/faostat/en/#data/TCL. Image created internally.

Where is Export Capacity?



Data source: FAOSTAT. (2020). Crops and livestock products. [Database]. https://www.fao.org/faostat/en/#data/TCL. Image created internally.

Devolving Trade Policy Space

2017: US withdrawal from TPP; tougher US approach on trade

2018-19: China retaliation vs. US; China-Canada tensions

Spring/summer 2018: US Sec 232 + 301 tariffs

2018 onward- US *ad hoc* support; alternative markets for displaced ag product- biofuel push

2018 USMCA/CUSMA;

Not quite trade agreements:

- US-Japan (2019)
- US-China (2020)
- EU-China (2021)

Paralysis of WTO Appeals panel

Brexit, Pandemic trade constraints

Limited July 2022 WTO Ministerial agreement

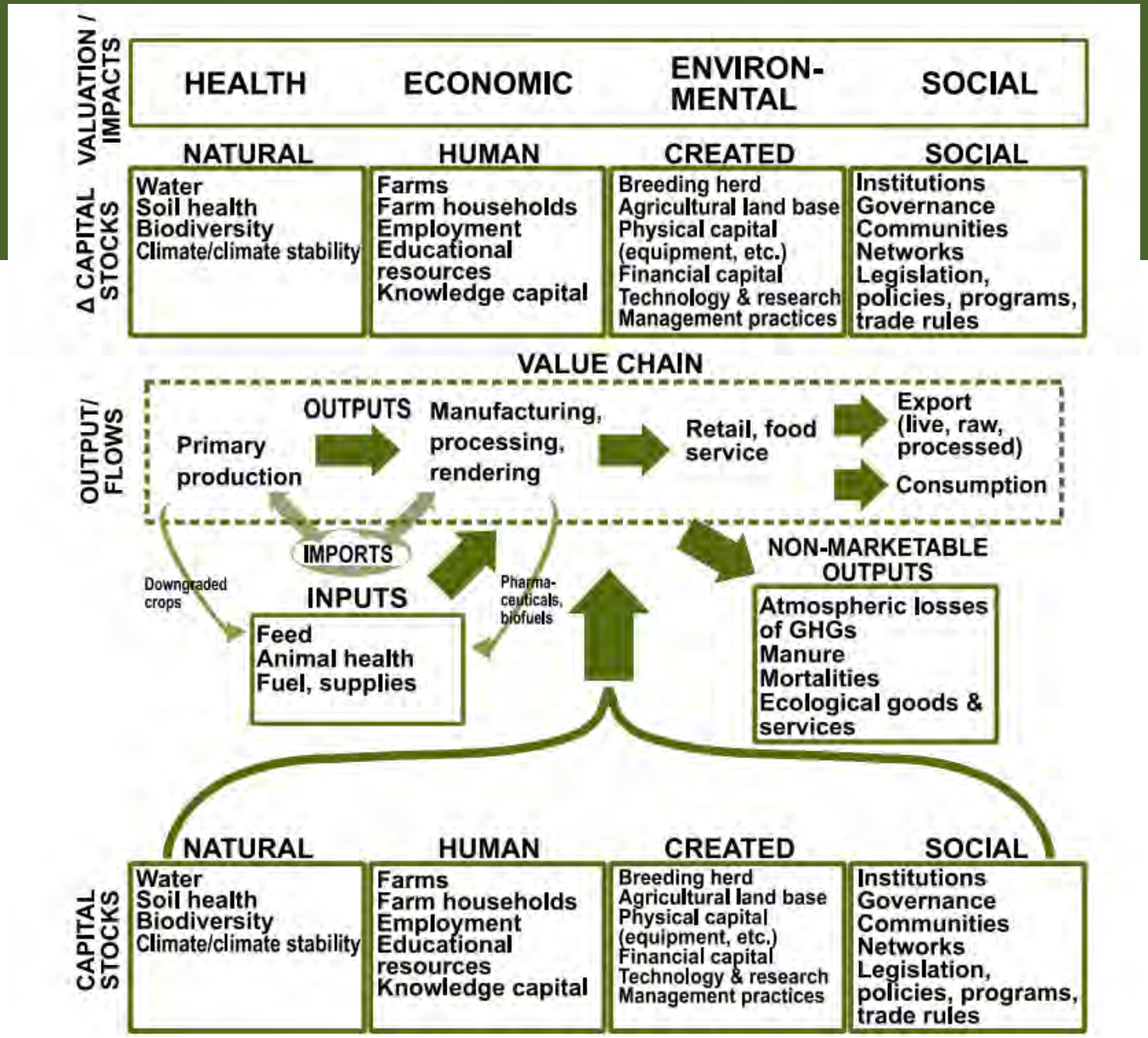
"The post-1945 international economic order was built on the idea that interdependence among nations through increased trade and economic ties would foster peace and shared prosperity. For most of the past 75 years, this idea guided policymakers, and helped lay the foundation for an unprecedented era of growth, higher living standards and poverty reduction. Today this vision is under threat, as is the future of an open and predictable global economy"

Ngozi Okonjo-Iweala
WTO World Trade Report, 2023

"There is going to be increasing emphasis on trading and doing business only with countries that respect international law. We cannot be working with countries that do not respect international law."

Tiff Macklem, *Financial Post*
April 22, 2022


CAPI
THE CANADIAN AGRI-FOOD POLICY INSTITUTE
November 2023
Forces Impacting Animal Agriculture in Canada: A Synthesis
Prepared for CAPI by
Al Mussell, Angèle Poirier, and Margaret Zafiriou
Research Report


VALUATION / IMPACTS
HEALTH
ECONOMIC
ENVIRON-MENTAL
SOCIAL
Δ CAPITAL STOCKS
NATURAL
Water
Soil health
Biodiversity
Climate/climate stability
HUMAN
Farms
Farm households
Employment
Educational resources
Knowledge capital
CREATED
Breeding herd
Agricultural land base
Physical capital (equipment, etc.)
Financial capital
Technology & research
Management practices
SOCIAL
Institutions
Governance
Communities
Networks
Legislation, policies, programs, trade rules
VALUE CHAIN
OUTPUT/ FLOWS
Primary production
OUTPUTS
Manufacturing, processing, rendering
Retail, food service
Export (live, raw, processed)
Consumption
IMPORTS
Downgraded crops
INPUTS
Pharma-ceuticals, biofuels
Feed
Animal health
Fuel, supplies
NON-MARKETABLE OUTPUTS
Atmospheric losses of GHGs
Manure
Mortalities
Ecological goods & services
CAPITAL STOCKS
NATURAL
Water
Soil health
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Climate/climate stability
HUMAN
Farms
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Technology & research
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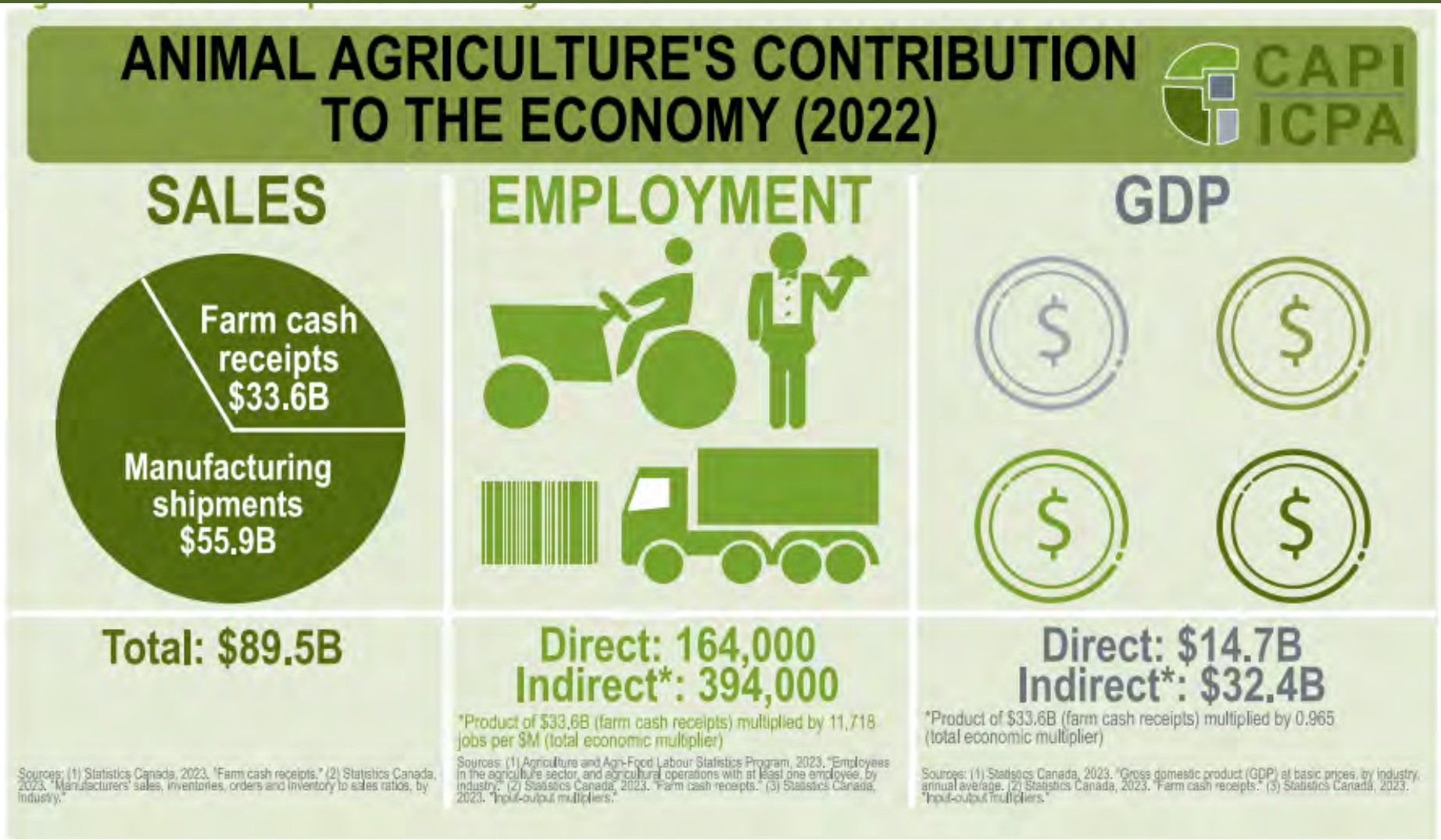
SOCIAL
Institutions
Governance
Communities
Networks
Legislation, policies, programs, trade rules

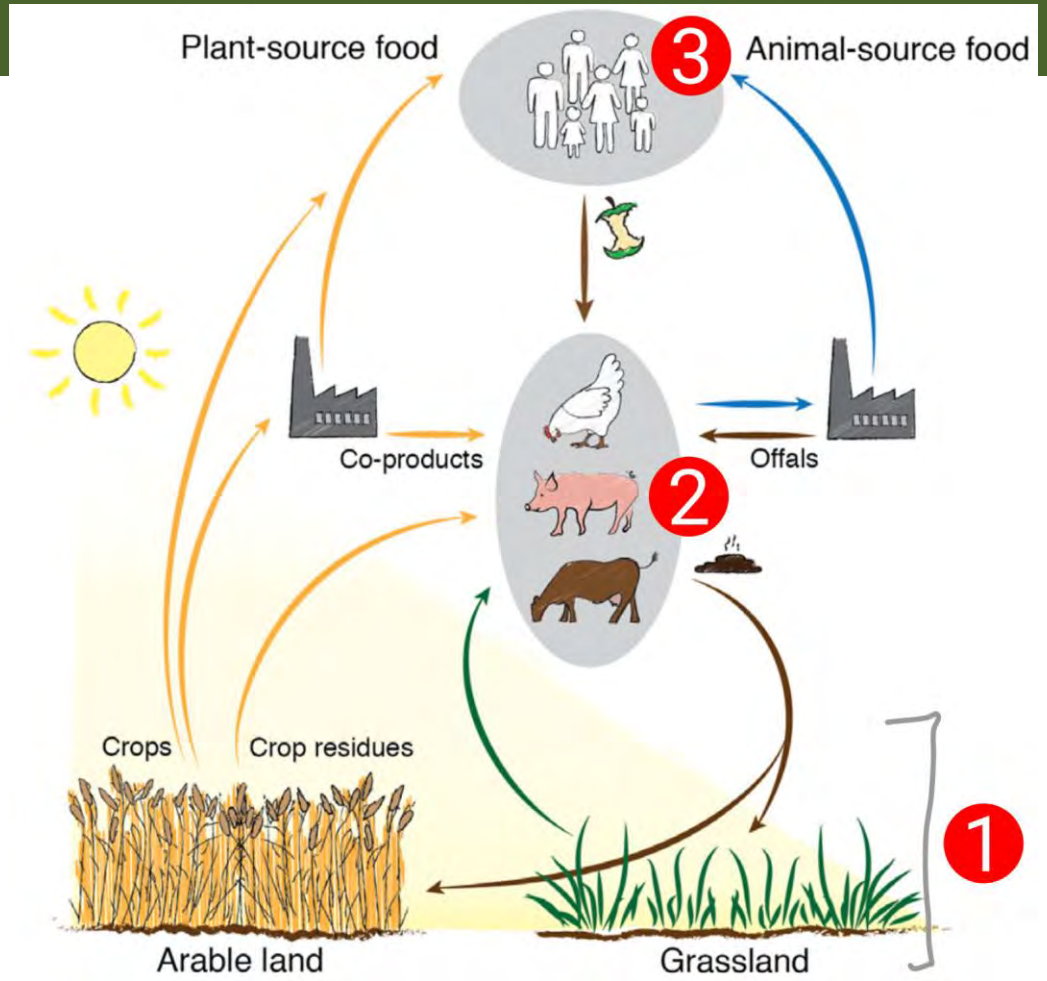
Observations from the framework and analysis

1. Animal agriculture is very important in Canada
2. Canada has a comparative advantage in livestock
3. Animal foods are healthy and important
4. We have made impressive improvements in productivity, but
5. We face some sobering challenges
6. Trends in global demand and Canadian capacity are out of synch
7. Canada is a low-intensity GHG producer

Animal Agriculture is Important in Canada

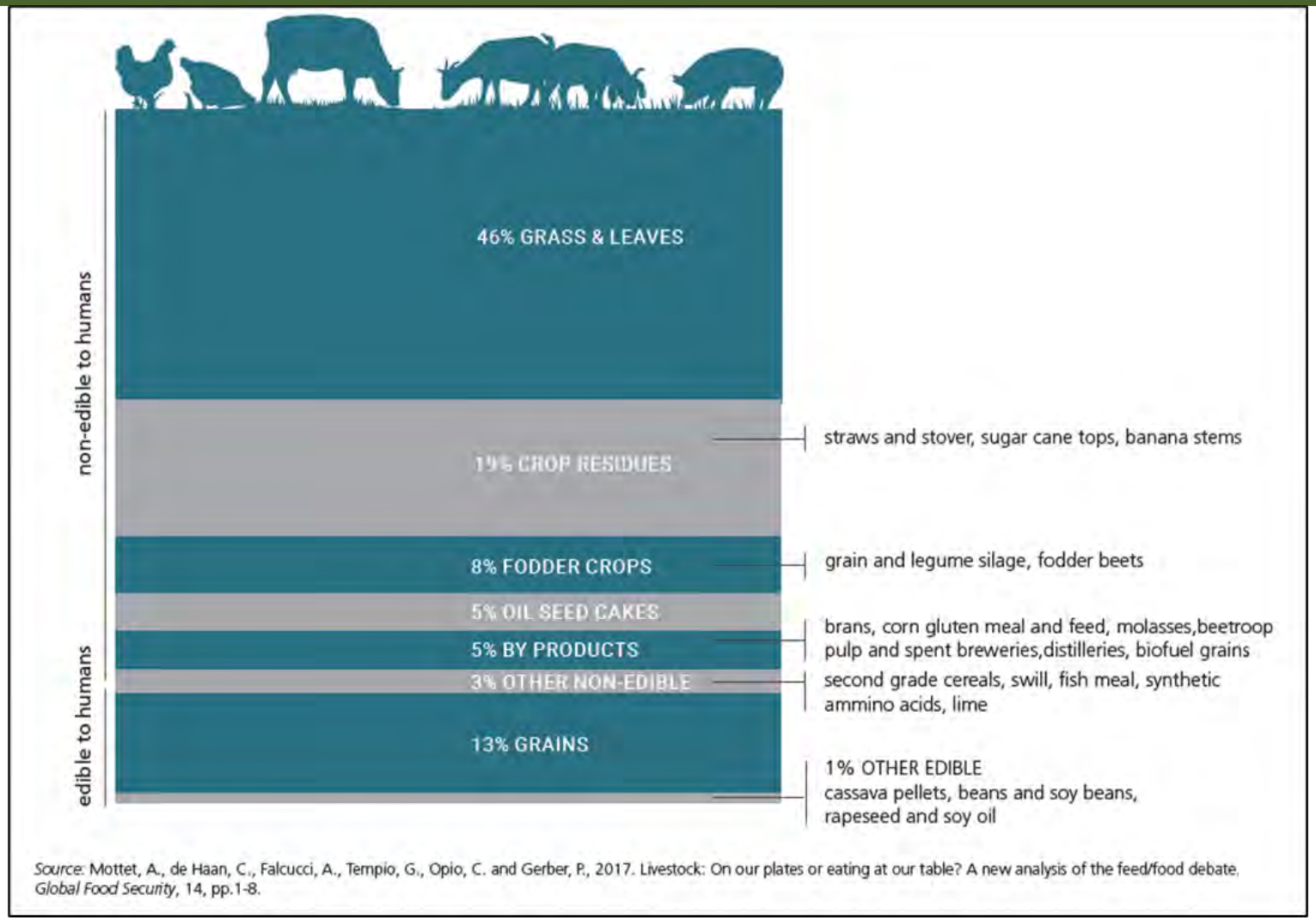


Animal agriculture upcycles material across trophic levels



Source: Van Zanten, H. H. E., Herrero, M., Van Hal, O., Röös, E., Muller, A., Garnett, T., Gerber, P. J., Schader, C., & De Boer, I. J. M. (2018). Defining a land boundary for sustainable livestock consumption. Global Change Biology, 24(9), 4185–4194.

Much of livestock diets derive from inedible materials

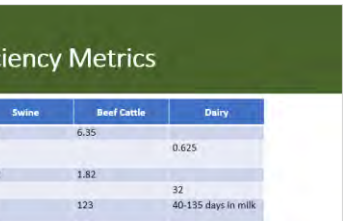


Source: Mottet, A., de Haan, C., Falcucci, A., Tempio, G., Opio, C. and Gerber, P., 2017. Livestock: On our plates or eating at our table? A new analysis of the feed/food debate. *Global Food Security*, 14, pp.1-8.

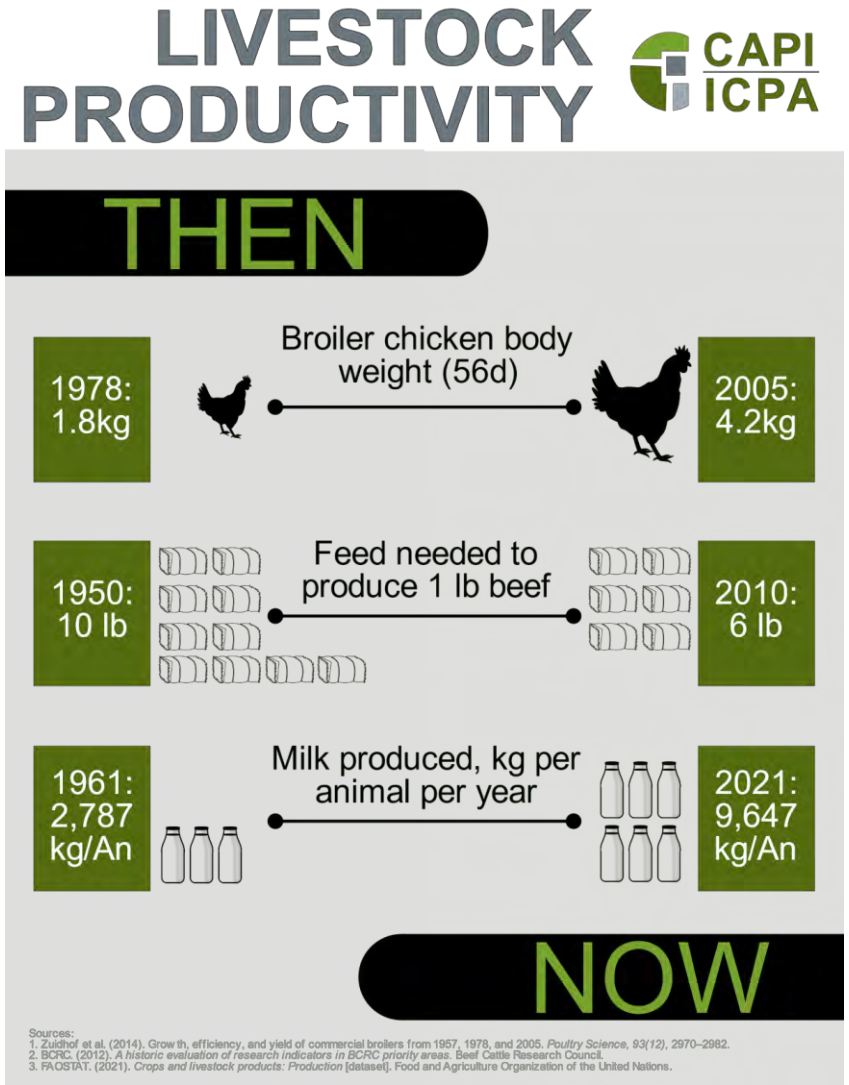
Feed Efficiency Metrics

	Broiler Chicken	Swine	Beef Cattle	Dairy
Kg DMI/kg gain	1.918	2.5	6.35	
Kg DMI/FPCM kg				0.625
ADG kg/day	0.07425	1.02	1.82	
FPCM kg/day				32
Feeding Period days	56	82	123	40-135 days in milk
Start Weight (kg)	0.044	31.0	418	
End Weight (kg)	4.202	115.0	644	
Source	(M. J. Zuidhof et al., 2014)	(Patience et al., 2015)	Data compiled from >200 studies, 2011-16 by Feedlot Health Mgmt. Inc.	Seymour et al., 2020

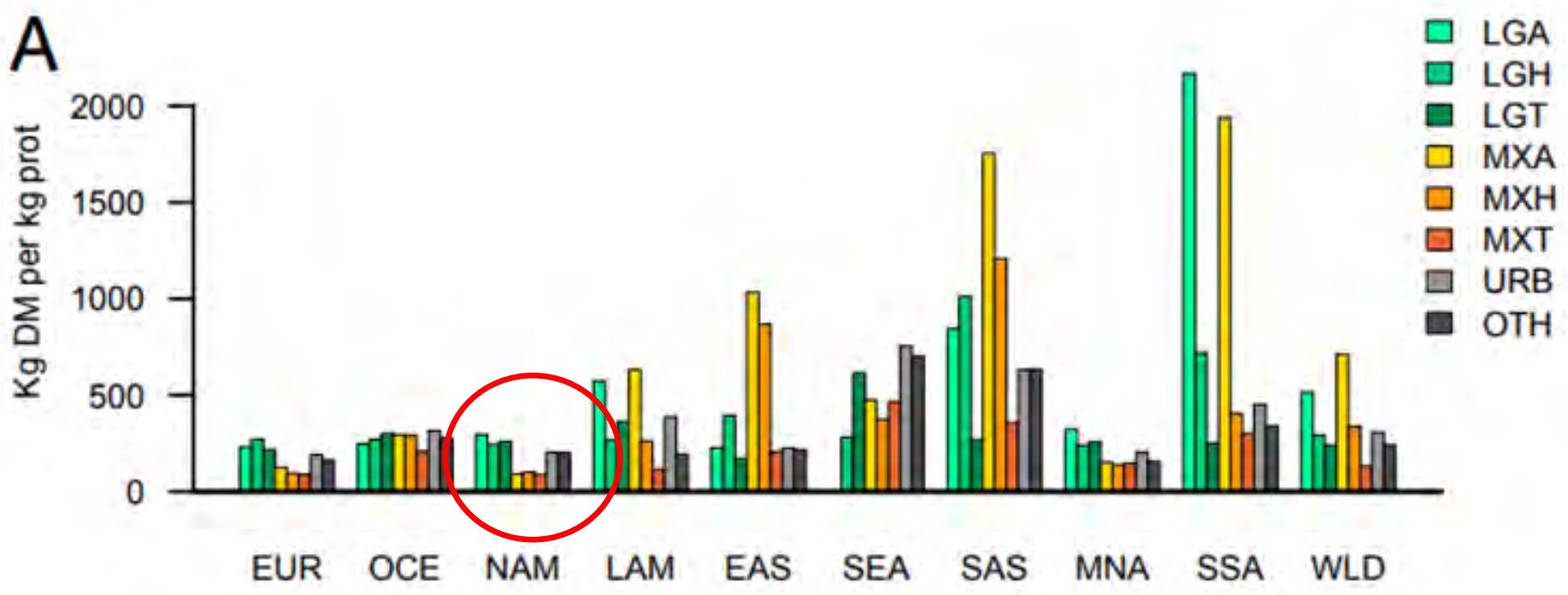
DMI: dry matter intake. FPCM: fat- and protein-corrected milk. ADG: average daily gain.



Impressive improvements in productivity/ animal performance



Comparative Feed Efficiency in Beef and Dairy by Region and Production System

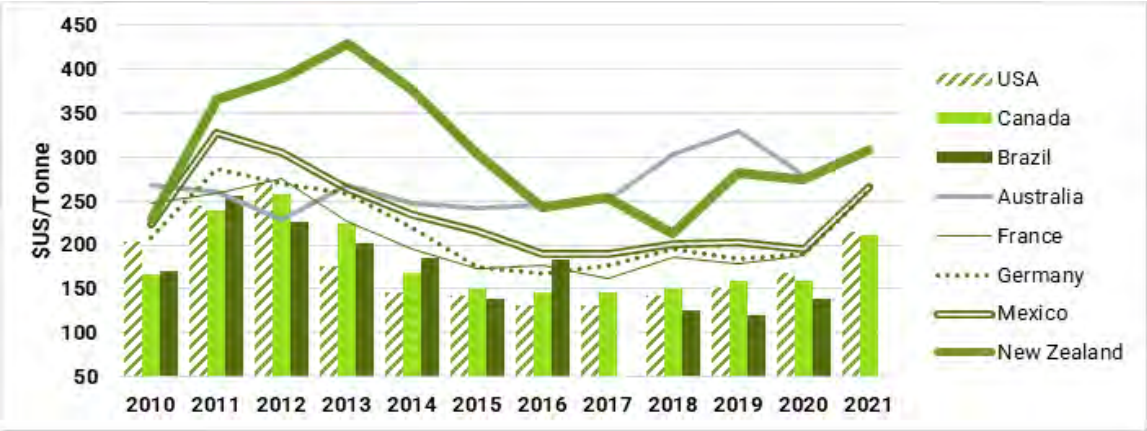


LGA: livestock grazing arid
LGH: livestock grazing humid
LGT: livestock grazing temperate
MXA: mixed arid
MXH: mixed humid
MXT: mixed temperate
URB: urban systems
OTHER: other systems

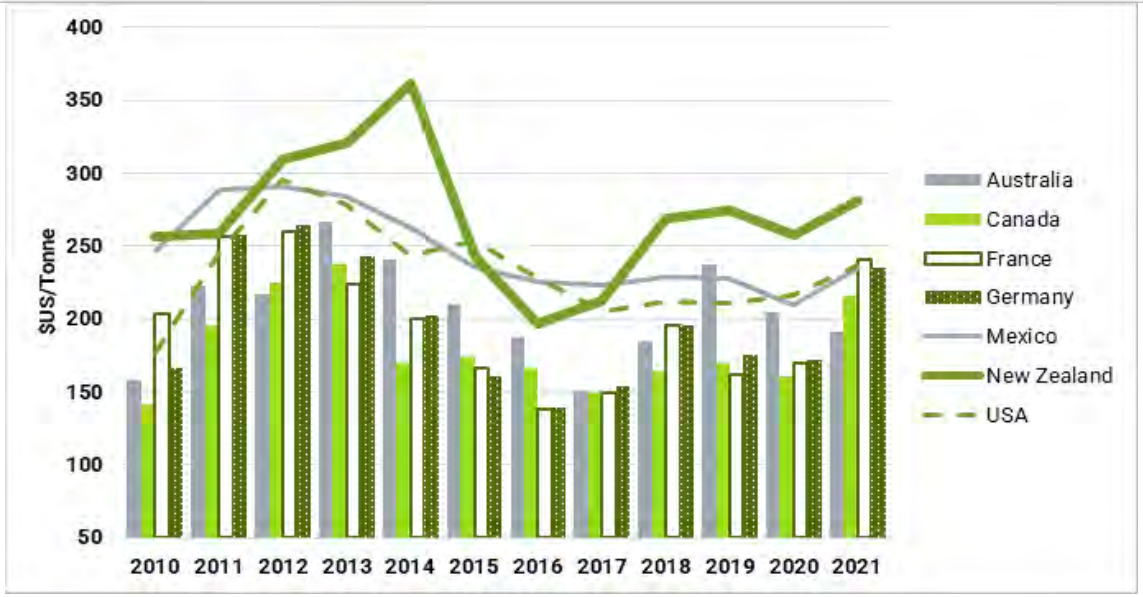
Production regions: Europe and Russia (EUR), Oceania (OCE), and North America (NAM), and the developing regions of Southeast Asia (SEA), Eastern Asia (EAS), South Asia (SAS), Latin America and the Caribbean (LAM), sub-Saharan Africa (SSA), and the Middle East-North Africa (MNA).
Source: Herrero et al., 2013.

Canada has comparatively low priced feed grains

Corn



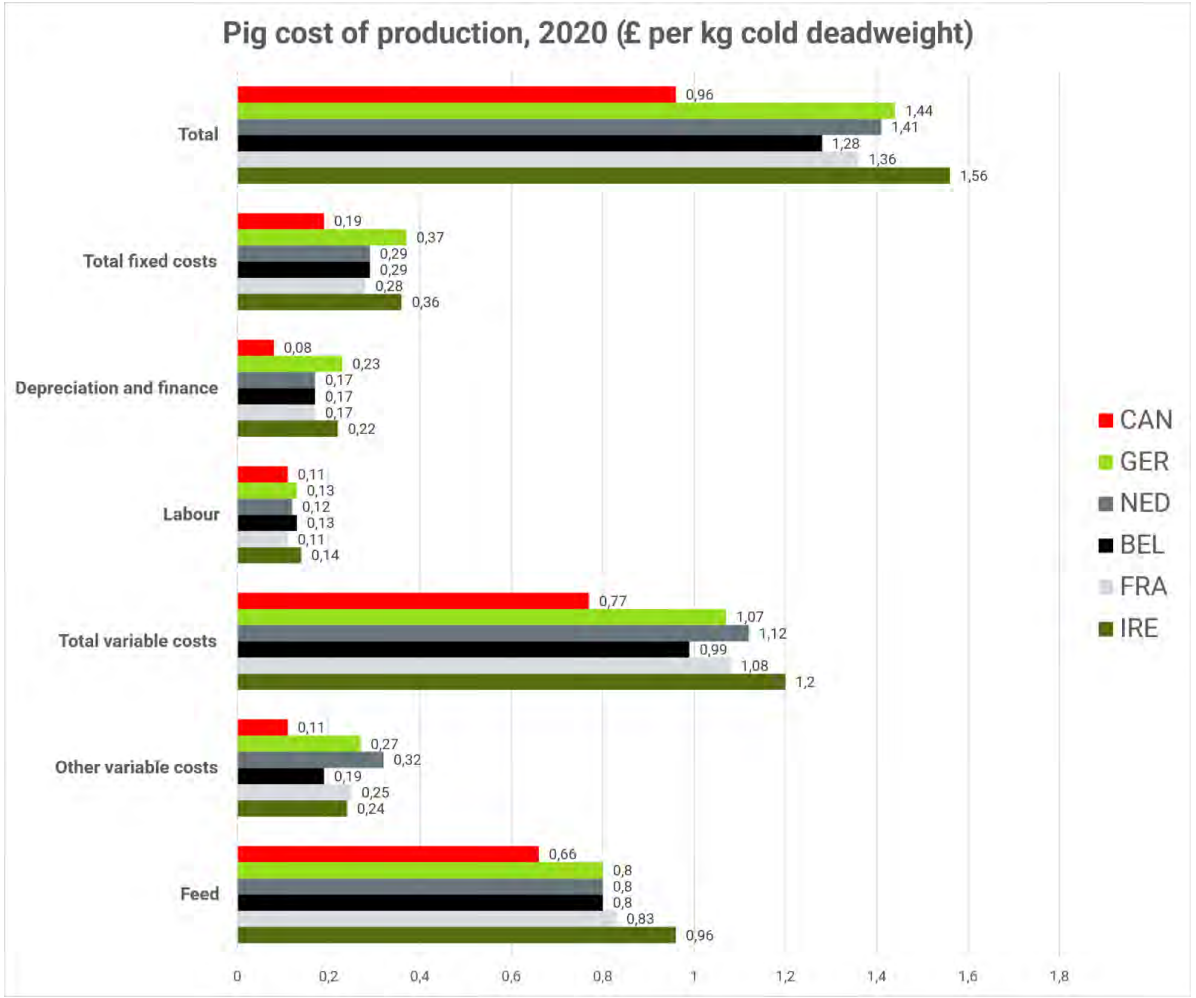
Barley



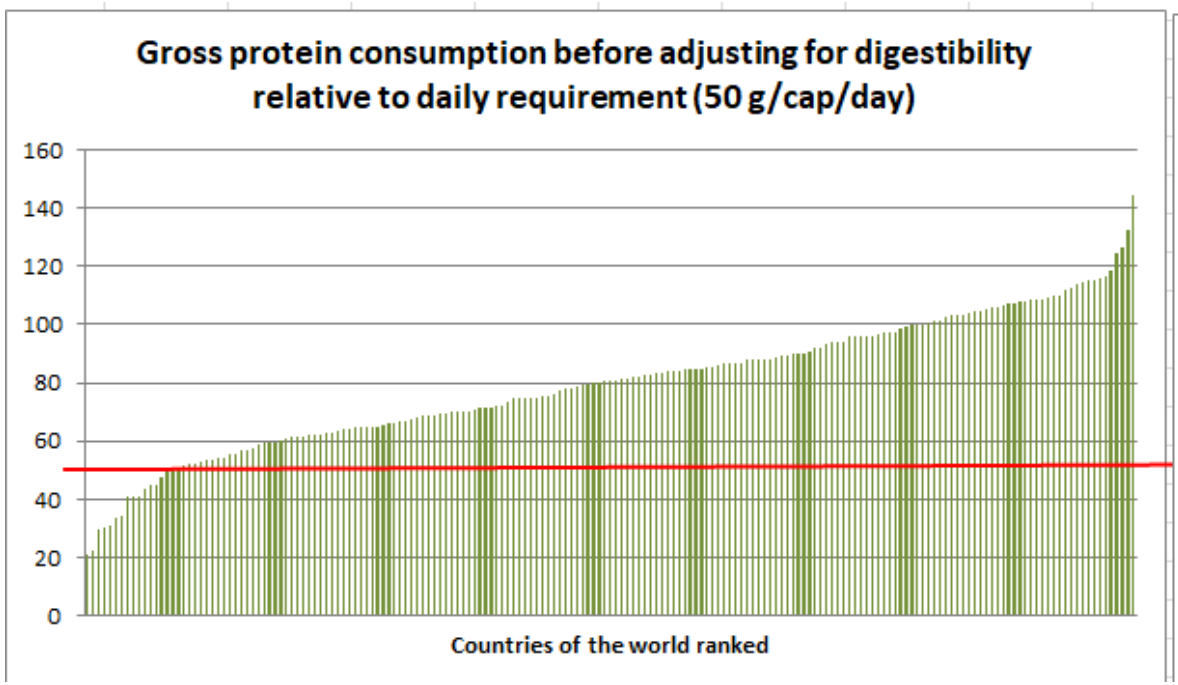
Based on economics, we bring livestock to feed, not vice-versa

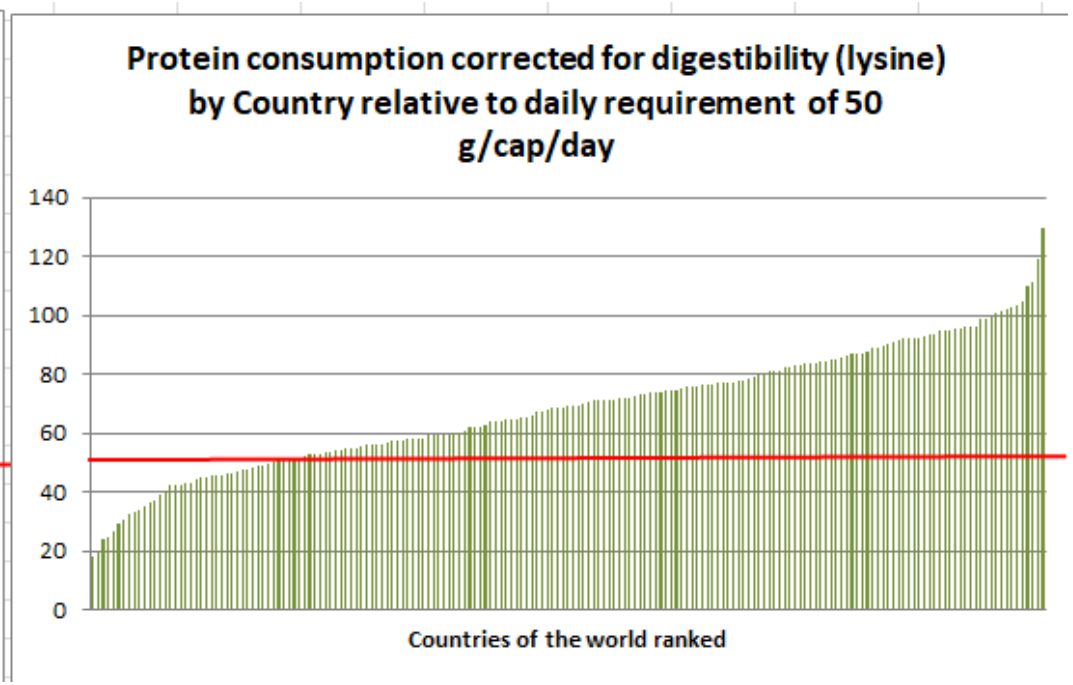
Source: FAOStat

Where we compete internationally, Canada is comparatively low cost



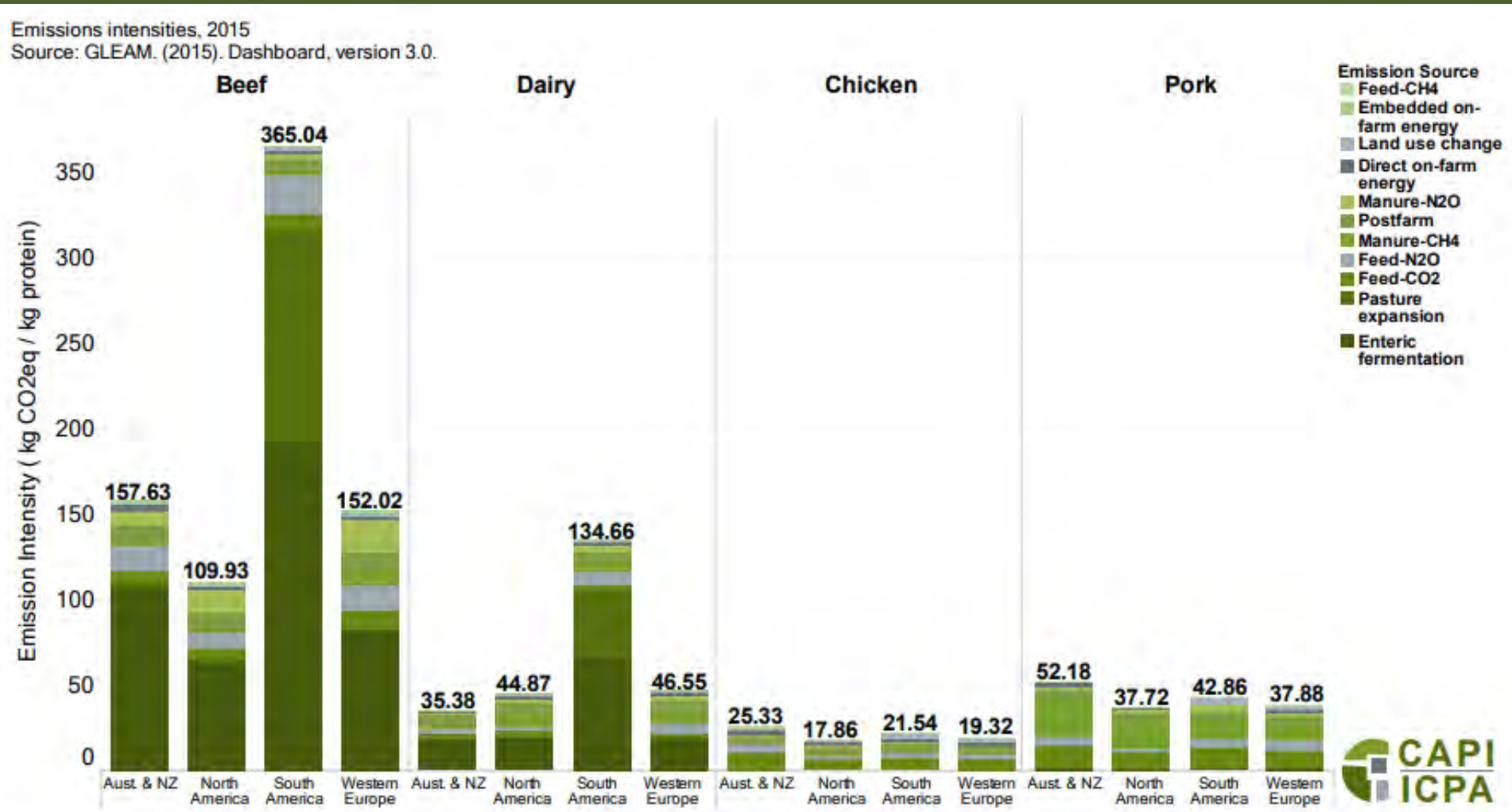
Animal Proteins are critical for health





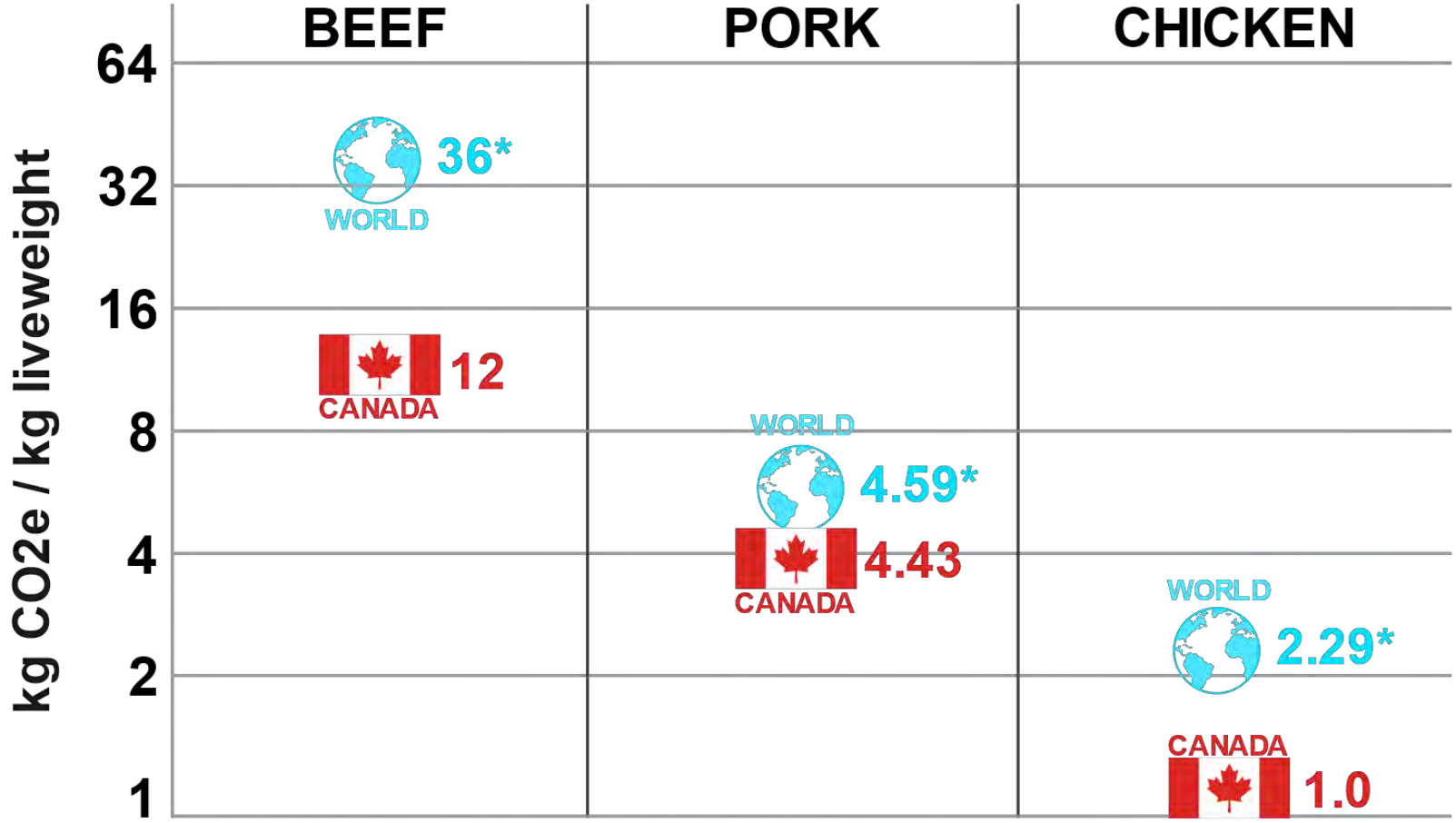
Source: Moughan, 2021 and FAO

GHG Emissions from Animal Agriculture



Graph created internally. Data source: (FAO, 2022). *GLEAM v3 Dashboard. In: Shiny Apps.* Global Livestock Environmental Assessment Model. https://foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/.

CANADA IS A LOW EMISSIONS INTENSITY PRODUCER



*Uses conversion factor from per kg protein (GLEAM) to per kg liveweight (see source #5)

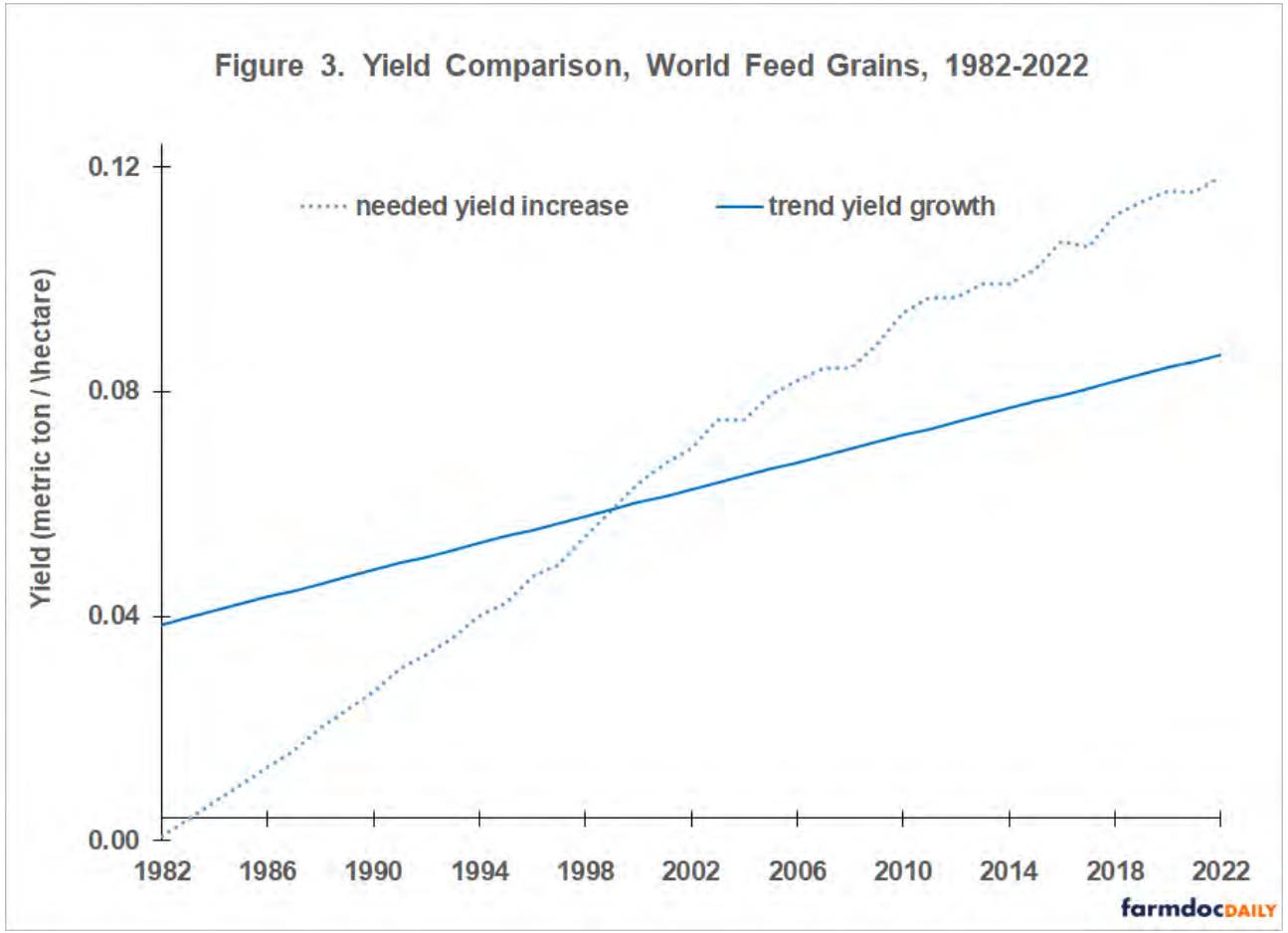
Sources:

1. World: FAO, 2022. *GLEAM v3 Dashboard. In: Shiny Apps.* Global Livestock Environmental Assessment Model.
2. Canada, beef: Legesse et al., 2015. Greenhouse gas emissions of Canadian beef production in 1981 as compared with 2011. *Animal Produ*
3. Canada, pork: Groupe Agéco, 2018. *Streamlined Environmental Life Cycle Assessment of Canadian Pork Production.* Canadian Pork Council meeting.
4. Canada, chicken: Vergé, X. P. C., Dyer, J. A., Desjardins, R. L., & Worth, D. (2009). Long-term trends in greenhouse gas emissions from Journal of Applied Poultry Research, 18(2), 210–222.
5. Dyer et al., 2010. The protein-based GHG emission intensity for livestock products in Canada [Table 2]. *Journal of Sustainable Agriculture,*

So much in front of us

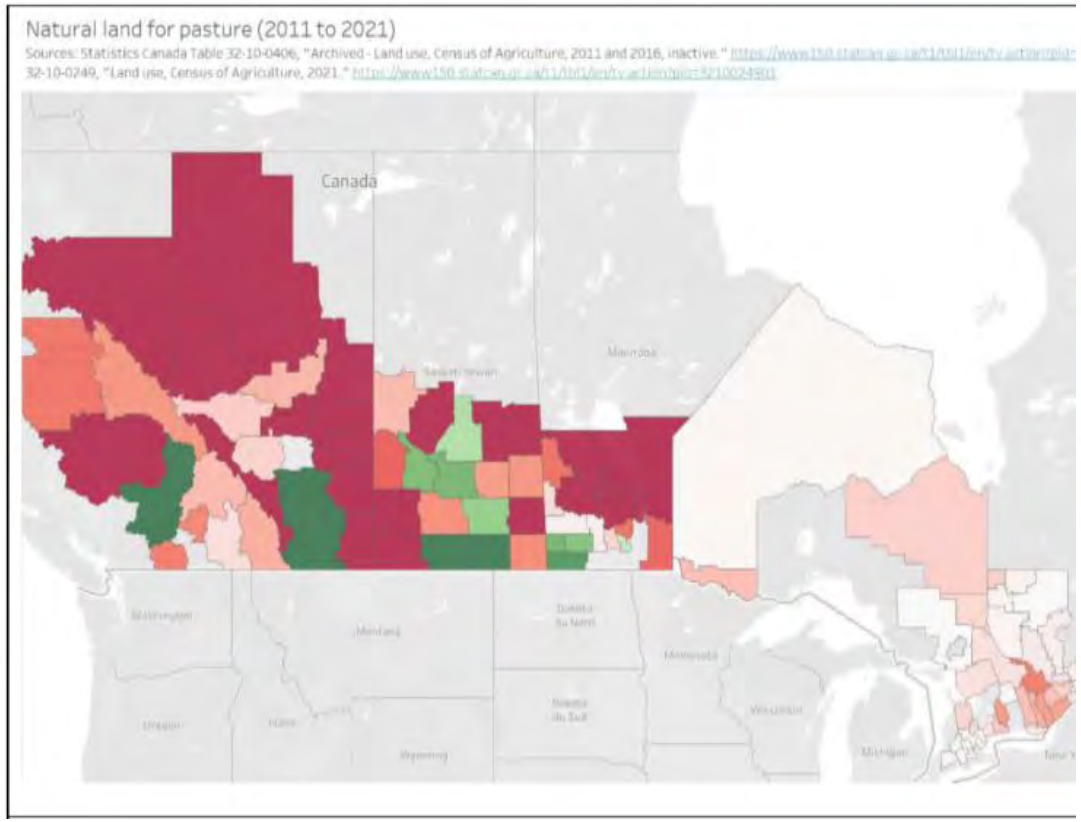
- Output growth without land conversion
- Workforce
- Increased incidence of extreme weather/climate change
- Menacing diseases
- Animal welfare and biological systems overload
- Anti-microbial resistance and new product development
- Maintaining social capital base

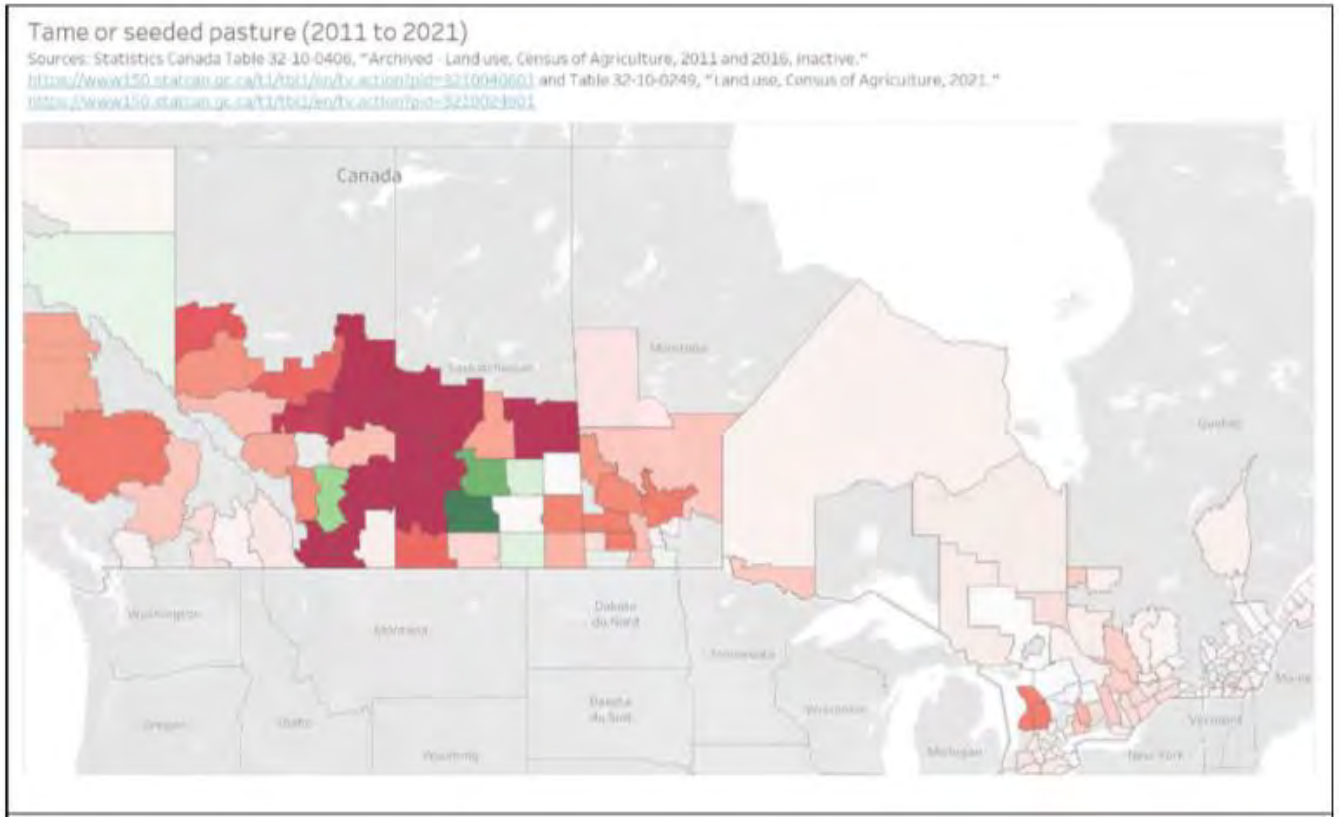
Globally Yield Growth in Feed Grains Lags Demand



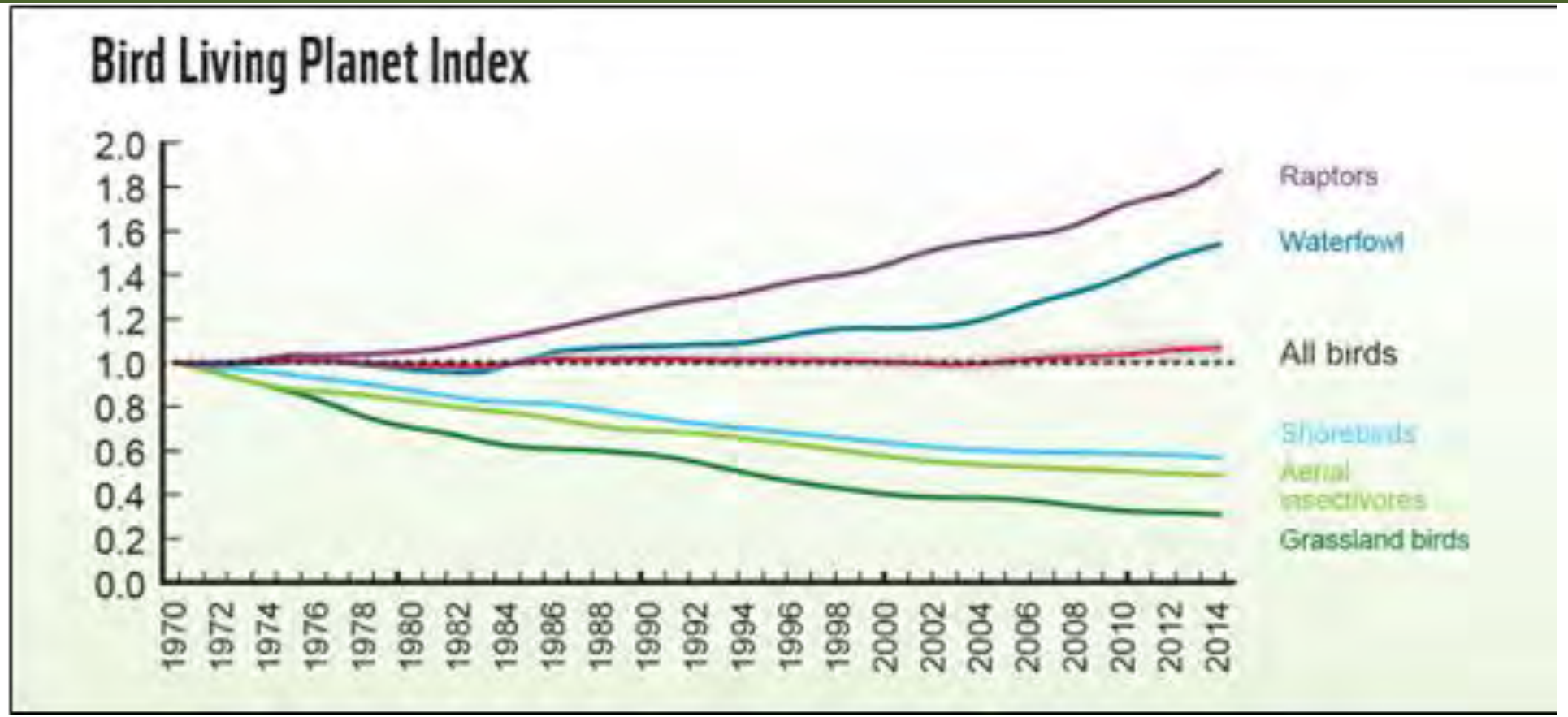
Feed grains are barley, corn, millet, oats, and sorghum.
Reprinted from: Zulauf, C. (2022). The World's Increasing Need for Cropped Land. Farmdoc Daily, 12(173)

Change in Pasture land 2011-2021





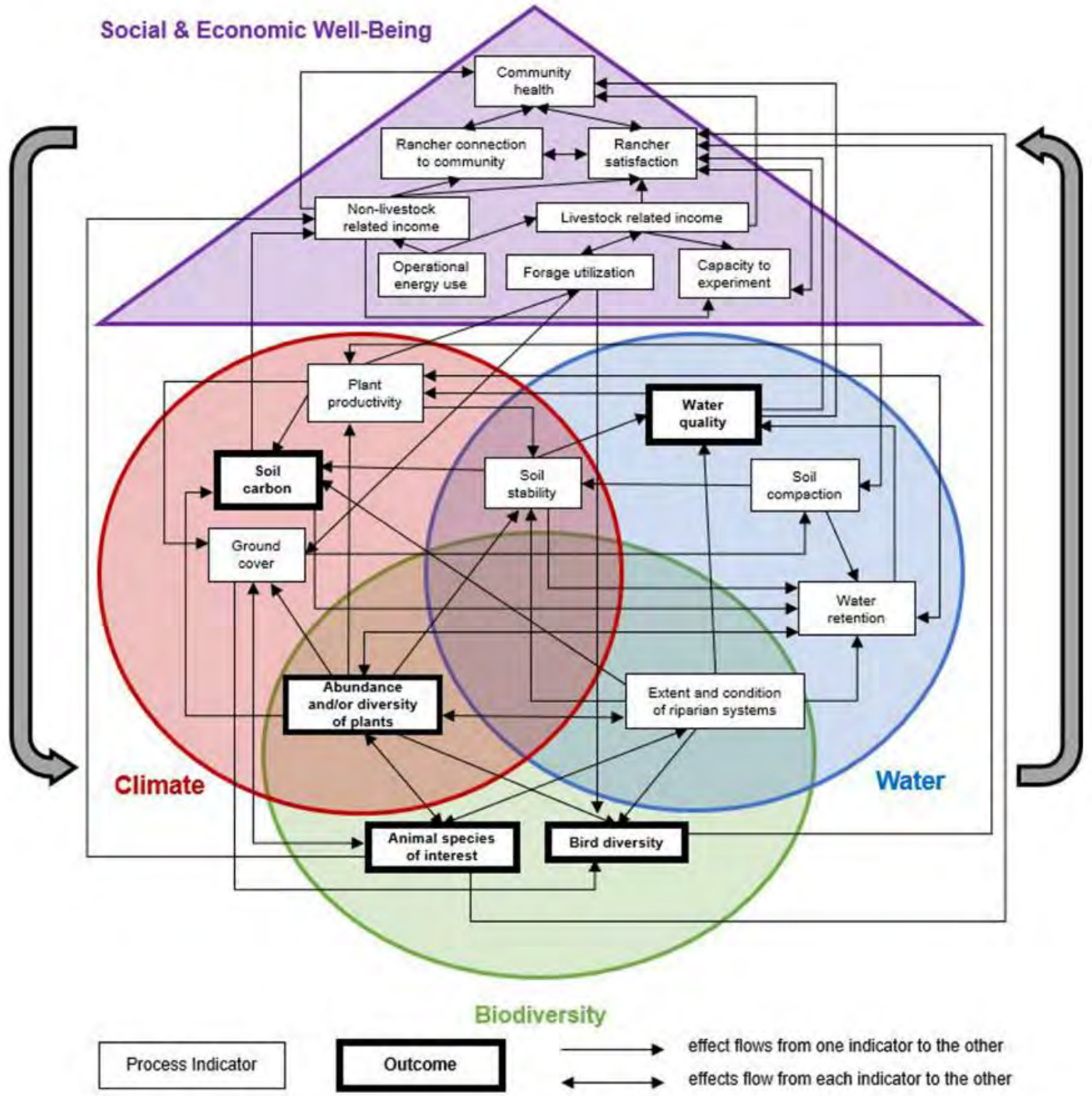
Biodiversity Pressures



Source: Reprinted from (World Wildlife Fund, 2017, fig. 13, p. 24). *Living Planet Report Canada*

Ranch-Level Sustainability Indicators for Land Managers and to Communicate Across the US Beef Supply Chain

M.A. Ahlering, C. Kazanski and P.E. Lendrum et al. / Rangeland Ecology & Management 79 (2021) 217–230



Workforce Gap
Canadian Agricultural Human Resource Council

	Beef	Dairy	Pork	Poultry and Egg	Mixed Animal
Farms	35,316	10,400	3,228	4,915	19,302
Unable to find Needed Workers	49%	42%	51%	36%	47%
Reported zero Canadian job applicants	51%	37%	42%	33%	30%
Employs TFWs	13%	16%	43%	7%	62%
Expect employment at their opeartions to increase in next 5 yrs	35%	35%	67%	46%	55%

Source: Data obtained from Statistics Canada's Labour Force Survey and 2018 CAHRC employer survey

Extreme Weather and Climate Change

Exposure to heat over 32°C results in heat stress, ↓feed intake,↓ milk yields (12 kg/day per cow), and reproductive problems (e.g. 26% ↓ conception rate), heat stress compromises cows' immune systems, ↑ 27% mortality rate compared to a period with no heat stress) … Carryover effects of stress are known to persist even after the heatwave ends- ON Provincial Climate Change Impact Assessment January 2023

Greater incidence of droughts, floods, etc. but

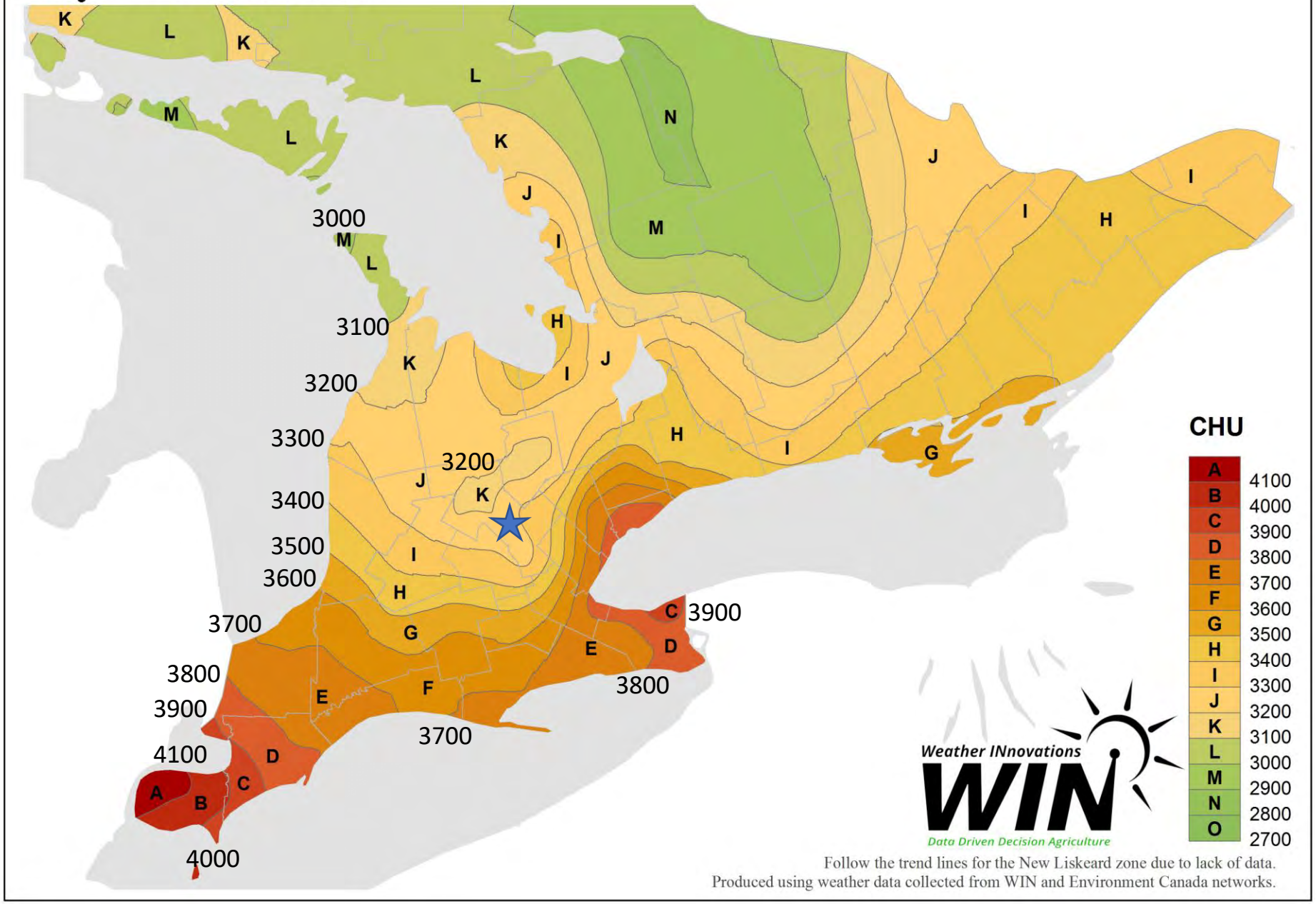
↑ atmospheric CO_2 acts to increase in yields of many crops, but

↓ in nutrient content of these crops; some worry about seed germination

Corn Heat Units - Ratings for **all areas of the province** are now based on the average heat unit accumulation for the period from **May 1** to the date in the fall when the long-term average daily temperature falls below 12° C or an occurrence of -2° C, whichever come first.

Average Accumulated CHU: 2011 - 2020

May 1 - October 31



Follow the trend lines for the New Liskeard zone due to lack of data.
Produced using weather data collected from WIN and Environment Canada networks.

Coccidiostats, industry development, and resistance

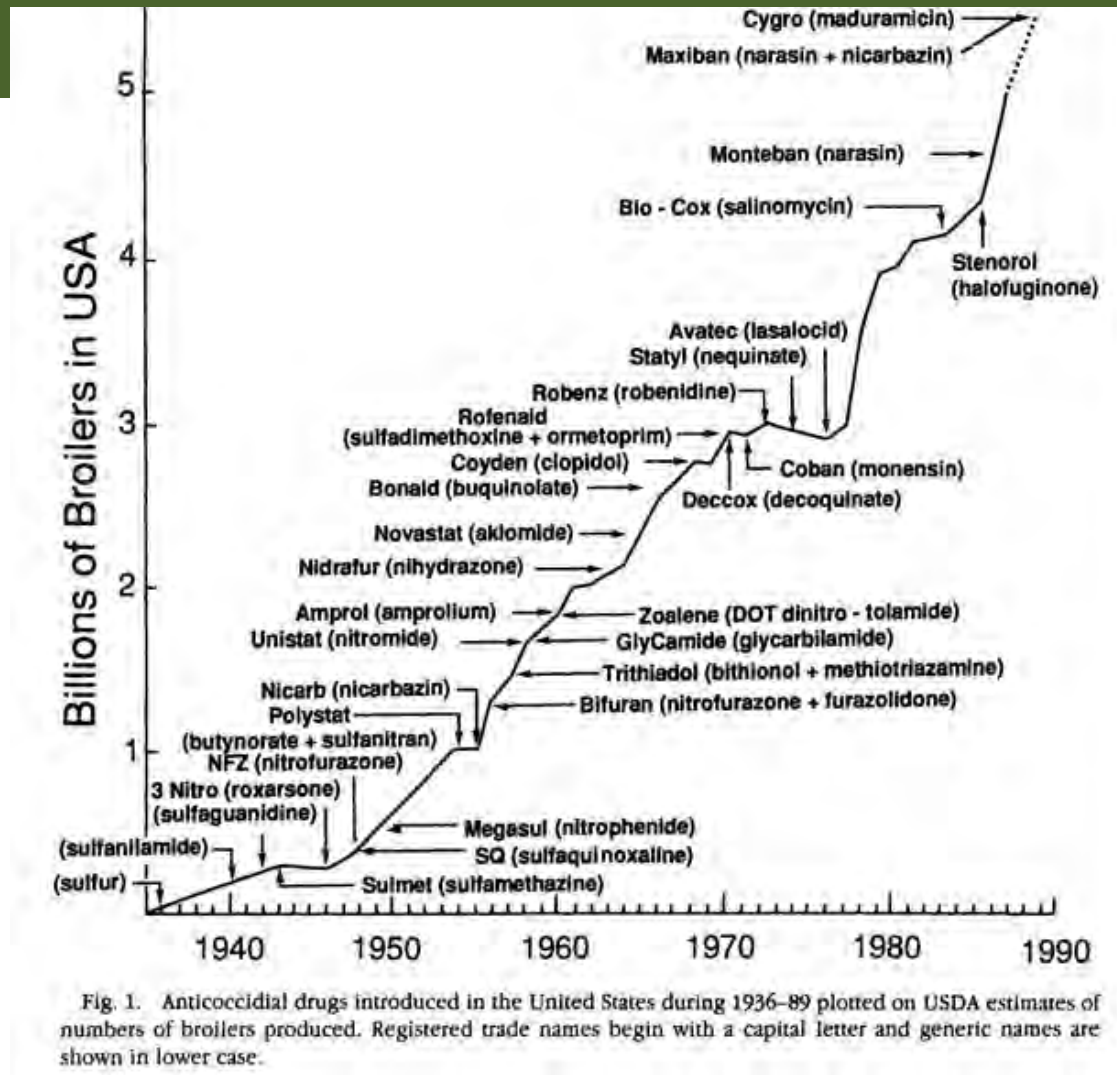


Fig. 1. Anticoccidial drugs introduced in the United States during 1936–89 plotted on USDA estimates of numbers of broilers produced. Registered trade names begin with a capital letter and generic names are shown in lower case.

Source: Reprinted from Reid, W. M. (1990). History of avian medicine in the United States. X. Control of coccidiosis. *Avian Diseases*, *34*(3), 509–525.

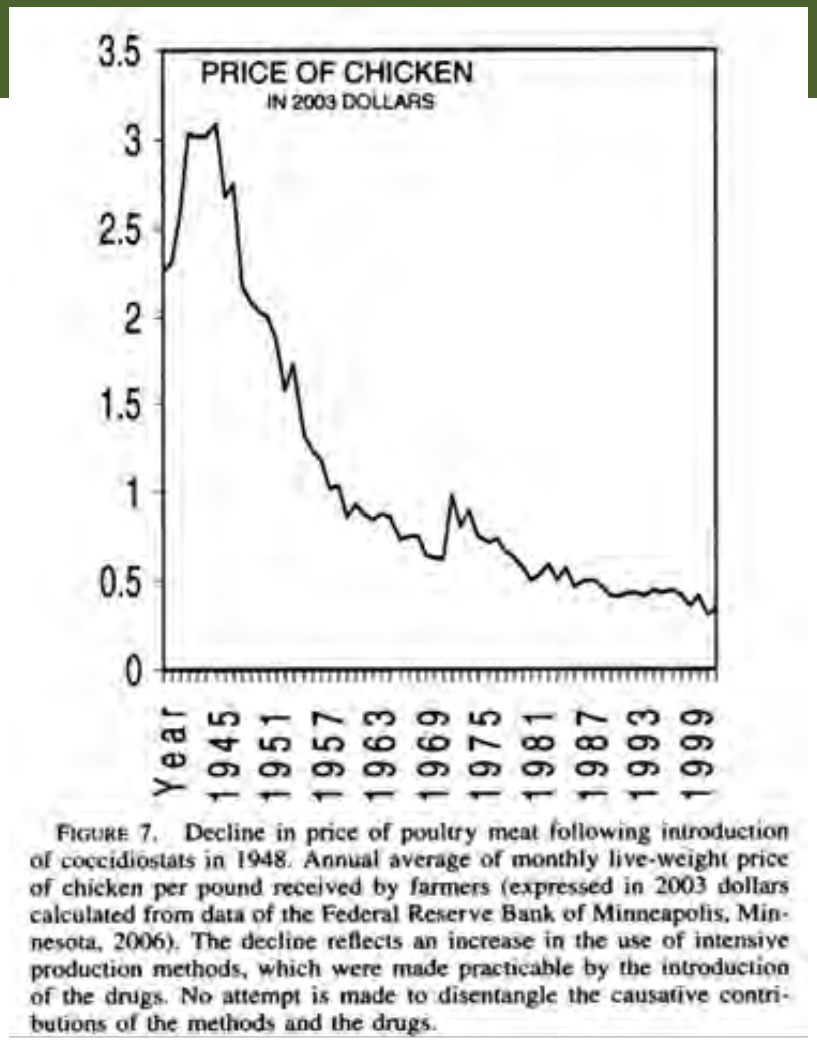
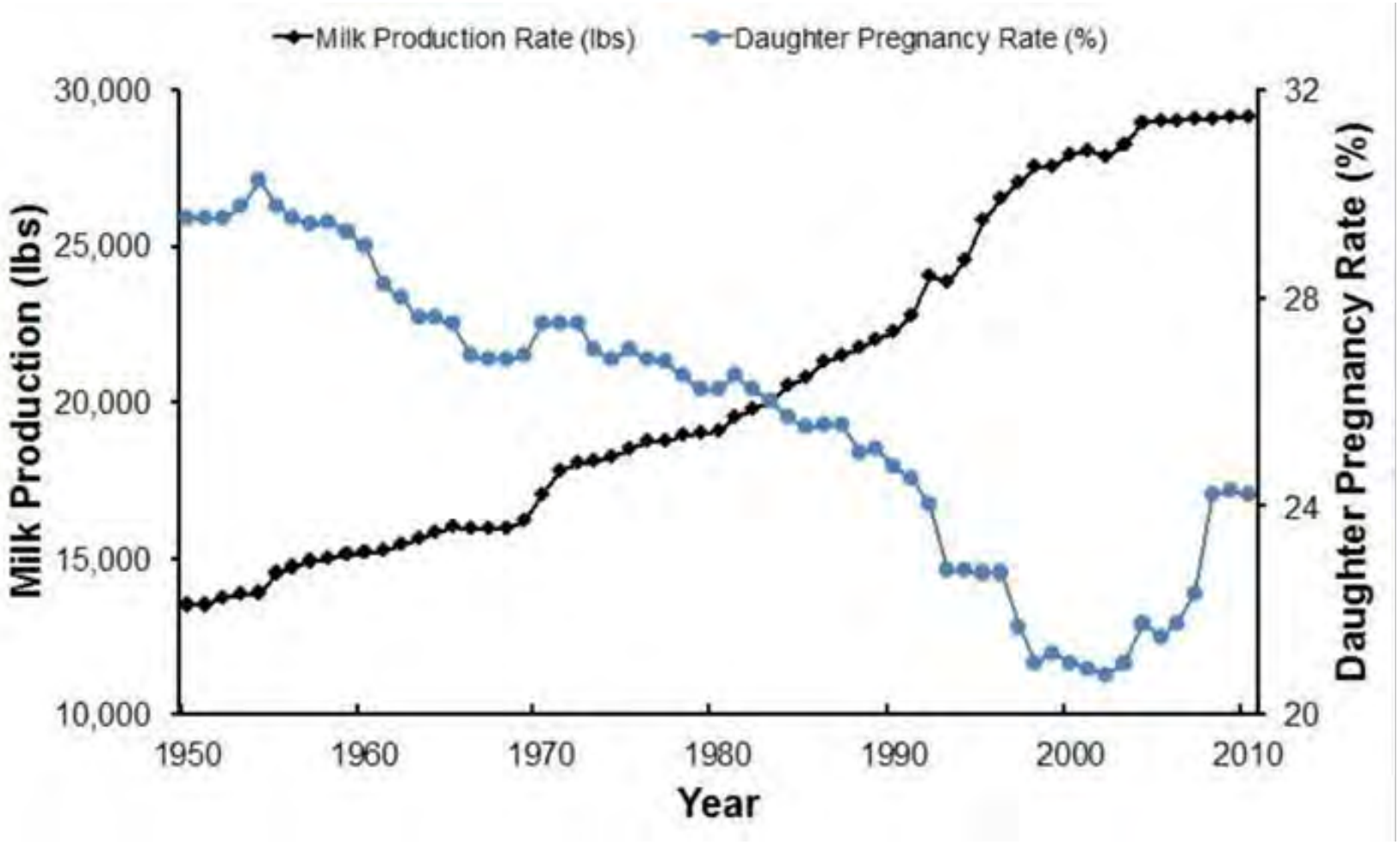


FIGURE 7. Decline in price of poultry meat following introduction of coccidiostats in 1948. Annual average of monthly live-weight price of chicken per pound received by farmers (expressed in 2003 dollars calculated from data of the Federal Reserve Bank of Minneapolis, Minnesota, 2006). The decline reflects an increase in the use of intensive production methods, which were made practicable by the introduction of the drugs. No attempt is made to disentangle the causative contributions of the methods and the drugs.

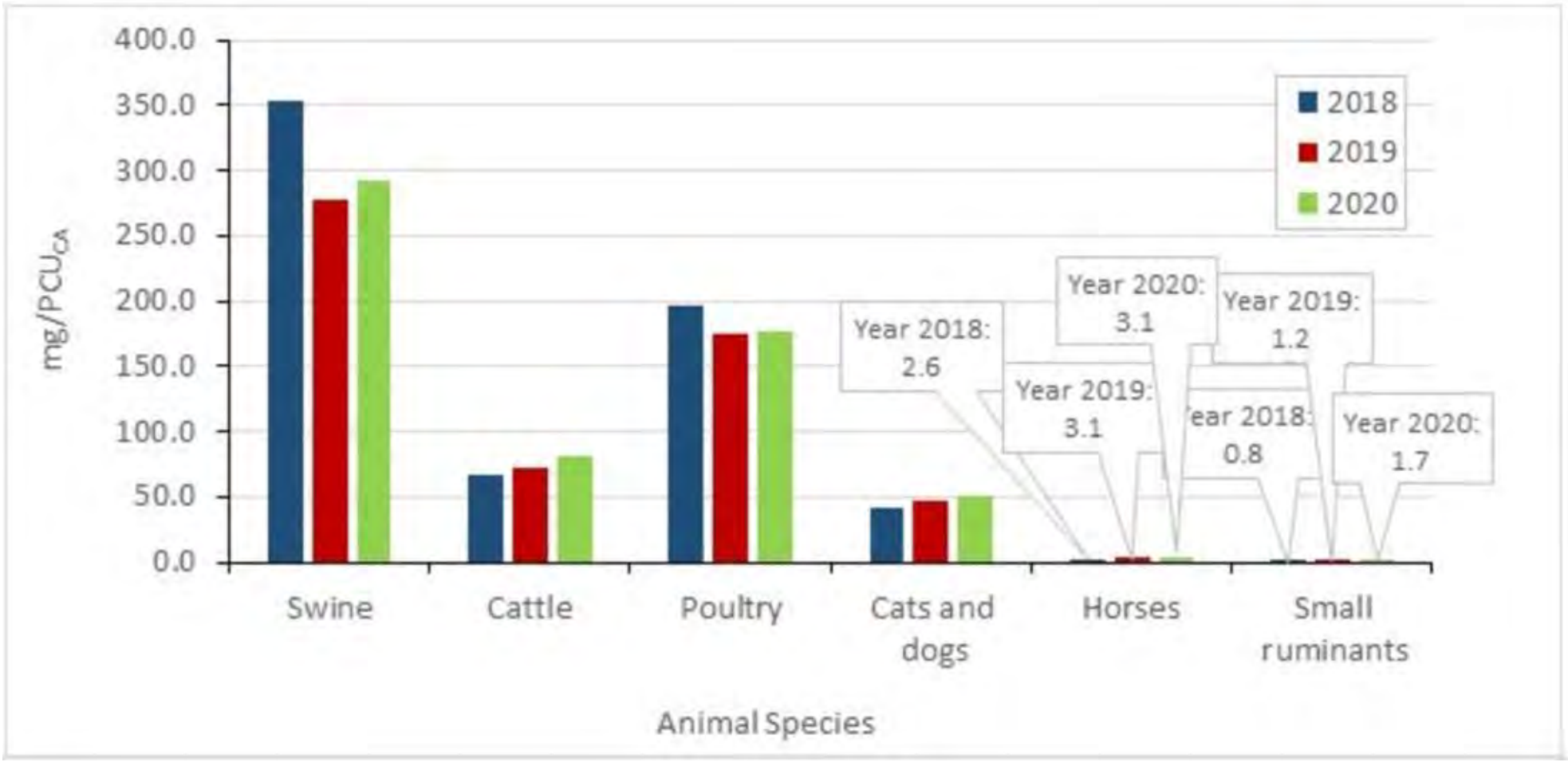
Source: Reprinted from Campbell, W. C. (2008). History of the discovery of sulfaquinoxaline as a coccidiostat. *Journal of Parasitology*, *94*(4), 934–945

Biological System Overload
US Dairy Milk Production and Reproductive Performance



Source: Reprinted from Spencer, T.E. (2013). Early pregnancy: Concepts, challenges, and potential solutions. *Animal Frontiers*, 3(4), 48–55.

Medically-important antimicrobials (adjusted for population and weights)



Source: Health Canada CIPARS

Regulatory Approval of Animal Health Products

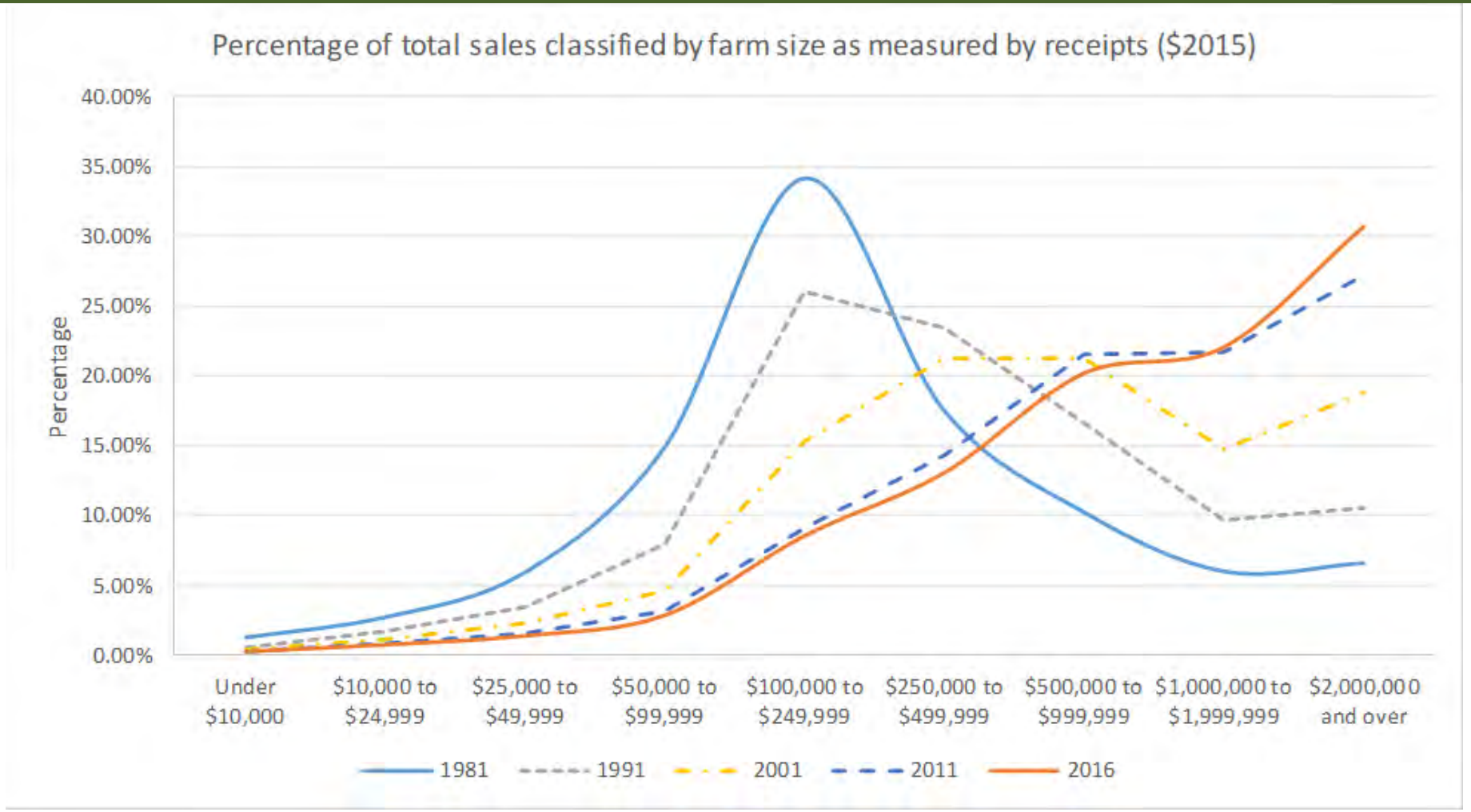
GLOBAL BENCHMARKING SURVEY 2020

Benchmarking the competitiveness of the global animal health industry

Canada challenges

- There is a need for modernisation of the existing regulatory framework and improved transparency.
- New regulatory requirements have caused a significant increase in mandatory defensive research and development costs.
- Costs have increased for licence renewals, due to increased requirements for AMR data and environmental safety data.
- Regulatory changes outpace updates to related guidelines and there is insufficient harmonization with the US and the EU.
- Significant issues persist with registration of EU-approved biologics, medicated feed additives and products for minor uses and minor species.
- Fees are disproportionate to the small size of the Canadian market.

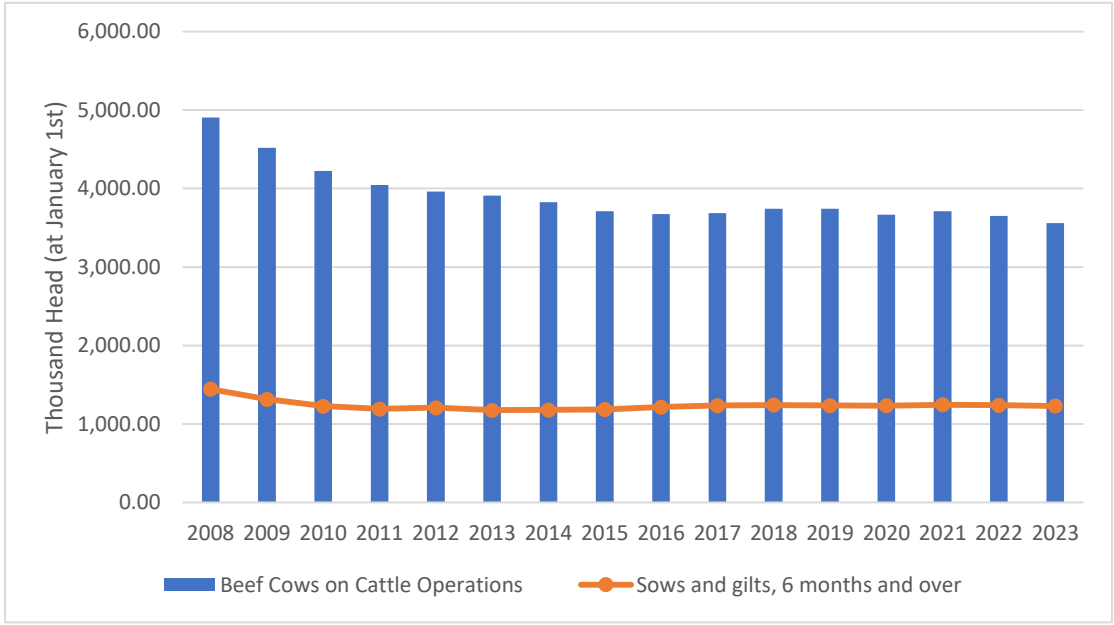
Concentration of farms can erode social capital



Based on data from Statistics Canada. Table 004-0006 - Census of Agriculture

Gap in Red Meat Industry Development

- The USDA recently projected that global per capita consumption of calories from animal products will increase by 29 percent by 2050 compared with a 2011 baseline, given a global population of 10 billion people.
- The OECD projects worldwide poultry, pork, beef, and sheep meat consumption growing by 15%, 11%, 10%, and 15% respectively by 2032
- Meanwhile in Canada:



Where Does this leave us?

The world has a food security problem

The world especially has a protein problem

The world has a climate change problem

There is a shrinking number of countries with the capacity to supply others and productive/GHG emissions efficiency

Canada is among them

What are the needs in Canadian Agri-Food policy?

Governments can explore policy measures that prevent the conversion of grasslands and the grazing sector

ASF is an existential threat to Canadian pork. Public action on the problem of wild pigs as vessels of infection and a permanent reservoir of disease remains inadequate

Canada has suffered from the erosion of rules-based trade and gaps in bilateral trade agreements. Canada has led

- Continue efforts to rejuvenate and strengthen multilateral rules-based trade
- Enforcement efforts on market access provisions of trade agreements, notably the CETA between Canada and the EU, appear to have left gaps for Canadian beef and pork. The entry of the U.K. into the CPTPP is another opportunity for Canada

What are the needs in Canadian Agri-Food policy?

The worries of climate change and food security should be on par as policy priorities.

- Canada has the platform, and the interest, to apply a food security filter to both national and international climate change policy
- Downsizing or impairing the efficiency of Canadian animal agriculture with strict emissions constraints are a contradiction

Conversion efficiency is the core focus that cuts across animal agriculture. It needs to be facilitated on an ongoing basis:

- Support industry cooperation and build social capital
- Support industry competitiveness- regulatory modernization, R&D, infrastructure, data capture and transfer
- Pay attention to biological systems overload

A balanced scorecard from which to assess animal agriculture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