Centre for Health Science and Law
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TO: Maximo Torero Cullen, PhD, Chief Economist January 29, 2023
AND TO: Ismahane Elouafi, PhD, Chief Scientist
AND TO: Qu Dongyu, PhD, Director-General
Food and Agriculture Organization
Viale delle Terme di Caracalla, 00153 Rome, Italy
By e-mail: Chief-Economist@fao.org, maximo.torerocullen@fao.org, Ismahane.Elouafi@fao.org, and Director-General@fao.org

Re: Comment on The State of Food and Agriculture 2023: Revealing the True Cost of Food to Transform Agrifood System.

Dear Drs. Torero Cullen, Elouafi, and Dongyu,

Please consider the following comments on the Food and Agriculture Organization's November 2023 report, *The State of Food and Agriculture 2023: Revealing the True Cost of Food to Transform Agrifood System*.

Importantly, FAO recommends "true cost accounting" as a development tool to reduce adverse health and environmental impacts of food systems, however, true-cost-accounting will best illuminate the need for corrective measures if it is applied to entire economies. This will better reveal the extent to which food systems (like alcohol, tobacco and fossil fuels) visit negative externalities on the environment (especially by warming the planet), health care and social protection systems, and workforces generally (by diminishing productivity). If the algorithms for calculating the costs are accurate, defensible—which can only be achieved by ensuring the adversely (or positively) affected industries do not have undue influence, they could truly help prevent illness, slow planet heating, and make economies more protecting and just.

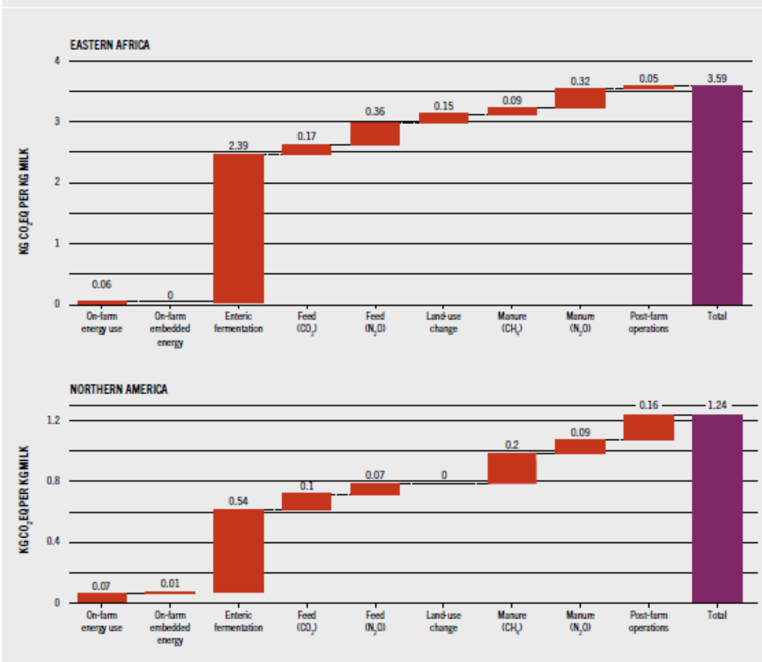
1. **Contribution of GHG emissions from cattle to climate change seems to be understated and regional variability seems to be over-stated.** On page 79 of the 2023 FAO SOFA report the authors claim that the GHG emissions from North American cattle is approximately 22% of that from cattle in Africa (per KG of food). The report states:

> *"However, because emissions associated with enteric fermentation are lower in the latter [i.e., North America] – due to higher output per animal, and different breeds, feed inputs and management practices – total emissions per unit of milk are lower in Northern America."*

Even though an FAO source document described only a two-fold difference (much closer than a nearly five-fold difference) between North American emissions from cattle (milk and beef), the reason for the difference was not adequately explained, especially considering none of the other plants regionally varied livestock or crops varied in emissions significantly. And, significantly reduced emissions—especially from North American cattle—seems contrary to published, peer-reviewed reports. For instance, Johns Hopkins and New York University researchers concluded that the conventional method for calculating methane gas contributions by livestock underestimates its impact on climate in high-Income countries like Canada and the United States to the extent that true methane contributions of meat and dairy production may be 39% to 90% higher than elsewhere.[1] Furthermore, numerous studies found that changes in feed, etc. were only marginally effective in reducing greenhouse gas emissions, for instance:

a) Nutrition and feeding approaches may be able to reduce CH4/ECM by 2.5 to 15%, whereas rumen modifiers have had very little success in terms of sustained CH4 reductions without compromising milk production. More significant reductions of 15 to 30% CH4/ECM can be achieved by combinations of genetic and management approaches. [Though these seem small compared to the starting point.];[2]
b) A 25-yr simulation of their current production system gave an average annual carbon footprint of 10.9±0.6 kg of CO2 equivalent units per kg BW sold, and the energy required to produce that beef (energy footprint) was 26.5±4.5 MJ/kg BW compared to 1970, the carbon footprint of the beef produced has decreased by only 6%;[3]
c) a study found only an 11% reduction in methane;[4]
d) a study promoted eating less food overall and wasting less instead of reducing beef consumption;[5]
e) only 11% reduction in methane production;[6] and
f) ironically, one study advocated breeding heat-resistance cattle[7]

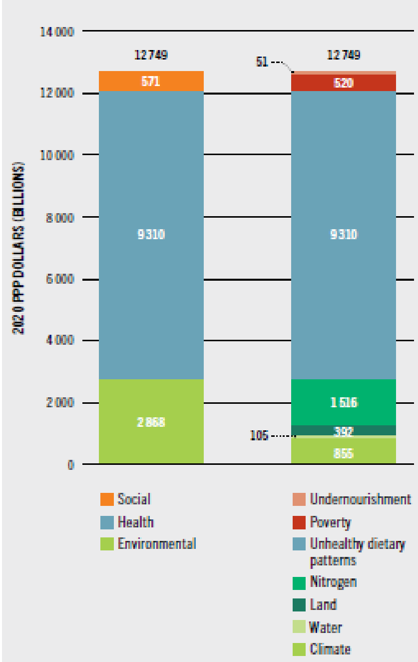
FIGURE B MILK-RELATED GREENHOUSE GAS EMISSIONS IN EASTERN AFRICA (TOP) AND NORTHERN AMERICA (BOTTOM)



SOURCE: FAO. 2023. GLEAM 3.0 Assessment of greenhouse gas emissions and mitigation potential. In: *Global Livestock Environmental Assessment Model (GLEAM)*. [Cited 28 April 2023]. https://www.fao.org/gleam/dashboard/en

Likewise, figure 6 on page 35 indicates that the problem of nitrogen is approximately double the size of the problem of "climate" (presumably methane and some CO2). This is news to me and does not appear to be explained in the report. The term methane is not even used in the report.

FIGURE 6 QUANTIFIED HIDDEN COSTS OF AGRIFOOD SYSTEMS BY COST CATEGORY (LEFT) AND SUBCATEGORY (RIGHT), 2020



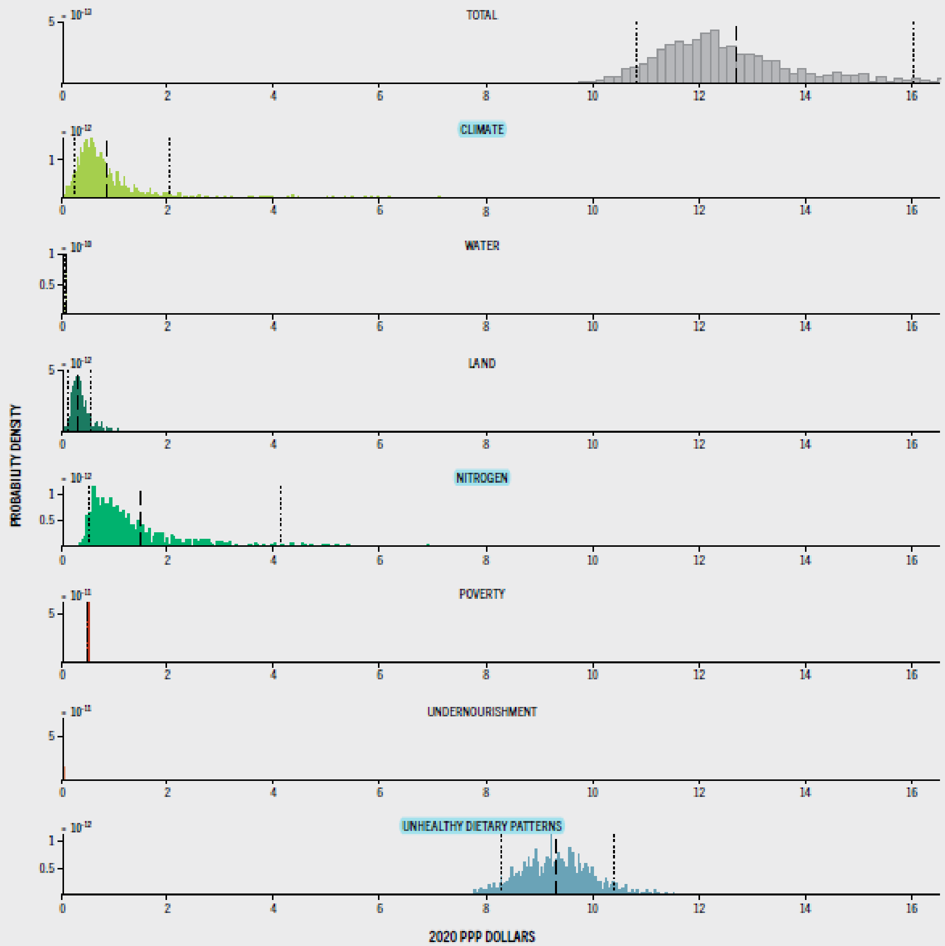
NOTE: All values are expected values.
SOURCE: Lord, S. 2023. *Hidden costs of agrifood systems and recent trends from 2016 to 2023 – Background paper for The State of Food and Agriculture 2023*. FAO Agricultural Development Economics Technical Study, No. 31. Rome, FAO.

3. **The magnitude of the cost externalities of the food systems require more context to clarify the special attention required to correct market failures there.** The authors estimate the Canadian negative costs of food (mostly health, but also the environment) at 8% of GDP. This is a much lower percentage than for lower-income countries with smaller per capita economies where populations generally eat nearly as much (but less meat), but have vastly smaller economies in the denominator. However, because Canada has an approximately CND$2.1 trillion economy, 8% amounts to CND$168 billion which rivals the total sales volume for the entire Canadian domestic food consumption market. If 8% of GDP is accurate, this clearly illustrates the full extent to which externalities of food systems undermine entire national economies and do so in ways that distinctly vastly outstrip and undermine other sectors of diverse economies, except, probably, fossil fuels, tobacco, arms industries, and alcohol (which SOFA does not appear to have included in the modelling).

4. **A key chart characterizing the risk the looming climate emergency seems to understate the of risk of serious, even potentially disastrous risk scenarios.** A chart that depicts the sum and components of various food system cost risks, quantitatively, seems to give the impression that there not many or no catastrophic risks of climate change (the light green probability density plot), i.e., that the risks are conveniently bunched together near the Y-axis (i.e., close to zero costs) Perhaps this reflects a conservative bias against publishing quantitative estimates of the worst (even if foreseeable) consequences of failing to cool the planet soon.

BOX 7 (Continued)

FIGURE GLOBAL QUANTIFIED HIDDEN COSTS OF AGRIFOOD SYSTEMS, WITH UNCERTAINTY, BY COST CATEGORY, 2020



NOTE: Excepted values are represented by the black dashed line.
SOURCE: Lord, S. 2023. *Hidden costs of agrifood systems and recent trends from 2016 to 2023 – Background paper for The State of Food and Agriculture 2023*. FAO Agricultural Development Economics Technical Study, No. 31. Rome, FAO.

5. **Integrating the amounts of food typically consumed with the GHG-emissions per KG of food adds important decision-making information, especially for milk.** The emissions per KG of milk makes it look appear like a minor contributor to innocent. However, using the benchmark consumption estimates in an FAO working paper cited in SOFA confirm the importance of reducing GHG emissions from meat and milk from ruminant animals and the need for further emphasis in future reports. Babies drink in the range of 600-700 mL per day of breastmilk and, presumably, a similar amount of cow's-milk-based formula when not breastfeeding,[8] a contribution to greenhouse gas emissions that can be largely avoided by consuming a nutritionally superior less expensive alternative (human mothers are not ruminants) that is substantially more likely with less formula marketing and more workplace and maternity leave protections. I have attached a machine-readable spreadsheet and have inserted an excerpt, below:

Valuation of the healthand climate-change benefitsof healthy diets

Background paper for The State ofFood Security and Nutrition in the World 2020

GHG emissions footprints in 2030 (kgCO2-eq per kg of product) by foodcommodity and regions

	Global (p.7)	High-Income (p. 7) The nearly identical regional emissions for all foods but beef and	FAO Estimated Daily Intake Baseline/Benchmark diets (page 3)	grams per day	Calculated Total GHG emissions per day (global)	Percent of global total GHG from food group	Calculated Total GHG emissions per day (high-income countries) even assuming same amount consumed/day which underestimates meat,	Percent of global total GHG from food group high income countries	
Wheat	0.37	0.37	Wheat	117	43	2%	43	3%	
Rice	1.55	1.49	Rice	126	195	8%	188	13%	High income countries consume far less rice, but it is a staple in many developing countries and recommnded diets model consumeing 30% less.
Maize	0.36	0.36	Maize	33	12	0%	12	1%	
Other grains	0.36	0.34	Other grains	22	8	0%	7	1%	
Roots	0.11	0.11	Roots	134	15	1%	15	1%	
Legumes	0.29	0.29	Legumes	17	5	0%	5	0%	
Soybeans	0.27	0.27	Soybeans	5	1	0%	1	0%	
Nuts and seeds	0.54	0.57	Nuts and seeds	13	7	0%	7	1%	
Vegetables	0.3	0.3	Vegetables	227	68	3%	68	5%	Health benefis justify GHG emissions
Fruits (temperate)	0.24	0.24	Fruits (temp)	37	9	0%	9	1%	
Fruits (tropical)	0.25	0.25	Fruits (trop)	62	16	1%	16	1%	
Fruits (starch)	0.55	0.55	Fruits (starch)	28	15	1%	15	1%	
Sugar	0.57	0.57	Sugar	51	29	1%	29	2%	
Palm oil	4.92	4.92	Oil (palm)	6	30	1%	30	2%	
Vegetable oil	2.06	1.65	Oil (veg)	22	45	2%	36	2%	
Beef	36.82	16.18	Beef	25	921	38%	405	28%	All four recommended diets model little or no meat.
Lamb	20.12	15.95	Lamb	5	101	4%	80	5%	All four recommended diets model little or no meat.
Pork	3.16	2.77	Pork	38	120	5%	105	7%	All four recommended diets model little or no meat.
Poultry	2.16	1.89	Poultry	31	67	3%	59	4%	
Eggs	1.82	1.54	Eggs	22	40	2%	34	2%	
Milk	3.07	1.31	Milk	221	678	28%	290	20%	Recommended diets model 30% less milk or none.
Shellfish	1.55	0.39	Shellfish	6	9	0%	2	0%	
Fish (freshwater)	1.95	1.34	Fish (freshwater)	8	16	1%	11	1%	
Fish (pelagic)	0.01	0.01	Fish (pelagic)	3	0	0%	0	0%	
Fish (demersal)	0.53	0.78	Fish (demersal)	5	3	0%	4	0%	
			Total GHG emissions pe		2452	100%	1470	100%	

** According to the FAO Statistical Yearbook (at page 287) Europe and the Americas consume double the amount of meat per capita as Asia and quadruple the meat consumption of Africa.

See: https://www.fao.org/3/cc8166en/cc8166en.pdf

See also: https://landgeist.com/2021/10/05/meat-consumption-in-europe/

SOFA 2023 promises to particularize the true cost accounting modeling for SOFA 2024 which, I hope, can benefit from these comments.

Respectfully submitted,

Bill Jeffery, BA, LLB, Executive Director and General Legal Counsel
Centre for Health Science and Law
Ottawa, Canada

Endnotes

[1] Matthew N Hayek, Scot M. Miller. Underestimates of methane from intensively-raised animals could undermine goals of sustainable development. *Environmental Research Letters*, 2021; DOI: 10.1088/1748-9326/ac02ef Available at: https://iopscience.iop.org/article/10.1088/1748-9326/ac02ef/pdf

[2] Knapp JR, Laur GL, Vadas PA, Weiss WP, Tricarico JM. Invited review: Enteric methane in dairy cattle production: quantifying the opportunities and impact of reducing emissions. J Dairy Sci. 2014;97(6):3231-61. doi: 10.3168/jds.2013-7234. Epub 2014 Apr 18. PMID: 24746124.

[3] Rotz CA, Isenberg BJ, Stackhouse-Lawson KR, Pollak EJ. A simulation-based approach for evaluating and comparing the environmental footprints of beef production systems. J Anim Sci. 2013 Nov;91(11):5427-37. 3.

[4] Ribeiro GO, Oss DB, He Z, Gruninger RJ, Elekwachi C, Forster RJ, Yang W, Beauchemin KA, McAllister TA. Repeated inoculation of cattle rumen with bison rumen contents alters the rumen microbiome and improves nitrogen digestibility in cattle. Sci Rep. 2017 Apr 28;7(1):1276.

[5] Hyland JJ, Henchion M, McCarthy M, McCarthy SN. The role of meat in strategies to achieve a sustainable diet lower in greenhouse gas emissions: A review. Meat Sci. 2017 Oct;132:189-195.

[6] Ribeiro GO, Oss DB, He Z, Gruninger RJ, Elekwachi C, Forster RJ, Yang W, Beauchemin KA, McAllister TA. Repeated inoculation of cattle rumen with bison rumen contents alters the rumen microbiome and improves nitrogen digestibility in cattle. Sci Rep. 2017 Apr 28;7(1):1276.

[7] Davis SR, Spelman RJ, Littlejohn MD. Breeding and Genetics Symposium: Breeding heat tolerant dairy cattle: the case for introgression of the "slick" prolactin receptor variant into dairy breeds. J Anim Sci. 2017 Apr;95(4):1788-1800.

[8] Rios-Leyvraz M, Yao Q. The Volume of Breast Milk Intake in Infants and Young Children: A Systematic Review and Meta-Analysis. Breastfeed Med. 2023 Mar;18(3):188-197. doi: 10.1089/bfm.2022.0281. Epub 2023 Feb 10. PMID: 36763610.