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Thanawat Tiensin
Director of Animal Production and Health Division (NSA)
UN FAO, Viale delle Terme di Caracalla
00153 Rome, Italy

Dear Dr Tiensin

We are writing as co-authors of studies referenced in the FAO's recent report *Pathways toward Lower Emissions* to express dismay that it seriously distorts the findings of our studies with respect to current food system emissions and the greenhouse gas mitigation potential of dietary changes. The combination of the framing of the analysis, the report's inappropriate choice of source data, and errors that seriously distort the findings of scientific papers of which we are co-authors, means that we are urgently requesting a retraction of this report, and a re-issuing of the report with more appropriate sources selected and methodological errors rectified.

The report appears to mainly use only one dietary change study from the literature, and uses it inappropriately, to arrive at the conclusion that the contribution of dietary change to reducing climate emissions is very small (approximately 2-5%). This conclusion is arrived at by conflating sustainable dietary change with nationally recommended diets and using opaque and incorrect methods with incomplete data. The result is likely to give a false impression that the emissions mitigation potential of reduced meat consumption is limited, and thus that intensification of livestock should be the primary, if not exclusive, aim. While the FAO's incorrect estimates suggest that dietary change can contribute only **0.19-0.53 Gt CO_2 eq $\cdot$ a^{-1}**, researchers in *Science* found an opportunity of **3.10 Gt CO_2 eq $\cdot$ a^{-1}** using robust and appropriate modeling (increasing to **6.22 Gt CO_2 eq $\cdot$ a^{-1}** if the land that is spared is used to draw down carbon)[1]. This lies within a range of earlier estimates aggregated by the IPCC: **0.7-8 Gt CO_2 eq $\cdot$ a^{-1}**.

We describe the many errors in the the FAO's below, **in summary:**

[1]Michael Clark et al. "Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets" *Science* (2020); 370: 705–708. doi:10.1126/science.aba7357

- The report **conflates now-obsolete nationally recommended diets (NRDs) with dietary opportunities**, ignoring voluminous evidence of healthy, environmentally friendly diets which have very large potential to reduce emissions.
    - Already, many NRDs have been updated, including the Spanish Guidelines recommending 0-3 meat portions/week (i.e. a range with no meat), Danish Guidelines which recommend limiting the intake of especially beef and lamb, and German guidelines that recommend at least 75% of the diet is plant-based. China has also systematically decreased recommended levels of meat intake over time, with the latest 2022 revision featuring lower maximum limits.
    - Many other sustainable and healthy diets could have been used in the analysis. Most NRDs do not factor sustainability into their design. NRDs are thus not reliable as an indicator of the emissions mitigation potential of "sustainable and healthy diets"**,** as the FAO claims. Healthy dietary guidelines were designed using sustainability criteria recommend significantly lower meat and dairy intake[2].
- Even if we assume NRDs are representative of dietary change opportunities, the report **systemically underestimates the opportunities of NRDs through a number of methodological errors** which distort the findings of the underlying studies:
    - Assuming a higher value for meat intake than the lower range for NRDs;
    - Inappropriately comparing emissions reduction of NRDs to a total emissions quantity from an incomparable paper, which further reduces the contribution of dietary change as a percentage of total emissions;
    - Double counting meat emissions to 2050 which further reduces the opportunity as a percentage of total emissions;
    - Mixing different baseline years for its analysis, reducing the opportunity further;
    - Including emissions from increases in vegetable, fruit and nut consumption which are unrelated to substituting meat and dairy in diets
    - Assuming very high emission intensities for increases in plant-based products.
- The report **omits key opportunities in carbon sequestration on saved land - the so-called *Double Climate Dividend*[3]**

More details on these issues are outlined below. First we give **our understanding of the FAO's methodology**, which reproduces their results as they have reported**:**

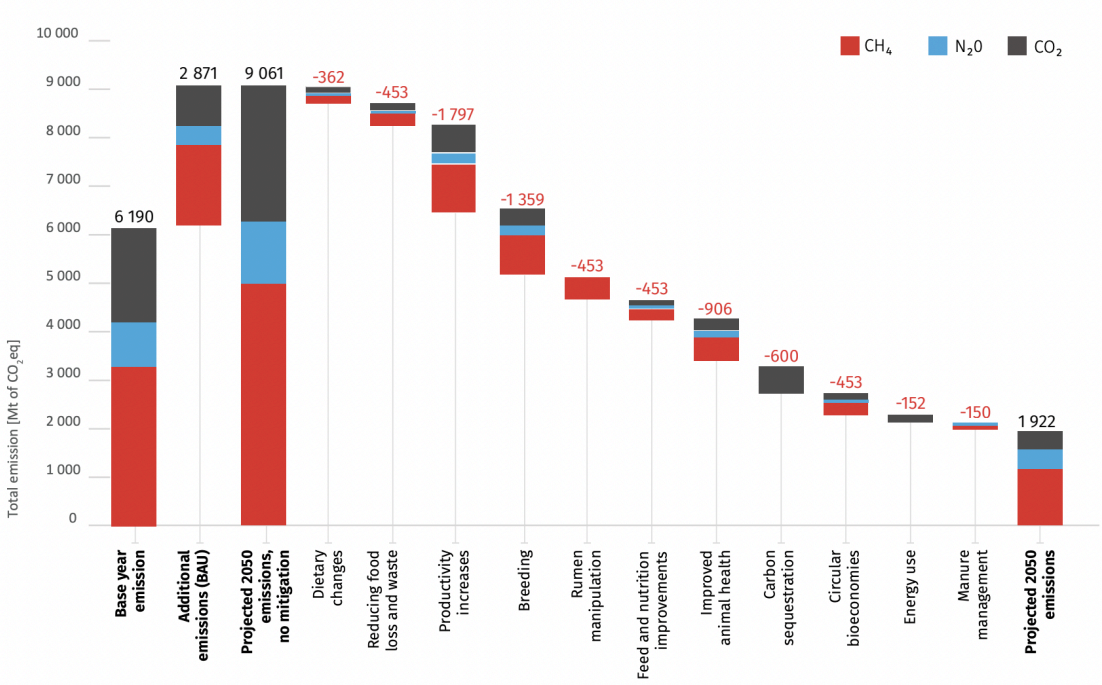
1. The FAO base their conclusions on a single study - **Behrens et al (2017)**[4] - which assessed the environmental impact of 37 nations representing 64% of the world's population aligning

[2] Springmann, M et al. "The healthiness and sustainability of national and global food based dietary guidelines: modelling study" *BMJ* (2020); 370; https://doi.org/10.1136/bmj.m2322
[3] Sun, Z. et al. Dietary change in high-income nations alone can lead to substantial double climate dividend. Nature Food, 3(1), (January 10, 2022) 29–37. https://doi.org/10.1038/s43016-021-00431-5
[4] Behrens, P et al., "Evaluating the Environmental Impacts of Dietary Recommendations," *Proceedings of the National Academy of Sciences* 114, no. 51 (December 19, 2017): 13412–17, https://doi.org/10.1073/pnas.1711889114.

their citizens' average diet with their own nationally recommended diets. The study concludes that "Uniform adoption of NRDs across these nations would result in reductions of **0.19–0.53 Gt CO_2 eq · a^{-1}**".

2. FAO then says that "These countries represent 64 percent of the global population. Prorating the emissions from the food system globally (**~16.5 Gt CO2eq**), **Tubiello et al. (2021)**[5] translates to savings of **2 to 5 percent**."[6] Our understanding is that the FAO's calculation was as follows: the FAO took the estimate of emissions mitigation potential from dietary change **0.19–0.53 Gt CO_2 eq · a^{-1}** from Behrens et al (2017), and since this represented countries with 64% of the world's population, compared this to 64% of the **16.5 GtCO2e** figure for total food system emissions taken from Tubiello et al. (2021)
    a. 0.19 GtCO2e / (16.5 GtCO2e * 64%) = **1.799%**
    b. 0.53 GtCO2e / (16.5 GtCO2e * 64%) = **5.109%**
3. The FAO thus assumes that these reductions are representative of the global food system, saying: "these GHG reductions could amount to a decrease of 0.19 to 0.53 Gt CO2 eq per year for the 37 countries considered, representing a 2 to 5 percent reduction in emissions associated with the entire global food system."[7]

The FAO then also make a comparison between Base year emissions + projected Additional Emissions in a Business as Usual scenario, in Figure 12 below[8]**:**



[5] Francesco N. Tubiello et al., "Greenhouse Gas Emissions from Food Systems: Building the Evidence Base," *Environmental Research Letters* 16, no. 6 (June 2021): 065007, https://doi.org/10.1088/1748-9326/ac018e.
[6] FAO, *Pathways towards Lower Emissions: A Global Assessment of the Greenhouse Gas Emissions and Mitigation Options from Livestock Agrifood Systems*, 19 Footnote 8.
[7] FAO, 18.
[8] FAO, 31.

The assumptions for this are shown in Table 3[9]:

TABLE 3. Overview of the estimated global reduction potential for the different interventions and the main assumptions

Theme	Interventions	Reduction potential (%)	Assumptions and sources
Demand	Changes in consumption of TASF	4	Prorating the emissions reductions of 0.19–0.53 Gt CO_2eq per year estimated by Behrend (2017) for the global food systems.
	Reducing food loss and waste	5	Impact through reducing TASF food waste by 70 percent; Assumption based on a calculation from FAO (2019), Lipinski (2020) and Bajzelj (2014), but applied to supply chains.

Our understanding of FAO's methodology for the chart is as follows - that FAO have assumed a reduction potential of 4% as an approximate mid-point from the 2-5% reductions found earlier. The FAO have then taken 4% of 9,061 Mt CO2eq (total projected livestock emissions) = **362 Mt CO2eq**. Our understanding is that, for the 2050 dietary change scenario, the FAO did not calculate changes to each greenhouse gas using a unique and independent calculation, but merely reduced each greenhouse gas equally by 4%.

There are numerous problems with the FAO's process in arriving at this conclusion:

Inadequate review of evidence:

- The FAO has used a single study - Behrens et al (2017) - rather than a proper literature review of the abundant scientific evidence of the emissions mitigation potential of different dietary changes. This is inadequate.

Ignoring more ambitious dietary change than nationally recommended diets:

- The Behrens et al (2017) study selected by the FAO focuses only on nationally recommended diets (NRDs) - most of which do not currently factor in environmental considerations in their design, and so are not reliable as an indicator of the emissions mitigation potential of "sustainable and healthy diets"[10], as the FAO claims. Most dietary guidelines based on both health and environmental factors - such as the Eat-Lancet diet[11] and the Nordic Nutrition Recommendations - recommend considerably lower animal product consumption. Research has shown that many NRDs are deficient in meeting both health and sustainability goals[12]. Moreover, NRDs are not a reliable benchmark for sustainability due to their highly political nature, and the capacity for interest groups like the livestock industry to influence them - such as the US livestock industry successfully

[9] FAO, 32.
[10] FAO, 19.
[11] Walter Willett et al., "Food in the Anthropocene: The EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems.," *Lancet (London, England)* 393, no. 10170 (2019): 447–92, https://doi.org/10.1016/S0140-6736(18)31788-4.
[12] Springmann, M et al. "The healthiness and sustainability of national and global food based dietary guidelines: modelling study" BMJ (2020); 370; https://doi.org/10.1136/bmj.m2322

"influencing government officials to drop sustainability from official US dietary guidance"[13].

- Even if NRDs were considered representative of sustainable diets, Behrens et al (2017) is out of date, because it examined NRDs circa 2016 - however, since then, an increasing number of countries have already updated their NRDs to include environmental considerations - and these updated NRDs invariably recommend lower animal product consumption, including the Nordic Nutrition Recommendations[14], Spain (whose NRD now recommends 0-3 portions of meat per week[15]) and Denmark (whose NRD now recommends meat consumption of no more than 350g per week[16]). More countries are likely to adopt NRDs which factor in sustainability while continuing to be healthier for the population than the average diet.
- Whereas NRDs provided a range of meat/dairy consumption recommendations, Behrens et al (2017) also uses the mid-point of NRDs - so does not represent the limits of what emissions reductions could be achieved even under 2016 NRDs, which would require looking at the lower end range of meat consumption recommendations, which would yield a higher emissions reduction.
- Using a better and coherent approach for answering this question, Clark et al, 2020 estimate the opportunity for dietary change alone (plant-rich diets) is **3.08 GtCO2eq per year**. This is within the range of previous assessments included in IPCC findings, which they report with high confidence, that a shift to more plant-based diets could mitigate GHG emissions by between **0.7 – 8 GtCO2eq per year**. Notably, higher reductions in meat and dairy lead to reductions at the higher end of this range[17]. For instance, one study was cited to show that global adoption of a flexitarian diet (75% of meat and dairy replaced by cereals and pulses, with only one portion of red meat a week) would reduce global emissions by approximately **5 GtCO2eq per year[18]**.

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[13] Donald Rose, Carina Vance, and Miguel Angel Lopez, "Livestock Industry Practices That Impact Sustainable Diets in the United States," *The International Journal of Sociology of Agriculture and Food* 27, no. 1 (June 28, 2021), https://doi.org/10.48416/ijsaf.v27i1.87.

[14] Nordic Cooperation, "Less Meat, More Plant-Based: Here Are the Nordic Nutrition Recommendations 2023," Nordic Cooperation, 2023, https://pub.norden.org/nord2023-003/.

[15] ASEAN, "Food-based dietary guidelines - Spain," Food and Agriculture Organization of the United Nations, 2022, http://www.fao.org/nutrition/educacion-nutricional/food-dietary-guidelines/regions/spain/es/.

[16] Ministry of Food, Agriculture and and Fisheries of Denmark, "The Official Dietary Guidelines – Good for Health and Climate" (Ministry of Food, Agriculture and Fisheries of Denmark, 2021), https://foedevarestyrelsen.dk/Media/638194807769097944/Danish_Official_Dietary_Guidelines_Good_for_Health_and_climate_2021_PRINT_ENG__webtil.pdf.

[17] P.R. Shukla et al., "Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems - Technical Summary" (IPCC, 2019), 49, https://www.ipcc.ch/site/assets/uploads/sites/4/2020/07/03_Technical-Summary-TS_V2.pdf.

[18] C. Mbow et al., "Food Security. In: Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems" (IPCC, 2019), 488, https://www.ipcc.ch/site/assets/uploads/sites/4/2021/02/08_Chapter-5_3.pdf.

- A more recent paper from Behrens and others - Sun et al (2022)[19] - found that aligning the diets of high-income countries (representing 17% of the global population) with the Eat-Lancet diet would "reduce annual agricultural production emissions of high-income nations' diets by 61% (equal to 0.75 GtCO2eq for these high-income country diets alone) while sequestering as much as 98.3 (55.6–143.7) $GtCO_2$ equivalent".
- Another paper from Behrens and others[20] found that the emissions mitigation potential of only shifting Europe's diets to align with the Eat-Lancet diet would be 0.22 $GtCO_2e\ yr^{-1}$. This is greater than half of the relatively meager mitigation potential that the recent FAO report erroneously concludes is possible for the entire world adopted healthy and sustainable dietary changes.

Ignores the opportunity costs of land spared through dietary change:

- Behrens et al (2017) does not factor in potential carbon sequestration possible on the land spared from dietary change.
- This is done in a subsequent paper from Behrens and others - Sun et al (2022)[21] report a carbon sequestration potential of 98.3 (55.6–143.7) $GtCO_2$ is possible from nature restoration on land spared by high-income countries shifting to the Eat-Lancet diet.
- Hayek et al (2021) report that the potential carbon sequestration through ecosystem restoration on land spared from shifts in global food production to plant-based diets could lead to cumulative sequestration of 332–547 $GtCO_2$[22]. This is equivalent to 4.4–7.3 $GtCO_2$ per year if annualized over a realistic ecosystem regrowth time frame of 75 years.
- As mentioned previously, Clark et al. (2022) also estimated carbon regrowth potential from dietary change through the 21st century. The total estimate of ecosystem restoration following global dietary shifts comparable to the EAT-Lancet diet is 3.12 $GtCO_2$ through 2050. This is in addition to reducing ongoing agricultural emissions by 3.10 $GtCO_2e$ through 2050, contributing a net mitigation potential of 6.22 $GtCO_2e$[23].

Major methodological errors:

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[19] Zhongxiao Sun et al., "Dietary Change in High-Income Nations Alone Can Lead to Substantial Double Climate Dividend," *Nature Food* 3, no. 1 (January 2022): 29–37, https://doi.org/10.1038/s43016-021-00431-5.
[20] Zhongxiao Sun et al., "Adoption of Plant-Based Diets across Europe Can Improve Food Resilience against the Russia–Ukraine Conflict," *Nature Food* 3, no. 11 (November 2022): 905–10, https://doi.org/10.1038/s43016-022-00634-4.
[21] Sun et al., "Dietary Change in High-Income Nations Alone Can Lead to Substantial Double Climate Dividend."
[22] Matthew N. Hayek et al., "The Carbon Opportunity Cost of Animal-Sourced Food Production on Land," *Nature Sustainability* 4, no. 1 (January 2021): 21–24, https://doi.org/10.1038/s41893-020-00603-4.
[23] Michael Clark et al. "Global food system emissions could preclude achieving the 1.5° and 2°C climate change targets" *Science* (2020); 370: 705–708. doi:10.1126/science.aba7357. This mitigation potential assumes a global warming potential of a hundred-year integrated timeframe (GWP_{100}) from non-CO_2 GHGs, a similar assumption and metric used by FAO in the report in question. The mitigation potentials by 2050 were calculating using supplementary data S2 in Clark et al. (2020), by subtracting their "healthy diets" dietary change scenario for year 2050 from a business-as-usual diet for year 2050, with all other scenario parameters set to business-as-usual projections.

- **Comparing total food systems emissions from Tubiello et al. (2021) with estimations for emissions mitigation potential from dietary change from Behrens et al (2017) study is not appropriate**, for a number of reasons**:**
    - Tubeillo et al. (2021) is incomparable to Behrens et al. (2017). Tubeillo et al. (2021) deliberately expands the boundaries and definitions of emissions that count as "within the food system" beyond what previous studies have counted, including Behrens et al. (2017). A major stated purpose of this research paper was to discover and monitor a growing category of emissions: pre- and post-production emissions. As such, this research added emissions from sources such as food waste disposal and food processing. Behrens et al. (2017) did not consider these emission sources within the systems boundaries for their study.
    - Importantly, Tubiello et al. consider and update estimates of land use change, which were not included in the EXIOBASE database of emission sources from food used by Behrens et al. (2017).
    - Altogether, the choice of these two studies generates a deflated proportion of dietary change-related mitigation (Behrens et al.) over an inflated global total food-related emissions (Tubiello et al.). The latter explicitly aimed to expand the system boundaries and quantity of emissions reflected. This causes the denominator to be inappropriately high, because the scope and quantity of lifecycle emissions is beyond that reflected in the numerator figure from Behrens et al. (2017). This results in an inappropriately small estimate of the proportion of food systems mitigation possible from dietary change in the FAO's report.
- **Comparing 2050 "Business As Usual" livestock emissions with figure derived from comparison of Behrens et al (2017) and Tubiello et al. (2021) studies, in Figure 12 is unjustifiable**, for a number of reasons**:**
    - **Different baseline years:** Behrens et al (2017) examines changes in emissions based on dietary changes relative to 2011 diets, 2011 population levels, and using 2011 emissions data - and does not make 2050 projections. Given that projected Business As Usual diets for 2050 include significantly higher meat consumption, aligning projected 2050 diets with nationally recommended diets (NRDs) would require significantly greater reductions in meat consumption, and in turn result in significantly higher reductions in emissions than is modeled in Behrens et al where current diets are used as the baseline. This makes Behrens et al (2017) an inappropriate study to measure potential emissions mitigation against a 2050 baseline.
    - **Double counting of emissions from increases in meat consumption, which offsets/obscures the emissions savings from meat reduction:** The FAO factors in a projection of an extra 2,871 Mt CO_2eq in Figure 12, driven by increased global meat consumption. But Behrens et al (2017)'s net emissions savings due to dietary changes also factor in increases in emissions in some countries due to

increased meat consumption, mainly in lower income countries, to bring them in line with their national dietary guidelines - which significantly offset and therefore obscure some of the emissions savings caused by the countries reducing their meat consumption. The emissions from these projected increases in meat consumption are therefore being double counted in the graph above - once in the additional emission (BAU) bar, and again in the Behrens et al study, in a way which further diminishes the emissions reduction potential from dietary change. A consistent way of calculating this would be to put all emissions from increased meat consumption in "Additional emissions (BAU)" and register all emissions related to dietary change compared to this 2050 baseline in the bar "Dietary change".

- **Including emissions from increases in vegetable, fruit and nut consumption which are unrelated to livestock-specific GHG reductions of substituting meat and dairy:** Figure 12 focuses entirely on the emissions of livestock - and the impact of mitigating livestock-specific emissions. Therefore, it is relevant to factor in emissions from plant-based foods, but only where these are used as a substitute for meat consumption. However, Behrens et al (2017) has a far broader scope - it looks also at the increases in fruit and vegetable production needed to ensure the global population is eating a healthy diet, e.g. increased fruit, vegetable, and nut consumption, which is generally recommended across countries that currently consume both low and high quantities of meat. As part of this, the study models changes that are totally unrelated to substituting meat - and these add considerable positive emissions which significantly offset/obscure the emissions savings of reduced meat consumption. Behrens et al (2017) is thus a completely inappropriate study to use to measure the emissions mitigation potential of dietary change on livestock emissions. It is worth noting that by 2050, significant decarbonisation of electricity grids and electrification of farm machinery would significantly lower the environmental impacts of global vegetable, fruit and nut production.

Other Claims

The FAO state that "replacing meat with calorically equivalent greenhouse vegetables or out-of-season fruits flown from afar could potentially reverse many GHG emissions offsets". The only evidence cited for this claim by the FAO is Fresán and Joan Sabaté (2019)[24] which in turn cites Vieux et al. (2012)[25] - a study which only references greenhouses once to say that

[24] Ujué Fresán and Joan Sabaté, "Vegetarian Diets: Planetary Health and Its Alignment with Human Health," *Advances in Nutrition (Bethesda, Md.)* 10, no. Suppl_4 (November 1, 2019): S380–88, https://doi.org/10.1093/advances/nmz019.

[25] F. Vieux et al., "Greenhouse Gas Emissions of Self-Selected Individual Diets in France: Changing the Diet Structure or Consuming Less?," *Ecological Economics* 75 (March 1, 2012): 91–101, https://doi.org/10.1016/j.ecolecon.2012.01.003.

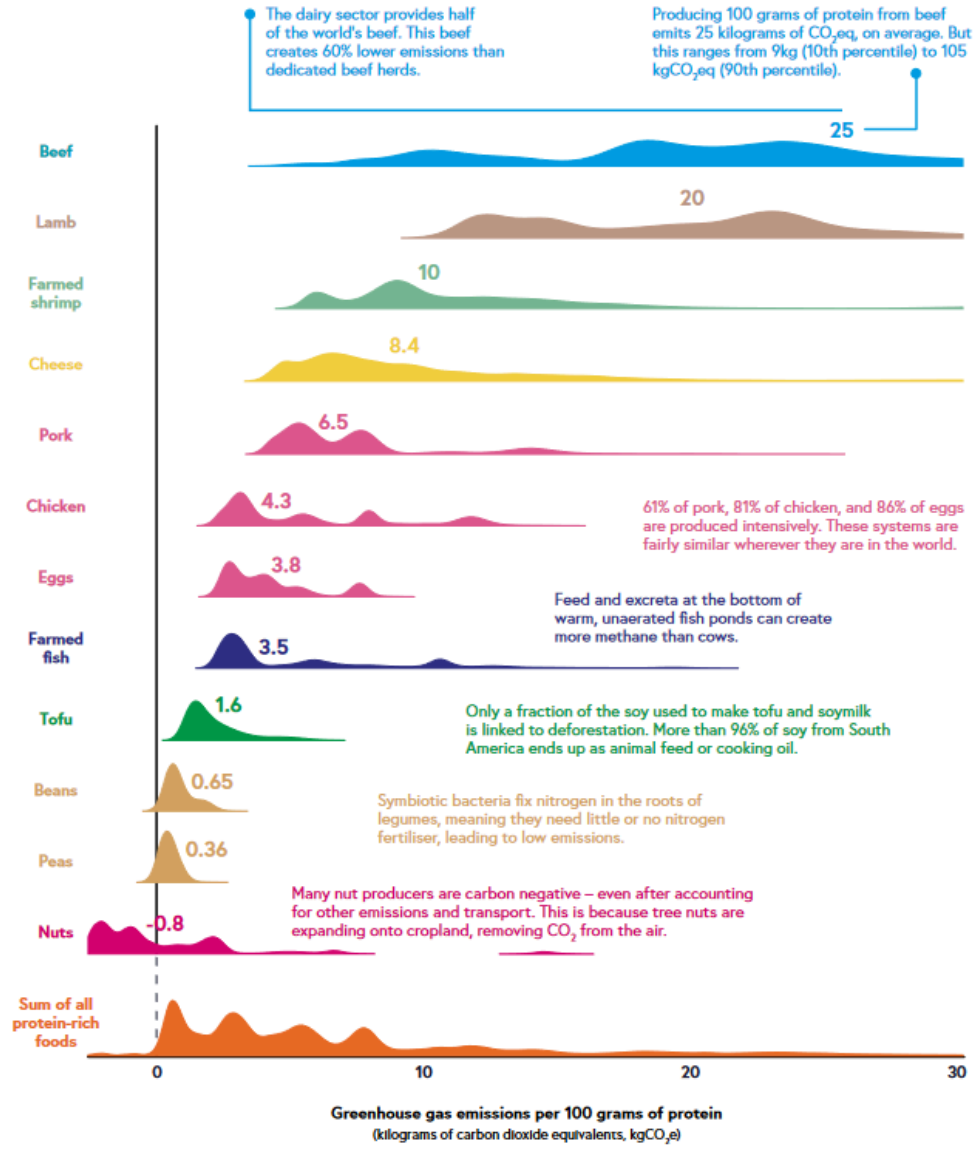
“Jungbluth et al. (2000) observed that the greatest environmental impacts were associated with fresh food that is flown from another country and with greenhouse production and meat consumption” - a very out of date study. In fact, Fresán and Joan Sabaté (2019)[26]’s main finding is that “Greenhouse gas emissions resulting from vegan and ovolactovegetarian diets are ~50% and ~35% lower” than current diets - information omitted by the FAO report. Additionally, fruit and vegetables transported from other countries is not a meaningfully large source of greenhouse gases, except in a few cases of berries or asparagus. Most food is shipped by ocean, as well as truck and rail. Altogether, only 0.16% of food is air-flown[27].

The claim is also dubious because the quantitative focus of the FAO report is on the replacement of animal-sourced foods, not on the additional fruit and vegetable consumption recommended by healthy dietary guidelines. These recommendations recommend replacing animal-sourced food with plant-based foods high in protein - such as legumes, pulses and nuts. These plant-based protein sources tend to have lower GHG emissions than even fruit and vegetables, which are already lower than most animal-sourced foods . For instance, the following diagram based on Poore and Namecek (2018)[28] and reported in the UK’s National Food Strategy[29] shows that even the most emissions intensive protein-rich plant-based foods are usually far less emissions intensive than the vast majority of animal proteins.

[26] Fresán and Sabaté, “Vegetarian Diets.”
[27] J. Poore and T. Nemecek, “Reducing Food’s Environmental Impacts through Producers and Consumers,” *Science* 360, no. 6392 (June 2018): 987–92, https://doi.org/10.1126/science.aaq0216.
[28] J. Poore and T. Nemecek, “Reducing Food’s Environmental Impacts through Producers and Consumers,” *Science* 360, no. 6392 (June 2018): 987–92, https://doi.org/10.1126/science.aaq0216.
[29] Henry Dimbleby, “The National Food Strategy: The Plan” (National Food Strategy, July 2021), https://www.nationalfoodstrategy.org/the-report/.

Figure 8.1

Vegetable proteins have low carbon footprints, while dairy and meat tends to be more carbon heavy[1]



Moreover, because the FAO presents meat substitution, and resulting GHG emissions, as an entirely hypothetical scenario, without any independent environmental or economic modeling, we must consider multiple counterfactual scenarios, including additional economic and land use changes. Consider that currently, many high- and upper-middle-income countries devote significant areas of cropland are used to grow animal feed[30]. Dietary change may thus free significant areas of cropland to enable extra domestic production of plant-based foods, without

[30] Emily S Cassidy et al., "Redefining Agricultural Yields: From Tonnes to People Nourished per Hectare," *Environmental Research Letters* 8, no. 3 (September 1, 2013): 034015, https://doi.org/10.1088/1748-9326/8/3/034015.

the need for imports. As noted above, the emissions intensity of greenhouses will also decrease as electricity is decarbonised by shifting to renewables before the year 2050. Finally, the majority of plant-based foods are transported by ground and ocean freight shipping - and could easily avoid being air freighted.

Conclusion

In sum, the modeling assumptions and approach used by FAO systemically and inappropriately appear to underestimate the opportunity of plant-based diets for reducing GHG emissions. The conflation of the mid-point of ranges in now-obsolete NRDs with the opportunities of dietary change is particularly erroneous, and causes a large underestimate of the true opportunity of dietary change.

However, even if one was to assume that the mid-point of these now-obsolete NRD ranges was reasonable (against large-volumes of recent scientific evidence), each subsequent modeling choice and assumption appears to have been chosen to reduce the contribution of dietary change to climate mitigation. Many methodological errors appear to have been committed - including double counting of the emissions from increases in meat consumption, use of emissions savings compared to current diets and falsely representing these as potential emissions savings compared to business-as-usual 2050 projections. Further errors arise by including emissions from fruits, vegetables and nuts, unrelated to meat substitution in diets.

The combination of the report's inappropriate choice of source data to answer the question at hand, and errors that seriously distort the findings of scientific papers of which we are co-authors, means that we are urgently requesting a retraction of this report, and a re-issuing of the report with more appropriate sources selected and methodological errors rectified. Moving forward, we hope that the FAO will include transparent modeling and the involvement of experts from the beginning of the process will provide a more scientifically honest assessment of the opportunities of dietary change in meeting climate goals.

Sincerely,

Paul Behrens

Matthew Hayek

CC: Maria Helena M.Q. Semedo
Dominik Wisser