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The evolution of “sustainable” and vegetarian recipes from manuscripts and cookbooks to online

Amsterdam Symposium on the History of Food

Food and the Environment: The Dynamic Relationship Between Food Practices and Nature

Saturday 12th February 09:30

Panel 4 —Recipes for (un)sustainability

Speaking: Christian Reynolds

Centre for Food Policy, City, University of London

@sartorialfoodie christian.reynolds@city.ac.uk

Wider project team:

Christian Reynolds, Berill Takacs, Anastasiia Klimashevskaja, Aslaug Angelsen, Eline van Oosten, Mark A.

Greenwood, Rebeca Ibanez Martin, Steve Brewer, Marieke van Erp, Alain Starke, Diana Maynard, Christoph Trattner



UNIVERSITY OF BERGEN



Centre for Food Policy

Shaping an effective food system

Who am I? – Christian Reynolds



Senior Lecturer at the Centre for Food Policy



Focus: healthy sustainable diets and food consumption (including waste)

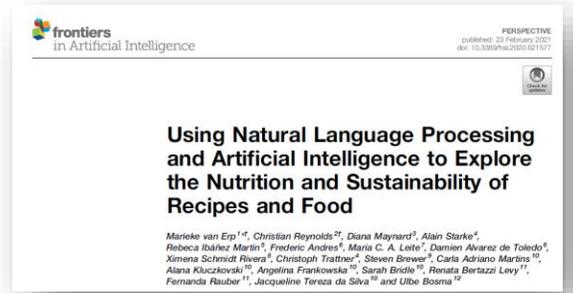
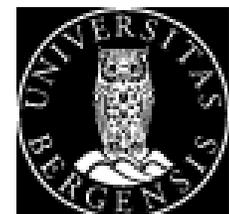
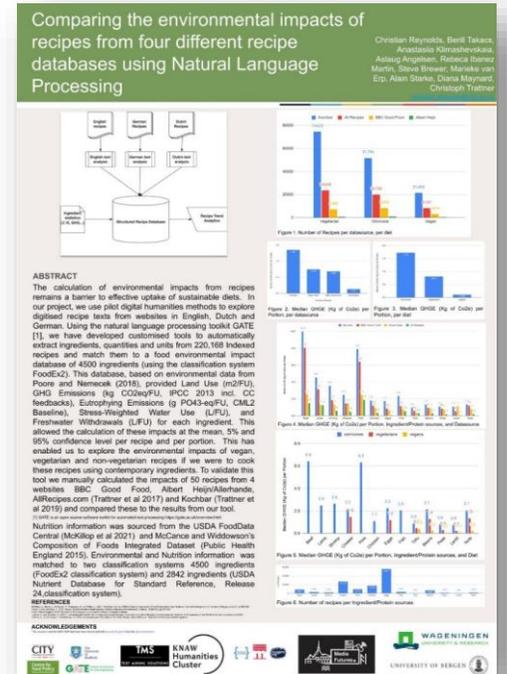


Previously: Food waste politics/history, social sciences approaches

This presentation is part of ongoing work

- <https://dhlab-nl.github.io/sustainable-recipes/>

Communicating the environmental impact of plant based recipes
project funded by The Alpro Foundation

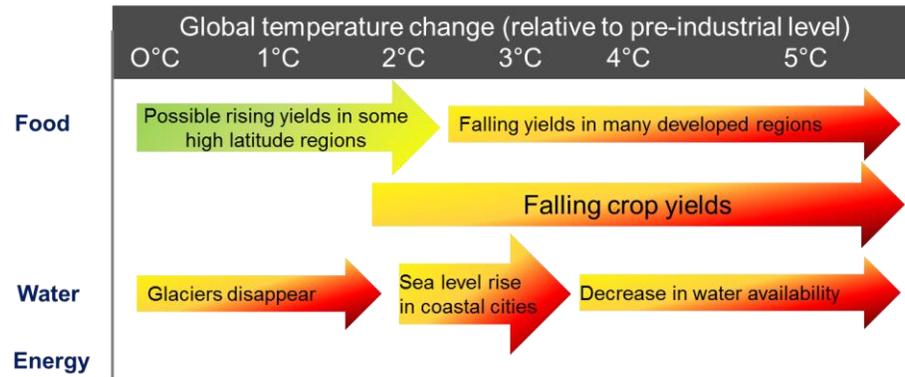
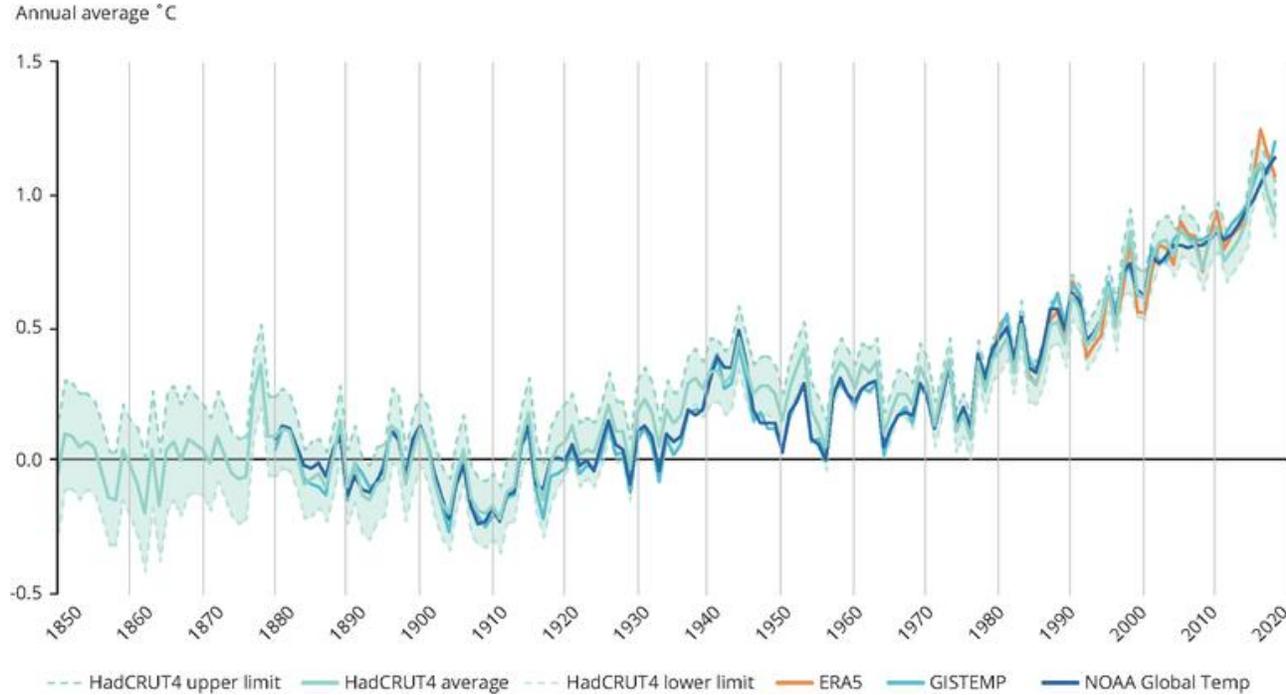


Christian Reynolds, Berill Takacs, Anastasiia Klimashevskaya, Aslaug Angelsen, Eline van Oosten, Mark A. Greenwood, Rebeca Ibanez Martin, Steve Brewer, Marieke van Erp, Alain Starke, Diana Maynard, Christoph Trattner

The climate is changing...

Global average near surface temperature since the pre-industrial period

Source [European Environment Agency \(EEA\)](https://www.eea.europa.eu/en/press-photos/2021/04)



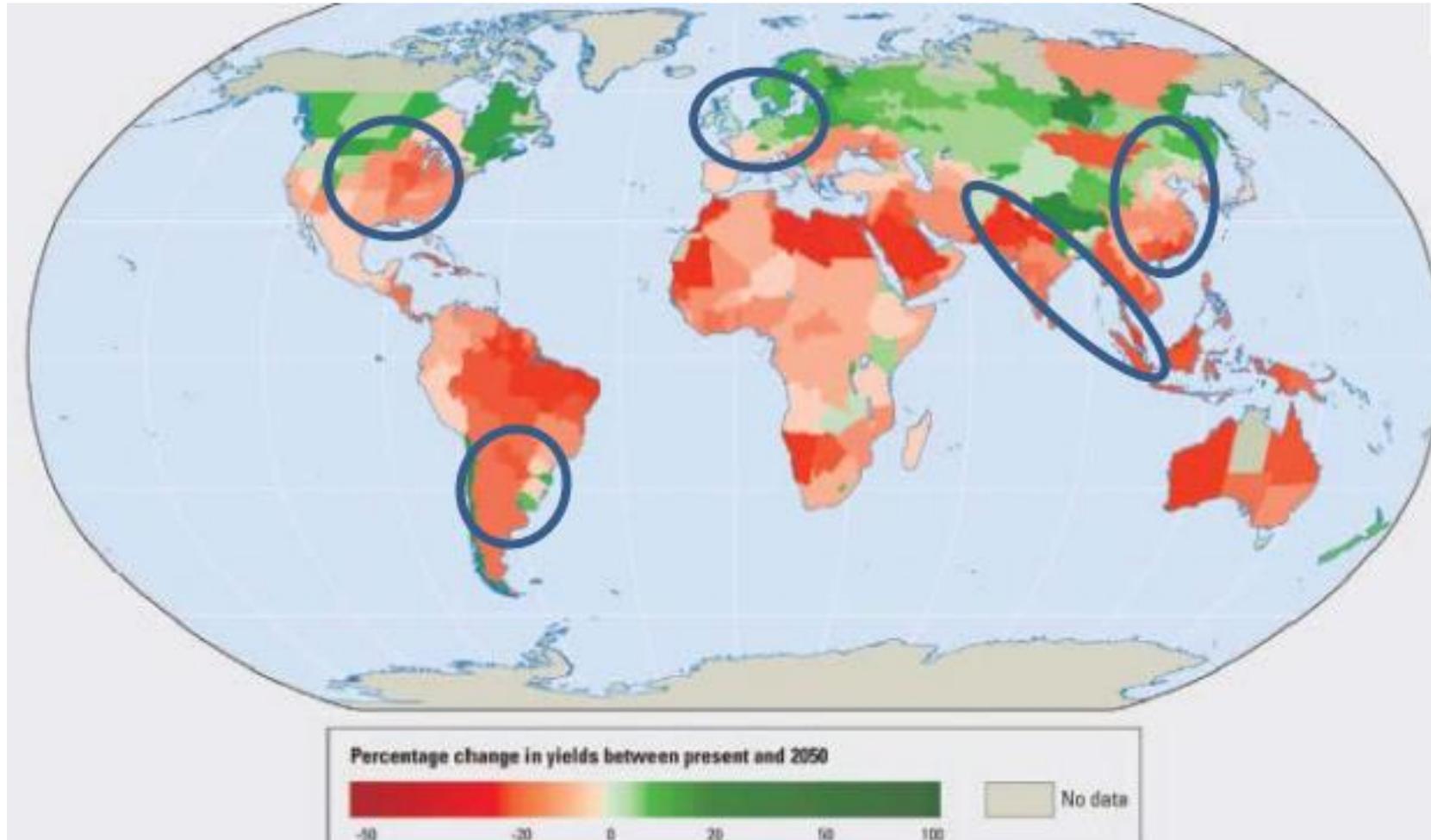
French winemakers count cost of 'worst frost in decades'

Government prepares rescue package as rare freezing temperatures damage crops and vines



▲ Burgundy vines have been set alight to fight against frost. Photograph: Etienne Ramousse/Zeppelin/Sipa/Rex/Shutterstock

Food production and climatic change are linked

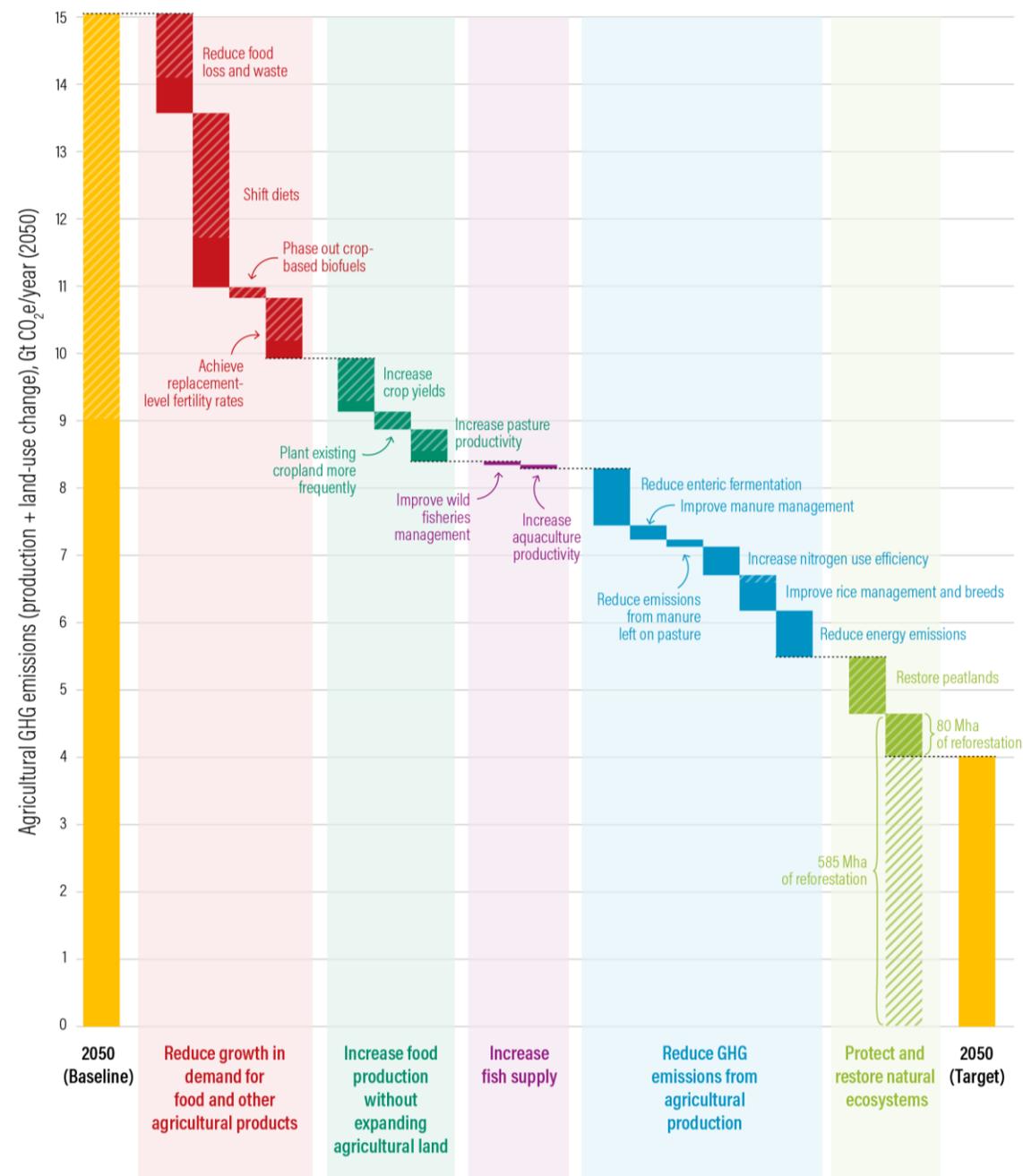


Wheeler, Tim, and Joachim Von Braun. "Climate change impacts on global food security." *Science* 341.6145 (2013): 508-513.

The emissions reduction challenge – A **warming** food system

The two biggest reductions we can make to agricultural GHGE to achieve a **2°C** warming target (4 Gt/year) or **1.5°C** warming target (0 Gt/year) are through:

1. **Shifting to sustainable diets**
2. **Reducing Food Loss and Waste**



Note: Solid areas represent agricultural production emissions. Hatched areas represent emissions from land-use change.

Source: GlobAgri-WRR model.

Source WRI, [World Resources Report: Creating a Sustainable Food Future](#)



Sustainable diets and The EAT–Lancet report

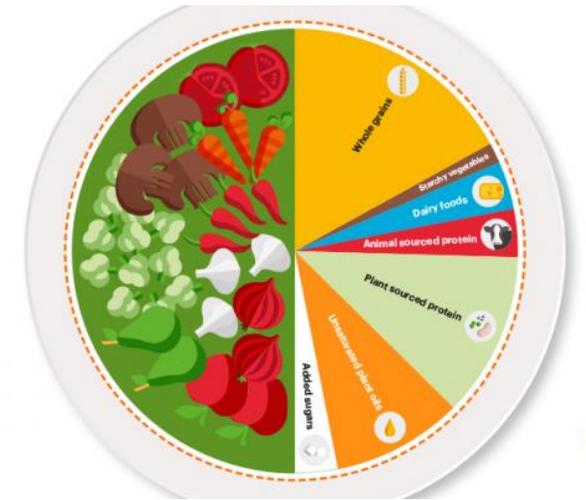
Published in 2019

Setting Scientific Targets for Healthy Diets and Sustainable Food Production

↑ consumption of fruit (100 -300g/day) & vegetables (200-600g/day)

↓ consumption of animal products

The Planetary Health Plate

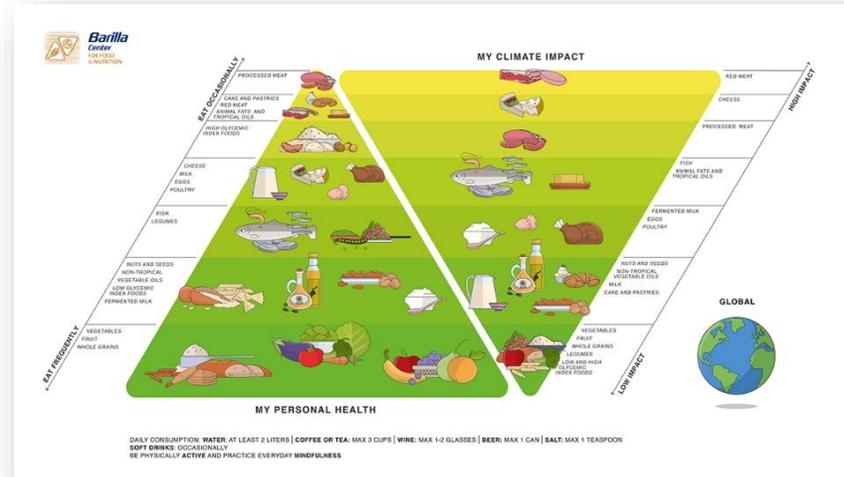
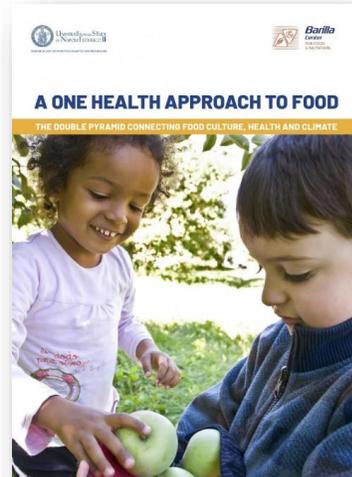
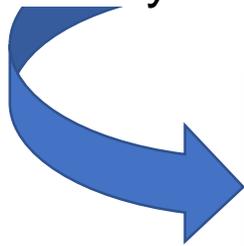


#foodcanfixit #EATLancet

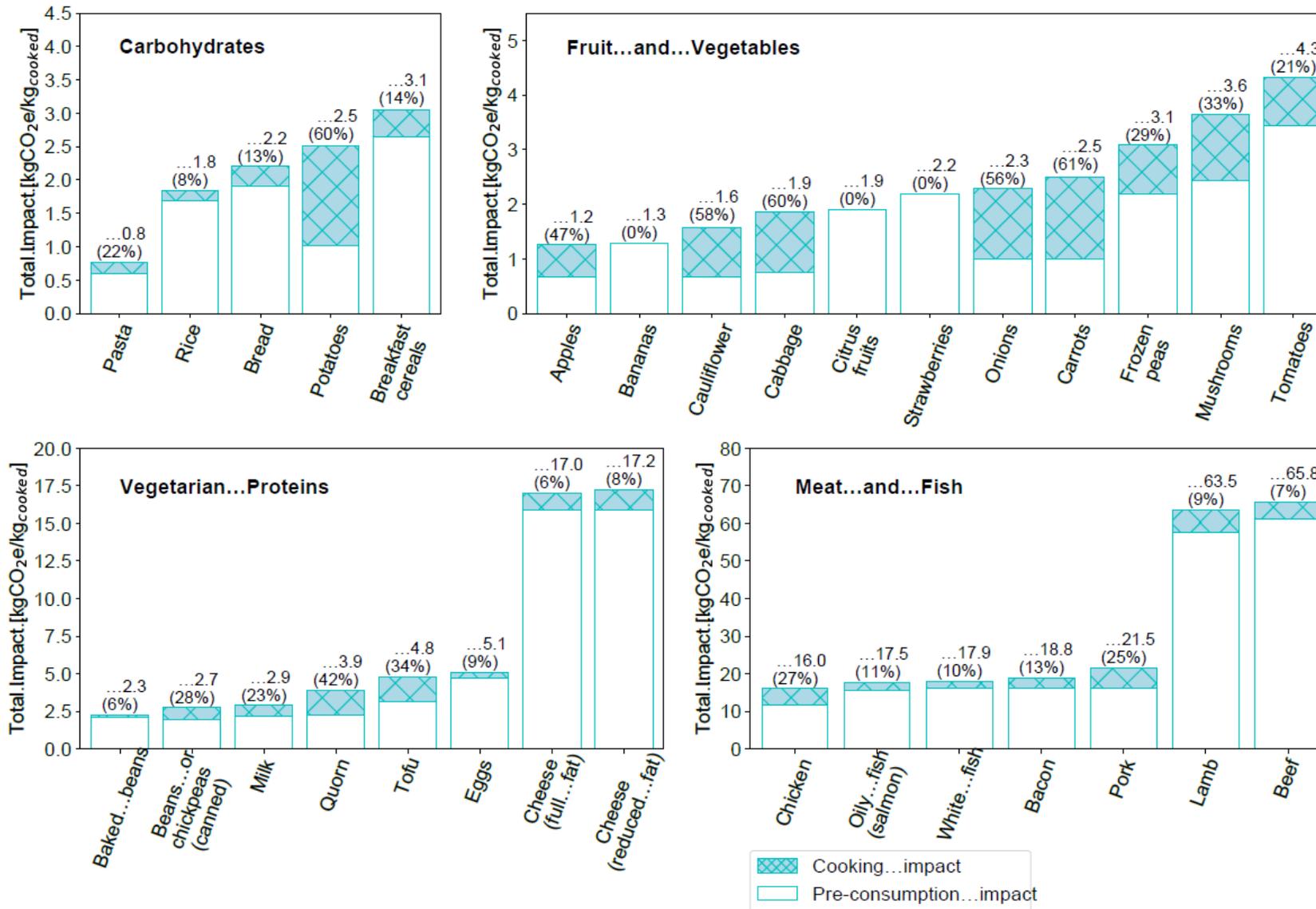


The EAT–Lancet report - A Critique

- Lack of consideration of local and traditional diets, food ways or systems of production.
- Limited suggestions on how to implement the ‘global healthy sustainable diet’ (only photos).
- Minimal discussion of cooking and real life examples (e.g. no recipes)
- Current sustainable dietary guidance is given as ingredients
- We have only just started to see translation into sustainable gastronomy – see Barilla foundation reports (2021)



How we cook matters! Up to 61% of GHGE impacts



Impacts of home cooking methods and appliances on the GHG emissions of food

Angelina Frankowska¹, Ximena Schmidt Rivera², Sarah Bridle¹, Alana Marielle Rodrigues Galdino Kluczkowski³, Jacqueline Tereza da Silva^{3,4}, Carla Adriano Martins¹, Fernanda Rauber⁵, Renata Bertazzi Levy², Joanne Cook¹ and Christian Reynolds⁶

Food is widely acknowledged as a major contributor to climate change but estimates of food-related greenhouse gas (GHG) emissions frequently consider supply chain stages only up to the farm gate or regional distribution centres. Here we estimate GHG emissions associated with different cooking methods and appliances in the UK. Data on current cooking practices were collected through a survey with more than 700 respondents. Our results reveal that home cooking accounts for as much as 61% of total emissions associated with specific foods, and that this can be substantially reduced through alternative, readily available cooking practices.

The contribution of home cooking to climate change is rarely assessed because data on household cooking practices are scarce. Yet understanding climate change impacts of different food items from cradle to grave is vital for effectively reducing greenhouse gas (GHG) emissions.

When whole life cycles of food products are taken into account, food is estimated to emit up to 37% of global GHG emissions¹. Most studies estimate the climate change impact of food only up to the retail/purchase stages of the food supply chain, thus excluding consumption (here defined as food preparation and cooking). However, the preparation of meat and vegetables can contribute up to 20% and 36% of total product emissions, respectively, when recipe recommendations of major cooking methods are followed^{2,3}. Cooking food from scratch at home can result in lower overall GHG emissions than consuming ready-made meals⁴.

Previous studies have indicated that GHG emissions from home cooking can be reduced by minimising cooking times and appliance use. Such a reduction can reach 86% in the case of pasta⁵ and the equivalent of 18–55% less energy use in the case of roast beef and Yorkshire puddings⁶. However, little is known about actual cooking practices for different foods in households. Previously recorded cooking practices adopted by university students could indicate how to reduce GHG emissions due to unsustainable cooking⁷, but are not representative of general consumption patterns across the population.

In this article we assess the impact of home cooking based on actual cooking practices and preferences rather than solely on recipe recommendations. We first report the results of a UK-wide survey conducted to collect data on cooking practices considering various foods, appliances and cooking times. Then, we compare different cooking methods with respect to their GHG emissions and estimate the contribution of cooking to food products' overall impact on

climate change. Based on these results, we identify the least and most sustainable cooking techniques as well as opportunities to reduce their GHG footprint. Unsustainable cooking practices such as prolonged heating-up of the oven or overcooking food, as well as not using energy-efficient appliances, may be factors that increase GHG emissions unnecessarily. Addressing these issues can help raise awareness about the contribution of cooking to climate change and how unsustainable cooking practices can exacerbate the problem.

Cooking practices in the UK
Our survey revealed that on average cooking accounts for 6–61% of the total GHG emission impacts for a given food (Fig. 1a). In the particular case of vegetables (mainly potatoes, carrots, cabbage, cauliflower and onions), cooking accounts for up to 61% of their total emissions. In the case of meat and fish, it represents 8–27% of their total emissions.

Considering foods that are ready to eat, the toasting of bread contributes 13% of the total emissions released (Fig. 1). For semi-cooked or precooked foods, such as tofu and Quorn, cooking accounts for up to 42% of their GHGs. Cooking canned baked beans, which are ready to eat after being heated up, represents 6% of their total emissions. Cooking other types of canned pulses (beans or chickpeas) with other ingredients in various dishes represents 28% of their total GHG emissions.

Cooking meat accounts for the highest overall emissions across the various foods in the UK. This is due to the long cooking times

(>60 min) of oven roasting, which consumes the most energy among the different appliance types (Fig. 2e.g. Supplementary Fig. 1p,q and Supplementary Tables 1 and 2). However, while lamb and beef cause the highest total GHG emissions by far, cooking impacts are mostly less than 11% of total GHG emissions. Compared with the pre-cooking stage (60 kgCO₂e per kg cooked), cooking-related emissions (up to 6 kgCO₂e per kg cooked) are negligible. This suggests that reducing the consumption of lamb and beef is more important than changing the cooking method. Replacing some meat with pulses provides a rich protein source that generates lower GHG emissions. For instance, frozen and canned pulses reduce emissions by up to 29 times and 10x, respectively, compared with beef/lamb and pork/chicken meat, respectively, per kilogram of cooked food (Fig. 1). Pulses also perform better in terms of protein content, reducing GHG emissions by about 40% compared with chicken/pork and by up to 5x-fold compared with beef/lamb (Supplementary Fig. 2). Furthermore, apart from mushrooms GHG emissions from beef are

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A wider timeline of “sustainable” food books...

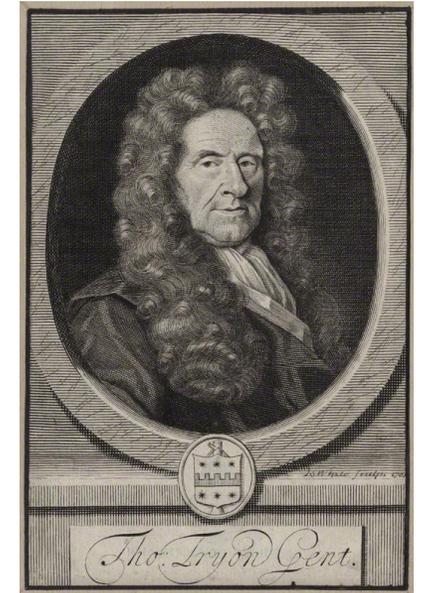
Depending on your definition of “sustainable” there is a long history of manuscripts that advise (proselytizing) what we would now think of as a sustainable diet...

"The greater production of food by agriculture than by pasture, shews that a nation nourished by animal food will be less numerous than if nourished by vegetable"...
*"The inequality of mankind in the present state of the world is too great for the purposes of producing the **greatest quantity of human nourishment, and the greatest sum of human happiness**" - Erasmus Darwin Zoonomia (1794–1796)*

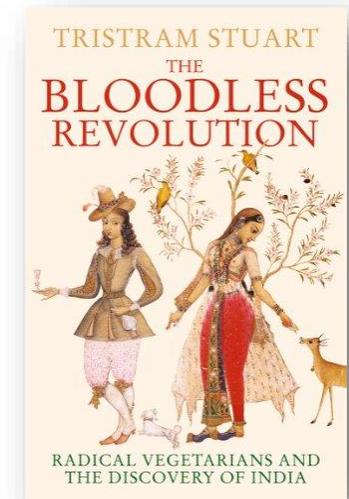
- Thomas Tryon, *The Way to Health and Long Life* (1683).
- Thomas Tryon, *Pythagoras His Mystic Philosophy Revived* (1691)
- John Oswald, *The Cry of Nature, Or, an Appeal to the Mercy and to Justice, on Behalf of the Persecuted Animals* (1791).
- Joseph Ritson, *Essay on Abstinence from Animal Food* (1802)
- William Andrus Alcott, *Vegetable Diet, Sanctioned by Medical Men and by Experience in All Ages* (1838)
- Howard William, *The Ethics of Diet* (1883).
- Henry Salt, *A Plea for Vegetarianism* (1886)
- Anna Kingsford, *The Ideal in Diet* (1898).



- Frances More Lappé, *Diet for a Small Planet* (1971)



[Thomas Tryon \(1634–1703\)](#)



Vegetarian cookbooks also have evolved.

- Colin Spencer highlights an evolution of the vegetarian cookery book and vegetarianism for multiple reasons.

1821 Mrs Brotherton's A New System of Vegetable Cookery

1833 Vegetable Cookery 'By a lady',

1847 A Few Recipes of Vegetarian Diet,

1849 The Vegetable Diet, William Alcott

1895 Fast Day and Vegetarian Cookery, by E.M. Cowen and Beaty-Pownall,

1895 Fat of the Land and How to Live On It, Elizor Goodrich Smith;

1899 The Natural Food of Man and How to Prepare It. Mrs Leadsworth

1904 Substitute for Flesh Foods: Vegetarian Cookbook by E.G. Fulton

1909 Mrs Rover's Vegetable Cookery and Meat Substitutes, Sarah Tyson Rover

1910 Jeanne Jardine wrote The Best Vegetarian Dishes I Know,

1914 Meatless Cookery; with Special Reference to Diet for Heart Disease,

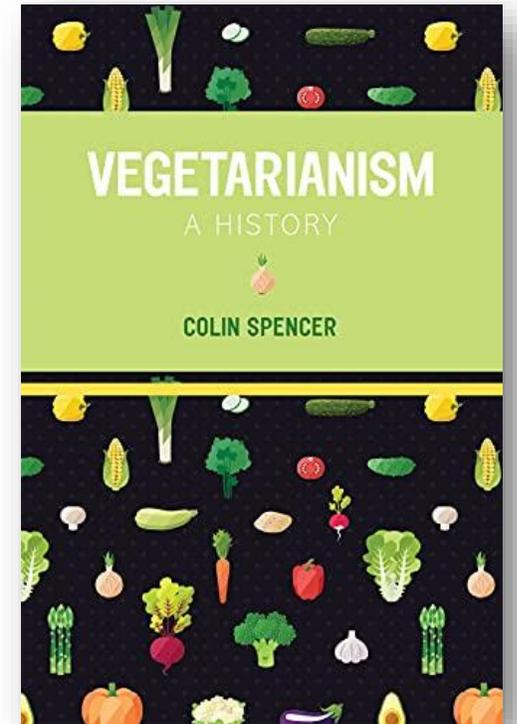
Blood Pressure and Autointoxication, by Marie McIlvaine Gillmore,

1920 to 1930 12 books

1960 to 1980 183 books

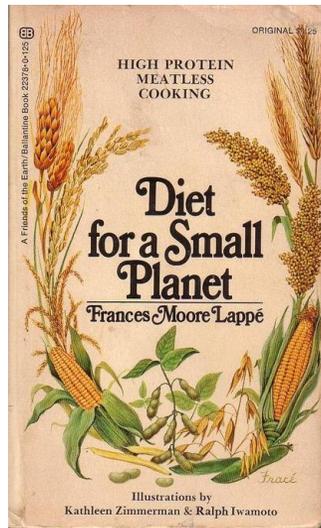
Etc....

On <https://www.eatyourbooks.com> there are now vegetarian n=5,428 (oldest book 1950) , vegan n=1,433 (oldest book 1982)

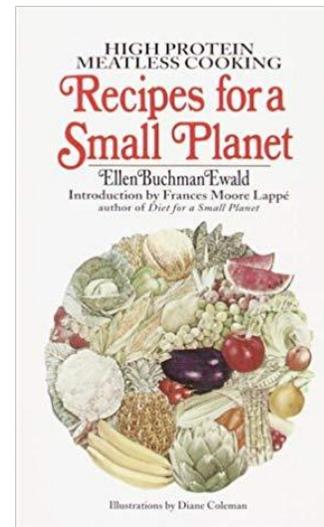


Is there such a thing as a sustainable cookbook?

Earliest English language “modern” “cookbook” rather than book on food?
1971 (Diet for a Small Planet) -> 1973 (Recipes For A Small Planet)



1971 0 recipes
1992 152 recipes
2022 85 recipes

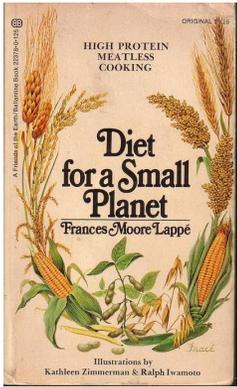


1973 202 recipes

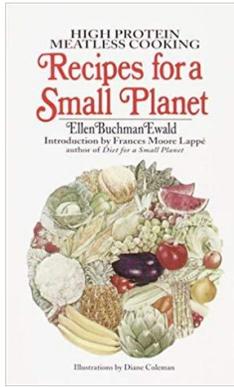
- Shifting of diet towards environmental vegetarianism (not carbon focused)
- Lentil and nuts – focused
- Large geography of cuisine styles: middle eastern, Indian, Brazilian, Mexican, Greek, Italian and ‘oriental’.
- Oven (and other high energy use methods) used.

A timeline of sustainable cookbooks

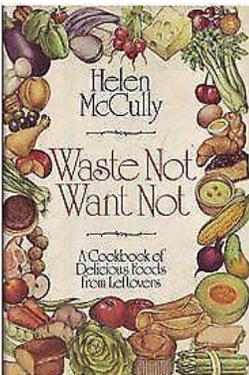
I searched <https://www.eatyourbooks.com/>* to find **278 cookbooks** that had titles including “sustainable”, “eco”, “planet”, “climate”, “carbon”, “waste”, and “flexitarian” 1973-2022



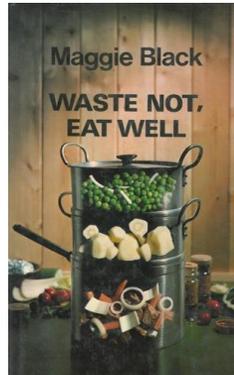
1971/2021
30 editions



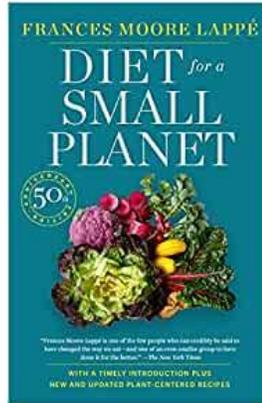
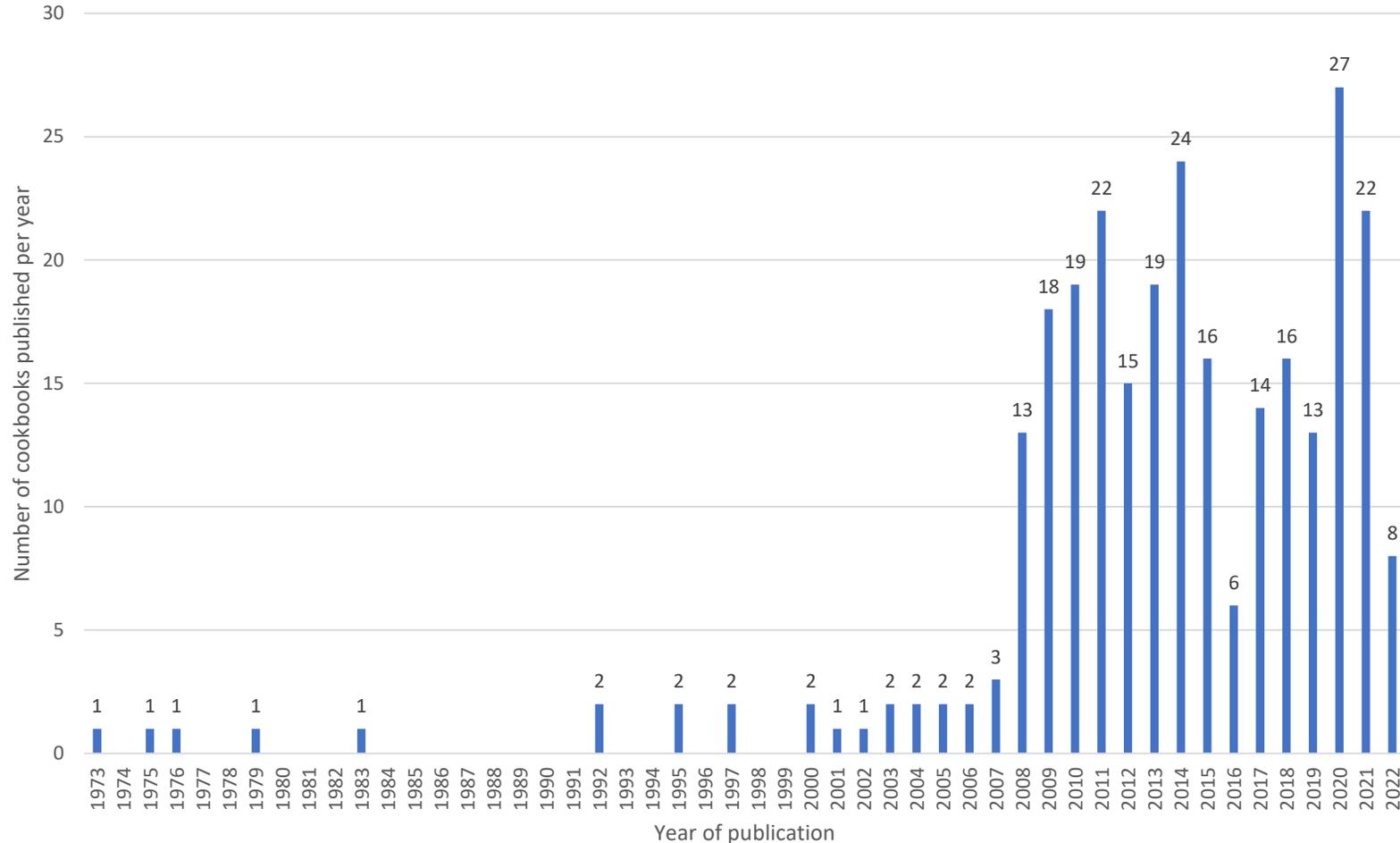
1973/1985



1975



1976

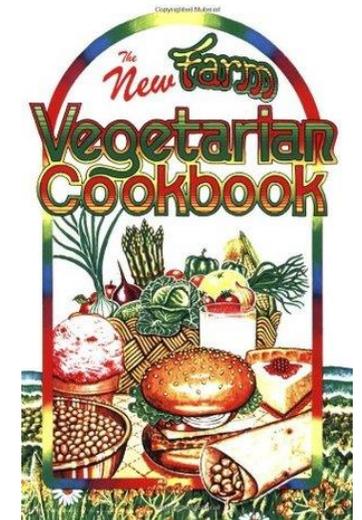
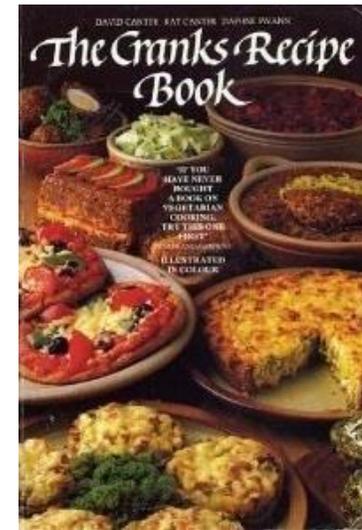
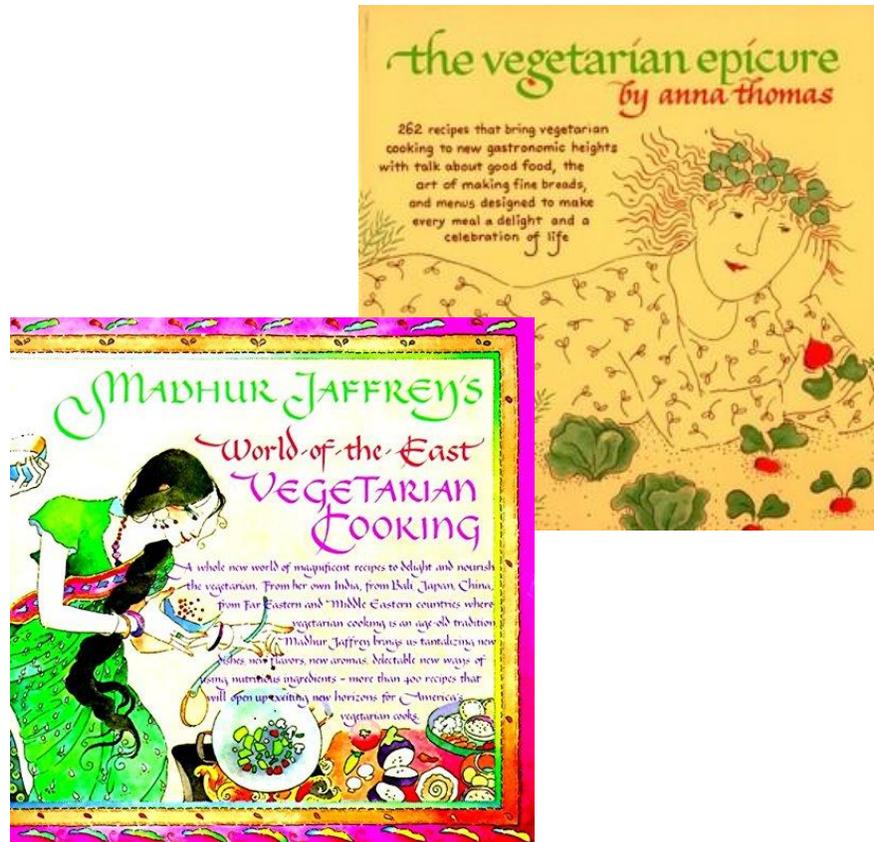
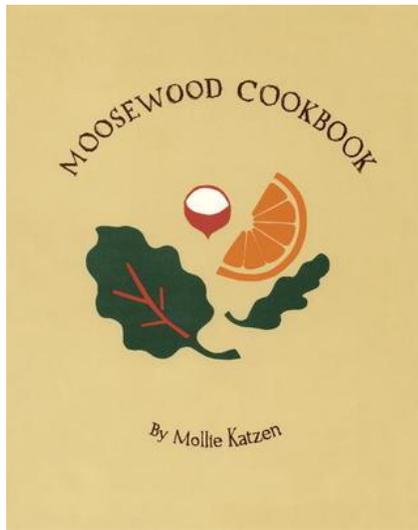


2021

* <https://www.eatyourbooks.com/> has n=160,943 books in its database (oldest book 1833), vegetarian n=5,428 (oldest book 1950) , vegan n=1,433 (oldest book 1982)

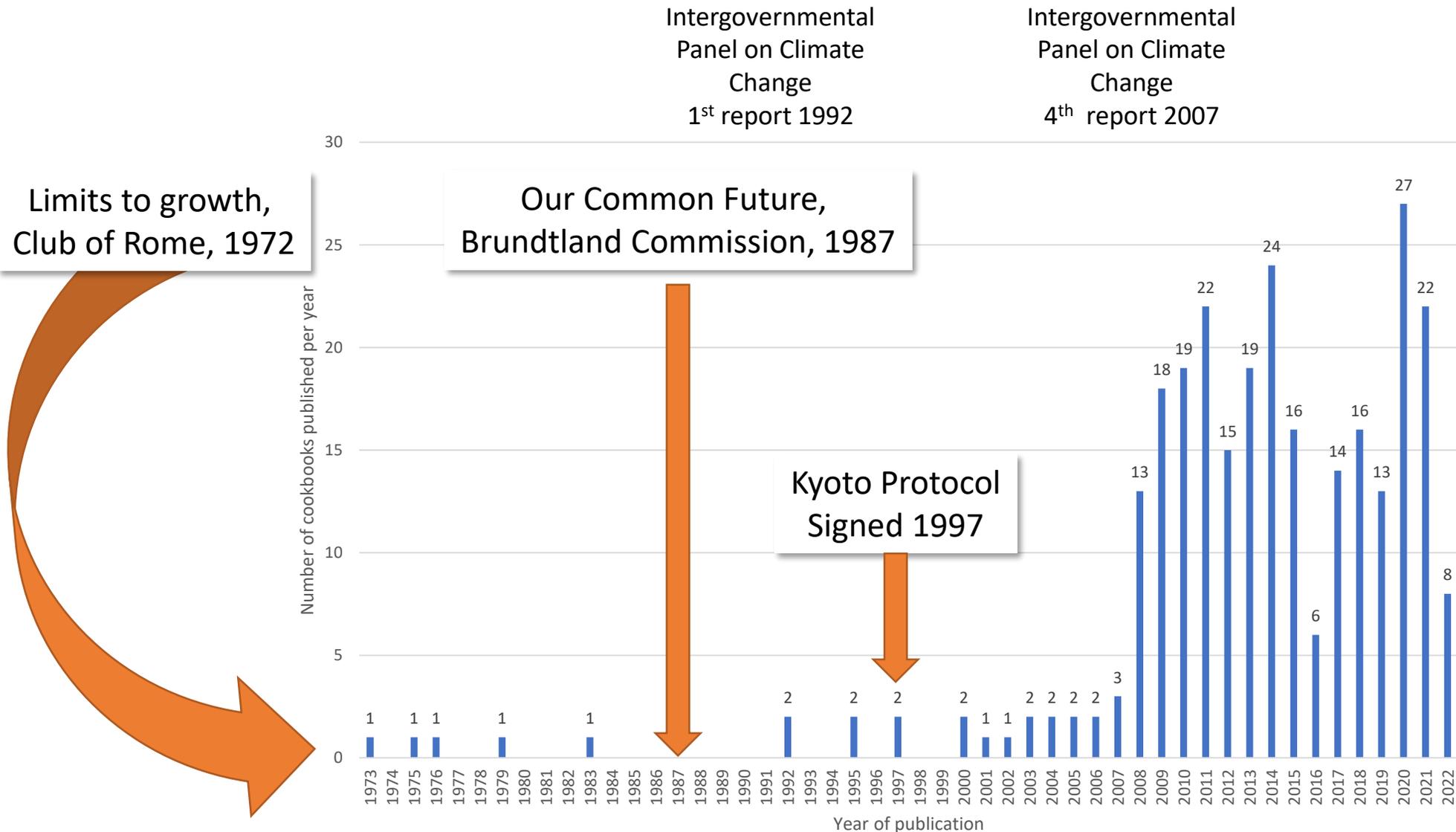
This did not include other “classics”

A limitation of this survey was that it missed many classic books that might also be considered sustainable such as vegetarian or vegan cookbooks that do not mention “sustainability” etc. in their title (but do in the text). This method also misses non English language cookbooks.

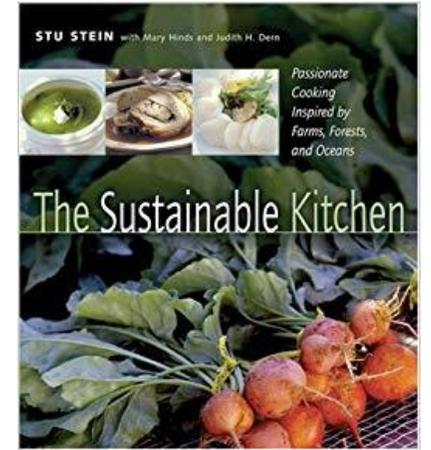
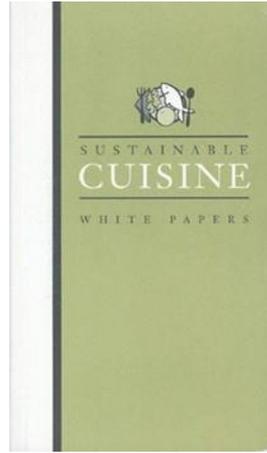


Context for sustainability and climate change

2007, the IPCC and U.S. Vice-President Al Gore were jointly awarded the Nobel Peace Prize



2000-2007



15 titles including...

2000 Planet Organic: Organic Cookbook by Eric Treuille and Renee Elliot

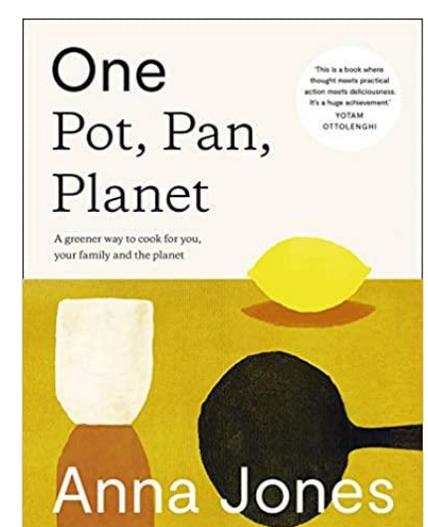
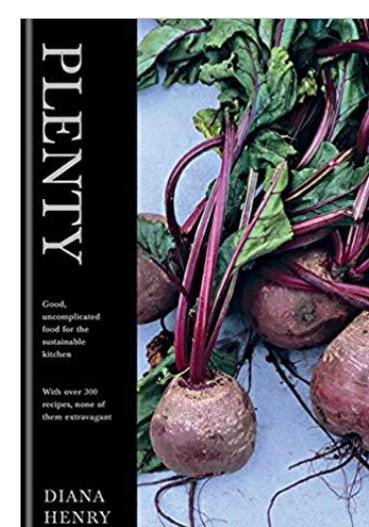
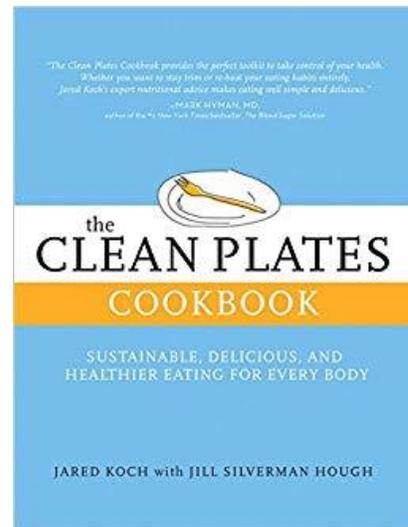
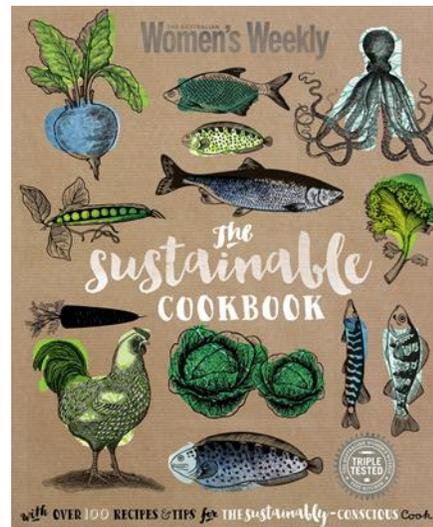
2000 Sustainable Cuisine: White Papers by Earth Pledge

2004 The Sustainable Kitchen: Passionate Cooking Inspired by Farms, Forests and Oceans

- 'Local' and small scale (supporting CSA) Understand ingredients (and their complex production processes and histories).
- Highlighted sustainable food is more than low environmental impact, needed to sustain heritage and community economies.
- No mention of cooking impacts
- Contains beef, lamb etc.

2008-2022

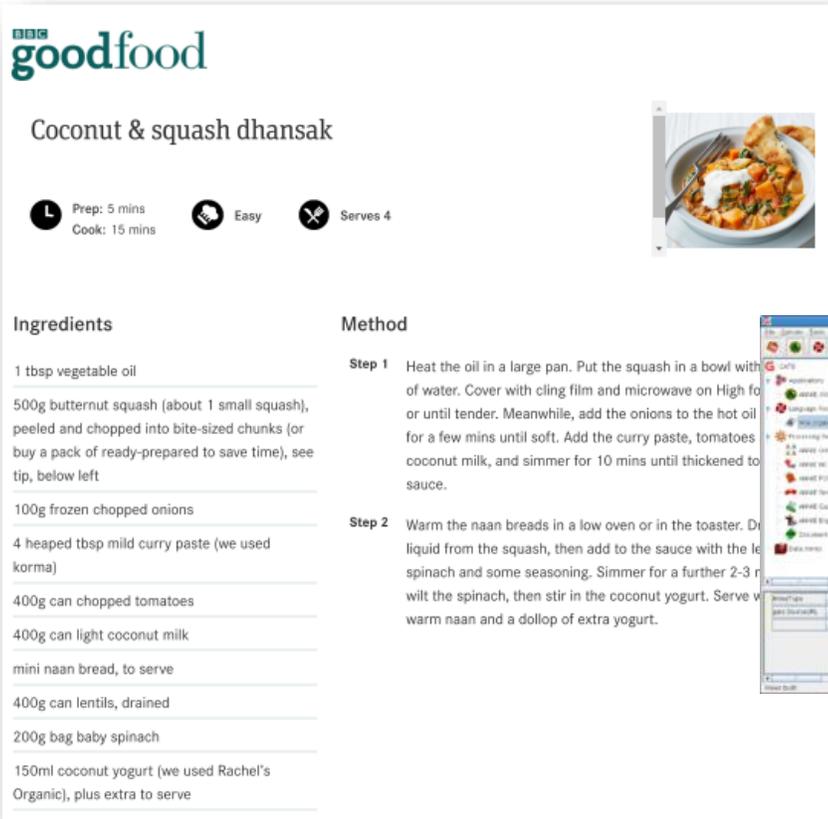
- 252 books, average of 16 published per year!
- Majority omnivorous recipes (containing beef or lamb), Become more plant based as time goes on...
- Rise and fall of sustainable seafood.
- Some read like “wellness” books.
- None of the books give the amount of carbon embodied in their recipes.
- All ask the reader to change behaviour: using leftovers, shopping organic, buying local, mindful eating, and eating seasonally.
- Books mention cooking impacts, but still use oven recipes and use beef/lamb.



What I had hoped to present in the rest of my talk...

I had hoped to present an analysis of how recipes from different sustainable cookbooks rate in terms of quantified sustainability impacts – e.g. Carbon footprint (kg of Co2e), water footprint etc.

However, our project's tool currently can only calculate the impacts of recipes from websites.



goodfood

Coconut & squash dhansak

Prep: 5 mins
Cook: 15 mins
Easy
Serves 4



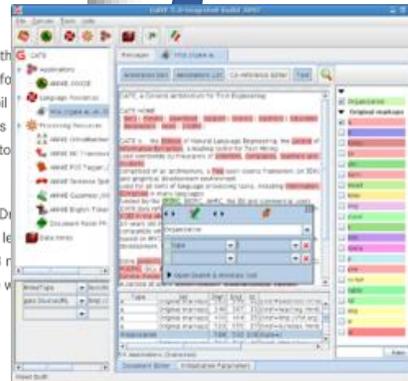
Ingredients

- 1 tbsp vegetable oil
- 500g butternut squash (about 1 small squash), peeled and chopped into bite-sized chunks (or buy a pack of ready-prepared to save time), see tip, below left
- 100g frozen chopped onions
- 4 heaped tbsp mild curry paste (we used korma)
- 400g can chopped tomatoes
- 400g can light coconut milk
- mini naan bread, to serve
- 400g can lentils, drained
- 200g bag baby spinach
- 150ml coconut yogurt (we used Rachel's Organic), plus extra to serve

Method

Step 1 Heat the oil in a large pan. Put the squash in a bowl with of water. Cover with cling film and microwave on High fo or until tender. Meanwhile, add the onions to the hot oil for a few mins until soft. Add the curry paste, tomatoes coconut milk, and simmer for 10 mins until thickened to sauce.

Step 2 Warm the naan breads in a low oven or in the toaster. Dr liquid from the squash, then add to the sauce with the le spinach and some seasoning. Simmer for a further 2-3 r wilt the spinach, then stir in the coconut yogurt. Serve w warm naan and a dollop of extra yogurt.



What recipe would you like to process?

URL

Please be aware that some pages may be slow to process, especially if they contain multiple recipes.

Recipe for 'Coconut & squash dhansak recipe | BBC Good Food'

Ingredients	150ml coconut, butternut squash, coconut milk, lentils, onions, spinach, tomatoes, vegetable oil
GHGE	1.74 kg CO2eq (-1.76 kg CO2eq to 12.4400015 kg CO2eq)
GHGE per Portion	0.435 kg CO2eq (-0.44 kg CO2eq to 3.1100004 kg CO2eq)
Eutrophying Emissions	17.84 g PO43-eq (4.84 g PO43-eq to 52.99 g PO43-eq)
Eutrophying Emissions per Portion	4.46 g PO43-eq (1.21 g PO43-eq to 13.2475 g PO43-eq)
Acidifying Emissions	39.66 g SO2eq (14.56 g SO2eq to 98.56 g SO2eq)
Acidifying Emissions per Portion	9.915 g SO2eq (3.64 g SO2eq to 24.64 g SO2eq)
Freshwater Withdrawals	2555.65 L (52.63 L to 7625.27 L)
Freshwater Withdrawals per Portion	638.9125 L (13.1575 L to 1906.3175 L)
Stress Weighted Water Use	135247.9 L (742.7 L to 474483.9 L)
Stress Weighted Water Use per Portion	33811.977 L (185.675 L to 118620.98 L)

THIS TOOL HAS BEEN DEVELOPED WITH A RESEARCH GRANT FROM THE ALPRO FOUNDATION

Results – high level

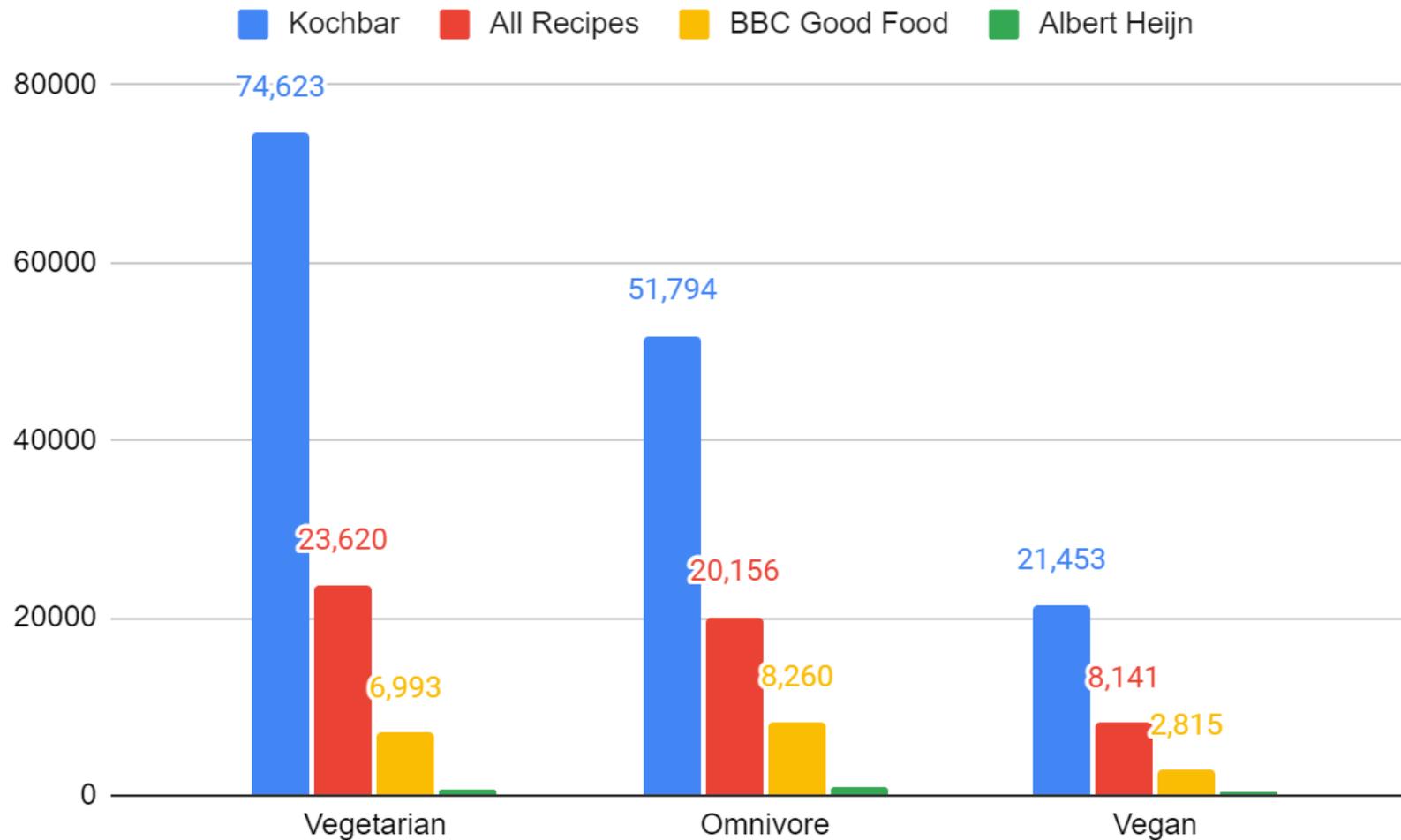


Figure 1. Number of Recipes per datasource, per diet

Results – high level

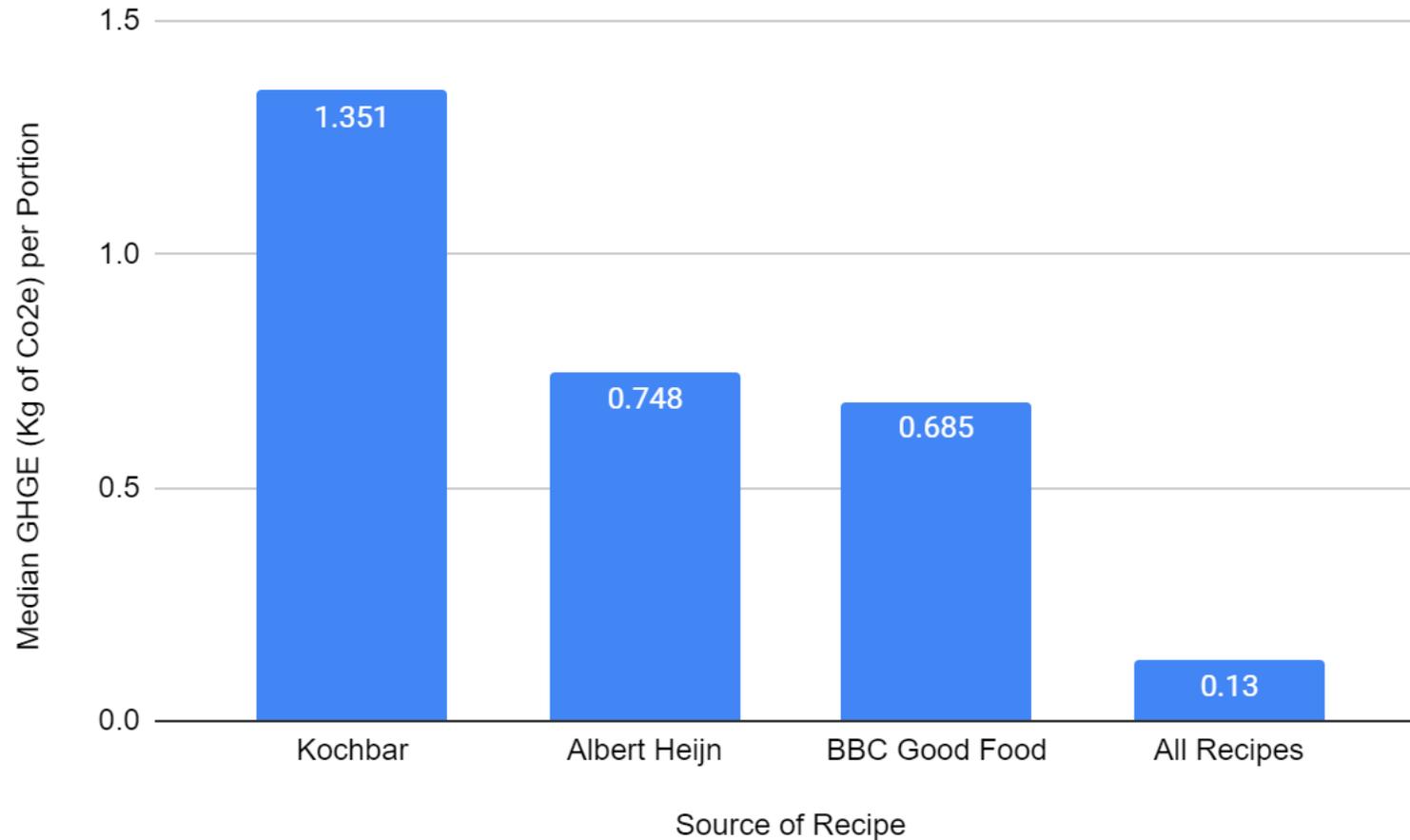


Figure 2. Median GHGE (Kg of Co2e) per Portion, per datasource

Reminder the EAT-Lancet has a carbon budget of 1.78kg of CO2e per person per day – that's ~0.59kg of CO2e per main meal

Results – high level

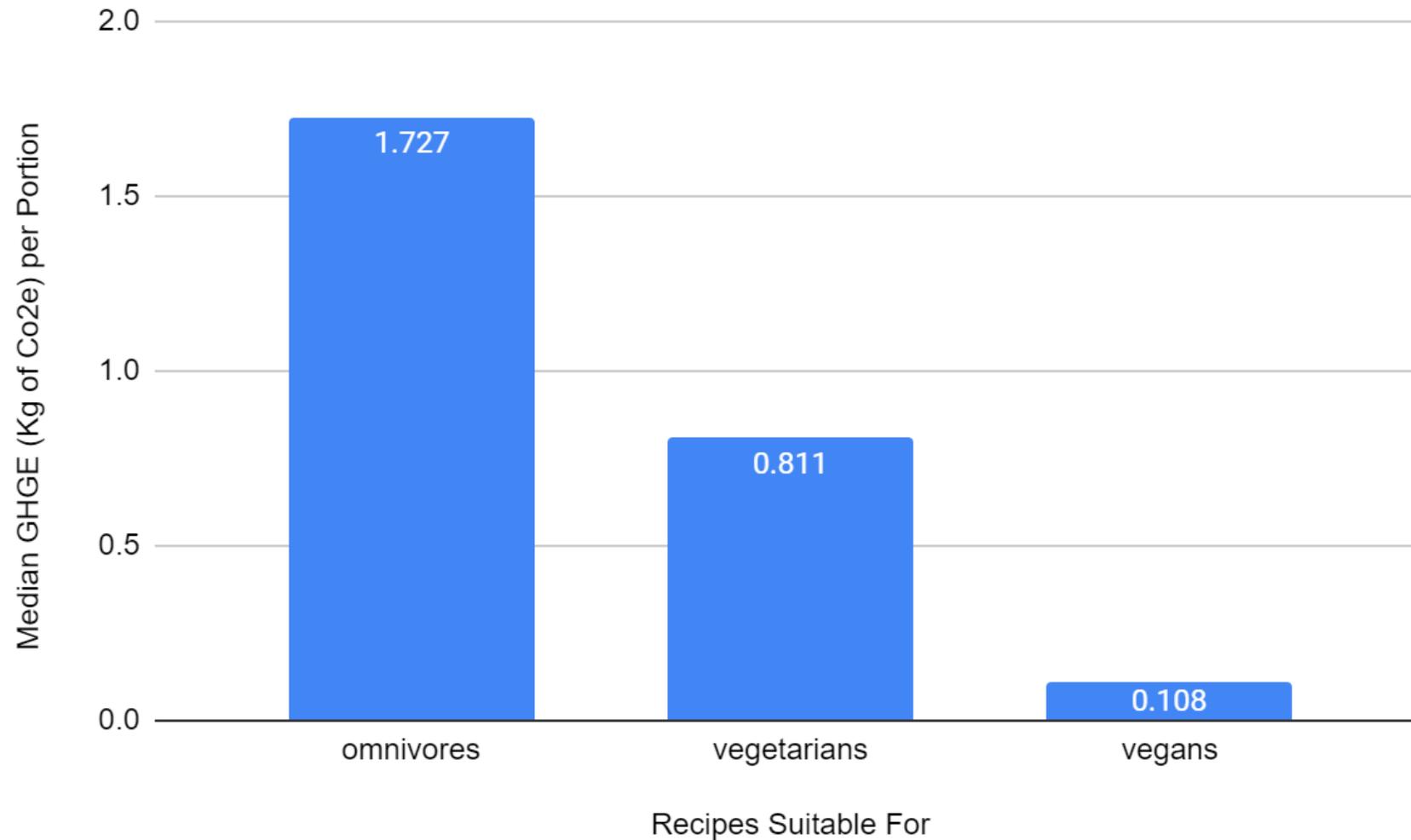


Figure 3. Median GHGE (Kg of Co2e) per Portion, per diet

Reminder the EAT-Lancet has a carbon budget of 1.78kg of CO2e per person per day – that's ~0.59kg of CO2e per main meal

Results – high level

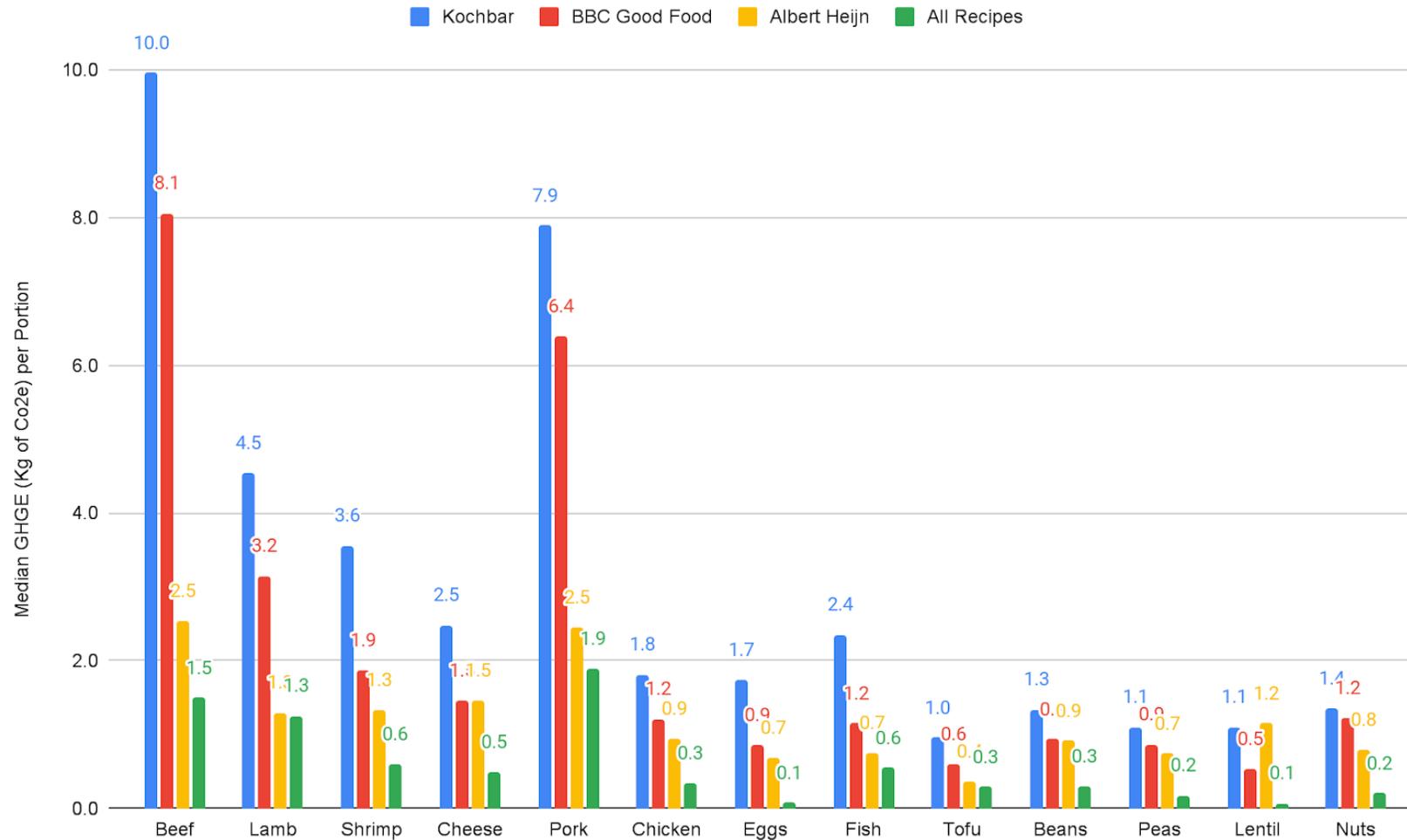


Figure 4. Median GHGE (Kg of Co2e) per Portion, Ingredient/Protein sources, and Datasource

Reminder the EAT-Lancet has a carbon budget of 1.78kg of CO2e per person per day – that's ~0.59kg of CO2e per main meal

Results – high level

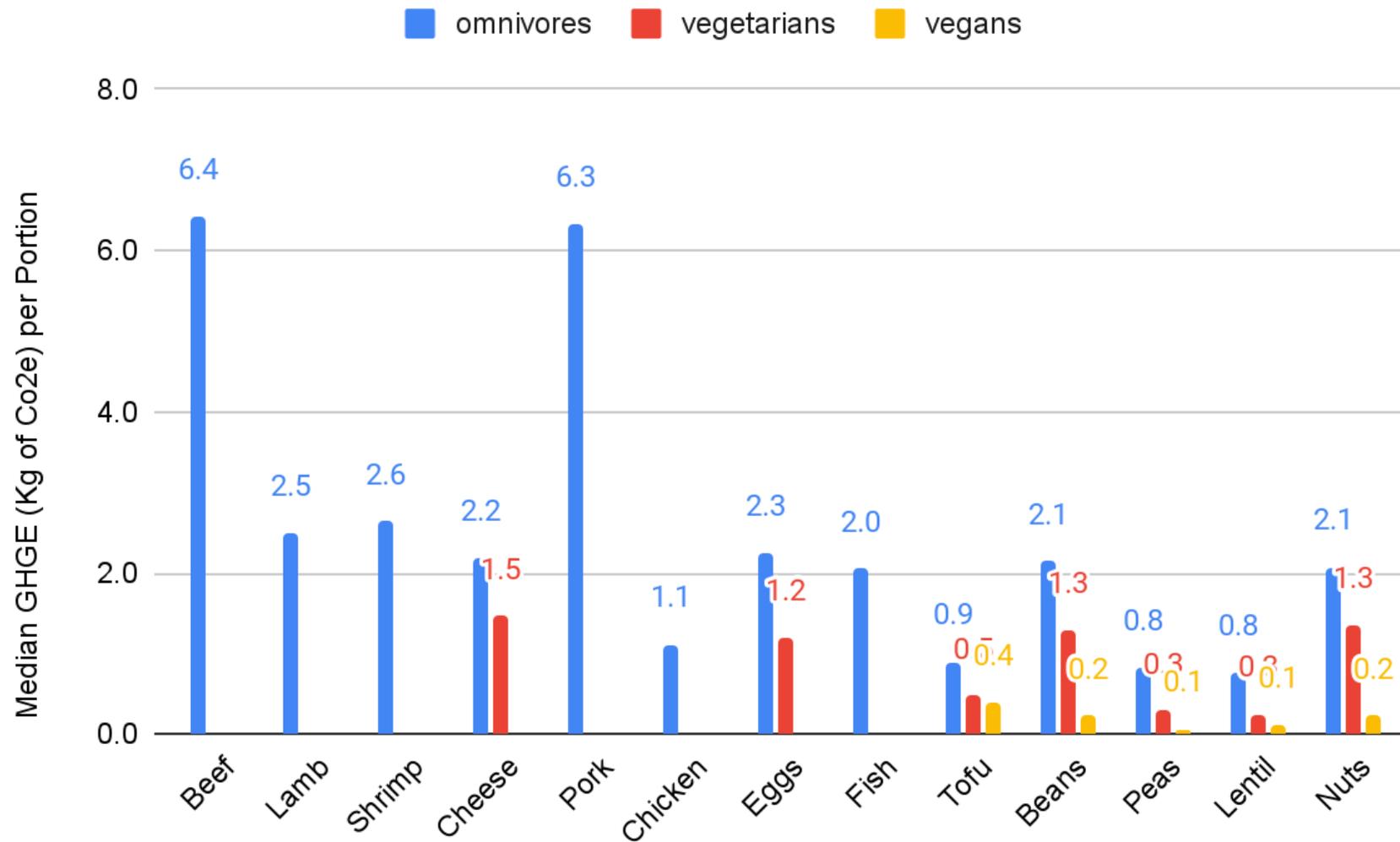


Figure 5. Median GHGE (Kg of Co2e) per Portion, Ingredient/Protein sources, and Diet

Reminder the EAT-Lancet has a carbon budget of 1.78kg of CO2e per person per day – that's ~0.59kg of CO2e per main meal

Results – lets deep dive! Tofu vs Beef

	GHG 5% CI	GHG Emissions (kg CO2eq/kg, IPCC 2013 incl. CC feedbacks) Mean	GHG Emissions 95% CI
Korean Tofu And Vegetable Soup	0.97	2.23	4.99
Mapo Tofu	1.48	2.98	6.3
Aarsis Tofu Curry	0.93	2.63	9.41
Crispy Tofu	0.64	1.39	3.15
Annas Scrambled Tofu	0.6	1.33	2.96
Limantro Tofu	0.53	1.24	2.79
Tofu Scramble	0.53	1.3	3.67
Barbecue Tofu Sandwiches	1.12	2.95	9.59
Sweet Sour Tofu	0.26	0.74	2.43
Salt Pepper Tofu	0.83	2.25	7.79

	GHG 5% CI	GHG Emissions (kg CO2eq/kg, IPCC 2013 incl. CC feedbacks) Mean	GHG Emissions 95% CI
Beef Curry	19.39	51.59	141.96
Beef Goulash	28.31	75.05	205.83
Beef Stroganoff	20.48	53.7	144.17
Beef Tips and Merlot Gravy with Beef and Onion Rice	17.51	46.29	124.59
Broccoli Beef I	17.24	45.64	123.24
Kellys Pressure Cooker Beef Stew	21.57	57.11	153.83
Beef Bourguignon	63.81	166.58	446.88
Creamed Beef	18.74	48.65	129.81
Slow Cooker Beef Stew	34.18	90.42	244.22
Coffee Crusted Beef Tenderloin Steak	6.47	17.13	46.18

Results – Cake VS Salads?

It becomes more complex with different dish types

	GHG 5% CI	GHG Emissions (kg CO2eq/kg, IPCC 2013 incl. CC feedbacks) Mean	GHG Emissions 95% CI
Baked Fudge Cake	0.73	6.37	23.48
Carrot Cake	3.74	9.92	22.18
Chocolate Caramel Nut Cake	-0.95	12.64	67.39
Easy Chocolate Cake	0.87	16.50	74.04
Chocolate Raspberry Birthday Layer Cake	3.41	11.80	33.81
Double Chocolate Cake li	-0.40	15.13	76.12
Applesauce Cake lii	0.84	2.07	3.52
Kaylas Southern Pecan Mist Cake	0.89	4.94	12.18
Vegan Lemon Cake	0.64	2.01	3.65
Easy Fruit Cobbler Cake	0.38	1.04	1.96

	GHG 5% CI	GHG Emissions (kg CO2eq/kg, IPCC 2013 incl. CC feedbacks) Mean	GHG Emissions 95% CI
10minute Couscous Salad	-0.13	1.55	5.53
Lentil Salad Tahini Dressing	2.94	7.35	17.63
Cilantro Avocado Tomato And Feta Salad	1.85	5.63	19.91
Epic Summer Salad	2.67	6.96	20.40
Greek Salad V	1.90	4.80	13.40
Taco Salad	17.87	46.77	126.20
Georgia Cracker Salad	1.16	2.04	4.53
Easy Broccoli Salad	0.34	0.92	1.95
Junked Up Kale Salad	-0.13	2.58	8.74
Raw Vegan Broccoli Salad	0.16	1.07	2.51

Conclusions

- Sustainable cookbooks have emerged as their own unique (sub) field of cookbook since the 1970s (with 2008 being the turning point of accelerated publishing).
- However, there is limited differentiation of recipes (and cooking methods) found in sustainable cookbooks from other cookbooks
- Post 2008 cookbooks share similarities with contemporary vegetarian / vegan / wellness books.

- To meet the EAT-Lancet recommendations we need to redesign recipes to be less than ~0.59kg of CO₂e per main meal
- Current recipes on websites have an average carbon impact per portion of 0.8 kg of Co₂e (vegetarian) and 0.1 kg of Co₂e (vegan)

Please do get in touch

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