



Food-Based Strategies to Promote Personal and Planetary Health: The Role of Nutrition and Dietetics Practitioners

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November 10, 2022 | 12:00-1:00 pm ET

Learning Objectives

After completing this activity, nutrition professionals will be able to:

- 1) List three food-based strategies to promote personal and planetary health.
- 2) Describe the benefits of food-based strategies to promote personal and planetary health.
- 3) Recommend and counsel clients using food-based strategies to promote personal and planetary health.

- Suggested Performance Indicators: 7.2.3 8.1.1. 8.3.6 8.3.7 12.1.3

Food for Thought

“Humanity faces a stark and urgent choice: breakdown or breakthrough. The choices we make – or fail to make – today could result in further breakdown and a future of perpetual crises, or a breakthrough to a better, more sustainable, peaceful future for our people and planet.”

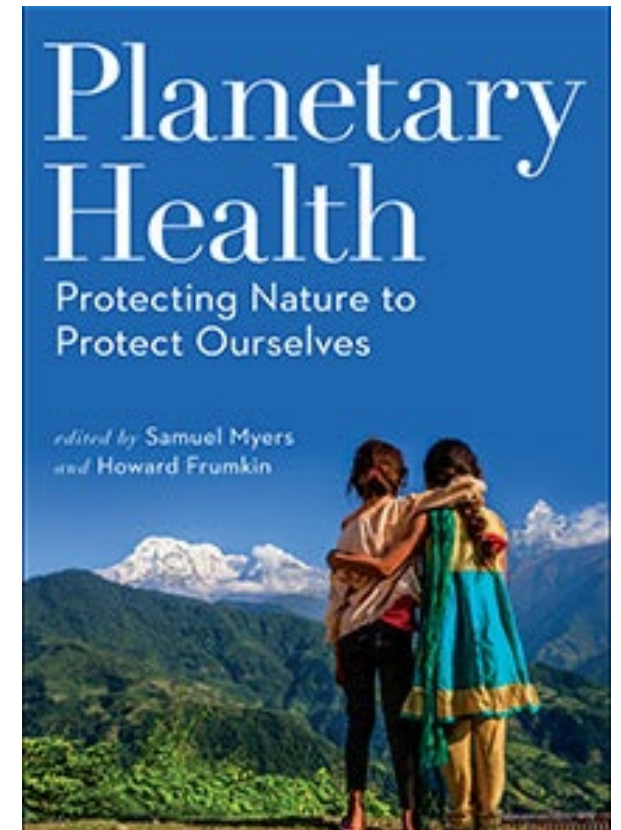
-UN Secretary General, Antonio Guterres

United Nations Secretary-General’s Report: *“Our Common Agenda – Report of the Secretary General”* (September 10, 2021):
<https://www.un.org/en/content/common-agenda-report/>

What is Planetary Health?

- Describes how planetary ecosystems and human health are intertwined, each interdependent on one another (Whitmee et al., 2015).
- The Rockefeller Foundation–Lancet Commission on Planetary Health defined this concept as:

“the achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems—political, economic, and social—that shape the future of humanity and the Earth’s natural systems that define the safe environmental limits within which humanity can flourish” (Whitmee et al., 2015; Prescott and Logan, 2019; Oladanjoye et al., 2022).



Planetary Health and Human Health

- Unsustainable human activity is now the driver behind biophysical changes to our planet
 - Resulting in environmental degradation and compromising human health and well-being (Pathak & McKinney, 2021; Myers & Frumkin, 2020).
- Climate change, air pollution, loss of biodiversity, changes in land use and land cover, and depletion of resources (Murphy, 2022).
- These rapidly changing environmental conditions have increased exposure to infectious diseases and natural disasters such as fires, droughts, and extreme weather events (Myers & Frumkin, 2020).
- Human activity and lifestyle behaviors are driving many of the environmental issues we are witnessing.



Villagers wade through waist-deep waters to reach their homes in Pratap Nagar in the Shyamnagar region, Bangladesh, October 5, 2021. The effects of global warming, particularly increased cyclones, coastal and tidal flooding that bring saltwater further inland, are devastating Bangladesh and destroying the livelihoods of millions [Mahmud Hossain Opu/AP Photo]. Source: Huq S, Adow M. Climate change is devastating the Global South. *Ajazeera*, May 11, 2022.



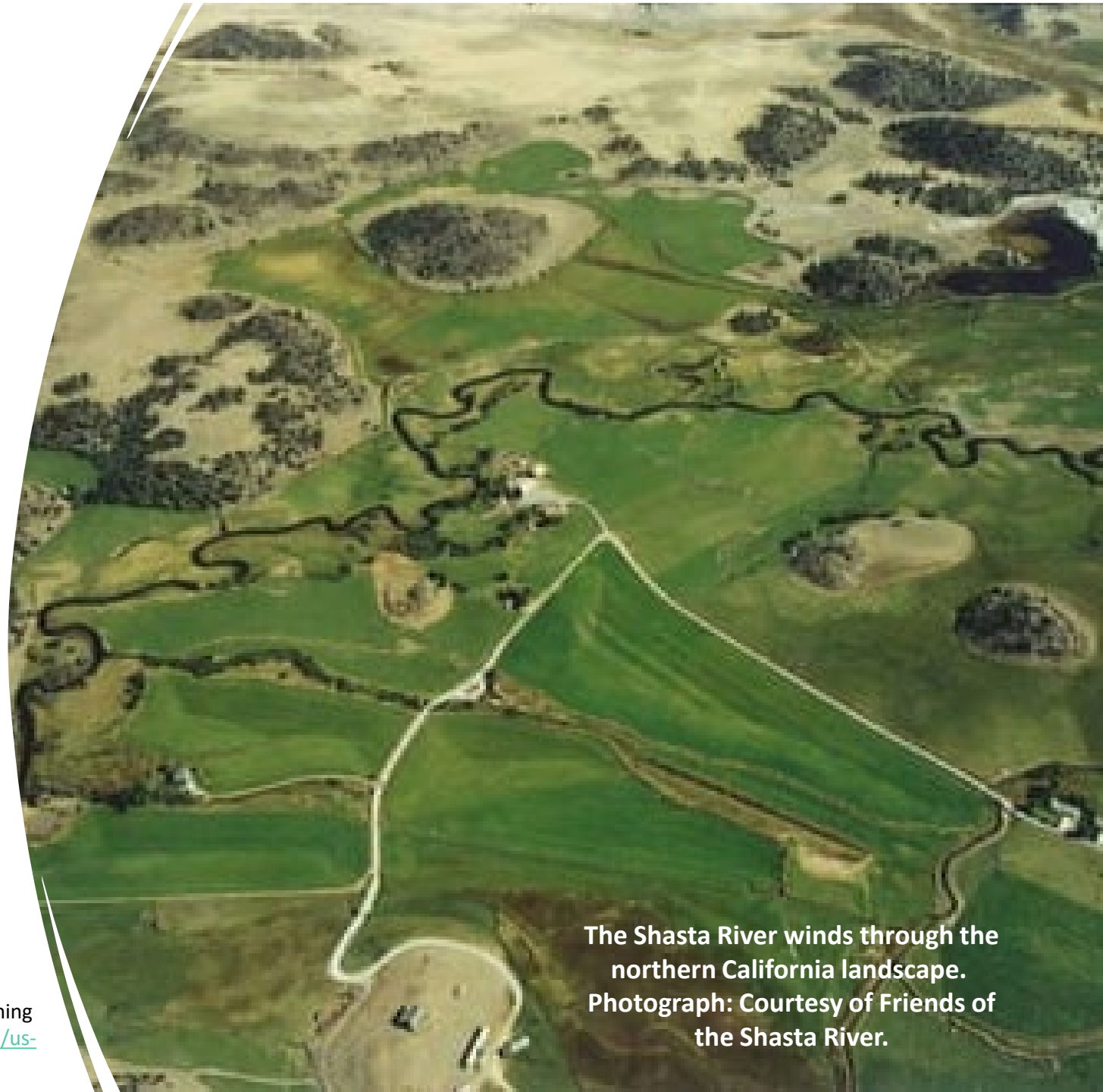
Planetary Health and Human Health

- Food production is a main cause of environmental impacts and stressors:
 - Biodiversity loss, climate change, eutrophication, & overexploitation of marine resources (Chrysafi et al., 2022; Sandström et al., 2022).
- Food systems are a key driver of biodiversity loss, responsible for 70 percent of the population decline of land animals and half of the decline in freshwater species (WWF, 2022).
- Half of all the world's habitable land is used for agriculture (Ritchie, 2019). Agricultural land area represents 38 percent of the global land surface.
 - About one-third of this land is used as cropland, while the remaining two-thirds consist of meadows and pastures for grazing livestock (FAO, 2020).
- Agriculture drives 70% of freshwater withdrawals (Chrysafi et al., 2022).

Planetary Health and Human Health

- Richter et al. (2020) identified cattle-feed irrigation as the proximate driver, and beef consumption as the ultimate driver, of river depletion, water shortages and fish species imperilment in the western US.
- In the US overall, beef consumption contributes 22% to the total water footprint of American consumers; beef consumption in the US is 3.9 times the world average.
 - The US is also a major producer of beef, accounting for 18% of global beef production in 2017 (Richter et al. 2020).

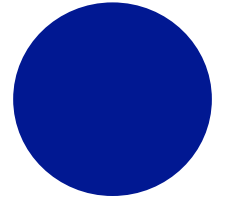
Source: Anguiano D. Ranchers' rebellion: the Californians breaking water rules in a punishing drought. *The Guardian*. September 22, 2022. Available at: <https://www.theguardian.com/us-news/2022/sep/22/california-ranchers-water-rights-diversions-fish>



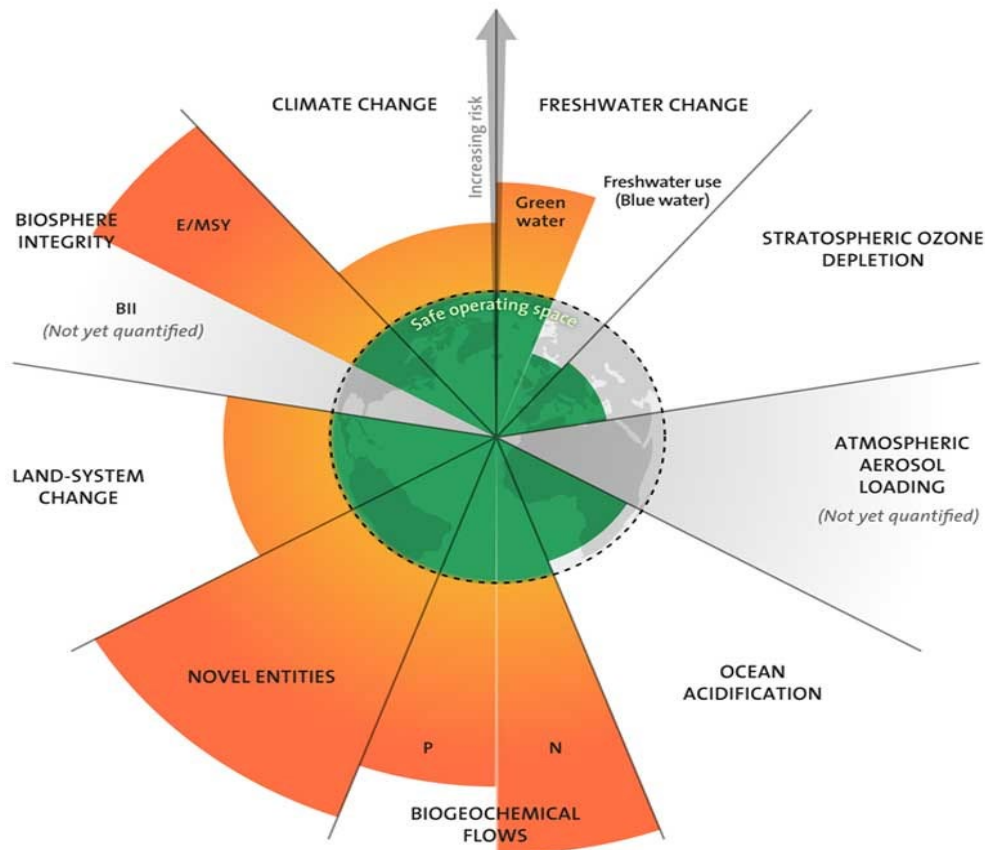
The Shasta River winds through the northern California landscape.
Photograph: Courtesy of Friends of the Shasta River.

Planetary Health and Human Health

- Biodiversity loss is deforestation driven by diets high in animal products particularly beef (Pathak & McKinney, 2021).
- “While cattle production is the single largest direct cause of deforestation, animal agriculture is also a major indirect cause. Soy production is the third largest driver of deforestation and is mostly used for animal feed.”
 - (77% of soy production is used for animal feed) (Harwatt et al., 2022).
- Deforestation also incurs social costs as there are documented cases of cattle ranches using slave labor and palm oil plantations using forced labor. Child labor is also common on palm oil plantations (Forest 500, 2022).

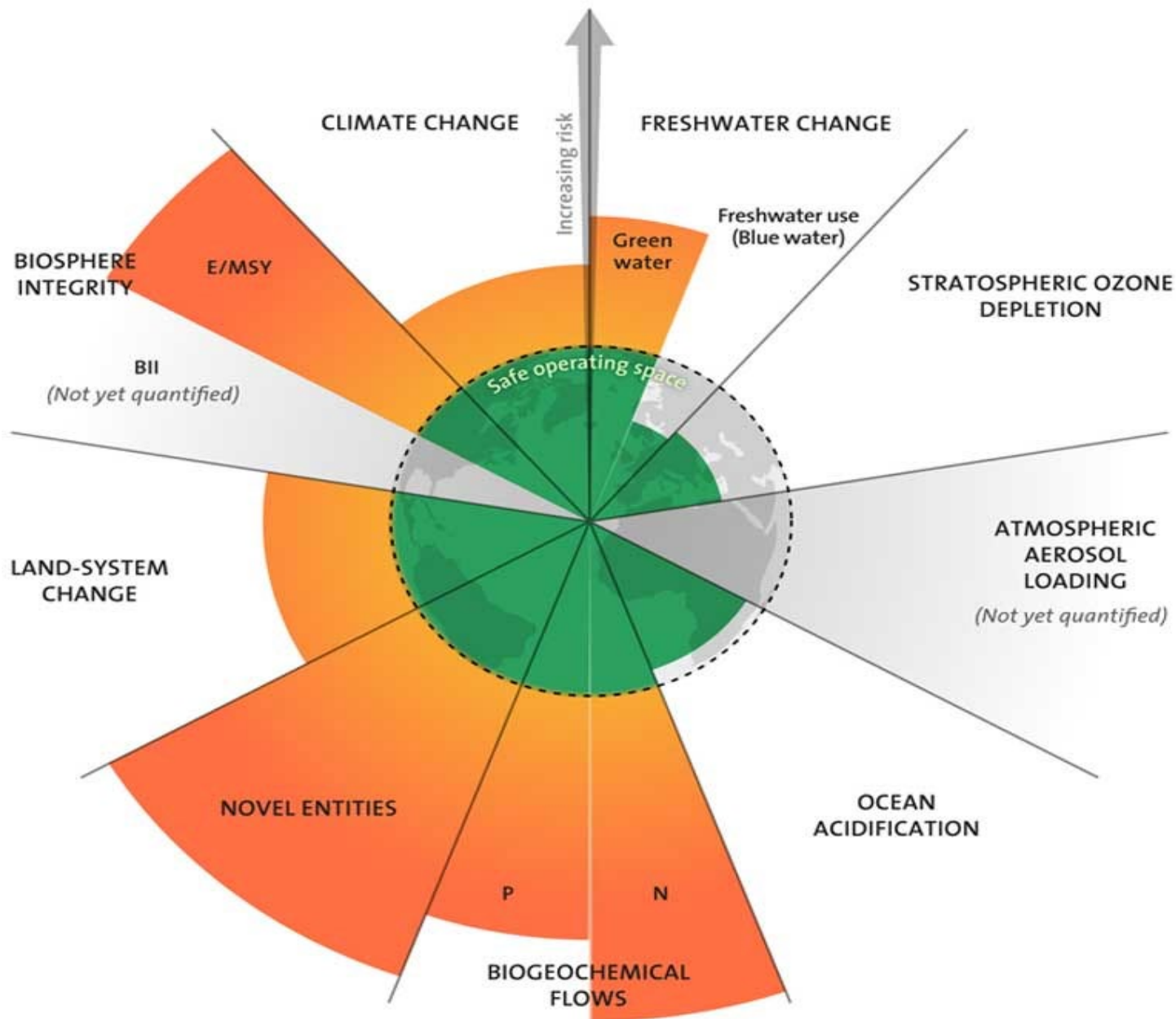


Planetary Health and Human Health



- Human pressures may have already pushed the Earth system beyond the safe operating space for humanity, as demarcated by the nine planetary boundaries describing critical Earth system processes (Chrysafi et al., 2022)
- Beyond these boundaries, the risk of abrupt or irreversible global environmental change increases, with the potential to push the Earth system out of its stable Holocene condition, thus threatening the capacity of humanity to develop and thrive (Chrysafi et al., 2022)

Image courtesy of J. Lokrantz/Azote based on Steffen et al. 2015 (via Stockholm Resilience Centre) (Kotzé, 2022)



Blue water = sourced from surface water or groundwater, e.g., water in freshwater lakes, rivers, and aquifers

Green water = from precipitation, which is stored in the soil & evaporated, transpired or incorporated by plants

Grey water = the amount of fresh water required to assimilate pollutants to meet water quality standards.

Sources: Steenson S, Bittriss JL. Healthier and more sustainable diets: What changes are needed in high-income countries? Nutrition Bulletin, 2021; 46:279-309. Kotze, P. Freshwater planetary boundary “considerably” transgressed: New research. April 27, 2022.

<https://news.mongabay.com/2022/04/freshwater-planetary-boundary-considerably-transgressed-new-research/>

Planetary Health and Human Health

- Land use, and land-use change due to agricultural expansion, is a major contributor to greenhouse gas emissions from the global food system (Crippa et al., 2021) (Steenenson et al., 2021).
- Reducing the proportion of land used globally for agriculture, through dietary changes (e.g., transition towards more plant-based diets) and improvements in the efficiency of food production (e.g., sustainable intensification), may offer benefits for the protection of natural habitats (and, therefore, biodiversity), as well as climate change mitigation (Steenenson et al., 2021; Harwatt et al., 2022).
- Shifts to more plant-based diets must ensure that target populations have sufficient physical and economic access to a variety of nutrient-dense plant-based foods (Kim et al., 2020).
- Agricultural systems need to scale up production of fruits, vegetables, and proteins (e.g., legumes) to meet the nutritional needs of the current population, concurrent with a more equitable redistribution of available food (Kim et al., 2020; Tuninetti et al., 2022)



Healthy adults eating a diverse diet with at least 8-10 grams soluble fiber a day have fewer antibiotic-resistant microbes in their guts. Soluble fiber is found in foods such as grains, beans, lentils, nuts, and some fruits and vegetables.

Source: ARS, USDA. Diets high in fiber associated with less antibiotic-resistant bacteria. May 10, 2022. Based on Oliver et al., *mBio* 2022;13(3): e00101-22.

Available at: <https://www.ars.usda.gov/news-events/news/research-news/2022/diets-high-in-fiber-associated-with-less-antibiotic-resistance-in-gut-bacteria/> 11

Planetary Health and Human Health

- To address the emerging zoonotic disease risks of animal agriculture, a multi-pillared approach has been proposed (Hayek, 2022).
- This approach includes reducing demand for animal-sourced foods through shifts to plant-rich diets, semi-intensification, and direct forest conservation (see Figure 2 in Hayek, 2022).
- Shifting from beef to chicken consumption mitigates climate emissions. However, this dietary strategy neglects zoonotic disease risks as intensive pig and poultry production entails greater antibiotic use, confinement, and animal populations than beef production (Hayek, 2022).
- Preventing zoonotic diseases requires international coordination to reduce the high demand for animal-sourced foods, improvement of forest conservation governance, and selectively intensifying the lowest-producing ruminant animal systems without confinement (Hayek, 2022).

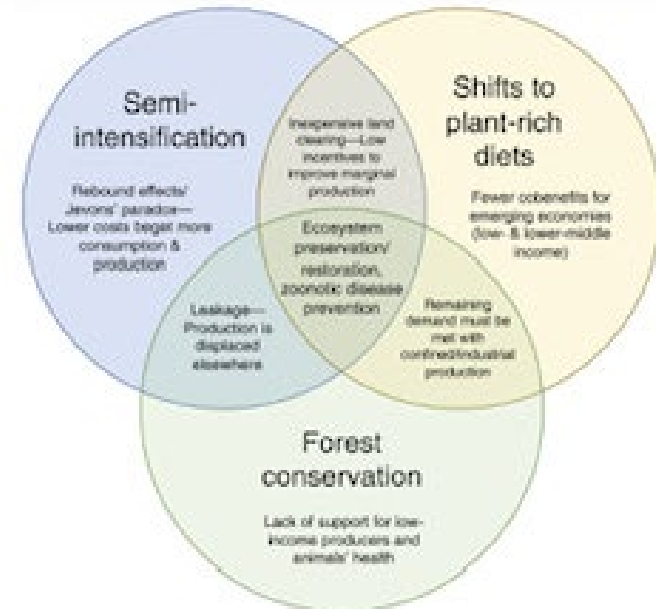


Fig. 2. A three-pillar approach for preventing zoonotic disease emergence and reducing environmental impacts from animal agriculture (center). Within individual circles and the intersections between the two, limitations of adopting only one or two strategies are described.

Source: Hayek M. The infectious disease trap of animal agriculture (Review). *Sci Adv.* 2022 4; 8(44):eadd6681. doi: 10.1126/sciadv.add6681.



Planetary Health and Human Health: A Common Agenda

- Six in 10 U.S. adults have one chronic health condition and 4 in 10 U.S. adults have at least two chronic health conditions driving healthcare costs to almost \$4 trillion annually (CDC, 2021).
 - These chronic conditions are largely preventable through changes in lifestyle factors, including diet, and create an opportunity for healthcare practitioners to improve client health while also encouraging “climate-friendly” behavior changes that will in turn improve our planet’s health (Murphy, 2022).
- A State-of-the Art Review published in the *American Journal of Preventive Cardiology* (2022), states that:
 - “Clear scientific evidence for climate change and its impact on human health have not yet resulted in the national and international impetus and policies necessary to slow climate change. As respected members of society who regularly communicate scientific evidence to patients, clinicians are well-positioned to advocate on the importance of addressing climate change.”
 - Regarding diet and weight, it is noted, “adopting plant-based diets co-benefits the patient’s health and decreases the energy expenditure on meat production.”

Planetary Health and Human Health: A Common Agenda

- Hadley & colleagues (2022) have proposed a new field of medicine called ‘climate cardiology,’ which aims to “protect patients and the planet at the same time.”
 - Key opportunities to protect cardiovascular health while reducing greenhouse gas emissions (GHGs) include the transition from high red-meat to plant-based diets as well as other specific interventions
- As food has been indicated to be the single strongest lever to optimize human health and environmental sustainability, the possibilities to improve planetary health by combining the concepts of “Food as medicine” and “Food for resilience”* are staggering” (Avesani et al., 2022).

*Food resilience = a concept aiming to prepare and recover the food system from disruptions, due, as an example, from an unsustainable environment, in a way to ensure accessible food for all.



Demand-side climate-change mitigation can be achieved through changes in socio-cultural factors, infrastructure design and use, and end-use technology adoption by 2050 (IPCC, 2022).

Nutrition:

End-use sector: Food, Services for well-being

Sociocultural factors: Dietary shifts (shifting to balanced, sustainable healthy diets) & avoidance of food waste and over-consumption

Infrastructure use: choice architecture and information to guide dietary choices; financial incentives; waste management; recycling infrastructure

End-use technology adoption: (for lab-based meat & similar options - no quantitative literature available, overall potential considered in socio-cultural factors).

Source: (IPCC, p. 39, Summary for Policymakers, 2022)

Sustainable Healthy Diets



Common Plant-Based Diets:

- **Vegan diets** omit all animal products, including meat, dairy, fish, eggs and (usually) honey.
- **Lacto-vegetarian diets** exclude meat, fish, poultry and eggs, but include dairy products such as milk, cheese, yogurt and butter.
- **Lacto-ovo vegetarian diets** include eggs and dairy, but not meat or fish.
- **Ovo-vegetarian diets** exclude meat, poultry, seafood and dairy products, but allow eggs.
- **Pesco-vegetarian (or pescatarian) diets** include fish, dairy and eggs, but not meat.
- **Semi-vegetarian (or flexitarian) diets** are primarily vegetarian but include meat, dairy, eggs, poultry and fish on occasion, or in small quantities.
- **EAT-Lancet reference diet (EAT-Lancet planetary health diet)** - consists of fruits and vegetables, whole grains, legumes, nuts, and unsaturated oils; moderate consumption of dairy (as an option); low to moderate consumption of seafood and poultry; zero to low consumption of red meat, processed meat, added sugar, refined grains, and starchy vegetables.

***EAT-Lancet* Planetary Health Diet: A Sustainable Food Systems Transition to Healthy Diets**

- The *Eat-Lancet* Commission developed global scientific targets for healthy diets and sustainable food production. It integrated them into a common framework, the 'safe operating space for food systems' so that planetary health diets (both healthy and environmentally sustainable) could be identified (Willett et al., 2019; Summary Report of the *Eat-Lancet* Commission, 2019).
- The global food system must operate within boundaries for both human health and food production to ensure healthy diets from sustainable food systems for an estimated 10 billion people by 2050 (Summary Report of the *Eat-Lancet* Commission, 2019).











EAT-*Lancet* Planetary Health Diet: A Sustainable Food Systems Transition to Healthy Diets



- “This safe operating space for food systems is defined by scientific targets for specific food groups (e.g., 100 to 300 g/day of fruit) to optimize human health and scientific targets for sustainable food production to ensure a stable Earth system” [planetary boundaries].
- Planetary boundaries were proposed for 6 Earth system processes affected by food production (Summary Report of the Eat-*Lancet* Commission, 2019).

Planetary Boundaries for Food Production

EARTH SYSTEM PROCESS	CONTROL VARIABLE	BOUNDARY (Uncertainty range)
Climate change	 GHG emissions	5 Gt CO₂ eq yr⁻¹ (4.7 - 5.4 Gt CO ₂ -eq yr ⁻¹)
Land-system change	 Cropland use	13 M km² (11 - 15 M km ²)
Freshwater use	 Water use	2,500 km³yr⁻¹ (1000 - 4000 km ³ yr ⁻¹)
Nitrogen re-cycling	 N application	90 Tg N yr⁻¹ (65 - 90 Tg N yr ⁻¹)* (90 - 130 Tg N yr ⁻¹)**
Phosphorous re-cycling	 P application	8 Tg P yr⁻¹ (6 - 12 Tg P yr ⁻¹)* (8 - 16 Tg P yr ⁻¹)**
Biodiversity loss	 Extinction rates	10 E/MSY (1 - 80 E/MSY)










* Lower boundary range if improved production practices and redistribution are not adopted.
 ** Upper boundary range if improved production practices and redistribution are adopted and 50% of applied phosphorous is recycled.

World Wildlife Fund (WWF), 2020; Adapted from Willett et al., 2019
<https://www.worldwildlife.org/publications/bending-the-curve-the-restorative-power-of-planet-based-diets>

A Sustainable Food Systems Transition to Healthy Diets

Summary Report of the EAT-
Lancet Commission, 2019

Willet et al., 2019

PLANETARY HEALTH DIET			
		MACRONUTRIENT INTAKE GRAMS PER DAY (Possible range)	CALORIC INTAKE KCAL PER DAY
	Whole grains RICE, WHEAT, CORN AND OTHER	232	811
	Tubers or starchy vegetables POTATOES AND CASSAVA	50 (0-100)	39
	Vegetables ALL VEGETABLES	300 (200-600)	78
	Fruits ALL FRUITS	200 (100-300)	126
	Dairy foods WHOLE MILK OR EQUIVALENTS	250 (0-500)	153
	Protein Sources		
	BEEF, LAMB AND PORK	14 (0-28)	30
	CHICKEN AND OTHER POULTRY	29 (0-58)	62
	EGGS	13 (0-25)	19
	FISH	28 (0-100)	40
	LEGUMES	75 (0-100)	284
	NUTS	50 (0-75)	291
	Added Fats		
	UNSATURATED OILS	40 (20-80)	354
	SATURATED OILS	11.8 (0-11.8)	96
	Added sugars ALL SUGARS	31 (0-31)	120

Scientific targets for planetary health diet, with possible ranges, for an intake of 2500 kcal/day.

Food-Based Strategies to Promote Personal and Planetary Health: Strategy 1: Plant-Based Diets

Why Do People Choose Plant-Based Diets?

- Concerns about health, environmental sustainability, and animal welfare are all reasons people are turning towards plant-based diets (McCullum-Gomez, 2022).
- Concerns about personal health and climate change are key drivers for consumers to choose [plant-based foods](#) and beverages, according to the *2022 Plant-Forward Opportunity Report* (Datassential, 2022).

Source: McCullum-Gomez C. Healthy people, healthy planet. A flexitarian approach to sustainable, healthy diets. *Today's Dietitian Supplement*. March 2022.
Available at: <https://secure.viewer.zmags.com/publication/ed02d13c#/ed02d13c/1>



Plant-Based Dietary Patterns for Human and Planetary Health

Results:

- Transitioning to plant-based diets has the potential to:
 1. Reduce diet-related land use by 76%;
 2. Reduce diet-related greenhouse gas emissions by 49%,
 3. Reduce eutrophication by 49%,
 4. Reduce green and blue water use by 21% and 14%,* respectively, whilst garnering substantial health co-benefits (see Figure 1 – Gibbs & Cappuccio, 2022).
- An extensive body of data from prospective cohort studies and controlled trials support the implementation of plant-based diets for obesity and chronic disease prevention (Gibbs & Cappuccio, 2022).

Source: Gibbs J, Cappuccio FP. Plant-Based Dietary Patterns for Human and Planetary Health. *Nutrients*. 2022; 14(8):1614. <https://doi.org/10.3390/nu14081614>

Plant-Based Dietary Patterns for Human and Planetary Health

- A study conducted in the United Kingdom by Rippin and colleagues (2021) reported that, “Non-vegetarian diets had GHG emissions 59% (95% CI 18%, 115%) higher than vegetarian [diets].
- Men had 41% (20%, 64%) higher GHG emissions than women.”
- Individuals meeting the World Health Organization (WHO’s) Recommended Nutrient Intakes (RNIs) for saturated fats, carbohydrates and sodium had lower GHG emissions compared to those exceeding the RNI.
- “Healthier diets had lower GHG emissions, demonstrating consistency between planetary and personal health.”
- “Policies encouraging sustainable diets should focus on plant-based diets...Further detail could be gained from incorporating brand, production methods, post-retail emissions, country of origin, and additional environmental impact indicators.”

Plant-Based Dietary Patterns for Human and Planetary Health

Diet, greenhouse gas emissions, and climate change in high-income countries:

- Sun et al. (2022) reported that if 54 high-income countries adopted the EAT-*Lancet* planetary health diet, they'd be able to cut their agricultural emissions by 61%.
- “This shift away from animal agriculture would free up 426 million hectares of land, a stretch of terrain larger than the European Union. Most of the freed land would be in the United States, followed by Australia, Germany, and France. About 35% of the land would lie outside wealthy nations in locations like Brazil and Botswana where livestock is farmed intensively and exported to wealthy countries.”

Sources: Sun, Z., Scherer, L., Tukker, A. et al. Dietary change in high-income nations alone can lead to substantial double climate dividend. *Nat Food* 2022; 3, 29–37. <https://doi.org/10.1038/s43016-021-00431-5>. Bryce M. What would happen if just 54 wealthy nations adopted the EAT-Lancet planetary health diet? *Anthropocene Magazine*, January 28, 2022. <https://www.anthropocenemagazine.org/2022/01/what-would-happen-if-just-54-wealthy-nations-adopted-the-eat-lancet-planetary-health-diet/>

Plant-Based Dietary Patterns for Human and Planetary Health

Diet, greenhouse gas emissions, and climate change in high-income countries:

- “[W]hat’s more, if these countries then worked together to proactively protect the newly-freed land—for instance reforesting it and restoring its soils—this rewilded terrain would be capable of sequestering 98.3 billion tons of carbon from the atmosphere by century’s end. That figure is the equivalent of 14 years of current global agricultural emissions, captured in restored biomass and soil.”

Sources: Sun, Z., Scherer, L., Tukker, A. et al. Dietary change in high-income nations alone can lead to substantial double climate dividend. *Nat Food* 2022; 3, 29–37. <https://doi.org/10.1038/s43016-021-00431-5>. Bryce M. What would happen if just 54 wealthy nations adopted the EAT-Lancet planetary health diet? *Anthropocene Magazine*, January 28, 2022. <https://www.anthropocenemagazine.org/2022/01/what-would-happen-if-just-54-wealthy-nations-adopted-the-eat-lancet-planetary-health-diet/>

Plant-Based Dietary Patterns for Human and Planetary Health

A large prospective European cohort study (Laine et al., 2021) (comprising > 400, 000 participants) found that switching from a lower adherence to a higher adherence to the EAT-*Lancet* diet could potentially reduce food-associated greenhouse gas emissions up to 50% and land use up to 62%.

- This “study overcomes limitations of previous studies for modelled sustainable dietary patterns that did not consider nutritional requirements, or that considered such patterns but did not consider planetary health, (Aleksandrowicz et al., 2016) whereas the EAT-*Lancet* reference diet improves the intakes of most nutrients compared with other environmentally sustainable diets (Willett et al., 2019)” (Laine et al., 2021).
- “Our findings, along with other studies, including the EAT-*Lancet* report, suggest that co-benefits to human health and the environment could be achieved by adopting diets that consider both nutritional quality and planetary impact, such as the EAT-*Lancet* diet.”

Source: Laine JE, Huybrechts I, Gunter MJ, et al. Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study. *Lancet Planet Health* 2021; 5: e786–96.



Plant-Based Diets and the Water Footprint*

- If all countries adopted the EAT–*Lancet* diet, the water footprint would fall by 12% at a global level but increase for nearly 40% of the world’s population (Tuninetti et al., 2022).
- “In most countries (118 countries, 60% of global population), the healthy transition...would decrease the dietary WF, with an absolute decrease larger than 2,000 l [liters] per day per capita in Bolivia, Israel and Brazil. In these countries, the DG [dietary gap] closure would happen in a strong synergy with the reduction of the WF, as similarly shown by Semba et al. [2020] for the GHG [greenhouse gases] footprint.”

Source: Tuninetti, M., Ridolfi, L. & Laio, F. Compliance with EAT–*Lancet* dietary guidelines would reduce global water footprint but increase it for 40% of the world population. *Nat Food* 2022;3, 143–151. <https://doi.org/10.1038/s43016-021-00452-0>



Plant-Based Diets and the Water Footprint*

- The most considerable relative reductions (>50%) would happen in Israel and the US, owing to the decrease in the consumption of water-intensive foods, which are mostly meat- and sugar-based.
- The US, Brazil, China, Russia and Mexico would exhibit the largest WF reduction in terms of the total annual volume...; these countries would be able to save up to 200 km³ of water per year—estimated in the US—owing to the dietary shift (Tuninetti et al., 2022).
- “Despite this, in 54 countries, the healthy transition would entail an increased dietary WF, primarily in sub-Saharan Africa and South and Southeast Asian countries..., where notable DGs [dietary gaps] have been shown.”

Source: Tuninetti, M., Ridolfi, L. & Laio, F. Compliance with EAT–*Lancet* dietary guidelines would reduce global water footprint but increase it for 40% of the world population. *Nat Food* 2022;**3**, 143–151. <https://doi.org/10.1038/s43016-021-00452-0>

Options for Sustainable Nut Production

These include:

1. Choice of which nut to produce,
2. Sustainable intensification of nut production to attain climate/soil specific nut type WF benchmarks,
3. Choice of where to produce nuts,
4. Integrated water resources management,
5. Decrease of food loss and waste across the food supply chain;
6. Regenerative agriculture.

(Vanham et al., 2020) (Fenster et al., 2021 – regenerative agriculture).

Regenerative agriculture can be defined as:



- “an approach to farming that uses soil conservation as the entry point to regenerate and contribute to multiple provisioning, regulating and supporting services, with the objective that this will enhance not only the environmental, but also the social and economic dimensions of sustainable food production” (Schreefel et al., 2020).
- “This style of farming may assist in combatting planetary scale problems (e.g., climate change, biodiversity loss, agricultural pollution, chronic human health problems, and declining rural communities) while making farms more profitable and resilient” (Fenster et al., 2021).
- In a study by Fenster et al. (2021), Regenerative management in almond orchards improved soil quality and increased biodiversity while producing almonds profitably.
- Nearly every major metric (soil carbon and micronutrient levels, water infiltration rates, and soil health indices) were improved on regenerative orchards vs. their conventional counterparts.

Plant-Based Dietary Patterns for Human and Planetary Health

Barriers to Plant-Based Dietary Patterns (Gibbs & Cappuccio, 2022):

- **Meat appreciation & abstaining from consumption**

Solution: Plant-based meats and plant-based meat analogues and other plant-based animal product alternatives (also, see: Bryant, 2022).

See consumer guide to plant-based meats developed by the Center for Science in the Public Interest. You can download a chart with their “Best Bites” and “Honorable Mentions” plant-based meat products at: https://www.cspinet.org/sites/default/files/2022-03/november21_plantBasedMeatsChart.pdf

- **Convenience/Taste** – Perception that plant-based food preparation is complicated, and that plant-based eating is “tasteless.”

Solution: Online educational resources and community cooking classes to facilitate the teaching of plant-based food preparation to the public. Incentives for businesses to offer more plant-based options, and new policies that include plant-based options at schools, hospitals, universities, and other state-owned services.

Plant-Based Dietary Patterns for Human and Planetary Health

Barriers to Plant-Based Dietary Patterns (Gibbs & Cappuccio, 2022):

- **Health concerns – perceived nutrient deficiencies (e.g., protein and calcium)**

Solution: International and national investment in public health and sustainability education. Educate the public on specific plant-based food sources of essential nutrients such as iron, calcium, and zinc and reassure them that their protein needs can be sufficiently met on a plant-based diet.

Nutrition and dietetics practitioners can educate other health professionals, dietetics students, and clients on the health and environmental benefits of plant-based diets. See articles by Hawkins & Mangels (2021) and Craig et al. (2021), as well as: Academy of Nutrition and Dietetics Position Paper on Vegetarian Diets available* at:

<https://pubmed.ncbi.nlm.nih.gov/27886704/#:~:text=Abstract,and%20treatment%20of%20certain%20diseases>

*This AND position paper is expired. A new one is under development. Learn more about the process here:

<https://www.eatrightpro.org/practice/positions-papers-and-stances/academy-positions>

Plant-Based Dietary Patterns for Human and Planetary Health

Barriers to Plant-Based Dietary Patterns (Gibbs & Cappuccio, 2022):

- **Health concerns – perceived nutrient deficiencies (e.g., protein and calcium)**

Solution: Education about the benefits of plant-based beverages, including soymilk.

- “The soybean is notable not only for its total protein content but the quality of soy protein which is higher than that of other plant proteins and similar to animal protein” (Messina, 2016).
- Within the plant-milk alternatives category, soymilk has the highest protein content—and is a plant-based source of complete protein. Silk soymilk contains 7-9 grams of protein in 1 cup (240 ml). Fortified soymilk is also a nutrient-dense food that contains calcium, vitamin A and vitamin D.



<https://www.silkreferralpad.com/>

Plant-Based Dietary Patterns for Human and Planetary Health

Barriers to Plant-Based Dietary Patterns (Gibbs & Cappuccio, 2022):

- **Expense/Cost**

Solution: Allocating subsidies to the production of sustainable, healthful foods (e.g., fruits and vegetables) financed by a tax on unhealthful, environmentally damaging foods (e.g., highly processed meats) or an incremental increase in income tax. Subsidized produce boxes and produce prescriptions for high-risk populations ('food as medicine').

A study published in *the Journal of Hunger & Environmental Nutrition* reported that participants who ate a vegetarian diet spent an average of \$750 less on food per year than meat eaters (Flynn and Schiff, 2015).

Source: Gibbs J, Cappuccio FP. Review: Plant-based dietary patterns for human and planetary health: review. *Nutrients*. 2022; 14, 1614. <https://doi.org/10.3390/nu14081614>

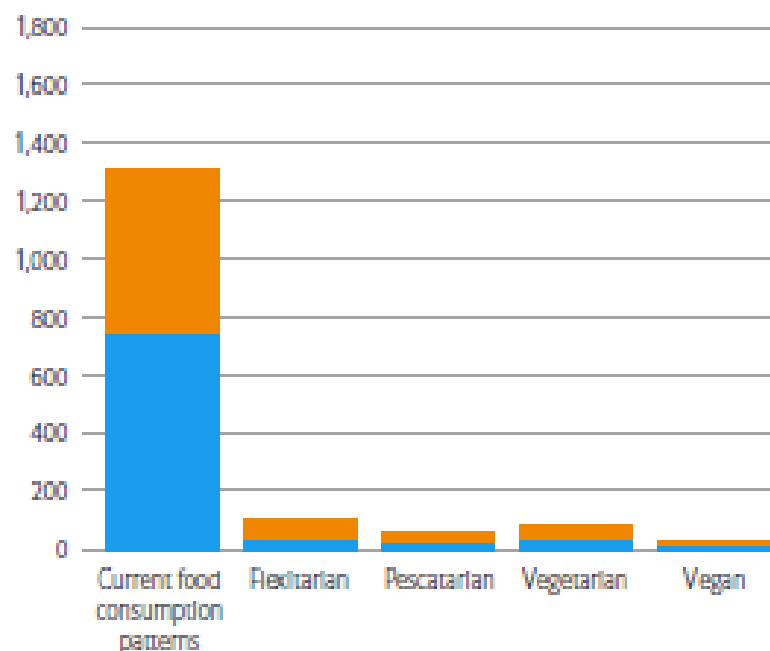
Cutting costs with alternative healthy dietary patterns



Global diet-related health costs

Cost in US\$ bn

Direct Indirect



Note: The global estimate considers 157 countries. Direct costs include direct medical and healthcare costs associated with treating a specific disease. Indirect costs include loss of productivity per working days and the costs of informal care associated with a specific disease. Health costs refer to four diet-related diseases included in the analysis: coronary heart disease, stroke, cancer and type-2 diabetes mellitus.

Source: FAO²⁰; BMJ 2020²¹



Global social costs of GHG emissions

Cost in US\$ bn

High-income countries Upper-middle-income countries
Lower-middle-income countries Low-income countries

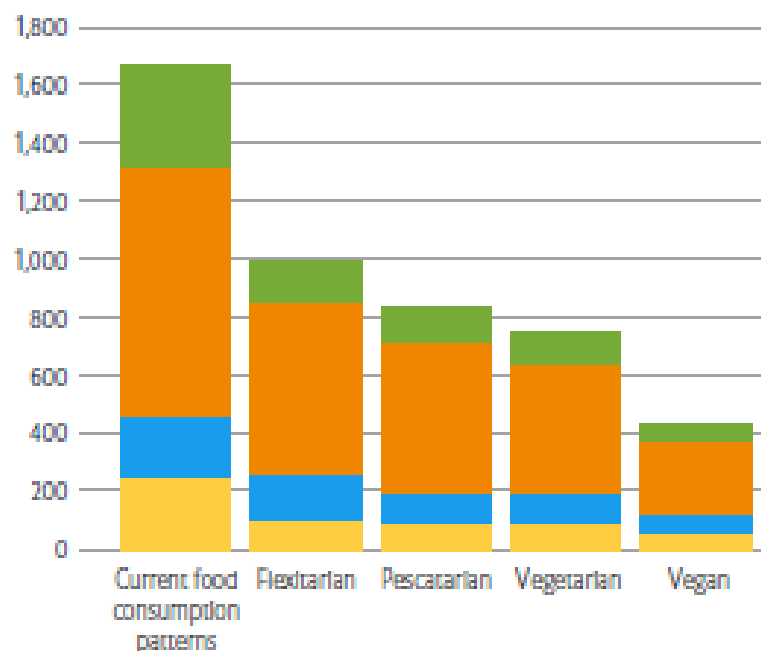


Figure: Cutting costs with plant-based, alternative healthy dietary patterns.

Source: *Fixing Food 2021: An Opportunity for G20 Countries to Lead the Way – Report*. The Economist Intelligence Unit & Barilla Center for Food & Nutrition; July 2021. Available at: <https://impact.economist.com/projects/foodsustainability/g20/fixing-food-2021-paper/about-this-report/>

Food-Based Strategies to Promote Personal and Planetary Health: Strategy 2: Locally-Produced, Seasonally Available Foods

- Research published in the journal *Nature Food* (Li et al., 2022) “suggests [that] transport accounts for one-fifth of total food-system emissions with fruits and vegetables among the most carbon-intensive.”
- The researchers reported that, “When the entire upstream food supply chain is considered, global food-miles correspond to about 3.0 GtCO₂e (3.5–7.5 times higher than previously estimated), indicating that transport accounts for about 19% of total food-system emissions (stemming from transport, production and land-use change).”
- Past studies suggested that transporting food has a small carbon footprint when compared to the rest of the food system. However, many did not account for emissions throughout the entire food supply chain.
- “This new study [by Li et al., 2022] aimed to fill this gap and included emissions for transporting fertilizers, machinery, and animal feed as well as the more obvious shipping and vehicle emissions from sending food products around the world.” (Tandon, 2022).

Locally-Produced, Seasonally Available Foods

- “Food-miles emissions are driven by the affluent world,” the study says. It finds that while “high income nations” represent only about 12.5% of the world’s population, they are responsible for 52% of international food miles and 46% of the associated emissions.” These authors also reflect on the pros and cons of buying local food (Southey et al., 2022; Li et al., 2022).
- The study also showed that ending all international food transport would cut food-miles emissions by only 9%, highlighting the relatively greater importance of other dietary strategies (e.g., plant-based diets) in tackling the climate impact of the food sector (Li et al, 2022; Southey et al., 2022)
- A move to the consumption of local, seasonal produce may mitigate climate change & improve nutrition and health in high-resource settings (Hendricks et al., 2022; Minaker et al, 2014; Harmon et al., 2014).

Locally Produced, Seasonally Available Foods

- Look for locally-produced, seasonally-available foods at your farmers' market. You can also start a home or community garden, and/or purchase a share through a community supported agriculture (CSA) farm. Finally, there are numerous food guides that help consumers locate locally-produced, seasonally-available foods.
- See the comprehensive guide to purchasing sustainably-produced local foods, and download a seasonal food guide, or free App, at:
<https://www.seasonalfoodguide.org/> or visit CT Grown: <https://ctgrown.org/all-posts>



Locally Produced, Seasonally Available Foods

To overcome income barriers, consider:

- WIC and Seniors Farmers' Market Nutrition Programs (USDA, 2022; Connecticut Department of Agriculture, 2022);
- Subsidized community supported agriculture (CSA) farm shares (Hanson et al., 2017; University of Wisconsin Population Health Institute, 2019) and;
- Produce boxes or 'produce prescription' programs for low-income and food insecure families (Brady et al., 2022, Platkin et al., 2022; Corbin Hill Food Project, 2022) including those available through the Gus Schumacher Nutrition Incentive Program (Gus NIP) - Produce Prescription Program (National Sustainable Agriculture Coalition, 2019; USDA National Institute of Food and Agriculture - NIFA).



Food-Based Strategies to Promote Personal and Planetary Health: Strategy 3: Reduce Food Loss and Food Waste

- Globally, around 14 percent of food produced is lost between harvest and retail. Significant quantities of food are also wasted in retail and at the consumer level (UN, 2022; FAO, 2019).
- The part of food that is lost from harvest up to, but not including, the retail level is called food loss. The part wasted at the consumer or retail level is referred to as food waste (FAO, 2022; FAO 2019).
- An estimated 17 percent of total global food production is wasted (11 percent in households, 5 percent in the food service and 2 percent in retail) (UN, 2022; FAO, 2019).¹

¹ The apparent discrepancy between the sum of the percentages for each sector and the total is due to rounding (UNEP, 2021).



Food Waste: Why Does It Matter?

Food waste is expensive.

- The average American consumer spends over \$1,300 per year on food that ends up being wasted (Conrad, 2020).
- “On average, Americans spent more annually on wasted food than they did on vehicle gasoline (\$1,250); apparel (\$1,207); household heating and electricity (\$1,149); property taxes (\$1,046); and household maintenance, repairs and insurance (\$936) for the average single-person household in 2017” (Conrad, 2020).



Food Waste: Why Does It Matter?



Food waste is expensive and it's a barrier to a healthy diet.

- On average, consumers spent more than one-quarter of their daily food budget on food that ended up being wasted, representing over \$3.50 per day.
- Meat and seafood (30%) accounted for the greatest proportion of daily food budgets spent on wasted food, followed by fruits and vegetables (30%), grains (10%), sweets (6%) and dairy (5%).
- The greatest amount of meat and seafood waste (by value) occurred outside of the home whereas the greatest amount of fruit and vegetable waste occurred within the home (Conrad, 2020).





Food Waste: Why Does It Matter?

Wasting food is bad for the planet.

- If food loss and waste were a country, it would be the third biggest source of greenhouse gas emissions (UNEP, 2021).
- According to the US Environmental Protection Agency (EPA), 35 percent of the U.S. food supply is wasted, and before it even arrives at a landfill, that waste results in annual greenhouse gas emissions equivalent to those of 42 coal-fired power plants. This number does not include methane emissions that occur when wasted food decomposes in landfills (US EPA, 2021).
- Food that is lost and wasted accounts for 38 percent of total energy usage in the global food system (UN, 2022).



Food Waste: Why Does It Matter?

Wasting food is bad for the planet and people.

- Food waste burdens waste management systems. It is a major contributor to the **three planetary crises: climate change, nature & biodiversity loss, and pollution and waste** (UNEP, 2021)."
- **Solution:** The United Nations (UN) Sustainable Development Goal (SDG) target 12.3 aims to halve food waste and reduce food loss by 2030.
- Reducing current levels of retail and consumer waste by half (in line with UN SDG target 12.3) has been estimated to reduce the blue water footprint by 14%. (Steenson & Bittriss, 2021).

Food Waste Reductions: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

1. Adopt a healthier, more sustainable diet

- In a study of patients' plate food waste (FW) at Loma Linda University Medical Center (LLUMC), overall, vegetarian meals were preferable to meat-containing meals served both in terms of minimizing food waste and lowering environmental impacts. (Berardy et al., 2022)



Food Waste Reductions: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

1. Adopt a healthier, more sustainable diet

- A review by Moreno et al. 2022 concluded that: “more diverse flexitarian [semi-vegetarian] diets and Territorial Diverse Diets [TDDs] (e.g., Mediterranean diet, Nordic Diet) are associated with reduced volumes of food waste and may be more acceptable, and easier to maintain for people who previously followed Western diets.”



Food Waste Reductions: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

1a. Adopt a healthier, more sustainable diet along with food waste reduction efforts

- A German analysis found that, “the share of plant-based food in national diets substantially reduces biomass and land use footprints.”
- “Fruits and vegetables generate more food waste and a higher water footprint than other food products.”
- “In other words, encouraging change towards plant-based diets alone can save biomass and land use but counteract waste reduction targets and freshwater conservation.”
- Therefore, a combination of increased plant-based food consumption and food waste reduction is most effective at saving resources (Helander et al., 2021).



Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

2. Buy only what you need

- Plan your meals. Make a shopping list and stick to it - be sure to avoid impulse buys. Not only will you waste less food, you will save money too.

3. Purchase 'ugly' or 'imperfect' fruit and vegetables

- Don't judge food by its appearance! Oddly-shaped or bruised fruits and vegetables are often thrown away because they don't meet arbitrary cosmetic standards. They taste the same and the nutrition is the same too. Use 'mature fruit' for smoothies, juices and desserts.
- **Misfits Market** and **Imperfect Foods** [sustainable food delivery services]: <https://www.healthline.com/nutrition/misfits-market-vs-imperfect-foods> (by: Kelsey Lorencz, RDN, 05/17/22)

4. Store food wisely

- Move older products to the front of your cupboard or fridge and new ones to the back (i.e., FIFO). Use airtight containers to keep open food fresh in the refrigerator.



Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

5. Understand food labelling

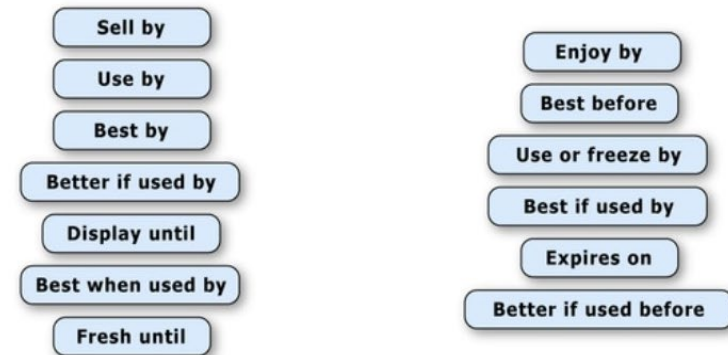
- There's a difference between “best before” and “use-by” dates. Sometimes food is still safe to eat after the “best before” date, whereas it's the “use-by” date that tells you when it is no longer safe to eat. (FAO, 2020)
- Standardizing “sell-by dates” could help home cooks not throw out perfectly good foods. (EPA, 2021) (GAO, 2019)

6. Start small

- Serve smaller portions at home, share large dishes at restaurants, or ask for smaller portions (smaller portions are now available on some menus).

Examples of Introductory Phrases for Date Labels

Currently Used by Industry



Source: GAO analysis of information from the Food Marketing Institute and the Grocery Manufacturers Association. | GAO-19-407

Food Date Labeling Act (2021): (S. 3324, H.R. 6167)

<https://policyfinder.refed.org/federal-policy/food-date-labeling-act>

Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

7. Love your leftovers

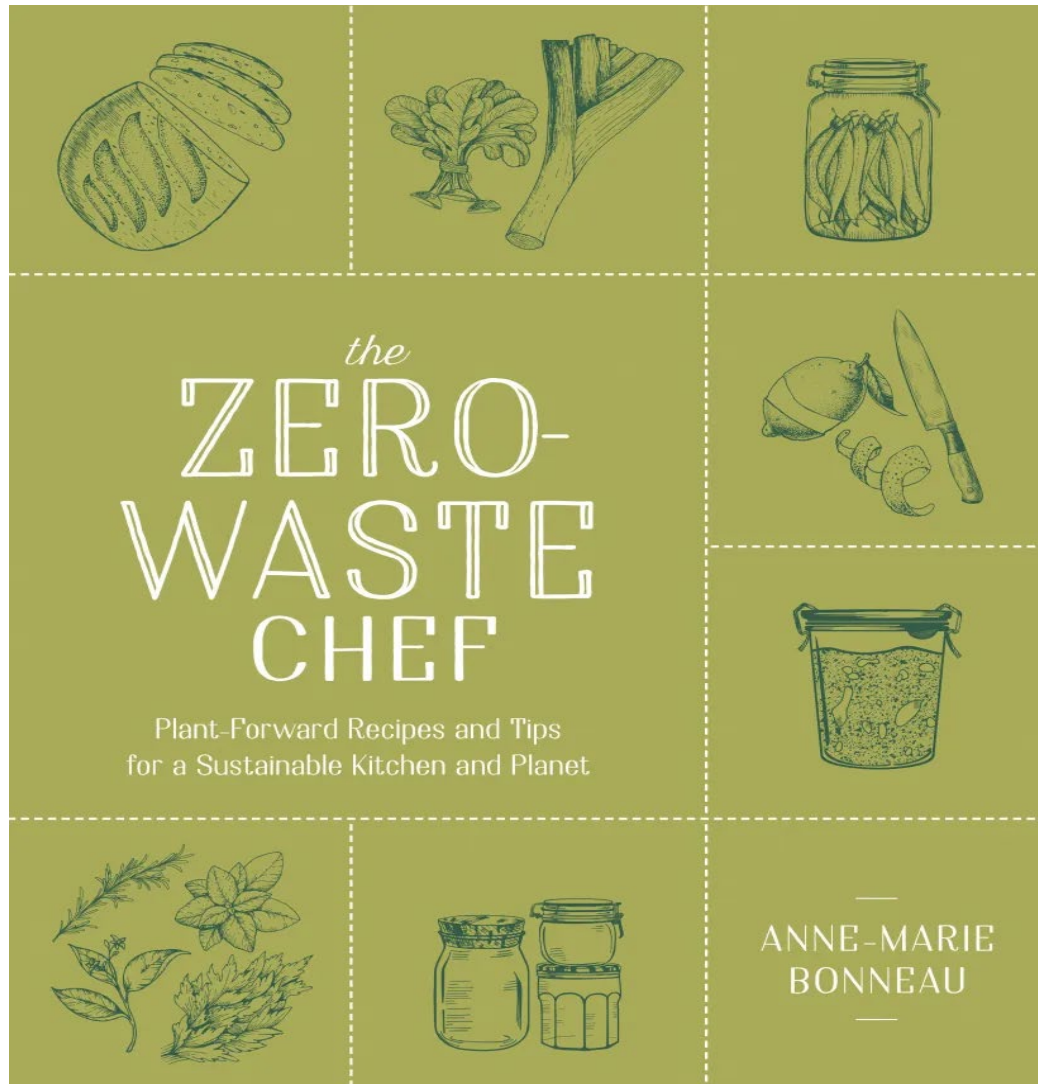
- If you don't eat everything you make, freeze it for later or use the leftovers as an ingredient in another meal.
- Use recipes that show you how to use leftover food items/food scraps in the next day's meal.

8. Put your food waste to use

- Instead of throwing away food scraps, compost them.
- Compost is organic material that can be added to the soil to help plants grow. It helps soil retain moisture, decreases the need for synthetic fertilizers, & lowers methane gas emissions from landfills.
- Begin by setting up a food waste bin that can include fruit and vegetable peelings, but you'll need additional components to complete the process.

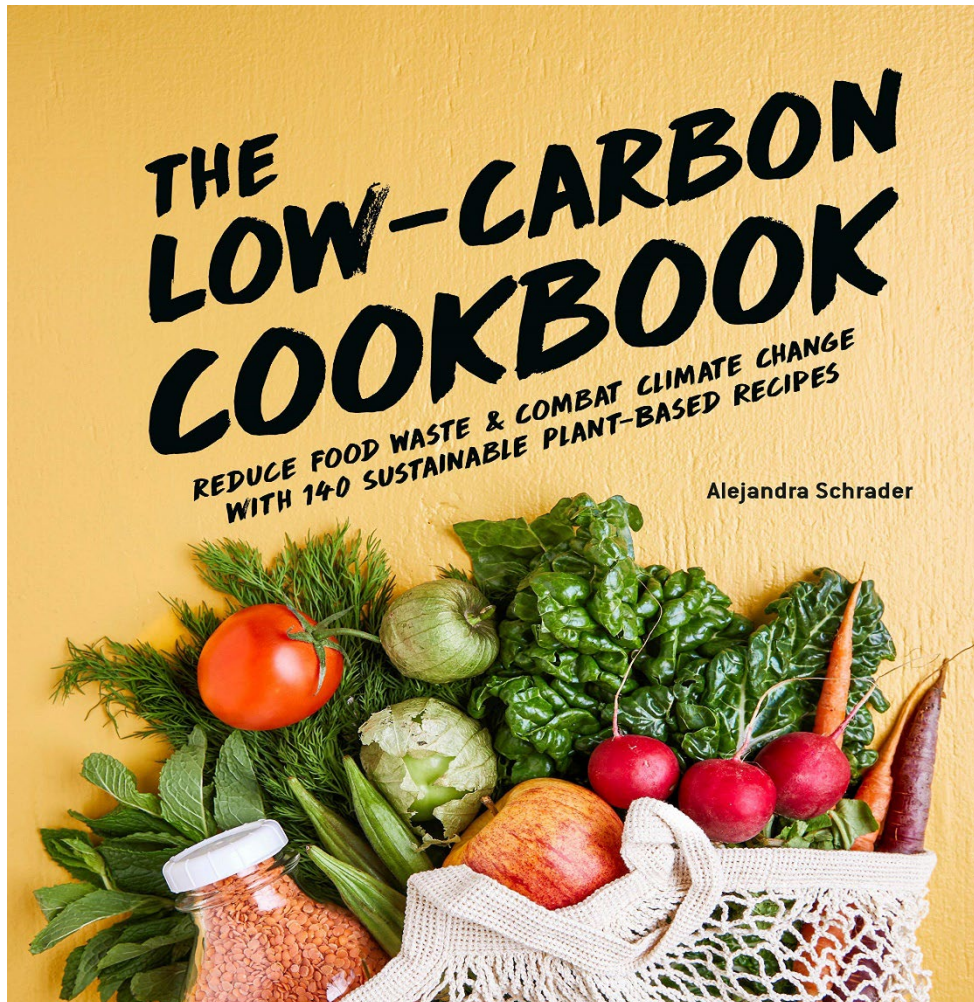


Food Waste: Cookbooks/Recipes



<https://www.stopfoodwasteday.com/en/cookbook.html>

Food Waste: Cookbooks/Recipes



"Ugly" Carrot Soup

Ingredients

500g "ugly carrots"
1 tbs oil
1 chopped onion
Celery/leek (stalk and leaves if you have them)
3 pods garlic chopped
2 1/2 inch ginger sliced/chopped
1/2 cup of orange juice (freshly squeezed, preserve rind for another quick recipe)
4 cups vegetable broth (recipe with vegetable odds and ends coming soon)
1/2 tsp turmeric
1 tsp cumin
1 green chilli chopped
Salt to taste

Method

In a stock pot, brown the garlic, onions, celery, leek and ginger, add the spices, Add the coarsely chopped carrots, orange juice and broth, bring to a boil and then cover and let simmer for 25-30 mins. Purée the soup in a blender and return to the stove, check seasoning and serve. This recipe is great for freezing and keeps well in



Food Waste Tips: Fresh Herbs

How to Use Extra or
Leftover Fresh Herbs

<https://www.instagram.com/FoodPrintorg/>

https://foodprint.org/blog/how-to-use-extra-leftover-fresh-herbs/?utm_source=mailchimp&utm_medium=newsletter&utm_campaign=healthy_label



Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

9. Respect food

- Food connects us all. Re-connect with food by knowing the process that goes into making it. Learn about ecologically-friendly food production practices.

10. Support local food producers

- Buy in-season produce and other products from local farmers who use agroecological and regenerative farming practices (i.e., ecologically-friendly farming practices). By doing so, you also help fight pollution by reducing delivery distances for trucks and other vehicles.



Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

10. Support local food producers (cont'd)

- “Although flexitarian diets and Territorial Diverse Diets [TDDs] (e.g., Mediterranean Diet and Nordic Diet) have a greater impact on the environment than vegan, vegetarian, and pescatarian diets, their negative effects are considerably reduced compared with Western diets, especially if diets include locally sourced seasonal foods” (Moreno et al, 2022)



Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

11. Keep fish populations afloat

- Eat fish species that are more abundant, such as mackerel or herring, rather than those that are at risk of being overfished. Buy fish that has been caught or farmed sustainably, such as eco-labelled or certified fish. Check out:
- Marine Stewardship Council Fisheries Standard:
<https://www.msc.org/en-us/standards-and-certification/fisheries-standard>
- Monterey Bay Seafood Watch Consumer Guides:
<https://www.seafoodwatch.org/recommendations/download-consumer-guides>



Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

12. Use less water

- Reducing food waste saves all the water resources that goes into producing food. At home, focus on reducing food waste from fruits and vegetables because they typically generate more food waste than other foods (Conrad, 2020, Conrad and Blackstone, 2021; Helander et al., 2021, Steenson and Blitriss, 2021).
- “Highly processed foods – such as packaged snacks and ready-made meals also use a lot of water. For example, ounce for ounce, potato chips have a higher water footprint than potatoes (FoodPrint, 2022).” To calculate your **Water Footprint**, go to: <https://www.watercalculator.org/>

13. Use compostable food packaging containers. Avoid or reduce using single-use plastic containers & bottles

- And don't forget to bring your reusable bags to the supermarket and farmers' market.

Source: Food and Agriculture Organization of the United Nations (FAO). 15 quick tips for reducing food waste and becoming a Food hero. September 29, 2020.
Available at: <https://www.fao.org/fao-stories/article/en/c/1309609/>

Food Waste Reduction: Action Steps

15 Food waste reduction tips adapted from FAO (2020):

14. At least once a week (or more), include a plant-based meal based on pulses or 'ancient' grains like quinoa. Prepare simple plant-based recipes that your entire family will enjoy!

- Some example plant-based recipes include: *Sweet Potato Avocado Sliders, Hearty Black Bean Chili, Southwest Quinoa Bowl, Creamy Butternut Squash and Apple Soup, & Roasted Carrots and Creamy Quinoa*

For these and other plant-based recipes, visit: <https://silk.com/plant-based-recipes/>

15. Sharing is caring

- Donate food to food banks and food pantries that would otherwise be wasted. In addition, Food Waste Apps can connect neighbors with each other and with local businesses so that surplus food can be shared, not thrown away.

7 Food Waste Apps for Saving Money *and* the Planet <https://www.wellandgood.com/food-waste-apps/>

18 Awesome Food Waste Apps To Save Money & The Planet. <https://www.almostzerowaste.com/apps-to-reduce-food-waste/>

Food Waste Reduction: Policy Steps

Opportunities to Reduce Food Waste in the 2023 Farm Bill (Report)

<https://www.nrdc.org/experts/yvette-cabrera/opportunities-reduce-food-waste-2023-farm-bill>

By: Harvard Law School, Food Law and Policy Clinic (FLPC), the Natural Resources Defense Council (NRDC), ReFED, and World Wildlife Fund (WWF)

Fighting Food Waste and Food Insecurity Through Legislation: Food Donation Improvement Act (S. 3281, H.R. 6251)

<https://policyfinder.refed.org/federal-policy/food-donation-act>

<https://foodtank.com/news/2022/07/fighting-food-waste-and-food-insecurity-through-legislation/>

- In November 2021, Senators Pat Toomey (R-PA) and Richard Blumenthal (D-CT) introduced the Food Donation Improvement Act (S. 3281), which would expand liability protection for food donation and reduce wasted food nationwide. A bipartisan coalition of representatives introduced the House version in December (H.R. 6251).
- It would update the existing Federal Bill Emerson Good Samaritan Food Donation Act, passed by Congress.
- The bill would expand protections for businesses that have excess food to donate but fear liability. It would also provide incentives for donors and enable organizations to give surplus food directly to families in need instead of going through a nonprofit partner.

Take Home Messages

- Plant-based diets have the potential to reduce diet-related land use, greenhouse gas emissions, water use, and eutrophication, particularly in high-income countries (and in some cases globally).
- Data from prospective cohort studies and controlled trials support the implementation of plant-based diets for obesity and chronic disease prevention.
- Nutrition and dietetics practitioners can work with clients to implement the adoption of plant-based diets including addressing potential barriers such as: ‘meat appreciation,’ convenience and taste, health concerns, and expense/cost (e.g., via produce boxes or produce prescriptions for low-income families – using a ‘food as medicine’ approach).



Take Home Messages

- Nutrition and dietetics practitioners can work with clients to recommend locally-produced, seasonally available foods via numerous strategies such as farmers' markets (including WIC and Seniors Farmers' Market Nutrition Programs), subscriptions to community supported agriculture (CSA) farms, home and/or community gardens, & produce prescription programs for high-risk populations.
- Nutrition and dietetics practitioners can work with clients to implement a range of strategies to reduce household food waste. Doing so, saves both money and environmental resources.





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