

Climate Change, Health and Diet

A community discussion



Welcome everyone!

Our Speakers:

Dr. Kumara Sidhartha (Medical Director, Cape Cod Healthcare)

Joanne Irwin M.Ed. (Plant-Based Culinary Educator and Consultant)

Sarah Griscom PhD (Chatham CAN, Science Advisor, Pleasant Bay Community Boating)

Tom Farkas (Chatham CAN, Organic Gardener, Permaculturist, Climate Activist)





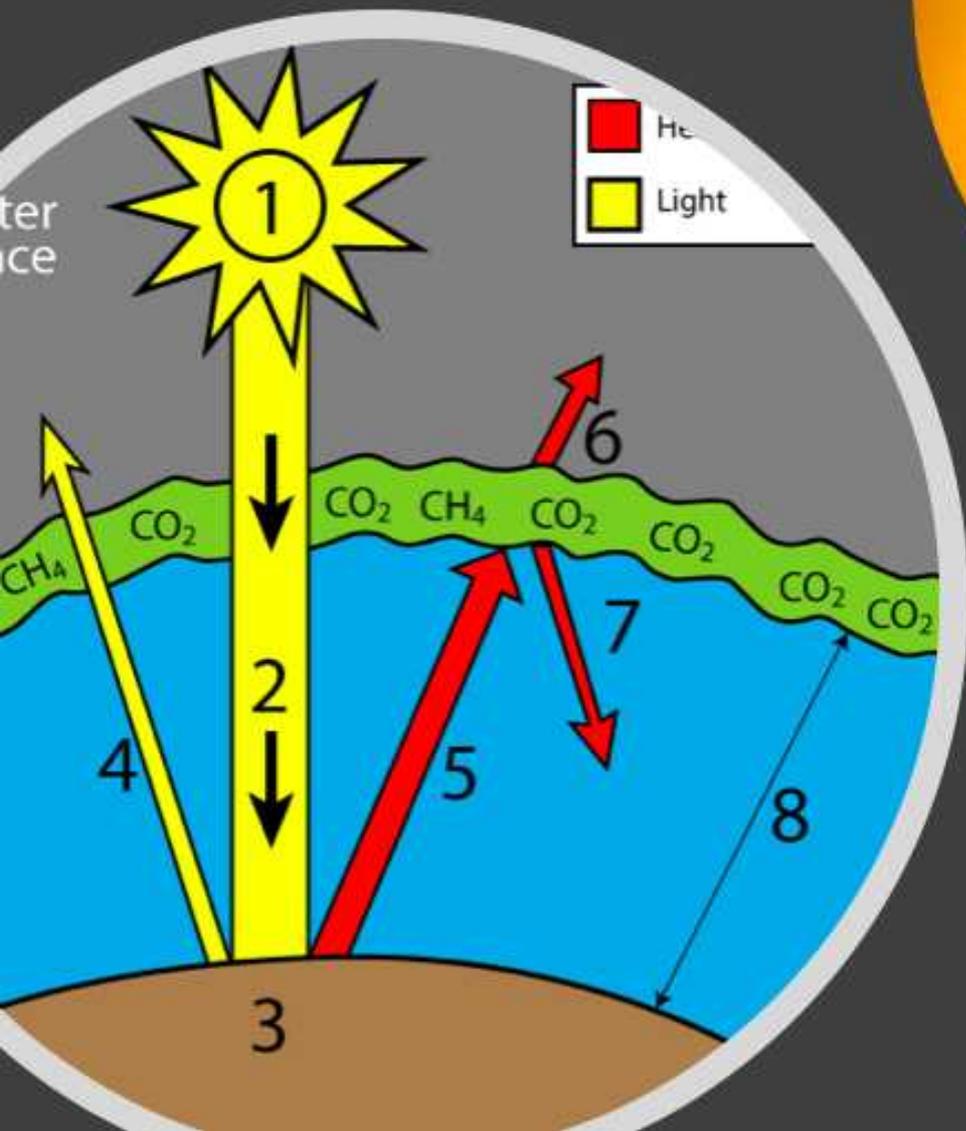
Climate Change, Health & Diet

a community conversation

Greenhouse Gases – a quick overview

Carbon Footprint: “Average American”

% GHG from Food Systems &
Agriculture Practices



STRENGTH OF GREENHOUSE GASES

CARBON DIOXIDE

METHANE

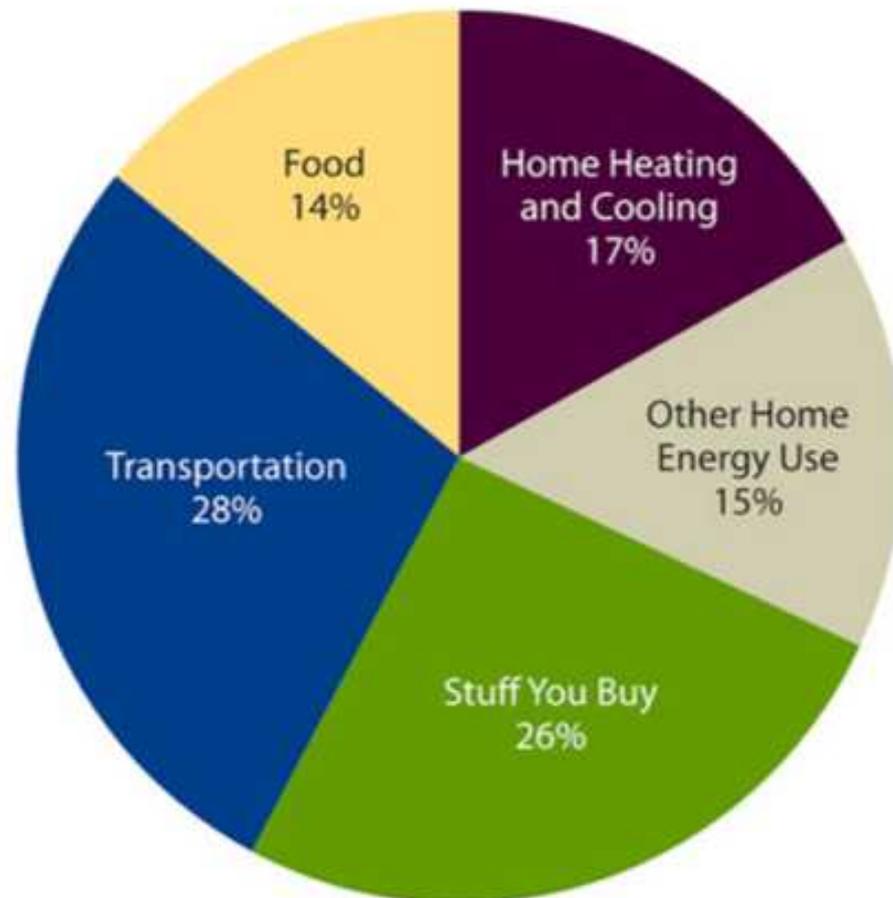
NITROUS OXIDE

28 molecules of CO_2

265 molecules of CO_2

Greenhouse Gases:
Trap heat within the
molecular bond

Where the Average American's Carbon Emissions Come From



Union of Concerned Scientists

2012

Food Systems & Agriculture Practices Create:

The background of the slide is a photograph of a farm. In the foreground, several cows of various colors (white, brown, black) are visible, some with red ear tags. In the background, there are large industrial silos and farm buildings under a clear sky.

10.5% (US Dept of Agriculture, 2018)

24 – 31% (Org for Econ Coop & Dev, 2016)

21 – 34% (Internl Panel on Climate Change, 2019)

**What we eat directly impacts the health of you
and the earth**

Greenhouse Gasses Emitted by the Agriculture Process

Various management practices on agricultural soils can lead to increased availability of nitrogen in the soil and result in emissions of **nitrous oxide (N₂O)**. Specific activities that contribute to N₂O emissions from agricultural lands include the application of synthetic and organic fertilizers, the growth of nitrogen-fixing crops, the drainage of organic soils, and irrigation practices.

Livestock, especially ruminants such as cattle, produce **methane (CH₄)** as part of their normal digestive processes. This process is called enteric fermentation, and it represents over a quarter of the emissions from the Agriculture economic sector.

The way in which manure from livestock is managed also contributes to **CH₄ and N₂O** emissions. Different manure treatment and storage methods affect how much of these greenhouse gases are produced. Manure management accounts for about 12 percent of the total greenhouse gas emissions from the Agriculture economic sector in the United States.

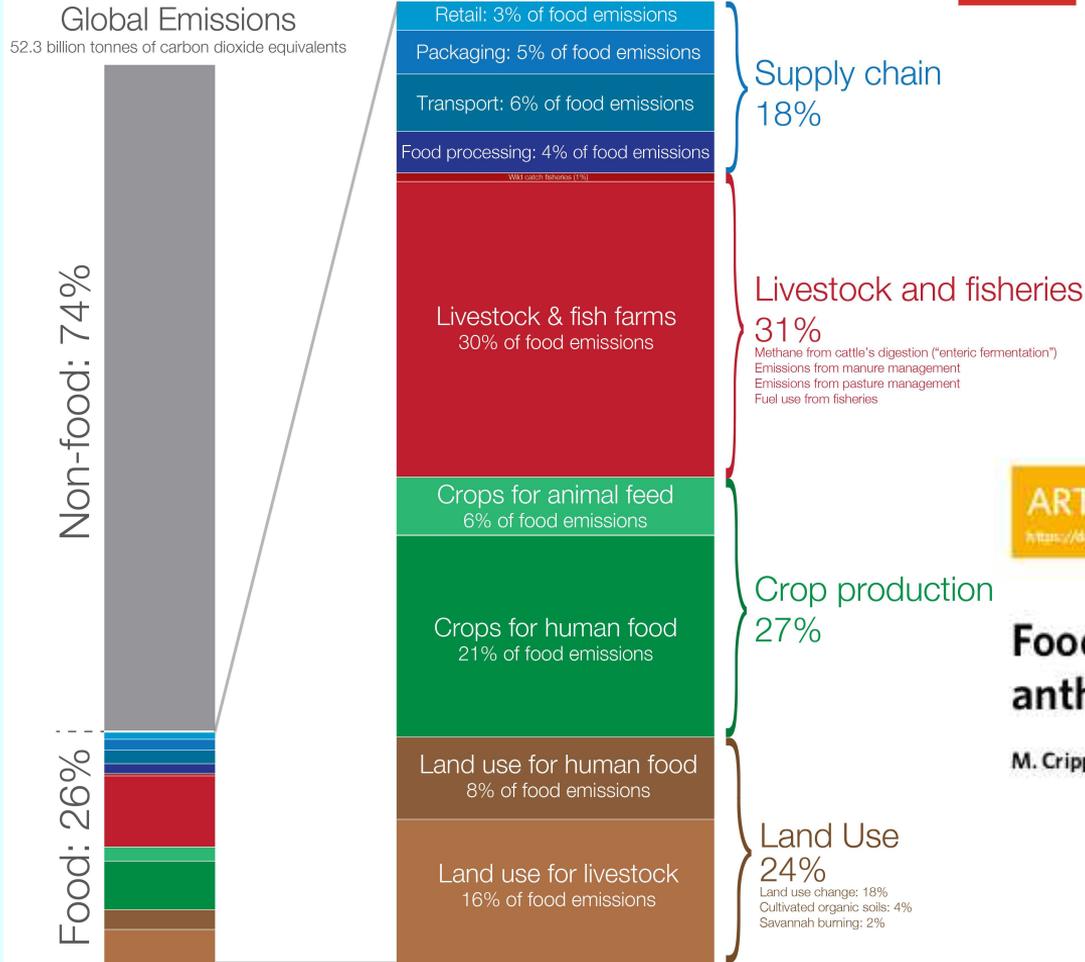
Smaller sources of agricultural emissions include **carbon dioxide CO₂** from liming and urea application, CH₄ from rice cultivation, and burning crop residues, which produces CH₄ and N₂O.

- Source: EPA



Global greenhouse gas emissions from food production

Our World in Data



Food production Is responsible for one quarter of the world's greenhouse gas emissions

ARTICLES
<https://doi.org/10.1038/s41467-021-00225-9>
 nature food
 Check for updates

Food systems are responsible for a third of global anthropogenic GHG emissions

M. Crippa¹, E. Solazzo¹, D. Guizzardi¹, F. Monforti-Ferrario¹, F. N. Tubiello² and A. Leip¹

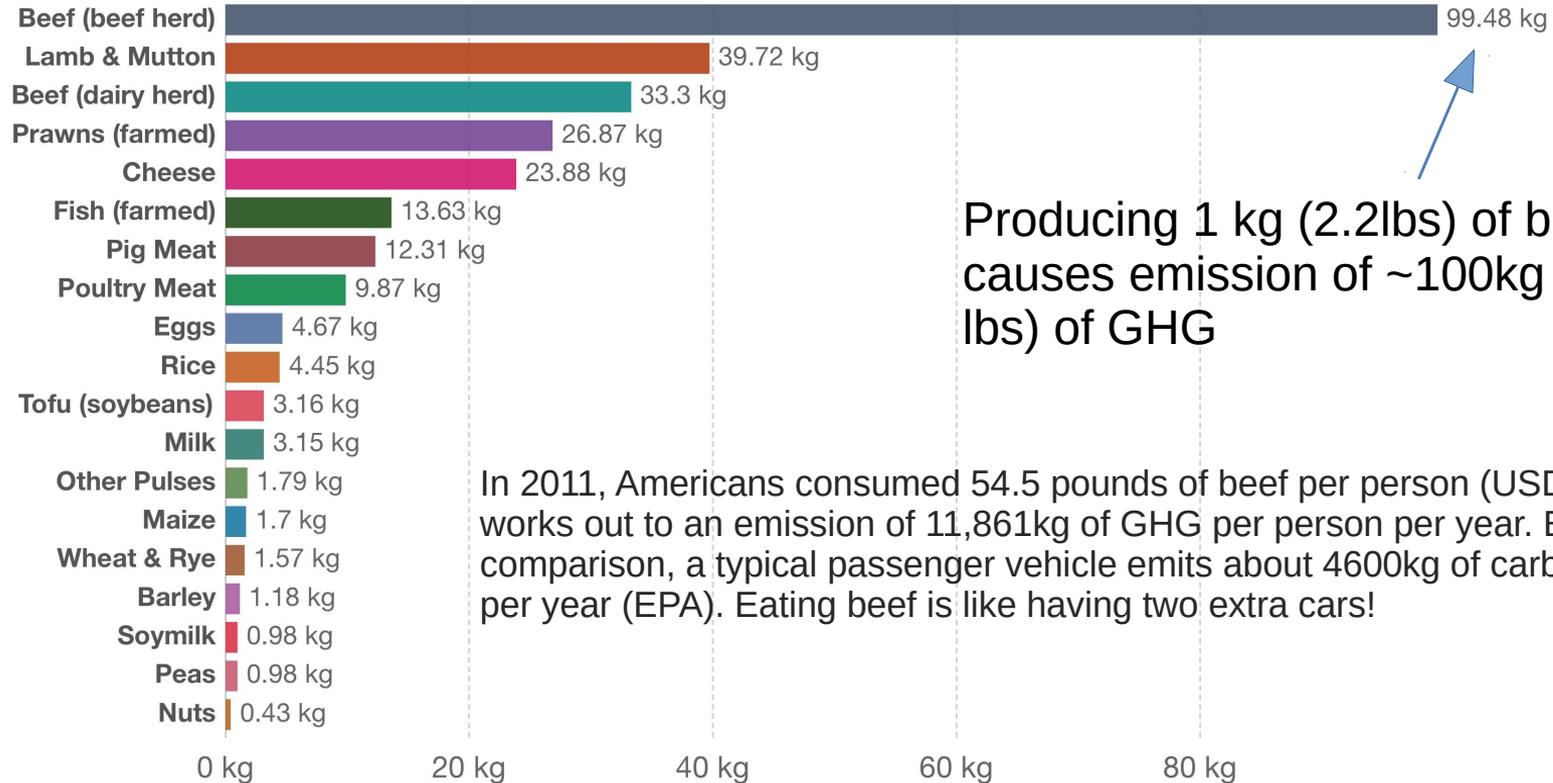
Data source: Joseph Poore & Thomas Nemecek (2018). Reducing food's environmental impacts through producers and consumers. Published in Science. OurWorldinData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the author Hannah Ritchie.



Greenhouse gas emissions per kilogram of food product

Our World
in Data

Greenhouse gas emissions are measured in kilograms of carbon dioxide equivalents (kgCO₂eq) per kilogram of food product. This means non-CO₂ greenhouse gases are included and weighted by their relative warming impact.



Producing 1 kg (2.2lbs) of beef causes emission of ~100kg (220 lbs) of GHG

In 2011, Americans consumed 54.5 pounds of beef per person (USDA). That works out to an emission of 11,861kg of GHG per person per year. By comparison, a typical passenger vehicle emits about 4600kg of carbon dioxide per year (EPA). Eating beef is like having two extra cars!

Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers.

Note: Data represents the global average greenhouse gas emissions from food products based on a large meta-analysis of food production covering 38,700 commercially viable farms in 119 countries.

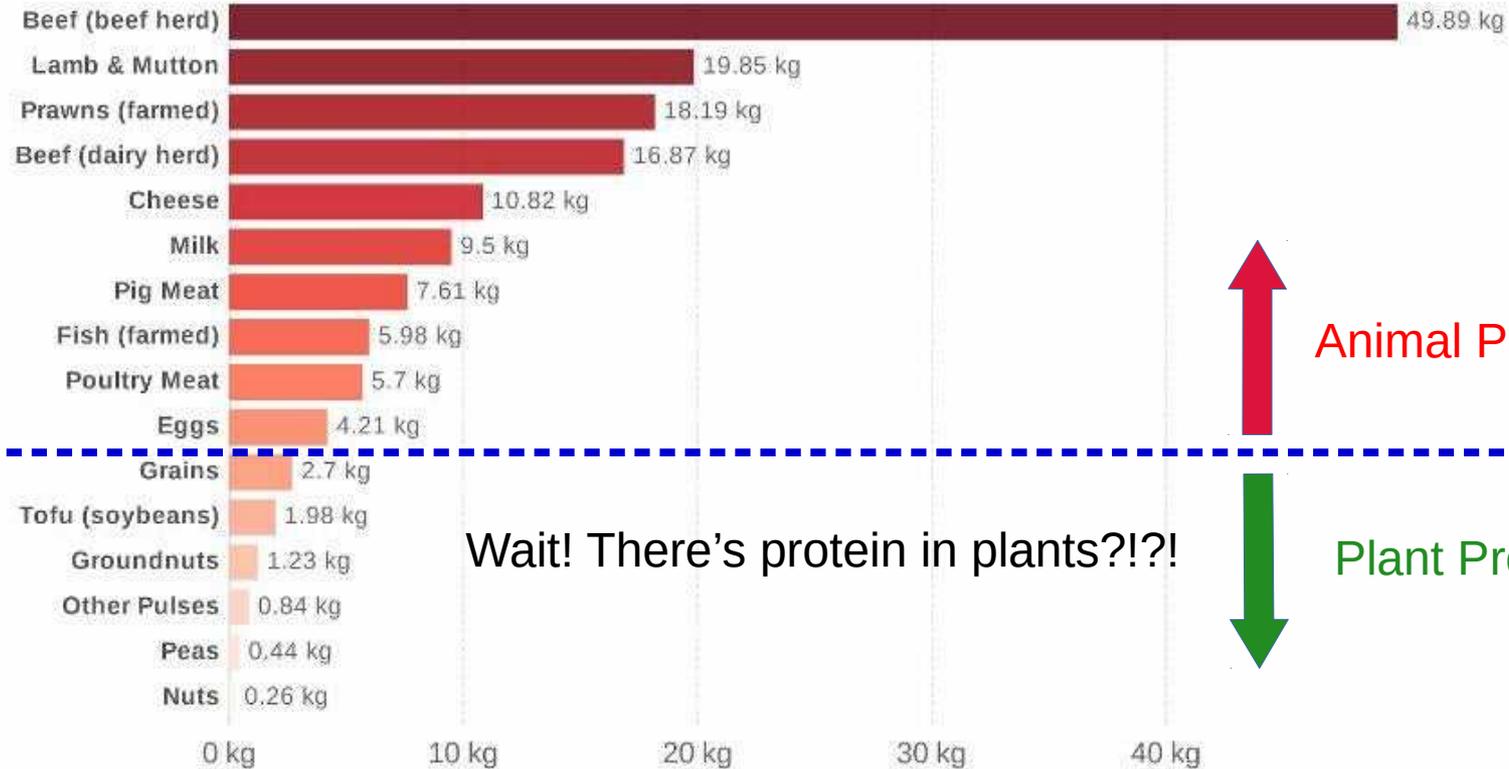
OurWorldInData.org/environmental-impacts-of-food • CC BY



Greenhouse gas emissions per 100 grams of protein

Our World
in Data

Greenhouse gas emissions are measured in kilograms of carbon dioxide equivalents (kgCO₂eq) per 100 grams of protein. This means non-CO₂ greenhouse gases are included and weighted by their relative warming impact.



Source: Poore, J., & Nemecek, T. (2018). Additional calculations by Our World in Data.

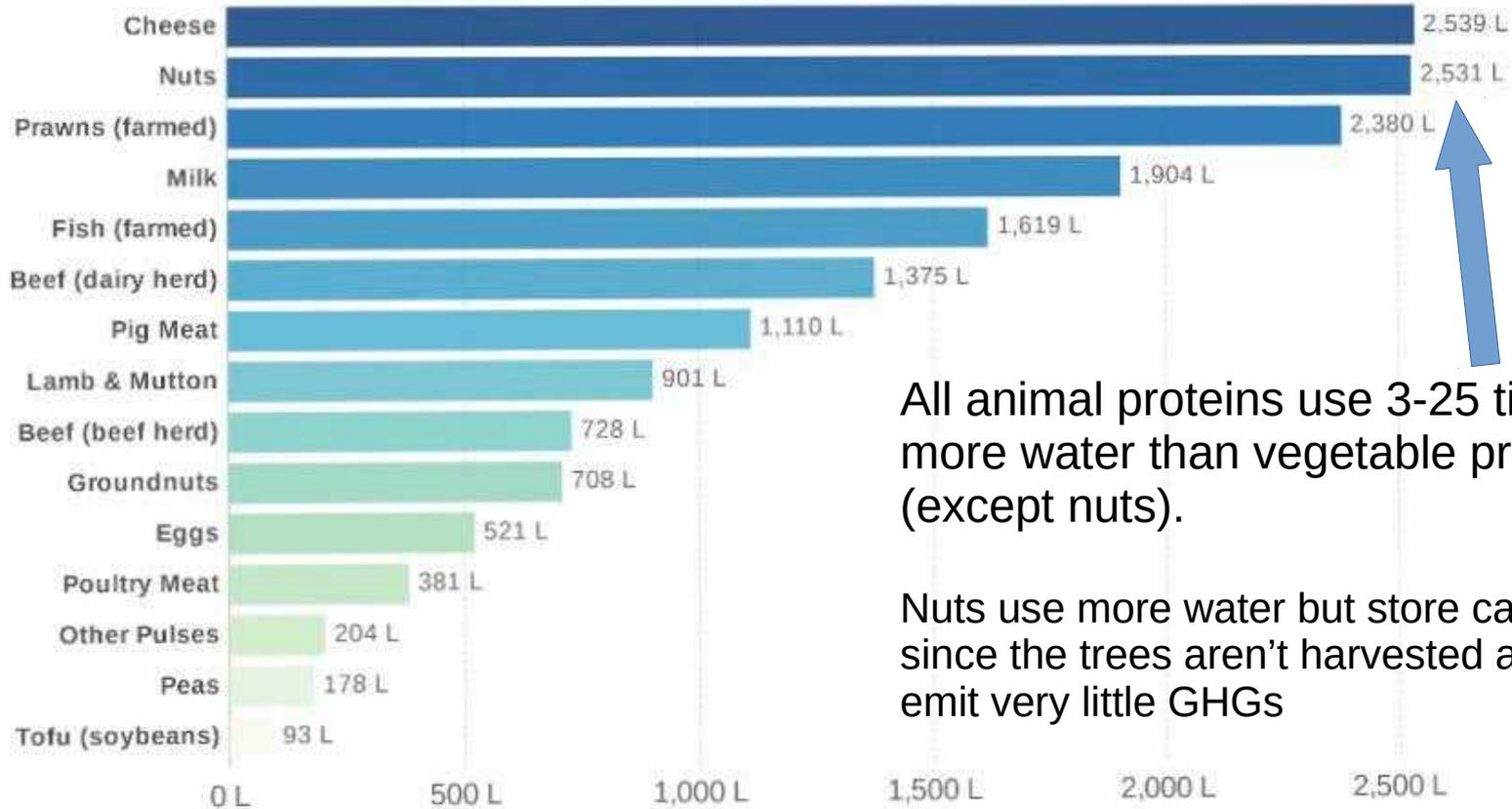
Note: Data represents the global average greenhouse gas emissions of food products based on a large meta-analysis of food production covering 38,700 commercially viable farms in 119 countries.

OurWorldInData.org/environmental-impacts-of-food • CC BY

Freshwater withdrawals per 100 grams of protein

Freshwater withdrawals are measured in liters per 100 grams of protein.

Our World
in Data



All animal proteins use 3-25 times more water than vegetable proteins (except nuts).

Nuts use more water but store carbon since the trees aren't harvested and emit very little GHGs

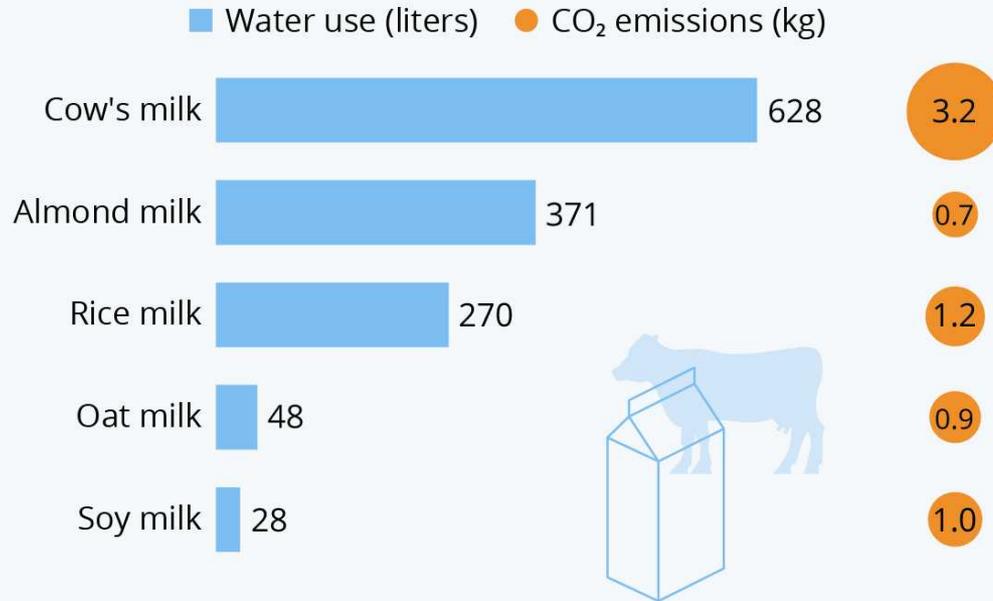
Source: Poore, J., & Nemecek, T. (2018). Additional calculations by Our World in Data.

Note: Data represents the global average freshwater withdrawals of food products based on a large meta-analysis of food production covering 38,700 commercially viable farms in 119 countries.

OurWorldInData.org/environmental-impacts-of-food • CC BY

Which (Plant) Milk Is the Most Sustainable?

Average amount of water used and CO₂ produced per liter of different types of milk



Source: Science via New York Times



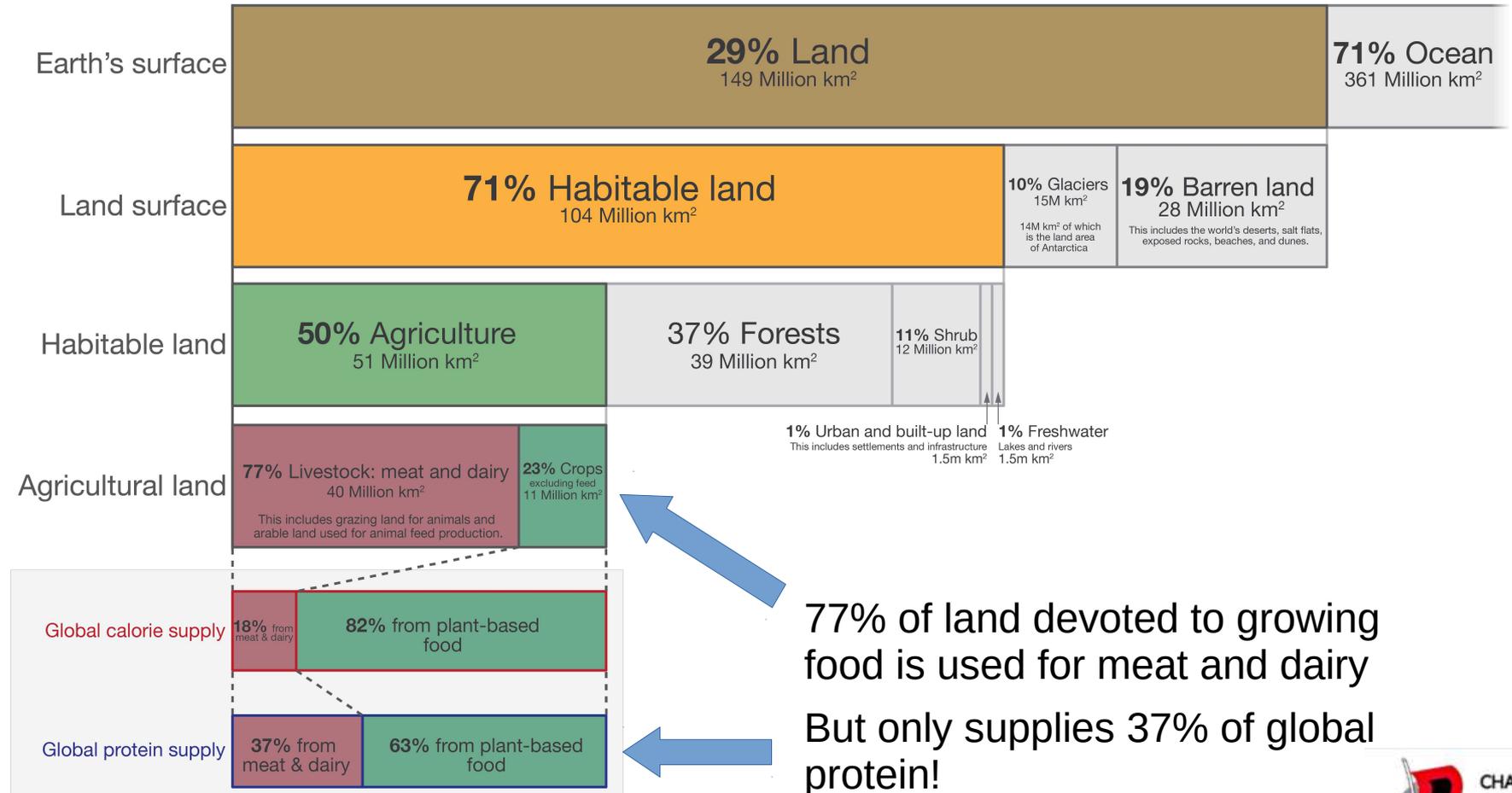
statista

Wait! What?

A liter (roughly a quart) of cows milk takes 628 liters of water and releases 3.2 kg (1.45 lbs) of CO₂ ?



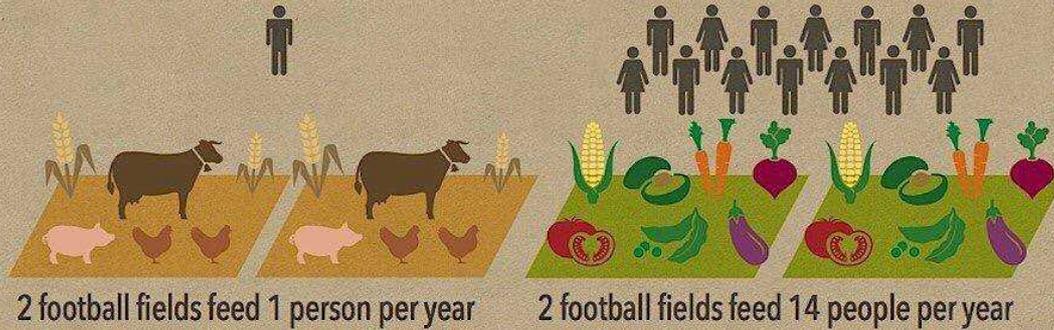
Global land use for food production



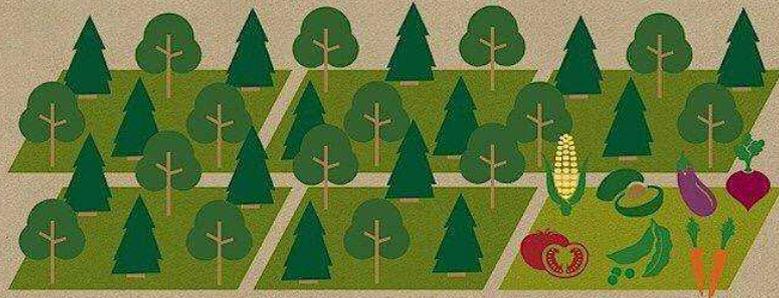
ANIMAL-BASED DIET V. PLANT-BASED DIET: LAND USE

On a Standard American Diet:

On a Plant-Based Diet:



If Everyone In the World Ate a Plant-Based Diet:



5 billion football fields worth of land could be returned to forests.



The Plantrician Project

“There are basic laws of biophysics that we cannot evade. The average **efficiency** of livestock converting plant feed to meat is less than 3%, and as we eat more meat, more arable cultivation is turned over to producing feedstock for animals that provide meat for humans. The losses at each stage are large, and as humans globally eat more and more meat, conversion from plants to food becomes less and less efficient, driving agricultural expansion and land cover conversion, and releasing more greenhouse gases.

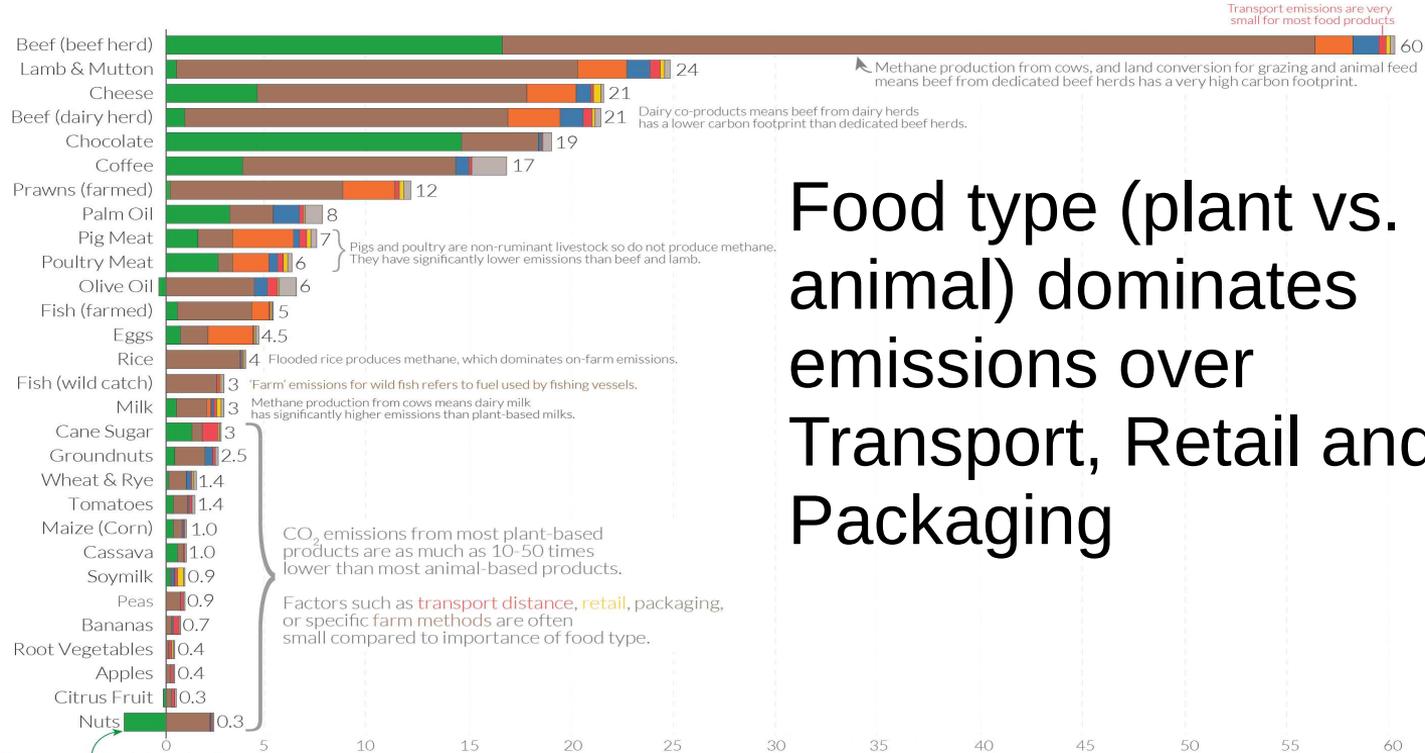
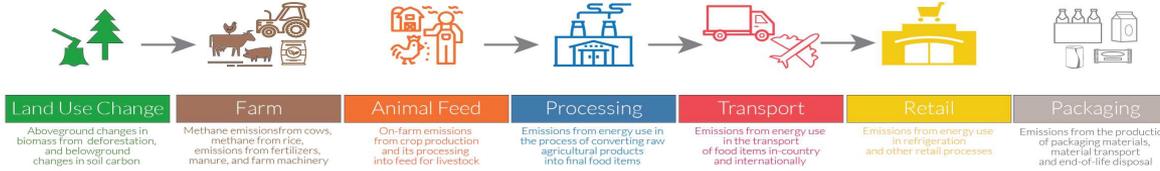
Agricultural practices are not necessarily at fault here – but our choice of food is.”

Source: University of Cambridge Research

It's all about efficiency!



Food: greenhouse gas emissions across the supply chain



Food type (plant vs. animal) dominates emissions over Transport, Retail and Packaging

Nuts have a negative land use change figure because nut trees are currently replacing croplands; carbon is stored in the trees.

Greenhouse gas emissions per kilogram of food product (kg CO₂-equivalents per kg product)

Note: Greenhouse gas emissions are given as global average values based on data across 38,700 commercially viable farms in 119 countries. Data source: Poore and Nemecek (2018). Reducing food's environmental impacts through producers and consumers. *Science*. Images sourced from the Noun Project. OurWorldinData.org – Research and data to make progress against the world's largest problems. Licensed under CC-BY by the author Hannah Ritchie.



But can we feed everyone on the Earth with a Plant Based diet?

Yes.

Vegan Alternatives Could Stop World Running Out of Food by 2050

RESEARCH ARTICLE

Current global food production is sufficient to meet human nutritional needs in 2050 provided there is radical societal adaptation

M. Berners-Lee^{1*}, C. Kennelly^{1†}, R. Watson¹ and C. N. Hewitt²

There won't be enough food to feed the world's population by 2050.

Plant-Based Diets Could Erase World Hunger, Says New Report

CORNELL CHRONICLE

U.S. could feed 800 million people with grain that livestock eat, Cornell ecologist advises animal scientists



- * Meat and dairy production contribute to climate change
- * Greenhouse Gas Emissions, Land and Water Usage
- * The current food system will **not** feed the world in 2050
- * Plant based food can sustainably feed the world in 2050
- * **So, how would our health be on a plant-based diet?**



Whole-food, Plant-based Nutrition

June 26, 2021

Kumara Sidhartha MD, MPH-Nutrition



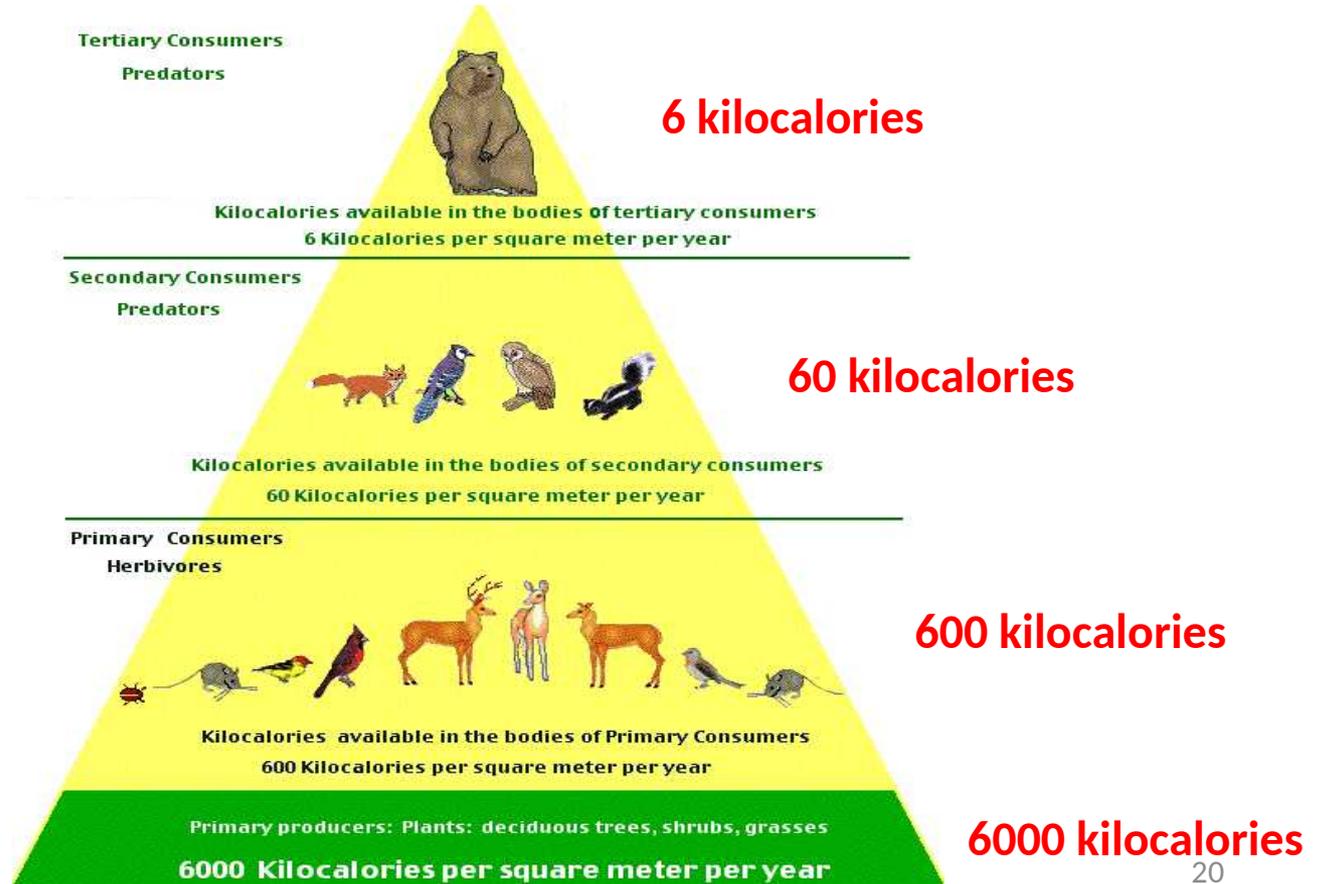
Is eating at the top of the food chain sustainable?

Entropy & Second Law of Thermodynamics

As the energy from sun moves up the food chain, there is more waste and less calorie availability.

Sustainability is in question when majority of the population of bears behave more as carnivore than herbivore for majority of the meals*

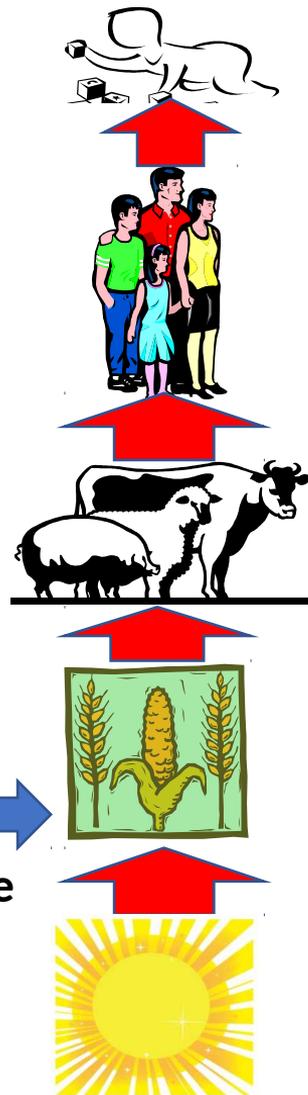
* Bears are omnivores like humans



Food chain & Nutrient cycle

Photosynthesis

$\text{CO}_2 + \text{Water} \rightarrow \text{glucose}$



Entropy & Second Law of Thermodynamics



Toxin concentration in tissues
(Bio-amplification)
e.g. Mercury and PCBs in Shark, Tuna etc.

Eating at the lower end of food chain is healthier (less toxins) and more sustainable.



Plant-based meals

- **Contain higher quality in nutrient analysis than animal-based meals**

Diet quality of vegetarian diets compared with nonvegetarian diets: a systematic review

Haley W Parker, Maya K Vadiveloo 

Nutrition Reviews, nuy067, <https://doi.org/10.1093/nutrit/nuy067>

Published: 08 January 2019

 Cite  Permissions  Share ▼

Abstract

Objective

Vegetarian diets are consistently associated with improved health outcomes, and higher diet quality may contribute to improved health outcomes. This systematic review aims to qualitatively compare the a priori diet quality of vegetarian and nonvegetarian diets.

“Vegetarians and vegans had higher diet quality than non-vegetarian diets”

(scoring based on Healthy Eating Index 2010)

Plant-based meals

- **Curb excess appetite**
- **Cater a feeling of fullness & satisfaction**

Article

A Plant-Based Meal Increases Gastrointestinal Hormones and Satiety More Than an Energy- and Macronutrient-Matched Processed-Meat Meal in T2D, Obese, and Healthy Men: A Three-Group Randomized Crossover Study

Marta Klementova ¹, Lenka Thieme ¹ , Martin Haluzik ¹, Renata Pavlovicova ¹, Martin Hill ², Terezie Pelikanova ¹ and Hana Kahleova ^{1,3,*}

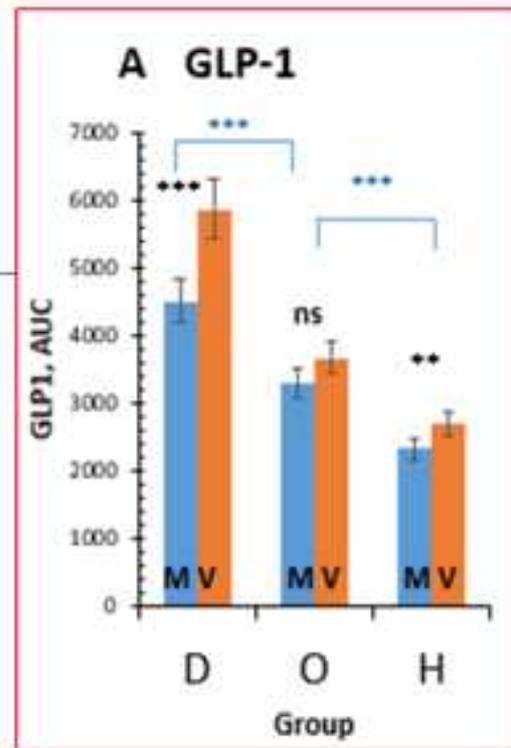
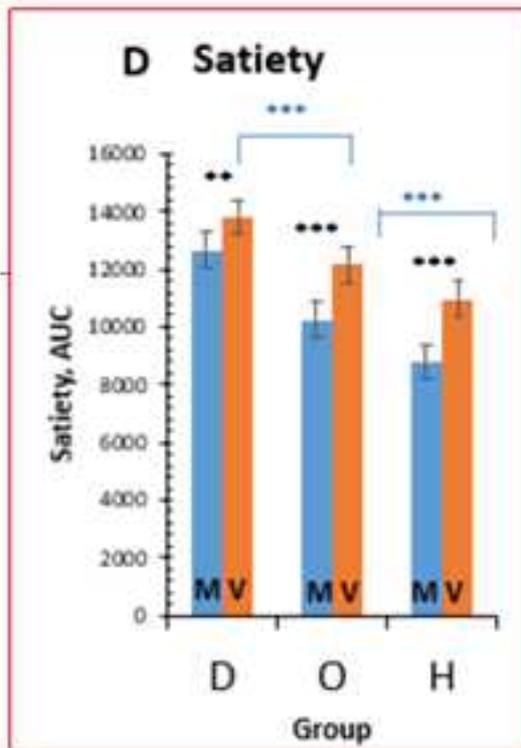
¹ Institute for Clinical and Experimental Medicine, 140 21 Prague, Czech Republic; mkli@ikem.cz (M.K.); belenka@volny.cz (L.T.); halm@ikem.cz (M.H.); renata.pavlovicova@ikem.cz (R.P.); tepel@medicon.cz (T.P.)

² Institute of Endocrinology, 113 94 Prague, Czech Republic; mhill@endo.cz

³ Physicians Committee for Responsible Medicine, Washington, DC 20016, USA

* Correspondence: hkahleova@pcrm.org; Tel: +1-202-527-7379

Received: 6 December 2018; Accepted: 9 January 2019; Published: 12 January 2019

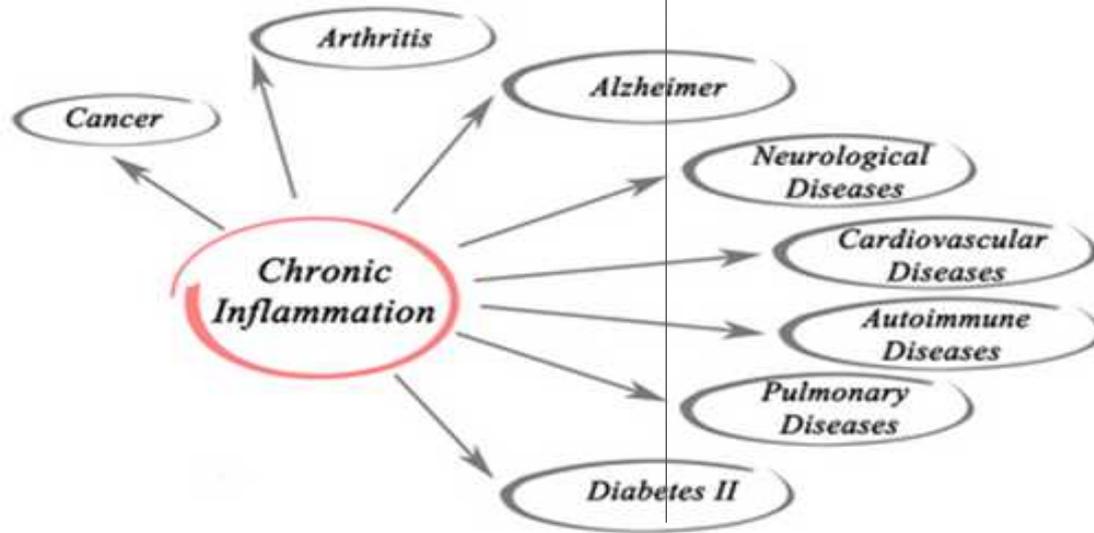


PLANT BASED MEALS CURB APPETITE AND HELP WITH LOSING WEIGHT BY STIMULATING STOMACH HORMONES (GLP-1) THAT REDUCE APPETITE

Plant-based meals

- **Reduce inflammation**

Chronic diseases: All in one, One in all



Anti-Inflammatory Effects of a Vegan Diet Versus the American Heart Association–Recommended Diet in Coronary Artery Disease Trial

Binita Shah, MD, MS; Jonathan D. Newman, MD, MPH; Kathleen Woolf, PhD, RD; Lisa Ganguzza, MS, RD; Yu Guo, MA; Nicole Allen, BS; Judy Zhong, PhD; Edward A. Fisher, MD, PhD; James Slater, MD

“A vegan diet resulted in a significant 32% lower high-sensitivity C-reactive protein when compared with the American Heart Association diet.

Results were consistent after adjustment for age, race, baseline waist circumference, diabetes mellitus, and prior myocardial infarction.”



American Heart Association | American Stroke Association

Conclusions—In patients with coronary artery disease on guideline-directed medical therapy, a vegan diet may be considered to lower high-sensitivity C-reactive protein as a risk marker of adverse outcomes.

Clinical Trial Registration—URL: <http://www.clinicaltrials.gov>. Unique identifier: NCT02135939. (*J Am Heart Assoc.* 2018;7:e011367. DOI: 10.1161/JAHA.118.011367)



Plant-based meals

- **Can prevent and treat diabetes**



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[Home](#) > [Endocrine Practice](#) > [January 2011](#) > Efficacy of High-Fiber Diets in The Management of Type 2 Diabetes Mell... [Advanced](#)

Volume 17, Issue 1
(January 2011)

[Previous Article](#) [Volume 17, Issue 1 \(January 2011\)](#) [Next Article](#)

- **Efficacy of High-Fiber Diets in The Management of Type 2 Diabetes Mellitus.** Endocrine Practice: January 2011, Vol. 17, No. 1, pp. 132-142

Methods: We searched PubMed, Medline, and Google Scholar for published data from the past decade (through December 2009) on dietary patterns and risk of type 2 diabetes mellitus. Only randomized controlled trials investigating the effect of whole grains, fiber, or vegetarian diets on type 2 diabetes were included. Search criteria included whole grain, fruit, vegetable, fiber, and meat intake regarding insulin sensitivity and glycemic responses in healthy, prediabetic, and diabetic persons.

Results: A total of 14 randomized clinical trials were included. Addition of insoluble or soluble fiber to meals, increased consumption of diets rich in whole grains and vegetables, and vegan diets improve glucose metabolism and increase insulin sensitivity. The greatest improvement in blood lipids, body weight, and hemoglobin A_{1c} level occurred in participants following low-fat, plant-based diets.

Conclusions: Increased consumption of vegetables, whole grains, and soluble and insoluble fiber is associated with improved glucose metabolism in both diabetic and nondiabetic individuals. Improvements in insulin sensitivity and glucose homeostasis were more evident in participants following a plant-based diet compared with other commonly used diets.

CONSENSUS STATEMENT BY THE AMERICAN ASSOCIATION OF CLINICAL ENDOCRINOLOGISTS AND AMERICAN COLLEGE OF ENDOCRINOLOGY ON THE COMPREHENSIVE TYPE 2 DIABETES MANAGEMENT ALGORITHM – 2018 EXECUTIVE SUMMARY

Nutrition

- Maintain optimal weight
- Calorie restriction (if BMI is increased)
- Plant-based diet; high polyunsaturated and monounsaturated fatty acids

+

- Avoid *trans* fatty acids; limit saturated fatty acids

+

- Structured counseling
- Meal replacement

Reversal of Type 2 DM

Case study

New diagnosis of Diabetes 12/06/05: Blood Sugar: 415 mg A1c : 11.7%

Shift to whole, plant-based nutrition.

After 2 weeks - 12/20/05: Blood sugar 341 mg

After 15 months -03/07: Blood Sugar: 124 mg A1c : 5.6%



Plant-based meals

- **Can prevent and contain cancer**



Eat wholegrains, vegetables, fruit & beans

Make wholegrains, vegetables, fruit and pulses (legumes) such as beans and lentils a major part of your usual daily diet

...entertainment behavior, such as sitting, lying down, watching TV, and other forms of screen-based entertainment.

- Doing some physical activity above usual activities, no matter what one's level of activity, can have many health benefits.

Eat a healthy diet, with an emphasis on plant foods.

Cancer and Animal Protein

theguardian

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News > Science > Nutrition

Diets high in meat, eggs and dairy could be as harmful to health as smoking

People under 65 who eat a lot of meat, eggs and dairy are four times as likely to die from cancer or diabetes, study suggests

Ian Sample, science correspondent

Cell Metabolism

Protein Intake, IGF-1, and Mortality

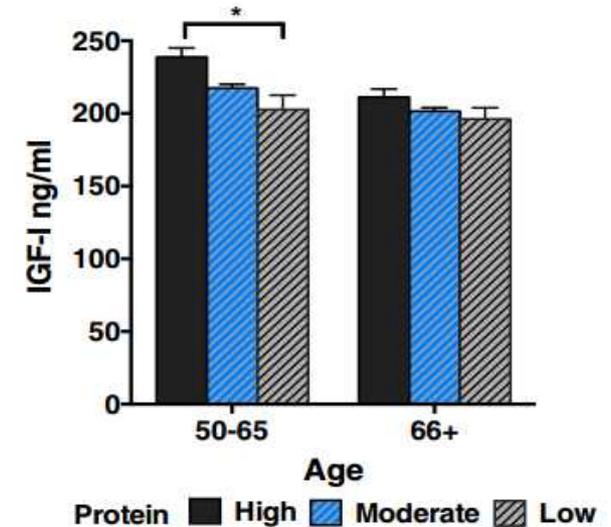


Figure 2. Serum IGF-1 Levels in Respondents 50–65 and 66+ Reporting Low, Moderate, or High Protein Intake

Source: Levine ME et al. Cell Metabolism. 2014. p 401-417



Plant based meals

protect the heart

Journal of the American Heart Association- Aug 2019

JAHA

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6 OPEN ACCESS
ARTICLE

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Plant-Based Diets Are Associated With a Lower Risk of Incident Cardiovascular Disease, Cardiovascular Disease Mortality, and All-Cause Mortality in a General Population of Middle-Aged Adults

Hyunju Kim, Laura E. Caulfield, Vanessa Garcia-Larsen, Lyn M. Steffen, Josef Coresh, and Casey M. Rebholz 

Originally published 7 Aug 2019 | <https://doi.org/10.1161/JAHA.119.012865> |
Journal of the American Heart Association. 2019;8:e012865

Plant foods and heart health: Conclusion

In conclusion, diets consisting of predominantly plant foods and that are lower in animal foods were associated with a lower risk of incident cardiovascular disease, cardiovascular disease mortality, and all-cause mortality in a general population. Dietary patterns that are relatively higher in plant foods and relatively lower in animal foods may confer benefits for cardiovascular health.

**Journal of the American Heart Association ,
Aug 2019**

Rx for human and planetary health

Vegetables

Fruit

Legumes

Whole grains

Nuts & Seeds

Meats, Poultry, Fish, Dairy, Eggs, sugar



If a plant based diet is healthier, how hard is it to adopt?



Images courtesy www.forksoverknives.com

G-BOMBS from Dr. Joel Fuhrman

Greens



Beans



Onions



Mushrooms



Berries



Seeds and Nuts

Basics of a Healthy Plant Based Diet



LOAD UP ON THESE

Fruits

(bananas, blueberries, oranges, strawberries)

Vegetables

(broccoli, carrots, cauliflower, kale, lettuce)

Tubers & starchy vegetables

(potatoes, corn, green peas, winter squash)

Whole grains

(barley, millet, oats, quinoa, wheat berries, brown rice)

Legumes

(black beans, chickpeas, lentils, pinto beans)



ENJOY IN MODERATION

Whole nuts & seeds, nut/seed butters

(walnuts, pumpkin seeds, tahini, almond butter)

Tofu & tempeh

Whole-grain flours & breads

Plant-based milks

(rice, soy, oat, almond, cashew, hemp milks)



AVOID OR MINIMIZE

Meat, poultry & seafood

Eggs

Dairy products

Refined sweeteners

Oils

Bleached flours, white bread & white pasta

White rice

Must See Documentaries

Forks over Knives

What the Health?

Food, Inc.

Game Changers

Plant Pure Nation

Cowspiracy

Seaspiracy

WHAT THE HEALTH

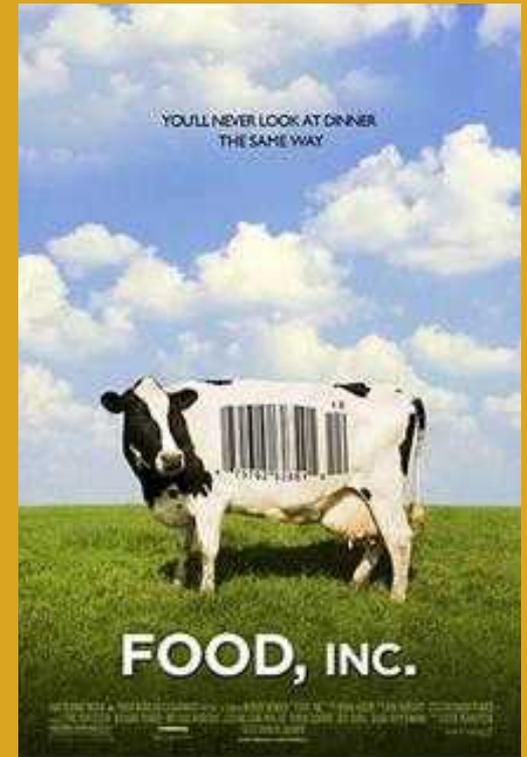
THE
**GAME
CHANGERS**

The only way to sustainably and ethically live on this planet with seven billion other people is to live an entirely plant-based vegan diet."

-Kip Andersen



COWSPIRACY
THE SUSTAINABILITY SECRET



Top Oil-Free Plant Based Websites

Forkoverknives.com (Professor T. Colin Campbell)

Happyherbivore.com (Lindsay Nixon)

Straightupfood.com (Cathy Fisher)

Fatfreevegankitchen.com (Susan Voisin)

Ohsheglows.com (Angela Liddon)

Thevegan8.com (Brandi Doming)

Engine2diet.com/plant-strong-recipes (Rip Esselstyn)



Dreenaburton.com

Potatostrong.com (Will and Bonnie)

Veganrunnereats.com (Alina Zavatsky)

Cookingwithplants.com (Anja Cass)

Nutritionstudies.org (T. Colin Campbell, Center for Nutrition Studies)

Pblife.org (Dr. Rosane Oliveira, UC Davis, CA)

Check out the Plant Based Docs

Professor T. Colin Campbell: www.nutritionstudies.org

Dr. Caldwell Esselstyn: www.dresselstyn.org

Dr. John McDougall: www.drmcDougall.com (Check his YouTube presentation: "Your Best Covid Defense")

Dr. Neal Barnard: www.pcrm.org (You Tube presentation: "A Nutritional Approach for Reversing Diabetes".)

Dr. Dean Ornish: www.ornish.com

Dr. Michael Greger: www.NutritionFacts.org (Check him on YouTube)

Dr. Garth Davis: www.forksoverknives.com/contributors/garth-davis-md?

Dr. Michael Klaper: www.doctorklaper.com (Listen to his Ted Talk on You Tube: "The Most Powerful Strategy for Healing People and the Planet")

Dr. Joel Fuhrman: www.drfuhrman.com

Doug Lisle, Ph.D.: www.forksoverknives.com/contributors/doug-lisle/

Jeff Novick, MS, RD: (Check his Fast Food Recipes on You Tube)



What's for ... breakfast, lunch and dinner?



Climate change is caused by the release of greenhouse gases

Agriculture is a major contributor to the release of GHG's

Animals raised for food are the dominant source

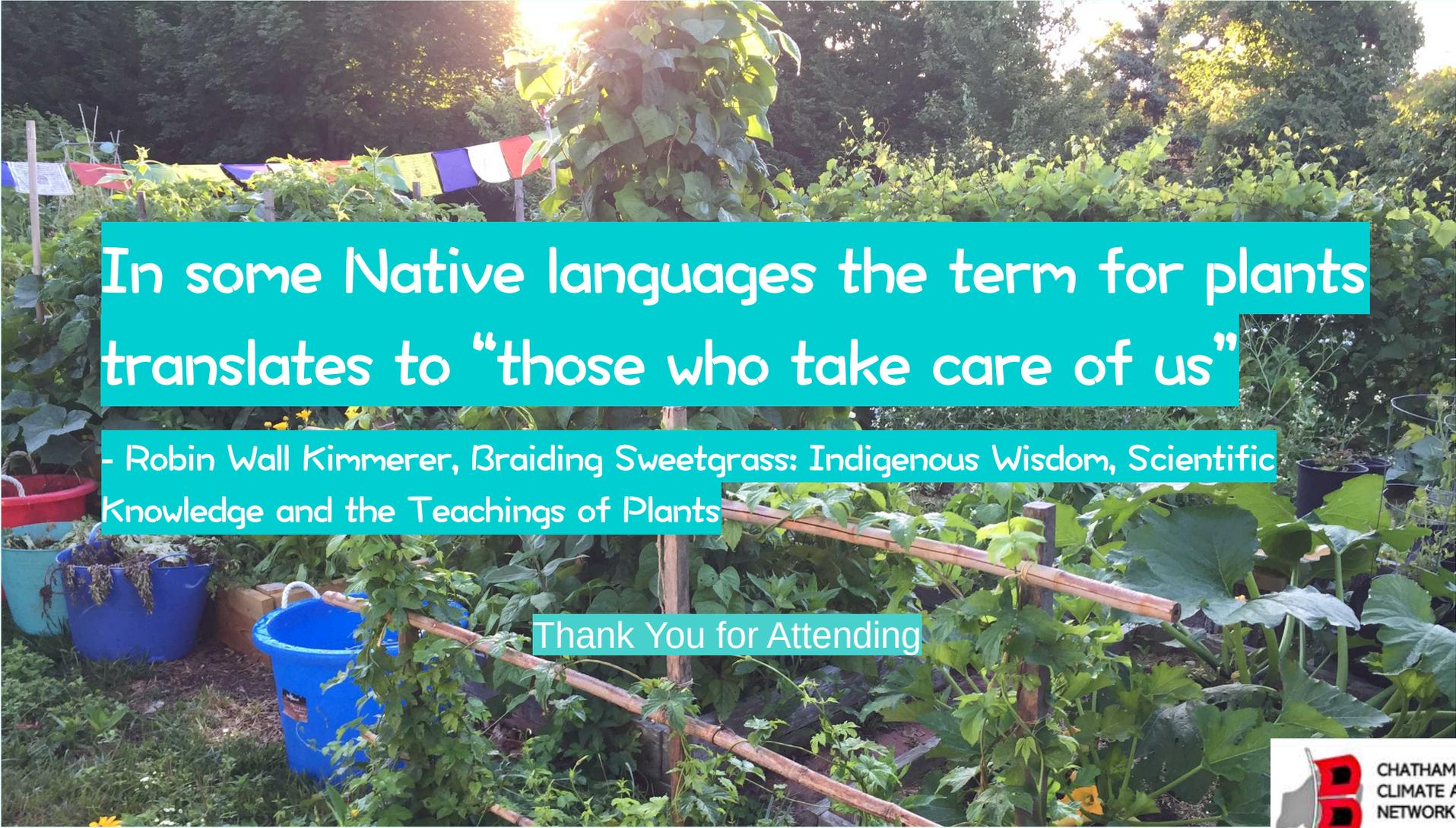
Questions and Answers

Plant based diets will reduce the amount of greenhouse gases released

Animal agriculture uses more land and water to produce less calories

Humans have less disease and are healthier on plant based diets

Humans can survive on plant foods only



In some Native languages the term for plants translates to “those who take care of us”

- Robin Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*

Thank You for Attending