MEALS FOR THE PLANET

ENVIRONMENTALLY-FRIENDLY RECIPES

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THE PLANETARY BOUNDARIES

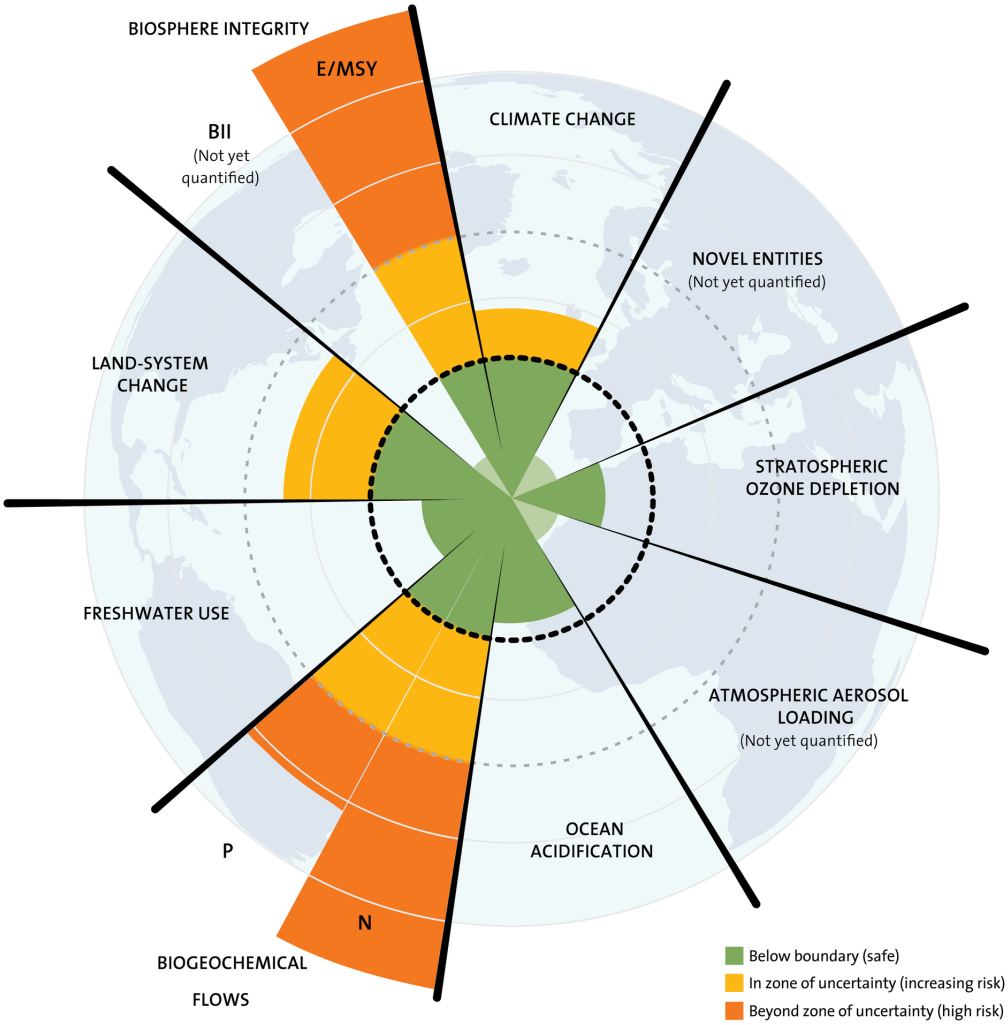


FIGURE 1. PLANETARY BOUNDARIES CONCEPT
CREDIT: J. LOKRANTZ/AZOTE BASED ON STEFFEN ET AL. 2015

The idea of "Planetary Boundaries" was created by a group of scientists who took on the task of figuring out the key environmental processes we need to pay attention to in order to maintain a stable biosphere (Rockstrom et al., Nature 2009). This study is a classic, and has been cited and built on by many other scientists. It was updated in 2015 (Steffen et al. 2015).

This graph is incredibly informative as it summarizes in one picture all of the critical environmental issues we face! Each slice of this graph shows a different way in which our actions can impact the Earth. The green area in each slice of the pie represents a "safe operating space for humanity," which is a level of disruption that we should not exceed in order to avoid abrupt changes in the biosphere. The yellow and orange zones depict where our current actions are exceeding sustainable limits.

The graph shows that our current trajectory is not sustainable with respect to **climate change, N cycling, land use, and biodiversity loss**. All four of these most critical processes are tightly linked to our food generation!

CREDIT: PIXABAY, ROBYNM--358611

CLIMATE CHANGE

These days there is no legitimate scientific debate about the reality of climate change or mankind's role in creating this problem. The mechanism behind this is no mystery—the heat trapping effect of carbon dioxide and other greenhouse gases has long been known. As we have been steadily and dramatically increasing the levels of these gases since the start of the industrial revolution, we have seen a concurrent rise in the Earth's average temperature, as expected. Regional variations in response to climate change are also expected and that is indeed what has been observed—some regions have gotten colder and some warmer. These variations apply also to changes in the water cycle that have been occurring due to climate change. Unfortunately, many areas that are already dry are projected to get even drier.

People are rightly concerned about the staggering human suffering and great economic burden that climate change presents. We have seen a pattern of increasingly intense storms that batter our citizens and infrastructure. Rising sea levels already adversely impact coastal groundwater resources and will continue to do so. Heat waves have cost lives among our most vulnerable populations. Across the globe, storm surges that overwhelm protective structures will threaten greater numbers of people. Animals and plants rely on indications from the climate for the timing of budding, mating, etc.—already climate change has disrupted healthy ecosystems in a multitude of ways.

A recent study in Science by Clark et al. (2020) found that even if we could immediately stop all fossil fuel emissions, **our current food system's impact on climate alone would preclude our climate targets.** Adoption of plant-rich diets and food waste reduction are two of the suggested steps.

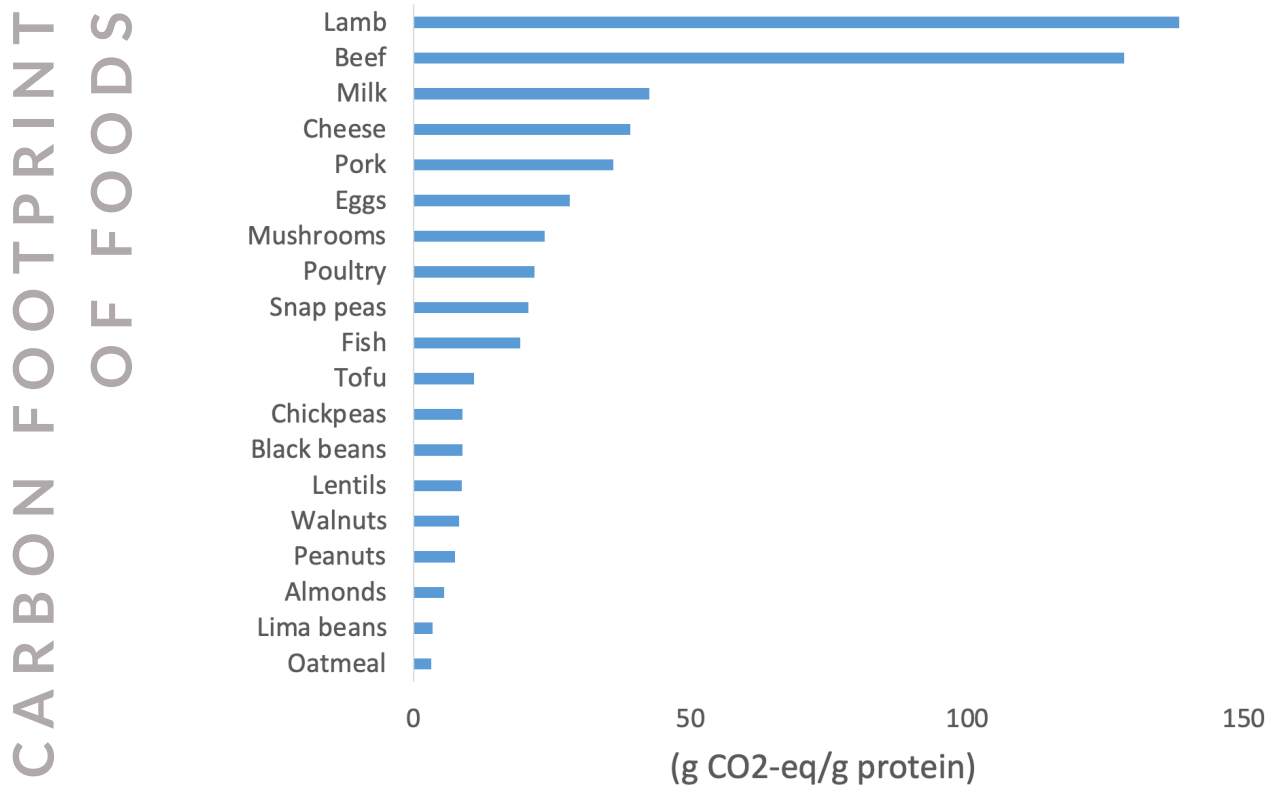


FIGURE 2. CARBON FOOTPRINTS FOR SOME FOODS. DATA FROM HELLER AND KEOLEIAN 2014

Foods vary widely in the greenhouse gas emission that are embodied in their production. The emissions can come from a variety of sources, including transport of feed crops, industrial production of fertilizers, energy for machinery, and methane production by ruminant animals. All of the different greenhouse gases are accounted for in the carbon footprint, which are reported in carbon dioxide equivalents.

You can see in Figure 2 that in general, plant foods have a lower carbon footprint. This is for two reasons. First, much of the food a farm animal eats is used for maintaining the animal, and some of it is lost in the waste. The amount of calories of food produced by the animal is small compared to the amount of calories the animal eats.

Second, certain types of farm animals (cows, sheep, and goats) are all ruminant animals, and they produce methane as part of their natural digestion, whether they are raised on a pasture or feedlot. Methane is a much more potent greenhouse gas compared to carbon dioxide.

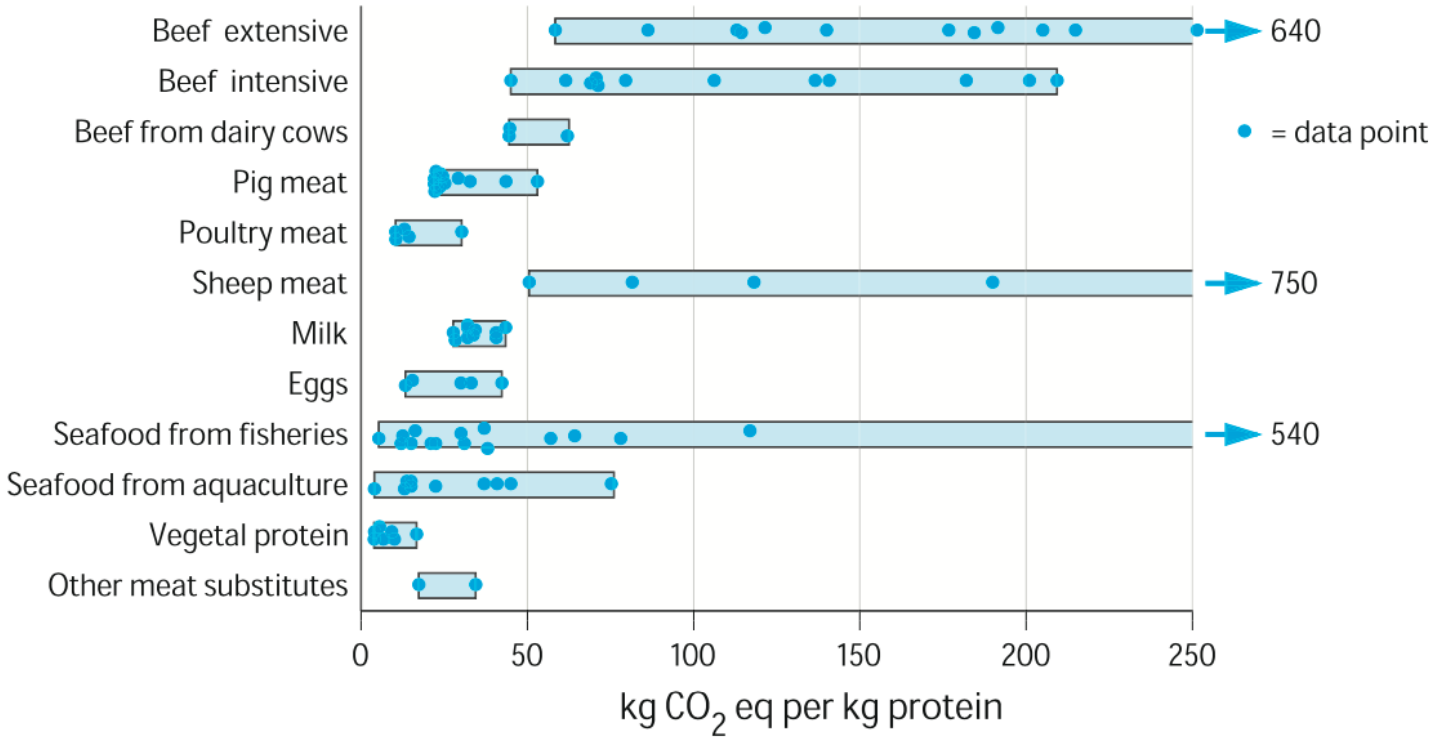
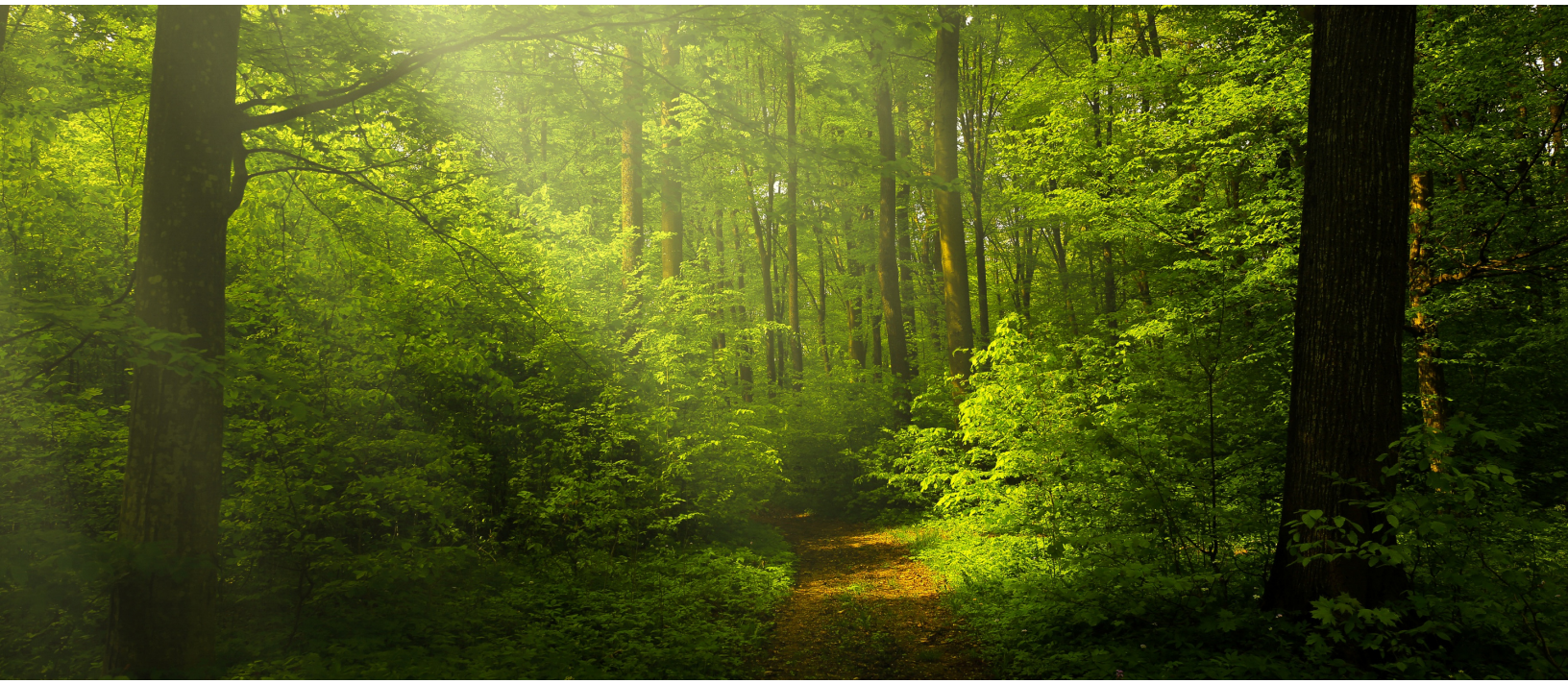


FIGURE 3. COMPILATION OF CARBON FOOTPRINTS FOR VARIOUS PROTEIN SOURCES. SOURCE: NIJDAM ET AL. 2012

A lot of people wonder about the sustainability of grass-fed beef. To address this, it is necessary to consider what aspect of sustainability we are interested in. See Figure 3 for a compilation of various studies of the carbon footprints of different sources of protein. Every dot represents a separate carbon footprint estimate. You can see that pasture raised beef, "Beef extensive," is on par with beef produced in a more confined system, "Beef intensive". This is because when the animals are eating grasses, which are the natural diet, they produce methane naturally. If part of their diet is switched to corn, for example, they will actually produce somewhat less methane. (The corn would have its own carbon footprint for its production, which is factored in.) Grass-fed beef has other benefits, including more humane treatment of the animals, but unfortunately it is no "free lunch" with respect to climate.

Research is underway for methods of cattle production that can sequester carbon dioxide in the soil, but currently, the benefits are confined to certain localities and are generally still outweighed by the emissions. The amount of carbon that can be sequestered depends on how much carbon is already there, and net sequestration stops as equilibrium is reached. Also, the sequestration is reversible by poor management, drought, fires, and land use change (Godfray et al, 2018).



SOURCE: PIXABAY, LUCKY2013

LAND USE

Conversion of natural habitat to agricultural land is a major driver of biodiversity loss. Eshel et al (2016) found that if we could hypothetically replace just our beef calories (123 per day on average) with nutritionally appropriate plant foods, we would free up an area equivalent to 48% of the contiguous US! Returning even a portion of that land to its natural state would create a great deal of habitat.

Almost all pathways for stabilizing climate change to under 2 degrees C require halting deforestation by 2050, and in fact, many scenarios indicate a need for reforestation of some portion of our current agricultural land (IPCC, 2019).

Different types of foods vary widely in the amount of land required for their production (see Figure 4). Through looking at agriculture data, we can make estimations of the land footprint for particular types of food. The data that are required for these estimates are often specific to certain locations, and while some studies have presented specific case studies, other research has made estimates of global average land requirements for food categories.

SOURCE: PIXABAY, LUCKY2013

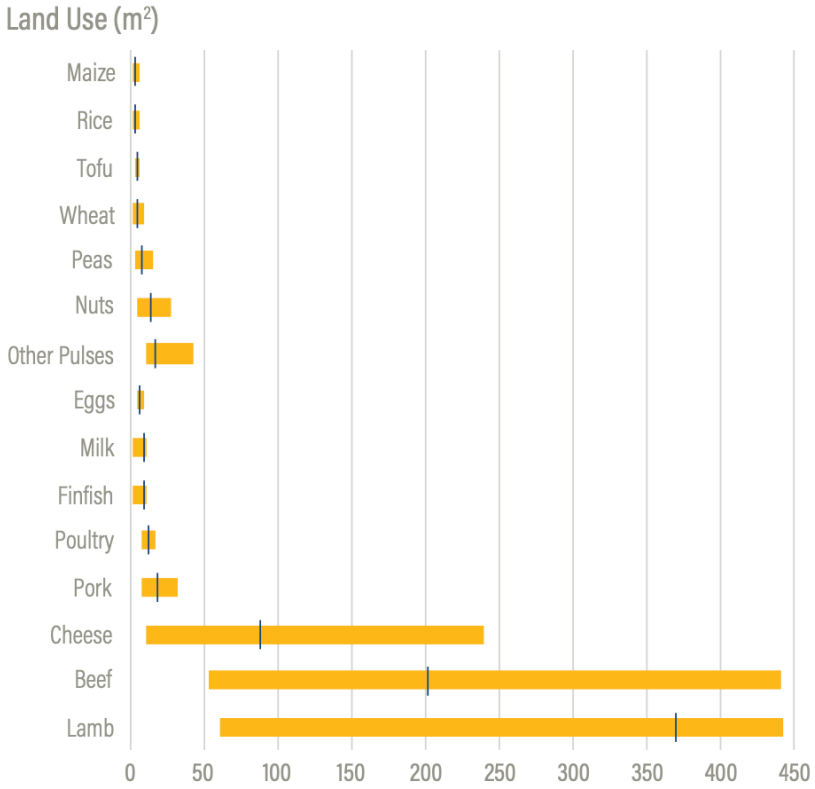


FIGURE 4. LAND USE PER KG OF FOOD. SOURCE: WAITE ET AL. 2019

BIODIVERSITY LOSS

Biodiversity loss is one of the planetary boundaries that are currently being exceeded. The extinction rate today is 100 to 1,000 times the background rate. In fact, we are in the midst of the 6th mass extinction in the Earth's history, with this one caused by human activity.

The main drivers of biodiversity loss are habitat change, climate change, pollution, invasive species, and overexploitation.

Conversion of natural habitat to agricultural land must be minimized if we are to stem biodiversity loss. Eshel et al (2016) found that if we could hypothetically replace just our beef calories with nutritionally appropriate plant foods, we would free up an area equivalent to 48% of the contiguous US! Returning even a portion of that land to its natural state would create a great deal of habitat.

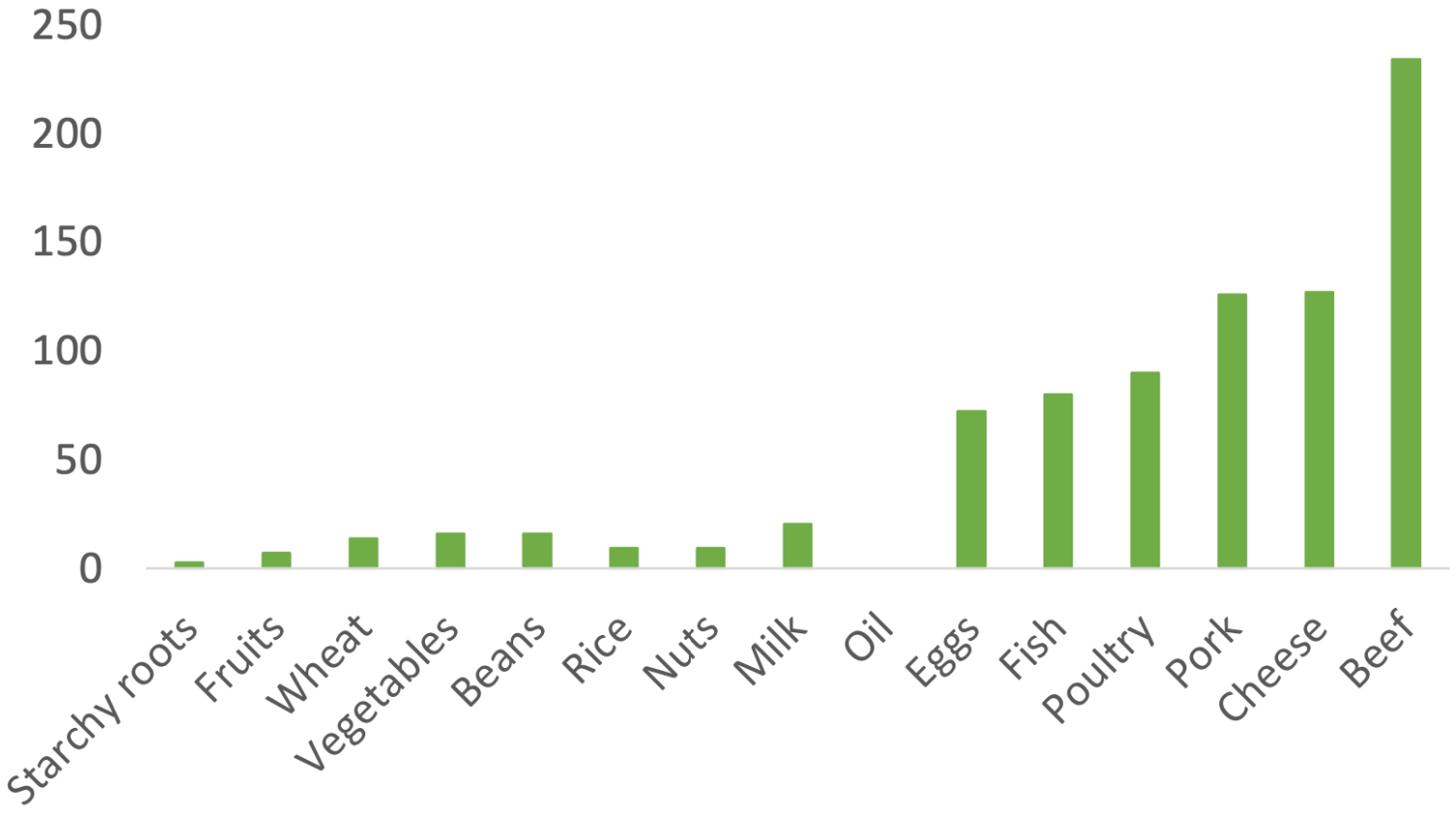


FIGURE 5. NITROGEN LOSS IN G N PER KG OF FOOD. SOURCE: LEACH ET AL. 2016

NUTRIENT CYCLING

Nitrogen use in agriculture has magnified the amount of active nitrogen in ecosystems, which shifts ecological balances. Too much added nitrogen leads to large "dead zones" in the ocean (areas of the ocean where oxygen has been depleted due to excess algae), increased greenhouse warming due to nitrous oxide, increased smog, and elevated nitrate in groundwater.

Nitrogen availability was a bottleneck (or limiting factor) for crop production. Our ability to grow large amounts of crops during the Green Revolution was enabled by the invention of the process to chemically convert nitrogen gas to ammonia, a usable form for plants. In this process, nitrogen gas and hydrogen are combined under very high heat to produce ammonia. The energy required for the high heat results in very significant greenhouse gas emissions for this process.

Human activity has doubled the amount of nitrogen entering the environment, overwhelming nature's capacity to return the bioavailable nitrogen to the atmosphere.

SIMPLE WAYS TO LOWER YOUR FOODPRINT

Boil only as much water as you need and use a lid
The energy required to heat your tea or pasta water is proportional to how much water is there, so just keep an eye on the volume you are heating. Also, using a lid and adjusting the heat so the flames are not traveling up the side of the pan will both decrease the energy cost associated with boiling your water.

Avoid foods that travel by plane or need to be kept cold during transport
Air transport is about 100X costlier (in greenhouse gas terms) than shipping, so avoid foods that don't travel well. Also, refrigerated trucking as well as in-store refrigeration both add to the carbon footprint.

Eat foods in as close to their natural state as possible
Processing steps, the miles the food travels between processing steps, and packaging add to the carbon footprint of your food. So, eating food as close to their natural state is generally better when possible. You can even buy in bulk with your own containers if you'd really like to be light on the planet.

Minimize your food waste
Approximately 40% of the food in the United States is wasted. All of that food had an embedded carbon footprint when it was created. Also, if the scraps go to the landfill, methane can be produced as it degrades.

Switch out some of your meat for plant-based sources of protein
In general, raising animals for food results in higher greenhouse gas emission than eating plants, due largely to the increased fertilizer and land required for all of the feed. Ruminant animals also produce methane, a potent greenhouse gas. Numerous studies have shown lower carbon footprints for vegan and vegetarian diets, but it's not an all or nothing proposition! Simply switching out a meal a week is a great step!

Reduce your dairy consumption
Dairy is not needed nutritionally past weaning, and research shows countries with high dairy consumption have higher levels of osteoporosis than those without. Enough calcium is required for bone health, but too much protein can actually be detrimental for your bones. These days there are some great dairy alternatives and dairy-free recipes out there to try!

BREAKFAST

Simple Sunday Pancakes

This is a great, simple pancake recipe. Top it with lots of berries and nuts, or chocolate chips if you are feeling decadent. If you use white whole wheat flour, you get the benefits of whole grains (lots of fiber, more protein and vitamins), but still a lighter pancake. It also works with standard whole wheat or white flour—you'll just find you need to add more or less milk to get the consistency right.

Mix the dry ingredients together with a fork, or sift to break up any lumps in the baking powder.

Add the wet ingredients and stir. Add more milk or water until the batter will run off your spoon like a syrup. You can adjust the consistency depending on how you like your pancakes.

Use some oil or margarine to grease your pan, and heat it to medium. You know the pan is hot enough when the batter will sizzle just a bit when poured on.

While you are cooking the first side, you can add blueberries, apple slices, etc.

SERVES 2-4

1 ½ cups white or whole wheat flour
•1 ½ t baking powder
•½ t salt
•1 t vanilla
•1 ½ T maple syrup
•1 ½ cups oat, soy, almond, or rice milk. You can also blend the plant-based milk with some water. Experiment to find the mixture you and your family like best.

Simple Sunday Pancakes *Environmental footprint*

Each of the four servings has 196 calories and 9 grams of protein, and has a carbon footprint of just 48 g CO2-eq. The breakdown is 26 and 21 CO2-eq per serving for the flour and vanilla soymilk, respectively, and 1 CO2-eq for the teaspoon of margarine. If you used unsweetened soymilk, the carbon footprint drops to 16 g CO2-eq for the milk, resulting in a total carbon footprint of 43 g CO2-eq per serving.

For comparison, if you used 2% dairy milk, an egg, and 1 t butter to grease the pan, the total footprint would be 201 g CO2-eq per serving, with 122, 39, and 14 g CO2-eq coming from the milk, egg, and butter, respectively. (Each serving would have 220 calories and 10 g protein.)

Making pancakes for four people using this low carbon footprint recipe saves the gas you would use in a 3-mile car ride, or the energy to run a high efficiency light bulb for 26 hours.

Warm Apple Oatmeal

Oatmeal is a fabulous comfort food with a very low carbon footprint. Once you start adding seeds, fruits, and nuts, the possibilities are endless and it becomes a nutritional powerhouse. This delicious recipe adds pieces of apple to cook along with the oats.

1 apple chopped
1/2 cup rolled oats. (I like old fashioned much better than quick.)
2/3 cup water
Cinnamon and salt to taste
1 T peanut butter (optional but delicious!)
flax seeds (optional)
chia seeds (optional)
walnuts (optional)
almond milk or soy, for the top

You can do this in a saucepan if you'd like, but for one bowl, you can just mix everything through the cinnamon and salt in a bowl and microwave for two minutes. In a saucepan, just boil the water,

add ingredients through cinnamon and salt, and turn down heat to a simmer for a few minutes. Top with peanut butter, flax seeds, chia seeds, and some oat, almond or soy milk.

SERVES 1

Warm Apple Oatmeal *Environmental footprint*

Here are the carbon footprints (in g CO2-equivalents per serving) for the ingredients of a bowl of oatmeal with toppings:

Apple, 1 small, 54
Rolled oats, ½ cup dry, 19
Walnuts, 4 halves, 9
Peanut butter, 1 T, 31
Soymilk, ¼ cup, 43

Total: 156 g CO2-equivalents per bowl

For comparison, a ¼ cup of 2% milk adds 81 g CO2-equivalents, so switching out even such a small amount of milk for non-dairy milk makes a difference of 38 g CO2-equivalents. Also, a serving of an English muffin with one egg and 1 oz. cheese has a total footprint of 472 g CO2-equivalents. Each ounce of bacon would add 220 g CO2-equivalents.

SIDES AND SNACKS

Spicy Black Bean Dip

This is a really delicious and low carbon footprint dip to serve with veggies or chips. If you really want to lay out a nice spread to get your party started, you can make this and Homemade Guacamole--they are both crowd pleasers.

It's also quick and easy enough to make for an everyday lunch. Just spin it all up, transfer to a container, grab some veggies and you're good to go!

SERVES 4

1 15 oz. can of black beans, drained and rinsed
Juice of one lime
One large clove of garlic
½ t ground cumin
½ t salt (to taste)
1 t hot sauce (to taste)

Blend up in your blender or food processor (you may need to add a tablespoon or two of water or veggie broth to make it smooth), add salt and hot sauce to your taste, and enjoy!

Spicy Black Bean Dip
Environmental footprint

Each serving of this dip has 148 kcal and 10 g protein, and results in just 95 g CO2-equivalents per serving.
Let's compare this to the carbon footprint of some other appetizers.

Buffalo chicken wings:
236 kcal, 12 g protein, 287 g g CO2-equivalents per serving
Cauliflower buffalo wings:
239 kcal, 9 g protein, 58 g CO2-equivalents per serving
1 oz cheese: 111, 7 g
protein, 277 g CO2-equivalents per serving

The carbon footprint is low for the black bean dip because production of beans only results in 0.78 g CO2-equivalents per g of food. For comparison, production of cheese, chicken, and beef result in 9.8, 5.1, and 26 g CO2-equivalents, respectively.

Beans are especially environmentally-friendly because they need less nitrogen fertilizer, the production of which results in high greenhouse gas emissions. Also, eating plants directly means fewer feed crops, food miles, and processing steps.

Homemade Guacamole

Making this quick and easy guacamole from scratch can cut its carbon footprint in half relative to store-bought!

3 avocados
3 garlic cloves, minced
2 limes
1 tomato, chopped
salt to taste

Simply cut the avocados in half, squeeze the lime juice into it, add the minced garlic (you can use garlic powder if in a hurry) and salt, and smash. Add the chopped tomatoes at the end. Also, you can add chopped red onion and cilantro if you'd like.

Homemade Guacamole
Environmental footprint

Ingredients alone (using conversions from Heller and Keoleian, 2014, which include average values for production and transport to a store or facility):

Ingredient, Carbon Footprint (g CO2-equivalents)

3 avocados, 572
3 garlic cloves, 3
2 limes, 67
1 tomato, 37
Total, 678 g CO2-equivalents per bowl

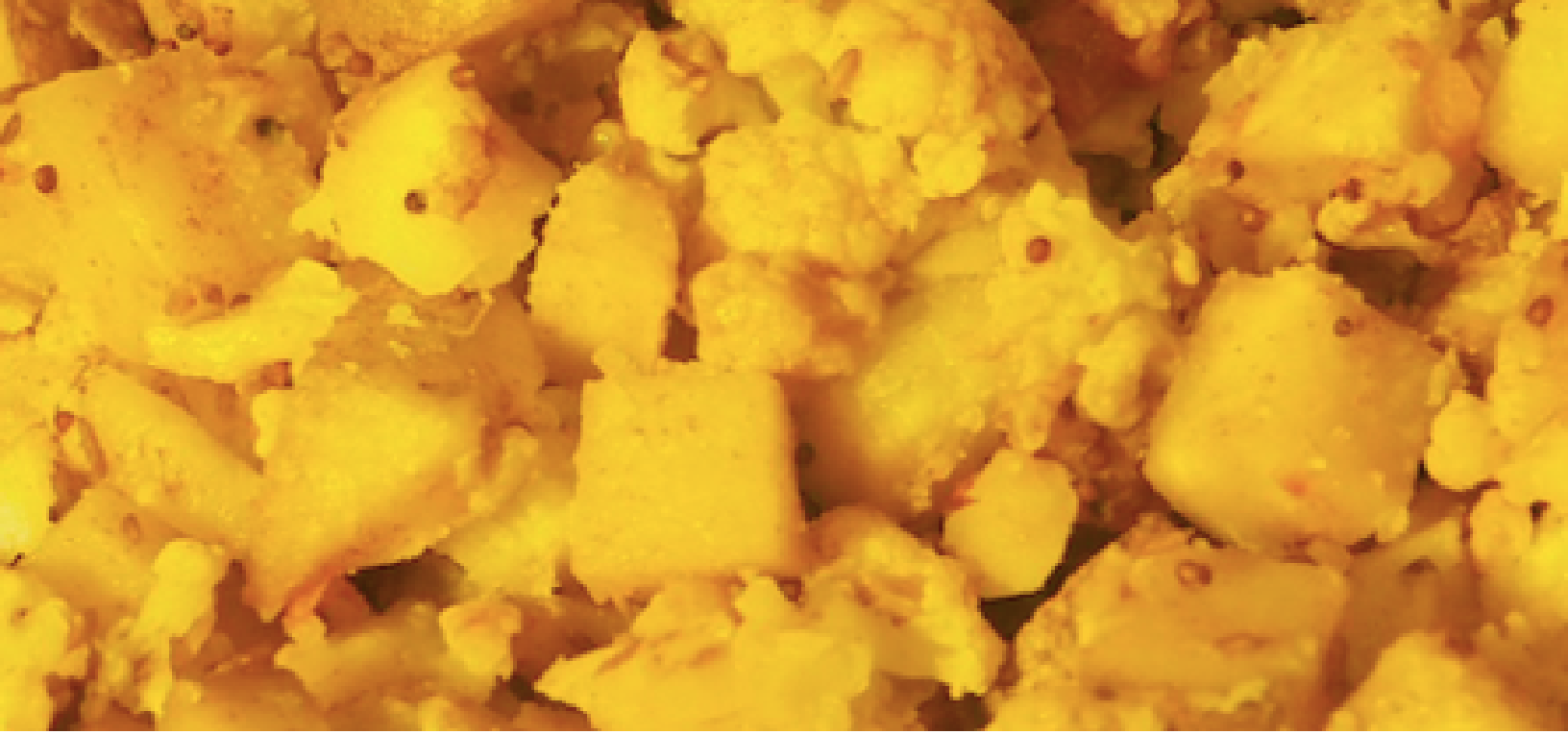
When you buy a prepackaged guacamole, you also need to consider the energy in processing, packaging, refrigerated transport, and in-store refrigeration. First, let's consider refrigerated transport. There is a great paper by Tassou et al. (2009) that compares the carbon footprint of various types of trucks carrying food at different temperatures. In the paper, they give values for g CO2 per pallet per km (these values are for the energy required for transportation and cooling, but exclude refrigerant leakage):

The paper also mentions a couple of other studies that indicate the greenhouse gas emissions are approximately 20% higher for the chilled and frozen scenarios if you do consider refrigerant leakage. So, to send the same amount of chilled guacamole 1500 miles assuming the pallet numbers and payload weights given in the paper for each type of truck, and assuming the 20% higher emissions with leakage), we would have to tack on 210 g CO2-equivalents for a large articulated truck (38 T) or 570 g CO2-equivalents for a medium sized truck per bowl of guacamole.

Next, what about the plastic container? To make a 1 L plastic bottle requires about 270 g CO2-equivalents (Gleick and Cooley, 2009). Assuming around the same amount of plastic for a fairly good-sized container of guacamole, we have a total of 480 to 840 additional g CO2-equivalents, just for the packaging and refrigerated transport of our bowl of guacamole. This analysis does not take into account the energy to make the guacamole, or to keep it cold in the store.

In general, eating foods closer to their natural state and making things from scratch is preferable, since processing, the food miles associated with various processing steps, refrigerated transport, and packaging can really make a difference!

If you are in a hurry, though, go ahead and grab those pre-packaged healthy foods—relying on climate-friendly ingredients is still the best way to keep your footprint low! In fact, a study on food miles by Weber and Matthews (2008) found switching out beef and dairy for foods with a lower carbon footprint just one day per week was as effective as eating locally seven days a week in reducing greenhouse gas emissions!!



Easy Aloo Ghobi
(Indian Potato and Cauliflower)

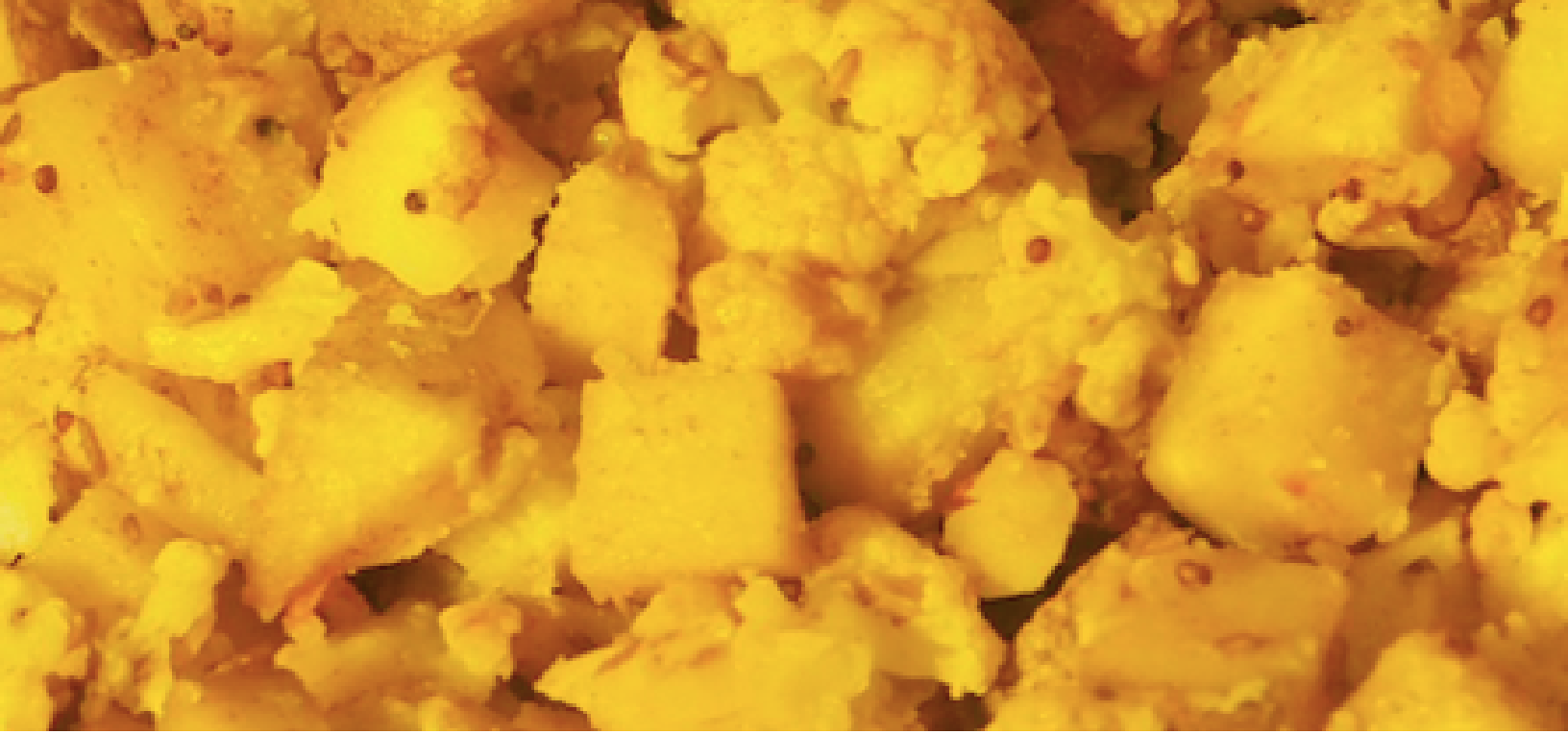
This recipe is crazy easy to throw together, and you won't believe how great it tastes!! It is a staple in our house, serving as an excellent side dish for red lentil dahl. Both dishes heat up well for lunches the next day. To make this dish a main course, you can add a bag of frozen edamame to it. A side salad topped with cumin powder, lemon juice, and salt is nice alongside.

1 medium head of cauliflower
4 medium potatoes
2 tomatoes (field production, not hothouse, to minimize footprint–see below)
1 T black mustard seeds
1 T cumin seeds
2 t turmeric
2 t salt (or to taste)

SERVES 4

Preheat oven to 400 F.
Chop up the potatoes, cauliflower, and tomatoes, and put the pieces into one large bowl.
Add the whole seeds, turmeric, and salt.
Transfer to a roasting pan with a cover (or use foil).
Bake 40 min or until vegetables are soft. You might want to stir once during roasting so that you get even cooking.

Note on recipe: I originally learned to make aloo ghobi from Anand and Nisha Patel—a big thank you to these great chefs!! Their recipe involves roasting the seeds in oil, and cooking the potatoes and cauliflower on the stove top. It is fantastically delicious done this way. For this recipe, I added tomato for some liquid while roasting, and I toss it all together into the oven just in the interest of simplicity.



Easy Aloo Ghobi
(Indian Potato and Cauliflower)
Environmental footprint

Each of the six servings (123 calories each, with lots of vitamins thanks to the cauliflower and tomato) for this recipe has 76 g CO2-eq associated with it. (The potatoes, cauliflower, tomatoes, and seeds contribute 21, 38, 9, and 8 g CO2-eq/serving, respectively.)

If you used hothouse tomatoes, the contribution from the tomatoes alone would be 159 g CO2-eq, and the new total would be 226 g CO2-eq!!

For comparison, one medium baked potato topped with onion and margarine would have a footprint of 67 g CO2-eq, while a potato with sour cream, butter, and cheese would have 534 g CO2-eq associated with it.

Just one portion of switching from the more loaded potato to the aloo ghobi with field production tomatoes saves the amount of gas used to drive a car two miles.

Notes on sources of data: Nutritional info is from the USDA Food Composition Database, and greenhouse gas emissions conversion factors all items except tomatoes are from Heller and Keoleian 2014. Conversion factors for various production styles of tomatoes are from Heller et al. 2013.

Broccoli Soup for the Planet

Creamy vegetable soups can vary really widely in impact on the environment, because creaminess can come either from dairy (relatively high environmental impact), or from alternatives including potatoes, cashews, or soy milk (less greenhouse gas intensive).

For this quick and easy recipe, two small potatoes are cooked up with onion in vegetable broth, with broccoli added later. The whole mix goes into your blender (or you can immersion blend), and you can season with salt, pepper, lemon, etc. If you like nutritional yeast, this is a great place for it to introduce a cheesy touch, but it tastes great either way!

SERVES 4

1 medium onion chopped
2 small potatoes chopped
4 cups vegetable broth--can use powdered or liquid
2 heads broccoli chopped
salt and pepper to taste
lemon juice optional, to taste
garlic powder optional, to taste

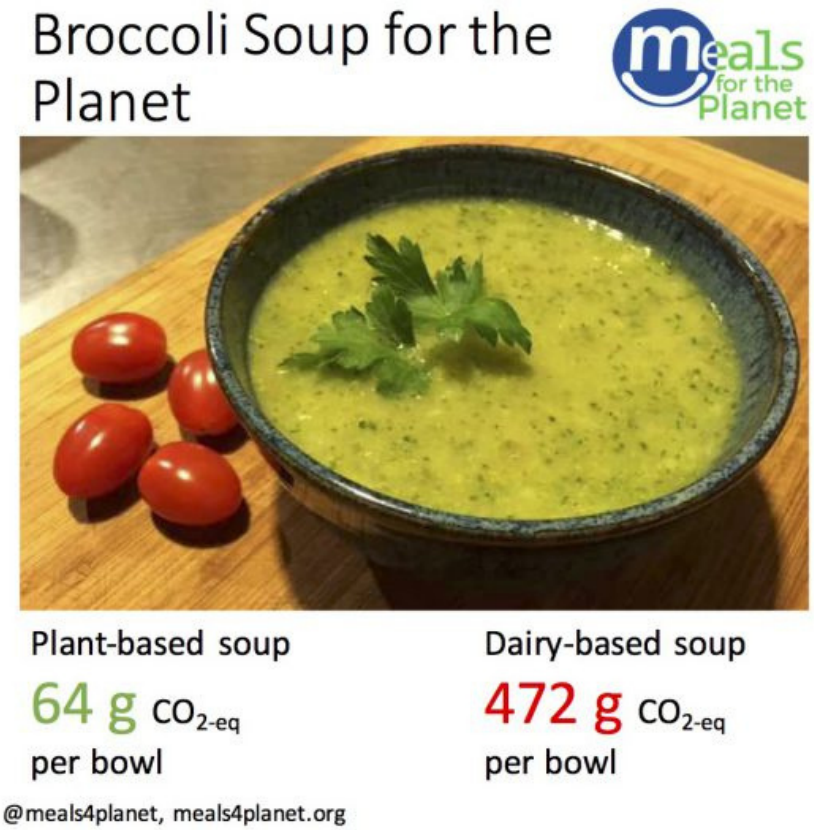
Broccoli Soup for the Planet *Environmental footprint*

Simmer the chopped potatoes and onion in broth for about 10 minutes.
Add the broccoli and simmer another 10 minutes, until everything is tender. Immersion blend (or you can allow it to cool and carefully transfer it to your blender, and then back to the saucepan).

Season it to taste with salt, pepper, garlic powder, and lemon. If you like a cheesy flavor, you can add nutritional yeast.

Assuming 4 servings, the carbon footprint of this recipe is a climate-cooling 64 g CO2-eq per serving! About half of that footprint comes from the broccoli, with the potato, oil, and onion making up the rest.

Contrast this with a traditional recipe, which has a whopping footprint of 472 g CO2-eq per serving! 89% of the footprint comes from butter and half and half!!



MAIN DISHES

Planet-friendly Hummus Pomodoro

This beautiful main course (or starter) is planet friendly and soooo delicious! The recipe is called Hummus Pomodoro with Warm Pizza Crust. It's by the amazing and award-winning Chef Chloe Coscarelli, who graciously agreed to provide this recipe for the Meals for the Planet effort. The spread is actually a white bean puree with lemon garlic flavor, so think Italian, rather than Middle Eastern it.

1 15 oz. can white beans rinsed and drained
1/4 cup olive oil
1 T lemon juice
1 clove garlic
1/2 t salt
1/2 t pepper freshly ground if possible
1 medium tomato chopped
1/4 cup fresh basil chopped
balsamic vinegar to taste

Blend all ingredients through pepper until smooth.
Combine the tomato and basil.
Drizzle with balsamic vinegar. You can top the creamy garlic dip with this mixture, or leave in separate bowls.
Spread the delicious creamy dip and tomatoes on warm pizza crusts, crostini, or baguette slices.

I made it without the oil just to keep it lighter and it was still really yummy. I added a bit more lemon and some water to make it smooth. I added two cloves garlic rather than just one.

SERVES 4-6

Planet-friendly Hummus Pomodoro
Environmental footprint

Nutrition Info and Environmental Footprint:
Assuming 6 servings, each serving has 314 calories (the version without oil has 230 calories), 9.9 grams protein, and a carbon footprint of just 89 g CO2-eq. The embodied water footprint is 223 L of water, and the nitrogen footprint is 1.9 g N lost per serving.

Compare this to a pasta with ground beef tomato sauce, which for the same 9.9 grams protein has a carbon footprint per serving of 552 g CO2-eq. The water footprint is 285 L/serving, and the nitrogen footprint is 5.5 g N lost/serving.

The carbon saved by cooking this recipe rather than the pasta with meat sauce just one time is the equivalent of the carbon emissions in a 12.5 mile car drive! If you made a similar switch every day for a year, it would mean saving the equivalent of about 4500 miles (assuming 40 MPG)!! Enjoy! Remember to check out Chef Chloe Coscarelli's site for more recipes and her cookbooks.

Chloe Coscarelli has been vegan since 2004–a time when veggie burgers were still feared by the general public. Since then, she has been at the forefront of the vegan revolution: Chloe believes that vegan can still mean mouthwatering foods, and she practices what she preaches. In Chloe Flavor, Chloe showcases new approaches to veganism with dishes like Maple Bacon Benedict, Hawaiian Teriyaki-Pineapple Burger, and Cajun Jambalaya with Scallion Biscuits. These dishes are playful, colorful, and supremely tasty. Best of all, she's made them as fast and as easy as possible because that's exactly how she likes to cook. Vegans will delight in Chloe's creativity–and carnivores won't miss the meat one bit.

Avocado Basil Pesto by Exceedingly Vegan

This is a very quick, planet-friendly dish with a lot of flavor. It was kindly donated to this site by Philipp of Exceedingly Vegan. Please check out his recipes at www.exceedinglyvegan.com. You can make this on a night that you really don't have much time for cooking, but want something healthy, warm, and delicious. If you want to keep it even more simple, leave off the tofu–there is plenty to the dish without it. This cuts your prep time down.

Pesto Ingredients:
100 grams pine nuts toasted. (3.5 ounces)
1 avocado ripe, seeded and chopped
100 grams spinach (3.5 ounces)
30 grams basil (~1 ounce)
2 T nutritional yeast optional
1 T garlic minced
3/4 t salt (or up to 1 t)
1.5 T lemon juice
1.5 T olive oil (I made it without this and it came out great.)
Black pepper to taste
3/4 cup water

SERVES 4-6

Crispy Tofu Ingredients:
200 grams tofu (7 ounces)
3/4 t garlic powder
3/4 t salt
1 t smoked paprika
1 dash black pepper
1 T olive oil
2 T flour

After making side by side versions both with and without the nutritional yeast, I added the note that the nutritional yeast is optional. I liked it both ways equally, and the two people I cooked for liked it better without the nutritional yeast.

Avocado Basil Pesto by Philipp Ertl of Exceedingly Vegan
Recipe continued

Start by squeezing the water out of 200g of tofu (you can either do this with a tofu press or yourself - see directions on Exceedingly Vegan's site. I often just wrap tofu in a hand towel or two, put a layer pan on top of it, and pile some cans onto the layer pan for weight.

Boil pasta or noddles in water with a bit of oil and a dash of salt.

Dry toast (no oil) the pine nuts in a large pan for about 5 minutes. Make sure they don't burn (they burn easily). This will bring out their flavor much more.

Using either a large blender or a small blender (then you will have to do this in 2-3 batches) add all pesto ingredients and blend until you get a smooth pesto.

After the water has been squeezed out of the tofu cut it into small cubes and add them to a bowl. Add all other crispy tofu ingredients as well and mix up by shaking the bowl (put a plate on top so you don't make a mess). Heat up some oil in a large pan and fry your tofu cubes until they get crispy. (You can keep this oil-free by just browning the tofu in a pan.).

Plate your dish with the pasta or noodles at the bottom, then pour the pesto on top (you could even heat it up quickly if needed) and then sprinkle the crispy tofu cubes on top. Enjoy!

Some Words from Philipp on ExceedIngly Vegan:
I started this blog to show how easy and exceedingly delicious vegan food can be, not just for vegans but for omnivores alike. Cooking is all about fun and pleasure and whenever I discovered a new yummy new recipe I got so excited that I wanted to share it with everyone. The aim of Exceedingly Vegan is to be inclusive; food is about enjoyment and sharing. I want everyone to sit together at a table and enjoy amazing food. It's not about becoming a vegan, but about opening people's minds to the amazing variety of luscious vegan dishes. My aim is to inspire people and help them open their minds (and mouths). I do believe a plant based life style is better for the planet, better for your health and of course better for animals but I know for most people this is a journey. If you are vegan, just want to try a vegan dish for the first time or incorporate more plant based meals into your diet, you are all welcome. After all life is a journey and everything starts with the first step (or dish).

Avocado Basil Pesto by Philipp Ertl of Exceedingly Vegan Environmental Footprint

This recipe	GHG emissions for amount in recipe (g CO_2-eq)	A traditional recipe	GHG emissions for amount in recipe (g CO_2-eq)
Pine nuts	117	Pine nuts	117
Avocado	191	Cheese	558
Spinach	13	Spinach	13
Basil	21	Basil	21
Garlic	1	Garlic	1
Olive Oil	38	Olive Oil	196
Total for sauce	**380**	**Total for sauce**	**905**
Tofu	84	Chicken	505
Total sauce plus tofu	**464**	**Total sauce plus chicken**	**1410**

You can see the reductions in carbon footprint that come with the omission of dairy and chicken. Cheese has a relatively high carbon footprint (around 10 g CO2-eq per gram of cheese), due in large part to the methane produced through the cows' natural digestion.Chicken has a carbon footprint of 5.05 g CO2-eq per gram of chicken, which is higher than that for tofu (0.84 g CO2-eq per gram of tofu).
Making this recipe with tofu rather than the traditional with chicken saves the amount of emissions in a four-mile drive in a 40 MPG car, and it's 25% of your per capita Paris Climate Accord Target!

Planet-saving tip: When cooking pasta, try not to boil too much water. All that energy really adds up. And, be sure to use a lid. The excellent book How Bad are Bananas? The Carbon Footprint of Everything has a discussion of this. You can find it on the Resource page here. In general, forgetting to use a lid wastes 20% of the heat, and having flames up the side wastes another 20%. Remember to check out Exceedingly Vegan for beautiful and delicious dishes.

Avocado Pesto by Exceedingly Vegan for the Planet

Pesto sauce

380 g $CO_{2\text{-eq}}$

for 4 servings

Traditional pesto

905 g $CO_{2\text{-eq}}$

for 4 servings

Thai Peanut Sauce with Veggies and Tofu

Recipe

This meal a great way to make a lot of people very happy (and healthy) with a low carbon footprint—it is ridiculously delicious and easy to throw together. You can lay out rice or noodles, steamed veggies, and peanut sauce in individual bowls so each person can make a creation. Or, to keep things simpler, just throw veggies into the boiling noodles for the amount of time you'd like and drain it all together. For example, add carrots into the water five minutes before the noodles are done, and broccoli and red pepper three minutes or so before they're done done. While all of that is cooking, you can warm up the peanut sauce, and you've got a great weekday meal on your hands. Go ahead and make a double batch of peanut sauce—it freezes well, and it can double as a salad dressing!

Start cooking pasta or rice for four people according to the directions. Steam the veggies (either individually or together), Braise the tofu in a bit of soy sauce if you'd like, or just steam it
.

For the peanut sauce, whisk all ingredients together in a saucepan over medium heat. When it starts to boil, turn it down to low until everything else is ready.

SERVES 4-6

For the peanut sauce
5 tablespoons soy sauce
1 can coconut milk (you can use light or regular)
2/3 cup smooth peanut butter
3 garlic cloves, crushed
2 T maple syrup or brown sugar
Juice from 1/4 small lime
2 t sweet chili sauce, 1/2 t chili powder OR 1 1/2 t chili garlic sauce or siracha (optional)

Any steamed veggies, tofu, rice, or noodles (broccoli works especially well).

Thai Peanut Sauce with Veggies and Tofu
Environmental Footprint

This is comfort food, plain and simple. It's easy to make, and it's easy on the planet. See below for a breakdown of the carbon footprint of the major ingredients:

Ingredient	Amount	g CO_2-equivalents
Coconut milk	1 can	498
Peanut butter	2/3 cup	332
Garlic	3 cloves	6
Broccoli, chopped	4 cups	146
Red bell pepper, chopped	1 large	131
Carrot, chopped	2 medium	65
Tofu	16 oz block	680
Total		**1858**

The meatless nature of this dish contributes to the low carbon footprint. For comparison, 16 oz. of chicken would contribute 2,297 g CO2-equivalents to the dish! Considering just the peanut sauce along, the carbon footprint is 836 g CO2-equivalents for the four servings. For comparison, the carbon footprint of a serving of cheese sauce with the same calories per servings as this recipe would be a total of 3248 g CO2-equivalents (the breakdown is 322, 2592 and 344 g CO2-equivalents for the 1 cup 2% milk, 265 g cheese and 2 T butter, respectively. A dinner using peanut sauce rather than cheese sauce saves emissions equivalent to an 11-mile drive! If you made a comparable switch once a day for a year, you'd save the emissions from driving your car over 4,000 miles!

DESSERTS

Cherry Pie for the Planet

This pie is beautiful, decadent, and surprisingly easy to prepare. If you want to use a store-bought pie crust and you are vegetarian or vegan, you'll want to check the ingredients because some options contain lard. If you have just a bit more time, try making the crust--you'll be glad you did!

For the filling:
2 14.5 oz cans red tart pitted cherries packed in water, not syrup (use 3 cans for no-stovetop cook option given in notes)
3 T corn starch
3/4 cup sugar
1/8 t salt
1/4 t cinnamon ground
1/4 t almond extract

For the crust:
2 1/2 cups flour
1/2 t salt
3 T sugar
1/2 cup plant-based butter (like Earth Balance)
6 T ice water
1 T apple cider vinegar

Preheat oven to 425 degrees.

For the filling:

Drain the packing water from the cherries into a medium sauce pan.
Whisk in the corn starch, sugar, salt and cinnamon. Heat, stirring constantly, until the mixture boils and thickens.

Add the almond extract and cherries.

Pour into the pie pan containing the bottom crust (directions on next page).

SERVES 1

To make the crust:

Mix flour, sugar, and salt together in a large mixing bowl.

Add half of the vegan butter by spoonfuls, and mix it with your fingers until the mixture is homogeneous and you have small round pieces of dough.

Mix in the rest of the vegan butter,

mix 4 T ice water with 1 T vinegar and drizzle into the mixture, mixing periodically. You may add more water if you need.

Divide the dough into two balls. You can refrigerate, or use right away by rolling out the two balls into large circles. The circles need to cover

No-stovetop cook version of this pie: For a less syrupy pie, just take 5 cups of drained cherries (or fresh cherries or other fruits), and toss them with cornstarch, sugar, salt, cinnamon and extract. Pour that into the crust and get straight to work on your lattice. No stove top cooking required!

Cut the top crust into strips.

Choose a strip from the center (a longer one) and lay it along the center of the pie.

Choose another long strip and lay it on the pie perpendicular to the first one you added.

Choose another long strip and lay it to the side of the first one you put down.The fourth strip will go to the side of the second strip. Then, lay the next strip parallel to the first one you put down, but on the opposite side from the third strip added (you alternate sides each time you add a strip in each direction). Crimp and sprinkle with sugar!
Bake at 425 for 15 min, and then at 350 for 20-25 additional minutes.

Cherry Pie for the Planet
Environmental footprint

In general, the numbers show that in any recipe you can really lower your carbon footprint by switching out dairy butter for a vegan butter. Butter has a footprint of 11.92 gram CO2-eq per gram while vegan butter has a footprint of 1.36 grams CO2-eq per gram. Conventional butter has a high carbon footprint because the natural metabolism of cows results in production of methane, a potent greenhouse gas. In addition, dairy cows require feed crops, which in turn require fossil fuels for fertilization, production, and transport. Finally, cow manure emits methane and nitrous oxide—both greenhouses gases! Using vegan butter for the 1/2 cup called for in one bottom crust saves 1,183 g CO2-eq, or the amount of CO2-eq emitted in a 5.3 mile drive. This reduction constitutes 32% of the amount each person would need to save each day to reach the Paris Climate Accord targets.
2013.

Cherry pie ingredients with vegan crust	Carbon footprint (g CO_2-eq)	Cherry pie ingredients with dairy butter crust	Carbon footprint (g CO_2-eq)
Cherries	166	Cherries	166
Sugar	156	Sugar	156
Wheat flour	87	Wheat flour	87
Vegan butter	152	Butter	1,335
Total	561	Total	1,774

Earth-friendly Peanut Butter Cookies

This recipe makes a delicious, quintessential peanut butter cookie. It's from a great cookbook by Alicia Simpson. She has graciously agreed to let us publish her recipe for the Meals for the Planet effort.

1/2 cup granulated sugar
1/2 cup brown sugar
1/2 cup non-hydrogenated margarine softened, I like Earth Balance
1/2 cup natural peanut butter
1/4 cup unsweetened applesauce
2 T plain soy or almond milk
11/2 cups flour you can experiment with the type
¾ t baking soda
½ t salt

Preheat oven to 375 degrees F.

Mix the first four ingredients together. You can use an electric mixer if you have one handy, but it's okay if not.

Mix in the margarine and peanut butter to the sugar/vegan butter mixture, then add the applesauce and soy or almond milk.

You should mix together the baking soda and salt with the flour before adding it to the mixture, so you don't get clumps.

Make 1" balls, drop them onto an ungreased cookie sheet, and use a fork to make a cross-hatch pattern.

Bake for 9-11 minutes, depending on how crunchy you like them.

Earth-friendly Peanut Butter Cookies
Environmental footprint

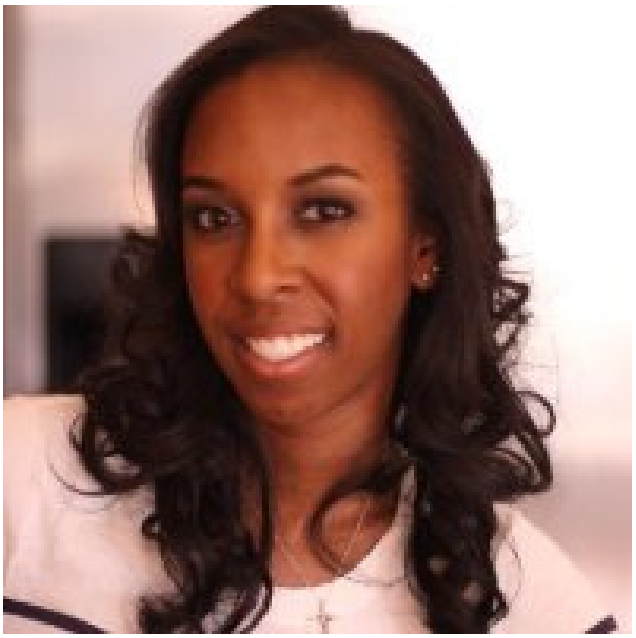
These cuties have just 30 g CO2-eq per cookie, with 10 g CO2-eq coming from the peanut butter, 4 g CO2-eq from each of the sugars, and 5 g CO2-eq from both the margarine and the flour. The applesauce contributes less than 1 g CO2-eq, and the soymilk less than 0.5 g CO2-eq, all per cookie.

If you used butter instead of margarine, the difference in impact would be a whopping 51 g CO2-eq per cookie, for a total of 81 g CO2-eq per cookie (the added butter contributes 56 g CO2-eq per cookie, roughly twice the total of all of the other ingredients)!!

An egg added to this recipe would contribute 7 g CO2-eq per cookie.

Baking just one batch of cookies with a plant-based margarine saves the equivalent of taking a 6 mile drive in a 40 MPG car.

This calculation shows the important role cutting down on dairy can play in reducing our carbon footprint. The reason is that cows are ruminant animals, which means their natural digestion process produces methane—a greenhouse gas with greater warming potential than CO2. In fact, an omnivorous diet very low in dairy can have a smaller footprint than a vegetarian diet that includes lots of cheese and milk.



About Alicia Simpson

Alicia C. Simpson has been cooking since she was tall enough to reach the stove. Alicia, MS, RD, IBCLC, LD, is a certified lactation consultant and registered dietitian specializing in maternal and pediatric nutrition. She is the executive director and founder of a nonprofit clinical lactation practice, Pea Pod Nutrition, providing nutrition and lactation education and support. She has also previously authored three cookbooks, including Quick & Easy Vegan Comfort Food, and is the creator of the popular blogs Vegan Guinea Pig and The Lady and Seitan. She lives in Atlanta, Georgia.

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Nutritional information is from the USDA Food Composition Database

ABOUT THE AUTHOR

For the last eighteen years, Jennifer Jay has been a Professor in the Civil and Environmental Engineering Department at the University of California Los Angeles. She specializes in the fate and transport of chemical and microbial contaminants in the environment. Her research addresses a wide range of topics including environmental proliferation of antibiotic resistance, coastal water quality, lead in urban soils, and the impacts of environmental education on the carbon footprint of student food choices. She teaches classes in Aquatic Chemistry, Statistics, Chemical Fate and Transport, and Food: A Lens for Environment and Sustainability. She was awarded the Presidential Early Career Award in Science and Engineering, and an engineering school-wide award for excellence in teaching. In addition, she was the Pritzker Fellow for Environmental Sustainability and a Carnegie Fellow for Civic Engagement in Higher Education. Jennifer Jay earned her B.S., M.S., and Ph.D. in Civil and Environmental Engineering at Massachusetts Institute of Technology.

Jenny enjoys biking, yoga, and spending time outdoors with her family. She created this e-cookbook in hopes of making science on the connection between food and the environment more accessible. You can follow her on Instagram at @meals4planet, and check out her blog at meals4planet.org.

PHOTO CREDIT: OSZIE TARULA

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