

Becoming a vegetarian naturally helps prevent cruelty to animals but there are environmental consequences of a meat-eating diet.

The production of beef and other animal protein consumes huge amounts of natural resources such as water, fossil fuels and topsoil, while polluting our water and air. In fact, switching to a plant-based diet from a meat-eating diet is the single most important move you can make to help the environment, much more effective than turning off the water when you brush your teeth or recycling and reusing.

Save large amounts of water

One of the biggest environmental impacts of a meat-eating diet is the depletion of natural resources, particularly the consumption of vast amounts of water for livestock production.

There are more than 17 billion livestock in the world; that's about three times the number of people.

Raising these animals requires huge amounts of water, most of it used to irrigate the grains and hay fed to the animals.

It takes 9,000 litres of water to produce one kilo of beef.

This is the same amount of water you would use if you took a three-minute shower every day for a whole year!

In contrast, only 50 litres of water are needed to produce one kilo of wheat.

40% of fresh water used in the U.S. in 2000 went to irrigate feed crops for livestock. Only 13% was used for domestic purposes including showers, flushing toilets, washing cars and watering lawns.

So, switching to a plant-based diet or reducing the amount of meat in your diet is by far the most important choice you can make to save water.

Raising livestock depletes other natural resources as well, including fossil fuels and topsoil.

40 calories of fossil fuel are needed to produce one calorie of protein from feed beef while only two calories of fossil fuel are needed to produce one calorie of protein from tofu.

Save the rainforests

Increased production of livestock also threatens the rainforest. Livestock production is responsible for 70% of deforestation in the Amazon region. Every second of every day one football field sized area of rainforest is being destroyed.

55 square feet of tropical rainforest are destroyed to make every fast-food hamburger made from rainforest cattle. To give you an idea of scale this is an area about the size of a small kitchen and it is gone forever each time one of these hamburgers is eaten. It is even worse because with each square foot of rainforest gone, up to 30 different plant species, 100 different insect species and dozens of bird, mammal and reptile species are destroyed. The rainforests are so important because half of the species on earth live in them and the forests are vital to the world's oxygen supply.

The meat industry is the number one source of methane throughout the world, releasing over 100 million tons a year. Methane traps heat in the atmosphere and causes the earth's temperature to rise and is 21 times more powerful a greenhouse gas than carbon dioxide.

Cows and sheep are responsible for 37% of the total methane generated by human activity.

But what would happen to the cows and sheep if we stopped eating them?

The turnover rate for the majority of ruminant farm animals is one or two years, which means that decreases in meat consumption would result in an almost immediate drop in methane emissions. The turnover rate for cars and power plants, on the other hand, can be decades. Even if cheap, zero-emission fuel sources were available today, they would take many years to build and slowly replace the massive infrastructure our economy depends upon today.

Similarly, unlike carbon dioxide which can remain in the air for more than a century, methane cycles out of the atmosphere in just eight years. Therefore, lower methane emissions translate to cooling of the earth quickly.

Avoid further pollution of our streams/rivers/oceans

Farmed animals produce about 130 times as much excrement, antibiotics and hormones as the entire human population of the UK.

Since factory farms don't have sewage treatment systems as our cities and towns do, this concentrated slop ends up polluting our water, destroying our topsoil, and contaminating our air.

Reduce destruction of topsoil & tropical rainforest

30% of the earth's entire land surface—a massive 70% of all agricultural land—is used for rearing farmed animals.

Livestock farming can lead to overgrazing causing soil erosion, desertification and deforestation. Twenty percent of the world's grazing land has already been designated as degraded due to the rearing of animals for their meat.

Reduce ecological footprint

By choosing a vegetarian diet instead of one loaded with animal products, individuals can dramatically reduce the amount of land, water, and oil resources that they consume and the amount of pollution they otherwise might cause. Of course, reducing one's ecological footprint should also mean causing less harm to the Earth's non-human inhabitants.

Help ensure environmental sustainability

Global production of meat has increased dramatically and is now the single largest source of animal protein in all affluent nations and demand for animal flesh is expected to more than double by the year 2050.

The way we breed animals is now recognised by the UN, scientists, economists and politicians as giving rise to many interlinked human and ecological problems, but with 1 billion people already not having enough to eat and 3 billion more mouths to feed within 50 years, the urgency to rethink our relationship with animals is extreme.

How much stress does our meat-eating put on ecological systems?

The answer is a lot but the figures are imprecise and disputed. In 2006, the UN calculated that the combined climate change emissions of animals bred for their meat were about 18% of the global total – more than cars, planes and all other forms of transport put together.

The authors of the report, called *Livestock's Long Shadow*, did not just count the methane from the belching, farting cattle, but the gases released from the manures that they produce, the oil burned taking their carcasses

to markets often thousands of miles away, the electricity needed to keep the meat cool, the gas used to cook it, the energy needed to plough and harvest the fields that grow the crops that the animals eat, even pumping the water that the cattle need.

The figure was revised upward in 2009 by two World Bank scientists to more than 51%, but attempts to fully account for meat-eating are condemned as simplistic. Should the studies have been based on giant US factory farms, or on more sustainable breeding in Europe? Should you include all the knock-on emissions from clearing forests? What about the fertiliser used to grow the crops to feed to the animals, or the emissions from the steel needed to build the boats that transport the cattle; or the “default” emissions – the greenhouse gases that would be released by substitute activities to grow food if we were to give up meat? And is it fair to count animals used for multiple purposes, as they mostly are in developing countries, from providing draught power to shoe leather or transport, and which only become meat once they reach the end of their economic lives?

It’s an accounting nightmare but depending on how it’s done, livestock’s contribution to climate change can be calculated as low as 5-10% of global emissions or as high as 50%.

Last year, a Food Climate Research Network report concluded that UK meat and dairy consumption was responsible for 8% of the country’s total greenhouse gas emissions. But however it’s counted, livestock farming ranks as one of the three greatest sources of climate changing emissions and one of the largest contributors to environmental degradation.

Eating up land

A human population expected to grow by 3 billion, a shift in developing countries to eating more meat, and global consumption on track to double in 40 years point to the mother of all food crises down the road.

How much food we grow is not just limited by the amount of available land but meat-eaters need far more space than vegetarians.

A Bangladeshi family living off rice, beans, vegetables and fruit may live on an acre of land or less, while the average American, who consumes around 270 pounds of meat a year, needs 20 times that.

Nearly 30% of the available ice-free surface area of the planet is now used by livestock, or for growing food for those animals. One billion people go hungry every day, but livestock now consumes the majority of the world’s crops.

A Cornell University study in 1997 found that around 13m hectares of land in the US were used to grow vegetables, rice, fruit, potatoes and beans, but 302m were used for livestock. The problem is that farm animals are inefficient converters of food to flesh. Broiler chickens are the best, needing around 3.4kg to produce 1kg of flesh, but pigs need 8.4kg for that kilo.

Other academics have calculated that if the grain fed to animals in western countries were consumed directly by people instead of animals, we could feed at least twice as many people – and possibly far more – as we do now.

To make matters worse, our hunger to eat animals has led to overstocking of fragile lands and massive soil erosion and desertification. Overgrazing, from the downlands of southern England to the uplands of Ethiopia and mountains of Nepal, causes great loss of fertility, as well as flooding.

But the figures must be treated with caution. Animal manures can revitalise the soil and millions of animals live on marginal land that is quite unsuitable for crops.

Not leaping to conclusions too quickly

But before we leap to conclusions and lump all livestock rearing together, consider this: in western countries animals are bred and reared to put on as much meat as possible in the shortest time after which they are slaughtered. But in poorer regions, cattle – especially in dry areas – are central to human life and culture and often the only source of food and income for many millions of pastoralists. The ceaseless movement of these nomadic herders over vast areas is the backbone of many African economies and, a major new study from the International Institute for Environment and Development suggests, a far more ecologically efficient method of farming than the way cattle are reared in Australia or the US.

Drinking too much water

Eat a steak or a chicken and you are effectively consuming the water that the animal has needed to live and grow.

It takes:

27 litres of water to grow 1 kilo of potatoes

49 litres of water to grow 1 kilo of wheat

103 litres of water to grow 1 kilo of rice

9,000 litres of water to grow 1 kilo of beef

Equally, it takes nearly 1,000 litres of water to produce one litre of milk.

A broiler chicken, by contrast, is far more efficient, producing the same amount of meat as a cow on just 1,500 litres.

Poisoning the earth

Industrial-scale agriculture now dominates the western livestock and poultry industries, and a single farm can now generate as much waste as a city. A cow excretes around 40kg of manure for every kilogram of edible beef it puts on and when you have many thousands crowded into a small area the effect can be dramatic.

Ruining the air

Anyone who has lived close to a large factory farm knows the smells can be extreme. Aside from greenhouse gases such as methane and carbon dioxide, cows and pigs produce many other polluting gases. Global figures are unavailable but in the US, livestock and animal feed crops are responsible for 37% of pesticide use, more than half of all the antibiotics manufactured and a third of the nitrogen and phosphorous in fresh water. Nearly two thirds of the manmade ammonia – a major contributor to acid rain – is also generated by livestock. In addition, concentrated factory farming of animals contributes to ozone pollution.

Draining the world's oil

The western animal farming economy is based on oil, which is why there were food riots in 23 countries when the oil price peaked in 2008. Every link in the chain of events that brings meat to the table demands electricity, from the production of the fertiliser put on the land to grow the animal feed, to pumping the water they need from the rivers or deep underground, to the fuel needed to transport the meat in giant refrigerated ships and the supermarket shelves. According to some studies, as much as one-third of all fossil fuels produced in the western world now goes towards animal agriculture.

Meat's costly, in many ways

Polls suggest that 5-6% of the population eats no meat at all, with many millions of others consciously reducing the amount of meat they eat or only eating it occasionally. This is backed by new government figures which show that last year we ate 5% less meat by weight than in 2005.

But the quantities are still staggering: according to the Vegetarian Society, the average British carnivore eats over 11,000 animals in a lifetime: 1 goose, 1 rabbit, 4 cattle, 18 pigs, 23 sheep and lambs, 28 ducks, 39 turkeys, 1,158 chickens, 3,593 shellfish and 6,182 fish.

For this, say the vegetarians, the meat eaters get increased chances of obesity, cancers, heart diseases and other illnesses as well as a hole in the pocket. A meat diet is generally considered twice as expensive as a vegetarian one.

Carbon foodprints

It is well understood that meat production has a big carbon footprint.

Numerous studies detail the climate impact of livestock, but just how big is its impact on a person's foodprint?

This section compares the carbon footprints of five different diets and finds that when it comes to foodprints vegans lead the way.

The carbon footprint of different diets

Even since the FAO announced that 18% of global emissions result from livestock people have talked about the climate benefits of reducing meat consumption.

More recent studies show that food system emissions could account for as much as a quarter of all human emissions. That is 12% from agricultural production, another 9% from farming induced deforestation, and a further 3% from things like refrigeration and freight.

Such studies beg the question, what is the impact of meat on an individual's foodprint?

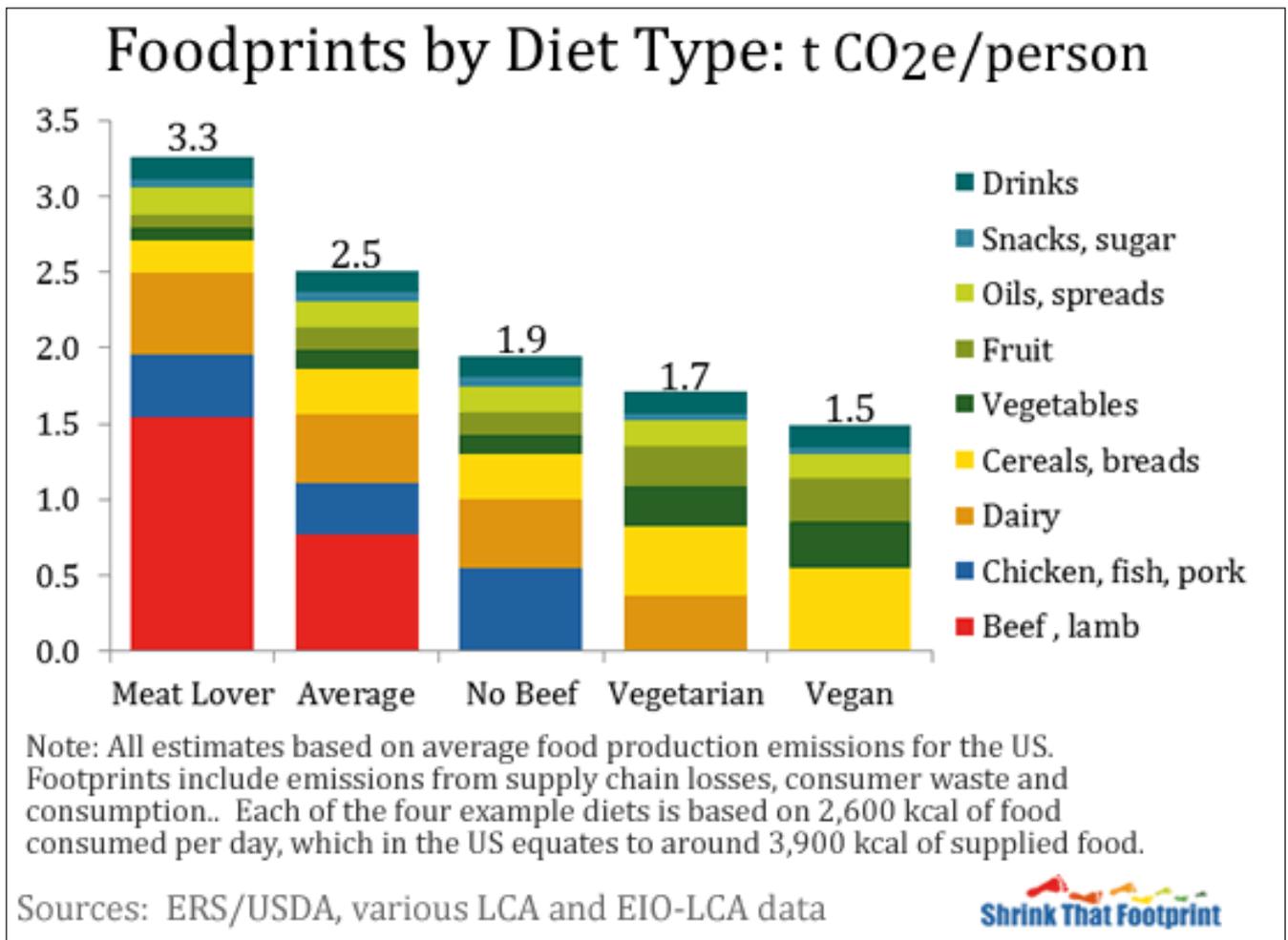
This analysis tries to answer that question using data from the US. In it we compare five different diets:

Meat Lover, Average, No Beef, Vegetarian and Vegan.

For each diet we look solely at the emissions associated with food supply, so we do not include those from consumer's transportation, storage or the cooking of food. Nor do we consider land use change emissions.

Rather than bore you with the methodology let's start with the results and work back through how they were calculated.

The results of our analysis look like this...



The Carbon Foodprints of Different Diets

A Vegetarian's foodprint is about two thirds of the average American and almost half that of a meat lover. For a Vegan it is even lower. But perhaps most interestingly, eating chicken instead of beef cuts a quarter of emissions in one simple step.

An Average American's diet has a foodprint of around 2.5 t CO₂e per person each year. For a Meat Lover this rises to 3.3 t CO₂e, for the No Beef diet it is 1.9 t t CO₂e, for the Vegetarian it's 1.7 t CO₂e and for the Vegan it is 1.5 t CO₂e. Each of these estimates includes emissions from food that is eaten, wasted by consumers and lost in the supply chain.

In the average diet animal products make up 60% of emissions despite accounting for just a quarter of food energy. For the Meat Lover beef consumption causes almost half of emissions from just a tenth of food energy. In the No Beef diet all the reductions from the Average foodprint come by switching from beef to chicken. The difference between the Vegetarian and Vegan diets arises from dairy consumption being switched to a mix of cereals and vegetables.

Perhaps the most fascinating thing is that although the foodprints vary greatly, three fifths of each diet is identical. In other words, 60% of food energy consumed is the same in each of these four diets.

The share that is constant accounts for 1550 kcal of food energy per day and about 0.7 t CO₂e of each foodprint. So all the variation depends on the remaining 1,000 kcal per day. The Vegan gets these 1000 kcal for 0.8 t CO₂e, the Vegetarian for 1 t, No Beef for 1.2 t, Average for 1.8 t and the Meat Lover for 2.6 t.

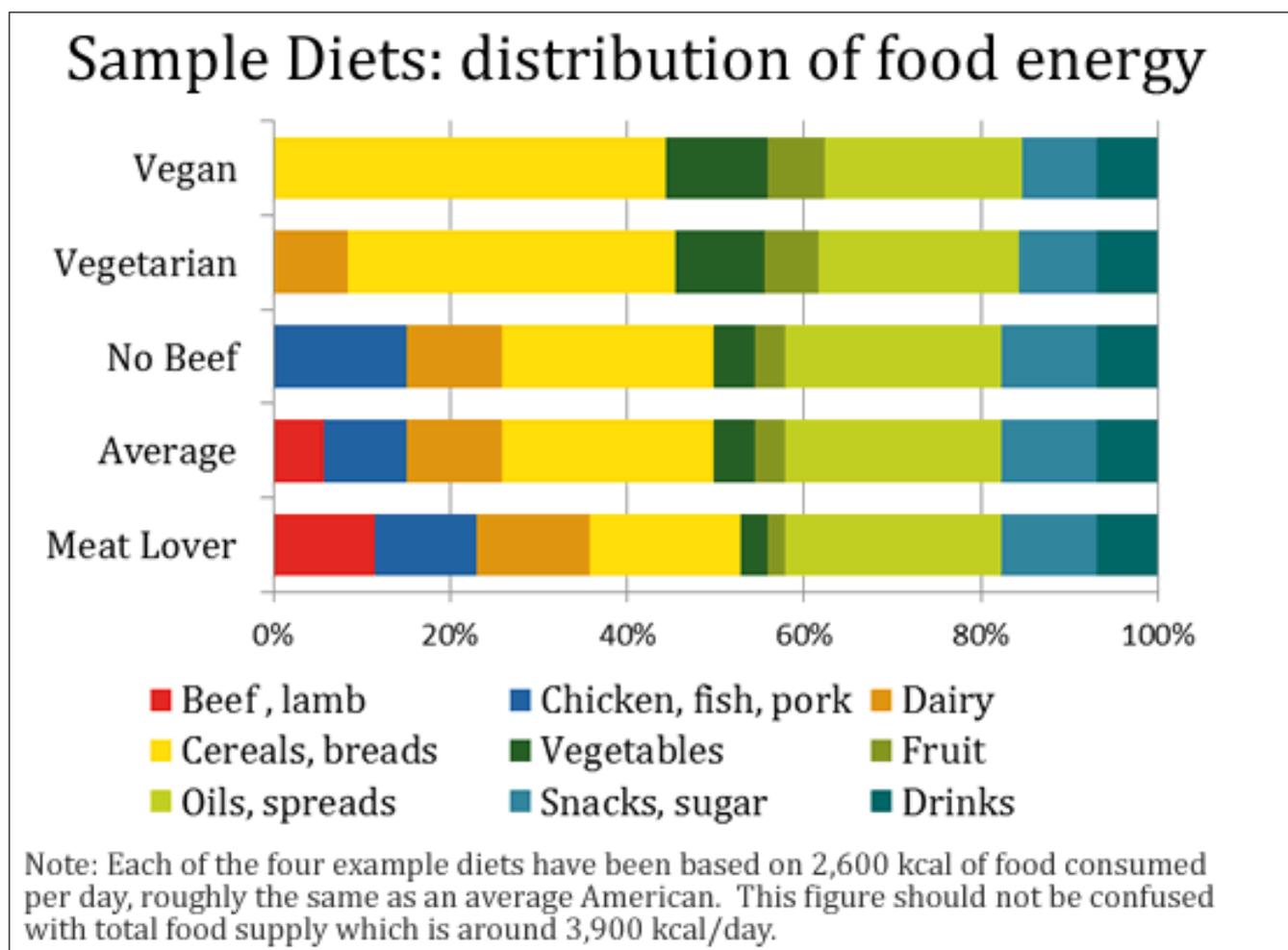
The diets we compared

Each of these five diets are variations of the average American diet based on data from the USDA's Economic Research Service.

For each of our diets we assume consumption of around 2,600 kcal of food energy each day, roughly equal to an average American. This should not be confused with total food supply which is around 3,900 kcal each day. In each diet food energy is split up among nine different food groups.

The five diets are all variations on the average diet. We assume the Meat Lover eats more red meat, white meat and dairy in place of some cereals, fruit and vegetables. The No Beef diet is just the average diet with all beef consumption switched to chicken. The Vegetarian switches away from beef and chicken to fruit and vegetables, while also reducing oils and snacks. The Vegan does much the same as the vegetarian while also eliminating dairy through further switching to cereals, fruits and vegetables.

In terms of food energy distribution the diets look like this:



The diets we compared

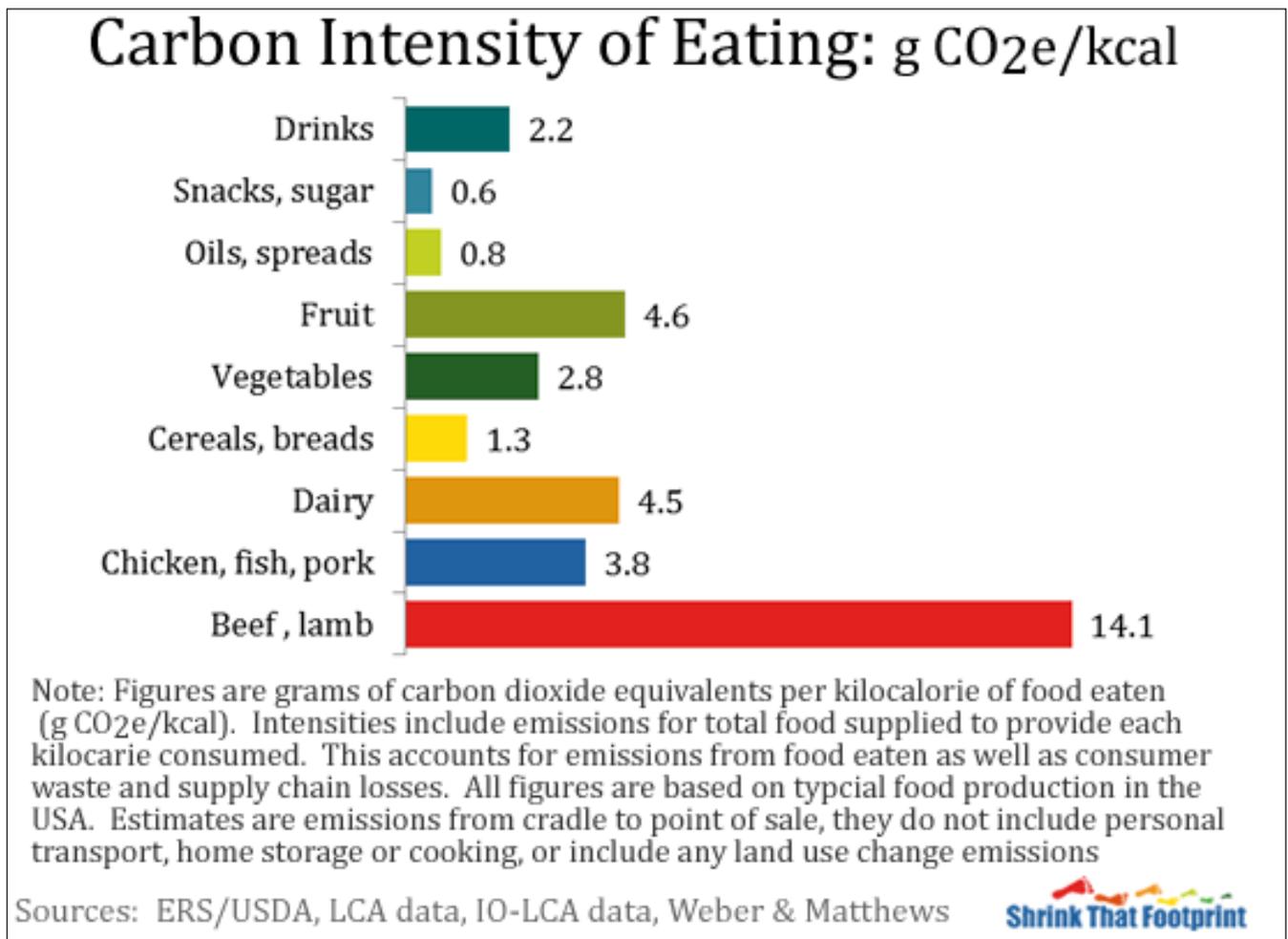
The food energy that remains the same in each diet is roughly 450 kcal of cereals, 80 kcal of fruit, 50 kcal of vegetables, 580 kcal of oils, 220 kcal of snacks and 180 kcal of drinks.

Comparing food group emissions

The reason that these five foodprints vary so much despite being so similar is that the carbon intensity of food consumption differs greatly between the food groups.

To estimate each foodprint we first calculated the carbon intensity of food consumption in each group. This involved estimating the cradle to retail emissions of food production (kg CO₂e/kg product), converting each to emissions per unit food energy produced, and then adjusting for food waste and supply chain losses. This gives emissions per unit of food consumed (g CO₂e/kcal). For a more complete explanation see our shrink your food footprint page.

The carbon intensity of food consumption for each food group is as follows:



Comparing emissions of consumed food

These figures estimate the emissions produced in the process of supplying a kilocalorie of food energy for each food group. They show on average how carbon intensive it is for Americans to get their energy from the different food groups.

Unsurprisingly red meat is the most carbon intensive way to get food energy, followed by dairy, fruit and chicken. Cereals, oils and snacks are the least carbon intensive. These factors are the reason why foodprints gets smaller as less red meat, dairy and chicken are consumed.

Although the carbon intensity of food production is the main driver in these figures, each is also influenced by how calorific foods are and what scale of supply chain losses and consumer waste they suffer.

For example oils, snacks and cereals are each highly calorific and have relatively low losses and waste, which results in them performing very well. The opposite is true of fruits and vegetables which are less calorific per unit weight but have a very high share of consumer waste and supply chain losses.

Using food groups also hides great variation of carbon intensity within each group. A hot housed tomato can have emissions 5 times higher than one grown in season, potatoes have tiny footprints compared to many other vegetables, and cheese has much higher emission than milk. So by limiting ourselves to just nine food groups we greatly understate the potential that changing diet has to reduce food emissions.

What about my foodprint?

This analysis attempts to show the important role animal products, and red meat in particular, have in determining the scale of a person's foodprint. It's relevance to your own foodprint will depend on what your own diet is like.

Because we use national averages for food consumption, production emissions, food energy content, food losses and food waste our estimates may vary significantly from an individuals diet.

Such caveats aside, this analysis does highlight that a small share of the food we eat can cause the majority of our food emissions. Beef, lamb and cheese are among the most carbon intensive things we can eat, while milk, out of season fruit and other meats can also have relatively high emissions.

Shifting some of your diet away from these foods towards cereals or in-season fruit and vegetables is a very effective way to shrink your footprint. If you're aiming for a very low carbon diet, you won't do much better than a seasonal vegan diet, particularly if you also limit food waste.

Read more at <http://shrinkthatfootprint.com/food-carbon-footprint-diet#tbke6r5Fhb6TiKIF.99>

NOTE

The data and text in this factsheet come from various sources all of which are gratefully acknowledged.