



Deep impact: The toll your protein takes on the Earth



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A field of soybeans -- most of which are grown for animal feed.
(Photo by Carol Vanhook.)

Now that we've touched on [how much protein we need](#), let's talk about how the production process behind high protein foods impacts the environment.

First, the big picture: While meat consumption has [gone down slightly](#) here in the U.S. in recent years, the rest of the world appears to be on the opposite track. Nearly half the protein eaten in the developed world [comes from animals](#) (compared to 28 percent of protein, worldwide) and, as incomes in larger developing nations like Brazil, India and China have picked up, so has the taste for meat.



World meat consumption [more than doubled](#) between 1950 and 2009 (bringing annual intake per person to over 90 pounds or around a quarter pound a day), and the uptick in consumption of eggs and milk has been similarly staggering. If we continue at this rate, by 2050 we'll be eating [two-thirds more](#) animal protein globally than we are today.

Add to all this the fact that animal protein is more resource intensive to produce than fruits, vegetables, and grains, and you begin to understand why it's especially important that the world gets its protein plan in order.

The story (or life cycle) of most animal-protein starts with acres of monocropped soybeans, corn, and wheat (grown with pesticides and nitrogen-heavy fertilizers that endanger the nation's water tables, travel down the Mississippi river, and end up in the Gulf, where they lead to dead zones). Roughly 35 percent of the [world grain harvest](#) is used to produce animal protein. Then there are the energy-heavy factories where the grains and legumes are processed (often broken down chemically, to create soy isolates and other wonders of modern science) before they're trucked around the country and fed to livestock kept in confined animal feeding operations (CAFOs) – or in around 1 percent of the time — on pasture or in smaller feeding operations.

Most of the recent research into food and environmental impact has focused on the carbon emissions implicit in this process, and – while that’s not the only rubric that matters – it has also shown that not all animal protein sources are the same. In fact, they require different resources or “inputs,” resulting in radically different carbon footprints.

The vegetarian footprint

Photo by Dot!

We all know that meat has a higher environmental cost than plant-based protein sources, but what about other animal protein, like dairy and eggs? If you’re a vegetarian, aka a lacto-ovo vegetarian (as opposed to a vegan, who eats no animal products at all), are your protein sources significantly more eco-friendly than meat?



Maybe not — especially if you eat a lot of cheese. A 2011 report by the [Environmental Working Group \(EWG\)](#) found that a 4-ounce serving of cheese produces the same amount of greenhouse gas as driving 3.5 miles in a car, which means cheese has a larger [carbon footprint](#) than any other common protein source except beef and lamb. The report determined the footprints of 20 food items using [life-cycle analysis](#), calculating emissions generated by growing the given crop or animal feed, raising the animals, processing their products, transportation, cooking, and disposal of unused food.

Milk, interestingly, has the third-lowest footprint of the 20 foods that EWG analyzed. Kari Hamerschlag, lead researcher and author of the report, explains that the carbon footprint of cheese is so much larger than that of milk because “it takes about 10 pounds of milk to make one pound of cheese.” Less-dense varieties, like cottage cheese, have a smaller footprint, because it takes less milk to produce them. Hamerschlag also clarifies that a normal serving size of cheese is 1-2 ounces instead of 4; the report uses 4 ounces because that is a typical serving for meat, and thus a good point of comparison with other foods. However, in terms of emissions per unit of protein (instead of per 4 ounces), cheese is still the third highest, behind beef and lamb. (Pound for pound, lamb has the highest carbon footprint of all meats—50 percent higher than beef—because lambs require similar quantities of feed as cows but produce less edible meat per animal. Not that they don’t have other benefits — but more on that later.)

What about eggs? According to the EWG report, the carbon footprint of a 4-ounce serving of eggs is equivalent to driving just a little over 1 mile—a lower footprint than any of the meat or fish products analyzed, so not too bad. But unless you’re [Cool Hand Luke](#), the number of eggs you can eat in a day is fairly low; the [2010 Dietary Guidelines](#) recommend no more than one egg per day, or seven per week. Egg production is also fairly water-intensive. One international study determined that it takes [2.29 liters](#) of water to produce 1 calorie from eggs—more water per calorie than pork.

But don’t rush out and become vegan just yet. Danielle Nierenberg, director of Worldwatch Institute’s Nourishing the Planet project, says that while she is vegan, “I don’t agree that it’s always better for the environment — I don’t think the way a lot of vegans eat is very sustainable.” She says this is because many vegans eat a lot of heavily processed foods, like “imported soy products, vegan cold cuts — it takes the agriculture out of the food.” In other words, processed vegan products are a far cry from the nuts and soybeans they’re made from.

The pasture factor

While a vegan diet may generally have a lower environmental impact than eating beef, there may be other benefits to supporting the production of sustainable livestock, like grass-fed meat. Few existing studies compare emissions from pasture-raised versus grain-fed, industrially produced meat, but there is some promising evidence. As the EWG report notes, grass-fed cattle may initially appear to contribute to higher emissions because they take longer to reach slaughter weight and thus emit more methane along the way. However, these increased emissions may be offset by the fact that pasture managed in conjunction with actively grazing cattle can help with soil carbon sequestration [PDF]. Then there's also the fact that pasture-based feed doesn't require energy-intensive inputs (such as fertilizer and pesticides), when compared to grains.

Cows and other grazers help pasture land sequester carbon. (Photo by Ready Subjects.)

As Hamerschlag explains, “From an environmental perspective, you’re always going to be better off consuming plant protein. But given that people aren’t going to stop eating meat altogether, we need to support grass-fed approaches and integrated farming systems.” In such systems, animals are raised on farms that also grow grains and vegetables, and the manure these animals produce is used to fertilize the fields, help to minimize energy input on the farm. “If we want to grow our food, we need fertilizer, and it’s far better to generate that fertilizer from animals that we’re going to eat than from petroleum-based products and all the accompanying environmental impacts that come from producing chemical fertilizers,” Hamerschlag says.

In the developing world, Nieremberg says, integrated systems are the norm. “Farmers aren’t raising livestock on the scale that we are in the United States — they’re using kitchen waste, letting chickens forage between crops. It’s a natural, walking form of pesticide.”

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