

How Meat Contributes to Global Warming

Producing beef for the table has a surprising environmental cost: it releases prodigious amounts of heat-trapping greenhouse gases

By Nathan Fiala

Most of us are aware that our cars, our coal-generated electric power and even our cement factories adversely affect the environment. Until recently, however, the foods we eat had gotten a pass in the discussion. Yet according to a 2006 report by the United Nations Food and Agriculture Organization (FAO), our diets and, specifically, the meat in them cause more greenhouse gases carbon dioxide (CO₂), methane, nitrous oxide, and the like to spew into the atmosphere than either transportation or industry. (Greenhouse gases trap solar energy, thereby warming the earth's surface. Because gases vary in greenhouse potency, every greenhouse gas is usually expressed as an amount of CO₂ with the same global-warming potential.)

The FAO report found that current production levels of meat contribute between 14 and 22 percent of the 36 billion tons of "CO₂-equivalent" greenhouse gases the world produces every year. It turns out that producing half a pound of hamburger for someone's lunch a patty of meat the size of two decks of cards releases as much greenhouse gas into the atmosphere as driving a 3,000-pound car nearly 10 miles.

In truth, every food we consume, vegetables and fruits included, incurs hidden environmental costs: transportation, refrigeration and fuel for farming, as well as methane emissions from plants and animals, all lead to a buildup of atmospheric greenhouse gases. Take asparagus: in a report prepared for the city of Seattle, Daniel J. Morgan of the University of Washington and his co-workers found that growing just half a pound of the vegetable in Peru emits greenhouse gases equivalent to 1.2 ounces of CO₂ as a result of applying insecticide and fertilizer, pumping water and running heavy, gas-guzzling farm equipment. To refrigerate and transport the vegetable to an American dinner table generates another two ounces of CO₂-equivalent greenhouse gases, for a total CO₂ equivalent of 3.2 ounces.

But that is nothing compared to beef. In 1999 Susan Subak, an ecological economist then at the University of East Anglia in England, found that, depending on the production method, cows emit between 2.5 and 4.7 ounces of methane for each pound of beef they produce. Because methane has roughly 23 times the global-warming potential of CO₂, those emissions are the equivalent of releasing between 3.6 and 6.8 pounds of CO₂ into the atmosphere for each pound of beef produced.

Raising animals also requires a large amount of feed per unit of body weight. In 2003 Lucas Reijnders of the University of Amsterdam and Sam Soret of Loma Linda University estimated that producing a pound of beef protein for the table requires more than 10 pounds of plant protein with all the emissions of greenhouse gases that grain farming entails. Finally, farms for raising animals produce numerous wastes that give rise to greenhouse gases.

Taking such factors into account, Subak calculated that producing a pound of beef in a feedlot, or concentrated animal feeding operation (CAFO) system, generates the equivalent of 14.8 pounds of CO₂ pound for pound, more than 36 times the CO₂-equivalent greenhouse gas emitted by producing asparagus. Even other common meats cannot match the impact of beef; I estimate that producing a pound of pork generates the equivalent of 3.8 pounds of CO₂; a pound of chicken generates 1.1 pounds of CO₂-equivalent greenhouse gases. And the economically efficient CAFO system, though certainly not the cleanest production method in terms of CO₂-equivalent greenhouse emissions, is far better than most: the FAO data I noted earlier imply that the world average emissions from producing a pound of beef are several times the CAFO amount.

Solutions?

What can be done? Improving waste management and farming practices would certainly reduce the "carbon footprint" of beef production. Methane-capturing systems, for instance, can put cows' waste to use in generating electricity. But those systems remain too costly to be commercially viable.

Individuals, too, can reduce the effects of food production on planetary climate. To some degree, after all, our diets are a choice. By choosing more wisely, we can make a difference. Eating locally produced food, for instance, can reduce the need for transport though food inefficiently shipped in small batches on trucks from nearby farms can turn out to save surprisingly little in greenhouse emissions. And in the U.S. and the rest of the developed world, people could eat less meat, particularly beef.

The graphics on the following pages quantify the links between beef production and greenhouse gases in sobering detail. The take-home lesson is clear: we ought to give careful thought to diet and its consequences for the planet if we are serious about limiting the emissions of greenhouse gases.

Note: This article was originally printed with the title, "The Greenhouse Hamburger".