

Fact Sheet:

Tough Questions about Beef Sustainability

Project Title:	Removing Beef from the Human Diet
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If beef were removed from the human diet, would there be fewer greenhouse gas emissions?

Some have proposed simply removing beef from the human diet to significantly lower greenhouse gas (GHG) emissions. However, upon examination of the scientific evidence, completely removing beef from the diet would likely not result in huge declines in GHG emissions and would likely have negative implications for the sustainability of the U.S. food system.

One must first consider the amount of beef consumed by Americans. U.S. Dietary Guidelines recommend at least 3.7 ounces of lean protein per day for a person consuming a 2,000-calorie diet.¹ Beef is one of the most common sources of lean protein in the United States, with 2.39 ounces of beef available per capita per day in 2012.² Per capita beef availability (a proxy for consumption) has actually been declining in the United States over the past 35 years (Figure 1) due in part to beef production not keeping pace with U.S. population growth. Along with being a significant source of lean protein, beef provides key nutrients such as iron, zinc, and B vitamins. Removing beef from the food chain would result in consumers having to seek alternative protein and micronutrient sources.

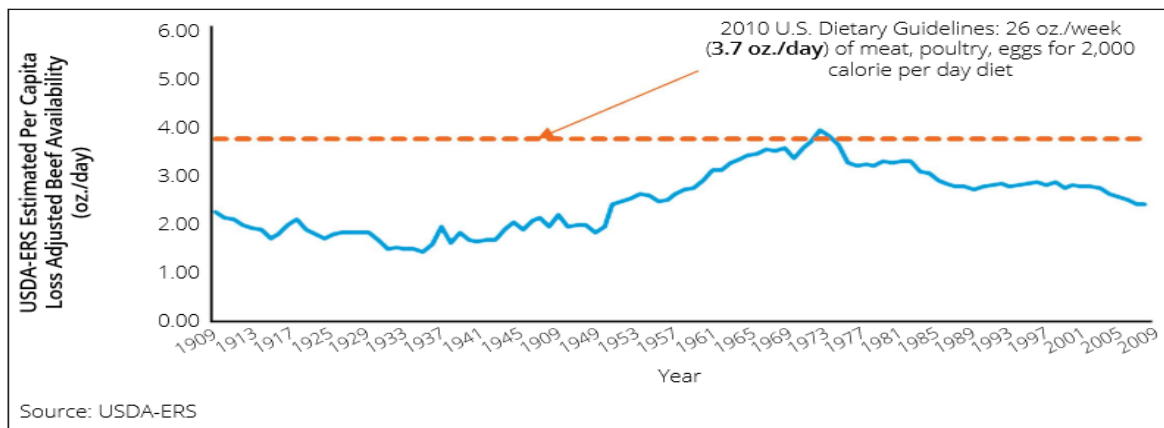


Figure 1. U.S. boneless beef availability per capita compared to U.S. Dietary Guidelines protein recommendations.

According to the U.S. Environmental Protection Agency (EPA), beef cattle production was responsible for 1.9% of total U.S. GHG emissions in 2013.³ By comparison, GHG emissions from transportation and electricity accounted for 25.8% and 30.6% of total U.S. GHG emissions in the same year (Table 1).³ Comparing food production (essential for human life) to transportation and electricity (non-essential for human survival, but important to our modern lifestyles) is problematic. However, the comparison is instructive because, though electricity and transportation produce much of the GHG emissions in the United States, most people do not call for the elimination of electricity or transportation. Rather, efforts are made to lower the GHG emissions produced to provide the same energy and transportation services (e.g. switching to renewable energy sources for electricity generation). Using this frame of reference, another way to consider GHG emissions from beef production would be, “How can the same amount of human nutritional value be produced by the

beef system while producing fewer GHG emissions?” Studying the different ways inputs (feed, water, and land) can be used more efficiently throughout the beef value chain to reduce GHG emissions per pound of beef would provide the means to maintain the same level of food production while reducing GHG emissions. Over time, beef production has made impressive advances to meet the protein demands of a growing population while reducing the amount of natural resources required to produce a pound of beef.^{4,5,6} For example, due to improved genetics (of cattle and the plants they consume), animal nutrition, management, and the use of growth-promoting technologies, the U.S. beef industry has decreased its GHG emissions per pound of beef 9-16% from the 1970’s to today.^{5,7} Further improvements in the efficiency of beef production are being continuously evaluated and researched at universities and research institutions in the United States and globally.

Another key component of reducing GHG emissions from the whole beef system is the role of the consumer. Approximately 20% of edible beef is wasted at grocery stores, restaurants, and in the home.⁸ As with other foods, the amount of non-renewable resources used and the environmental impacts that went into producing the portions of beef that are being sent to a landfill are often overlooked. Consumers could improve beef sustainability by 10% if beef waste were reduced by half.⁸

Table 1. U.S. EPA GHG Emissions Inventory for 2013

Item	CO ₂ -eq emissions (Million Metric Tons)	Percent of U.S. Total CO ₂ -eq emissions
Enteric Methane Emissions from Beef Cattle (from their digestive tracts)	117.1	1.75%
Beef Cattle Manure Nitrous Oxide Emissions	7.6	0.11%
Beef Cattle Manure Methane Emissions	3.0	0.04%
Total Direct Emissions from U.S. Beef Cattle	127.7	1.90%
Burning fossil fuels for transportation carbon dioxide emissions	1718.4	25.80%
Burning fossil fuels for electricity generation carbon dioxide emissions	2039.8	30.60%
Other	2659.40	39.80%
2013 U.S. Total CO₂-eq Emissions	6673	100%

Source: U.S. EPA Executive Summary 2015

Beef production makes many positive contributions to the sustainability of our food system that are often overlooked by analyses of GHG emissions’ impact of removing beef from the diet. Cattle have the ability human nutritional value be produced by the beef system while producing fewer GHG emissions?” Studying the different ways inputs (feed, water, and land) can be used more efficiently throughout the beef value chain to reduce GHG emissions per pound of beef would provide the means to maintain the same level of food production while reducing GHG emissions. Over time, beef production has made impressive advances to meet the protein demands of a growing population while reducing the amount of natural resources required to produce a pound of beef.^{4,5,6} For example, due to improved genetics (of cattle and the plants they consume), animal nutrition, management, and the use of growth-promoting technologies, the U.S. beef industry has decreased its GHG emissions per pound of beef 9-16% from the 1970’s to utilize forages (e.g., grass) and byproducts (e.g., distillers grains) that are unfit for human consumption. Specifically cattle can utilize cellulose, one of the world’s most abundant organic (carbon-containing) molecules, that is indigestible by humans.⁶ Consequently, U.S. beef producers feed their cattle feed sources that are not in direct competition with humans and/or would have gone to waste (byproducts).⁶ Cattle can also convert low-quality feeds into high-quality protein from land not suited for cultivation, thereby reducing soil erosion and enhancing soil carbon storage.⁶ Furthermore, integrated crop and beef systems (e.g., using cattle to graze crop residues and cover crops) can lead to many positive

environmental sustainability outcomes including increased soil waterholding capacity and enhanced nutrient cycling.⁹

Bottom Line: Beef is a valuable asset to the human diet; it is an affordable, nutrient-dense source of lean protein. As with the production of all foods, the production of beef results in GHG emissions; however, direct emissions from the U.S. beef industry are only estimated to be 1.9% of the total U.S. GHG emissions.³ Thus, even without consideration of the unintended consequences and impacts of alternative protein sources, completely removing beef from the U.S. diet would likely have a minimal impact on GHG emissions. However, as historical progress has demonstrated (GHG emissions per lb. of beef have been reduced 9-16% since the 1970's^{5,7}), there are opportunities to reduce beef's impact, chief among them being reducing consumer waste.

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