THE TRUE COST OF A HAMBURGER

From feed crops to cattle, kitchens and the planet

A hamburger may take only minutes to eat, but producing it connects farms, forests, rivers, factories, workers and consumers across the world. Its ecological footprint includes the land, water, energy and materials used throughout its life cycle, not just the resources used in the restaurant.

01	02	03	04	05
Grow feed	Raise cattle	Process meat	Make burger	Consume & waste

01 Growing feed: land, water and forests

Cattle eat grass, but many beef supply chains also depend on maize (corn), soy meal and other feed crops. Growing these crops uses farmland, irrigation water, machinery, fertilizers and pesticides. In some regions, the expansion of pasture and soy production contributes to deforestation and habitat fragmentation. Not all soy is fed to cattle, and cattle production varies widely between regions, but the demand for feed links a single burger to distant landscapes.

Fertilizers contain nitrogen and phosphorus. Rain can wash these nutrients from fields into streams and lakes. The resulting algal blooms may block sunlight; when algae die, decomposition consumes dissolved oxygen. This process, eutrophication, can create low-oxygen “dead zones” where fish and other aquatic life struggle to survive.

02 From pasture to feedlot: what is a CAFO?

Many cattle begin life grazing on pasture and are later “finished” on a concentrated, energy-rich diet. A feedlot houses many animals in pens to efficiently increase their weight. In the United States, a large animal-feeding operation may be regulated as a concentrated animal feeding operation (CAFO), depending on the number of animals and pollution levels. CAFO is a regulatory term, not a name for every cattle farm worldwide.

Concentrating animals can lower some per-kilogram costs of beef production, but it also concentrates manure and urine. Poorly managed runoff or leaking waste storage can carry nutrients, pathogens and organic matter into waterways. Ammonia emissions can worsen local air quality. Where antibiotics are used, careful veterinary oversight and waste management are important for limiting the risk of antimicrobial resistance.

FOLLOW THE WATER Water is used to grow feed, supply drinking water, clean facilities and process meat. Much of beef’s reported water footprint is rainfall on grazing land or feed crops; irrigation withdrawals and local water scarcity are especially important when judging actual water stress.

03 The cow and the climate

Cattle are ruminants. Microbes in their stomachs break down fibrous plant material and release methane, primarily through belching. Methane is a powerful greenhouse gas, particularly over the decades after it enters the atmosphere. Manure management can release methane and nitrous oxide; feed production, land-use change, refrigeration and transport add further emissions. Beef therefore generally has a substantially higher greenhouse gas footprint per kilogram of food than beans, lentils, and many other protein sources.

04 Processing, packaging and the other ingredients

After slaughter, beef is chilled, minced, shaped into patties, packed and transported through a refrigerated supply chain. Refrigeration and cooking require energy, while packaging creates material waste. Workers in slaughterhouses and meat-processing plants may face injuries, repetitive tasks and demanding conditions; worker protections matter alongside environmental standards.

The bun needs wheat, land, milling and baking energy. Cheese adds dairy-related methane and land use. Lettuce, tomato, onions and sauces require farming, water, transport and sometimes refrigerated storage. The beef patty is often the largest source of the burger's climate and land impacts, but every ingredient has a supply chain. Food waste at farms, retailers and restaurants adds avoidable impacts.

05 The human and ethical questions

High-density cattle systems raise animal-welfare questions: Can animals move comfortably, rest, avoid heat stress and receive timely veterinary care? Welfare depends on stocking density, shade, handling, diet, transport and slaughter practices; a feedlot is not automatically identical to every other feedlot. Ethical evaluation also considers farm workers, nearby residents exposed to odours or pollution, and communities affected by land conversion.

Red meat provides protein, iron and vitamin B12. However, eating large amounts of red meat, especially processed meat, is associated with higher risks of some diseases. The World Health Organization's cancer agency classifies processed meat as carcinogenic to humans and red meat as probably carcinogenic; these classifications describe the strength of evidence, not the size of risk. A balanced diet and moderation matter more than judging one burger in isolation.

06 Why more burgers? The nutrition transition

As incomes rise and cities grow, diets often shift from staple grains and legumes toward more meat, dairy, processed foods and meals eaten away from home. Advertising, convenience and global fast-food chains can accelerate this nutrition transition. The pattern is not universal: culture, price, religion and personal choices also shape diets. Yet multiplying a resource-intensive meal across millions of consumers increases demand for cattle, feed, land and water, and can enlarge ecological footprints.

A CASCADING IMPACT Higher burger demand → more cattle and feed → land conversion, water demand and manure → nutrient runoff and eutrophication; alongside methane emissions, biodiversity loss and pressure on local communities.