Positioning for the Future of Beef Production: Focus on Sustainability

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Outline

- How much animal protein do we consume in the U.S. and globally?
  - Does "less meat" really mean "less heat"?
- What's the role of ruminants in a sustainable food system?
  - Are they an environmental nightmare, or a sustainable solution?
- What opportunities do we have to improve?
  - Are we leaving environmental and economic efficiency on the table?

2

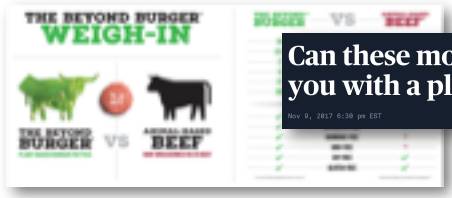
FOOD FOR THOUGHT

Silicon Valley's Bloody Plant Burger Smells, Tastes And Sizzles Like Meat

June 21, 2016 · 7:00 AM ET

LINDSEY HOSHAW

FROM KQI



Can these mock meat entrepreneurs fool you with a plant-based burger?

Nov 9, 2017 6:30 pm EST

Paul Grimwood Follow
Non-executive Chairman of Nestlé USA
Oct 23, 2017 · 5 min read

We're putting our money where your mouth is

Our 2017 acquisitions and investments provide a glimpse of the company we want to be at Nestlé

Today, as many as half of all American consumers want more plant-based foods in their diet, and 40 percent are open to reducing meat consumption. Increasing nutritious plant-based options [redacted] for our consumers and for our planet.

Why Max Burgers Remains One Step Ahead in the Fight Against Climate Change

by Alison Watson May 24, 2018

Image credit: Max Burgers

Max Burgers may not be well-known outside its Northern European base or its collection of growing stores in the Middle East, but it's been quietly implementing a strategy over the last 10 years to reduce red meat consumption. Remarkably, the company is now chasing an ambitious target to increase purchase of non-red-meat meals to 50 percent of sales by 2022.

"Taste is everything. The goal is always to ensure that green burgers taste every bit as good as red meat burgers,"

4


Farming

Avoiding meat and dairy is 'single biggest way' to reduce your impact on Earth

Biggest analysis to date reveals huge footprint of livestock - it provides just 18% of calories but takes up 83% of farmland

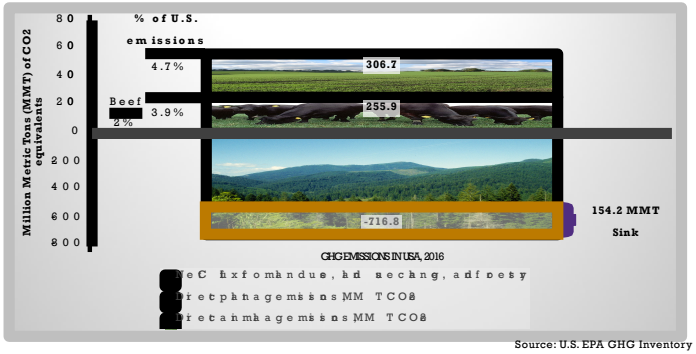
Damian Carrington
Environment editor

361,625 3,749

"Agriculture is a sector that spans all the multitude of environmental problems," he [*lead author Poore, University of Oxford*] said. "Really it is animal products that are responsible for so much of this. Avoiding consumption of animal products delivers far better environmental benefits than trying to purchase sustainable meat and dairy."

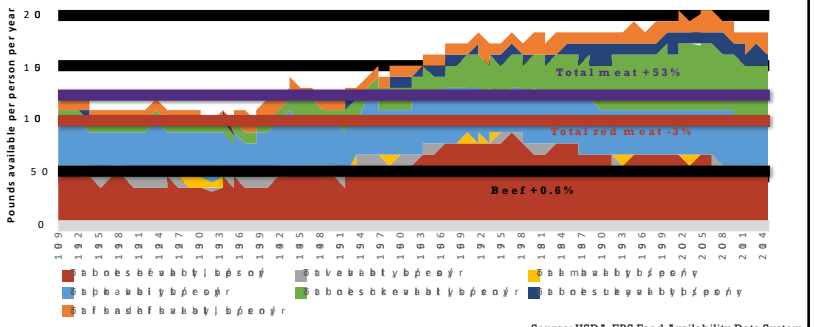
The analysis also revealed a huge variability between different ways of producing the same food. For example, beef cattle raised on deforested land result in 12 times more greenhouse gases and use 50 times more land than those grazing rich natural pasture. **But the comparison of beef with plant protein such as peas is stark, with even the lowest impact beef responsible for six times more greenhouse gases and 36 times more land.**

Agriculture + forestry in the United States is a net sink of carbon



Source: U.S. EPA GHG Inventory 1990 - 2016

Americans eat the same amount of beef as 1909, but 500% more chicken



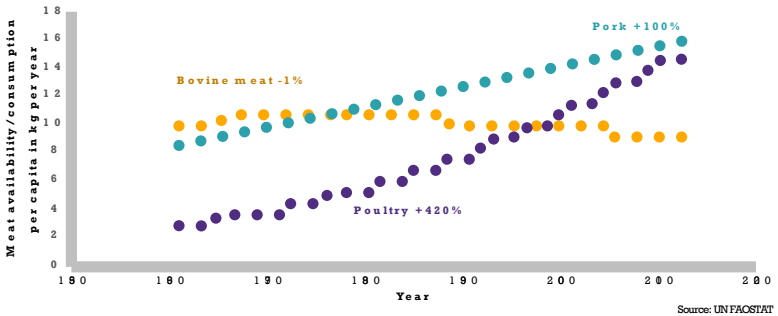
Source: USDA-ERS Food Availability Data System

Productivity is a key driver in improving sustainability

	1976	2017	2017 with 1976 productivity
	218 million	326 million	326 million
	128 million	94 million	129 million
	3.0 ounces/person/day	1.8 ounces/person/day	1.8 ounces/person/day

Sources: USDA-ERS, NASS, and Census Bureau

Long-term trends do not suggest a large rise in global per capita beef consumption

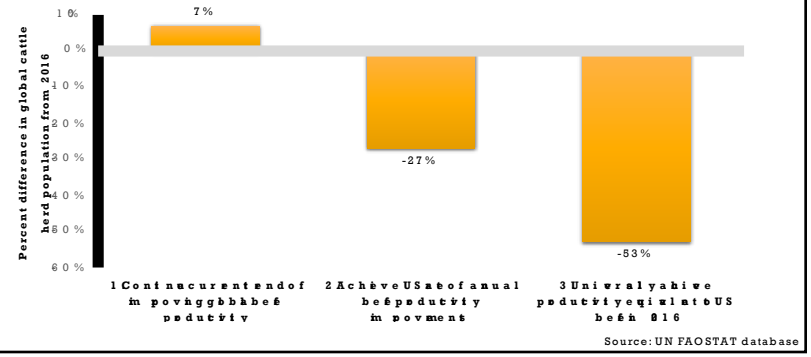


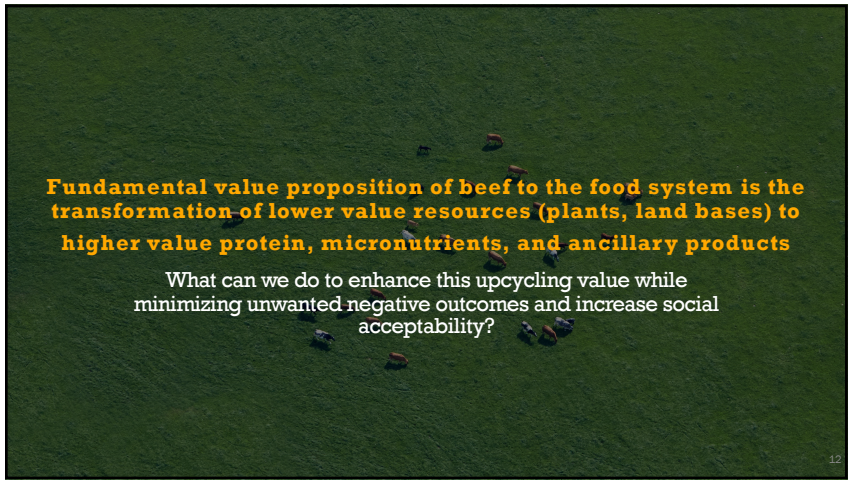
Global farm animal and human population trends

	1961	2016	%change
Cattle, beef and dairy	942,175,069	1,474,887,717	57%
Buffalo	88,321,807	199,280,228	126%
Goats	348,726,793	1,002,810,368	188%
Sheep	994,268,736	1,173,353,790	18%
Total ruminants	2,373,492,405	3,850,332,103	62%
Chickens	3,906,690,000	22,705,417,000	481%
Turkeys	204,241,000	468,745,000	130%
Pigs	406,180,364	981,797,339	142%
Horses	62,161,208	59,048,194	-5%
Humans	3,090,305,279	7,466,964,280	142%

Source: UN FAOSTAT database

Change in global cattle herd with different productivity scenarios, assuming 9.8 billion persons population and flat per capita beef consumption in 2050

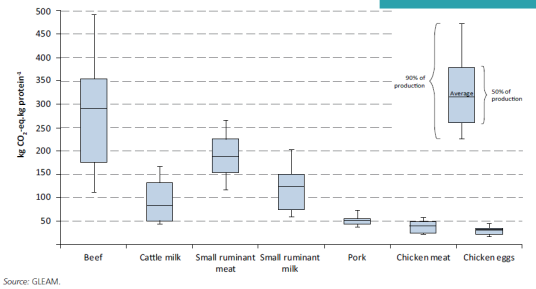




Carbon footprints across animal agriculture

FIGURE 3. Global emission intensities by commodity

Note: Functional unit = kg of protein

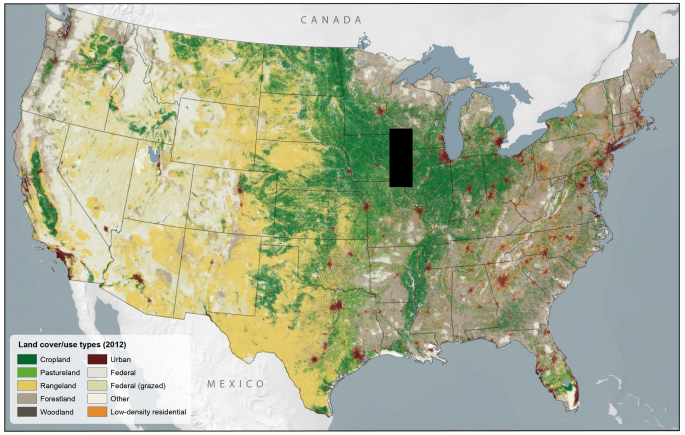


Source: GLEAM.

Source: UN FAO, 2013. Tackling Climate Change through Livestock

	Pounds of feed per pound of product, live weight	Pounds of human-edible feed (e.g., corn, soy) per pound of product, live weight	Net protein contribution** (values > 1 mean more high quality protein generated than used)
U.S. average grain-finished beef *(full life cycle)** 	13.8	1.6	2.53
Broiler chicken *(Avigen ROSS 308 @40 days)* 	1.6	1.4	0.85
Pork *(Wilkinson, 2011)* 	2.5	2.0	0.70

*From Rotz et al., unpublished data under review **Using DIAAS from Ertl et al., 2016



15

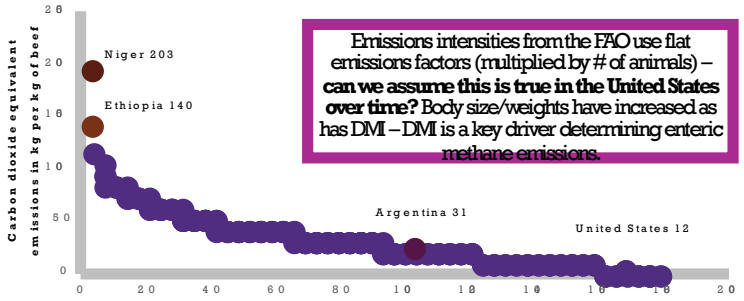
Source: https://www.farmland.org/initiatives/farms-under-threat

The United States has the most environmentally-efficient beef production system in the world

But, what opportunities are we leaving on the table?

Source: US Beef Sustainability Assessment

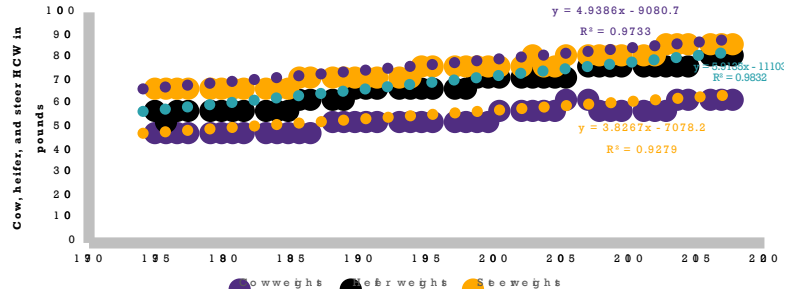
Beef emissions intensities, 2014



Emissions intensities from the FAO use flat emissions factors (multiplied by # of animals) – **can we assume this is true in the United States over time?** Body size/weights have increased as has DMI – DMI is a key driver determining enteric methane emissions.

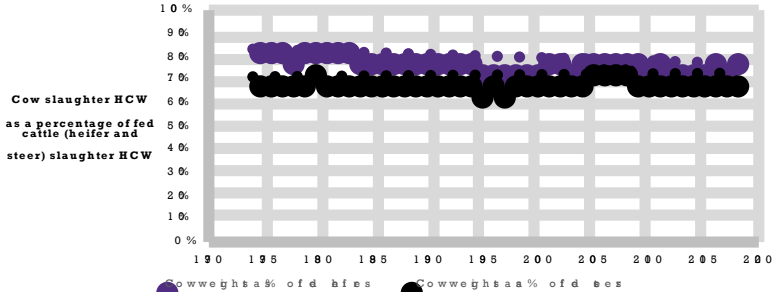
Source: UN FAOSTAT database

Cow weights and fed cattle weights have increased linearly over time



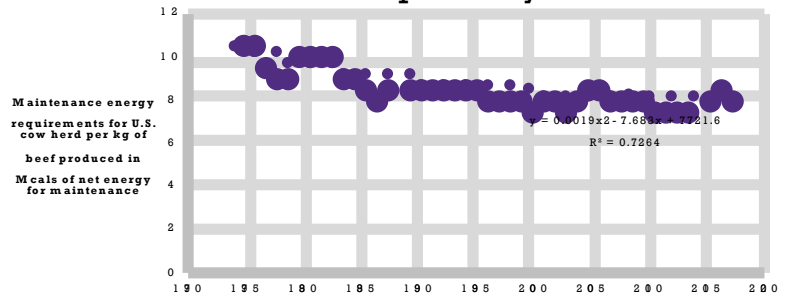
Source: USDA - NASS

Cow weights as a percent of finished cattle slaughter weights have remained relatively consistent over time



Source: USDA - NASS

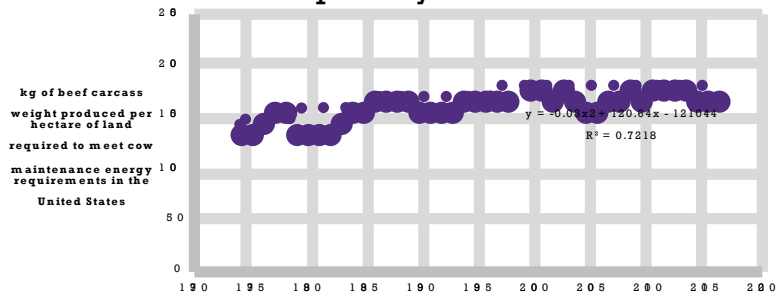
Cow maintenance energy requirements per kg of beef produced in the U.S. have remained flat over the past 20 years



*Assumptions: NEm, Mcals = 0.077*MBW; 50% dressing % for cows;*

Source: USDA - NASS

Beef production for every hectare of land required to meet cow maintenance energy requirements for cows has remained flat for past 20 years



*Assumptions: NEm, Mcals = 0.077*MBW; 50% dressing % for cows; 0.9 Mcal NEm pasture/range density per kg DM; 680 kg DM/acre average for grazing lands*

Source: USDA - NASS

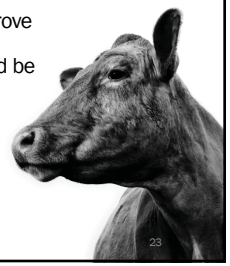
What are we leaving on the table?

- We have made progress towards being a more sustainable industry, but opportunities remain
- What can we take from our monogastric friends?
  - Focus on both components of the feed-to-gain ratio – we're likely nowhere close to the biological efficiency potential of cattle
  - Focus on increasing red meat yield, decrease whole industry maintenance energy costs, avoid producing "extra fat"
- How can we take **further advantage of cattle being ruminants?**
  - If our feed efficiency metric is lbs. of DM feed/lb. of product produced, beef (and other ruminant meats) will lose every time to monogastric species
  - We should enhance human edible-to-human edible protein conversion efficiency
    - Can we add more total gain on forage cost-effectively and still produce a superior eating experience product? Can we get more gain out of every lb. of human edible feed cattle eat?

22

What are leaving on the table?

- Beef's sluggishness in responding to sustainability concerns has created a "sustainability" marketing opportunity for "alternative proteins"
  - Current public and private efforts to benchmark and improve sustainability are great, but we are late to the game
  - Tough to quantify a tangible effect on demand, but should be taken seriously



23

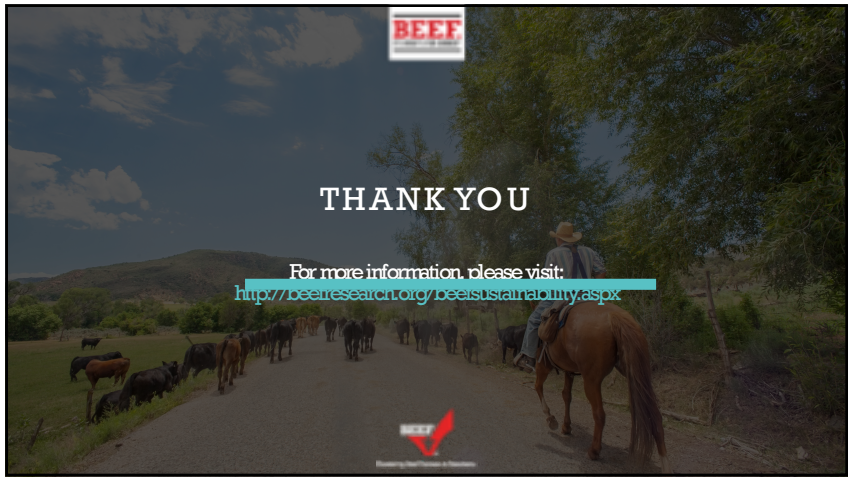
Food for thought

The beef community uses a technology that produces high-quality protein from solar energy locked within human inedible plants. The technology produces a natural organic fertilizer, and is mobile without using fossil fuels. The technology self-replicates.

The technology is…
Cattle.

Beef is the original plant-based meat.

Photo Courtesy of Oklahoma State University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