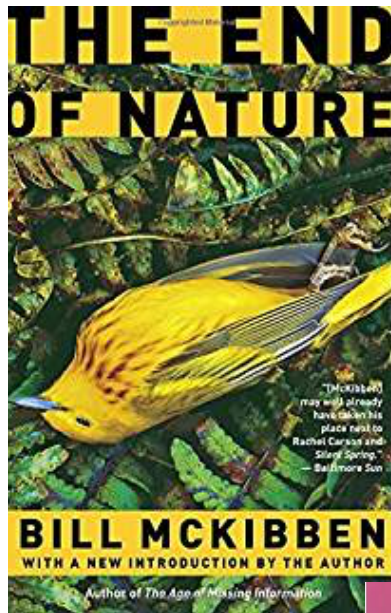


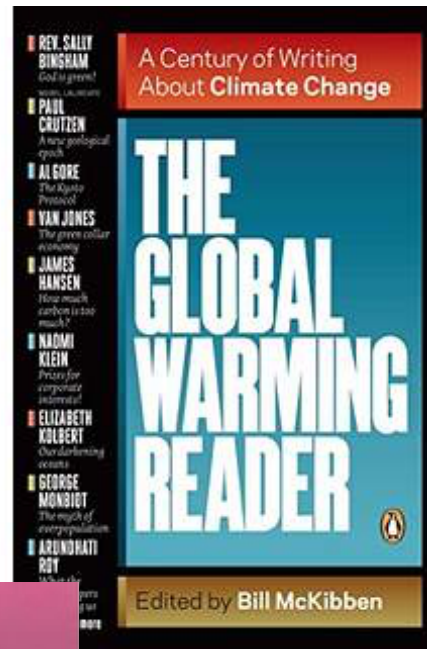
Population & Consumption

Bill McKibben

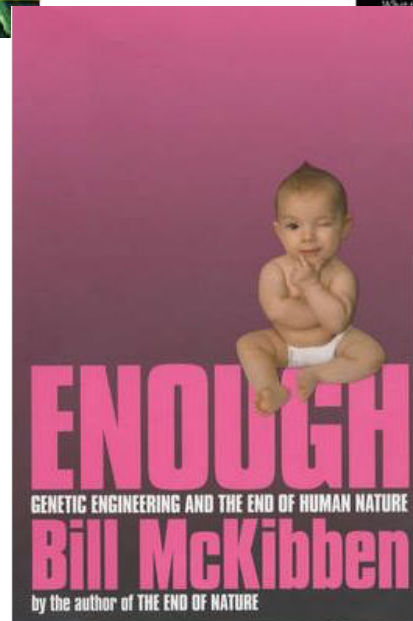


1989

2004



2012



Bill McKibben
(born 1960)

Population and Consumption

How *many* are we?

How *big* are we?

Population and Consumption

How many are we?

(about 7.5 billion)

How big are we?

As hunter-gatherers: 2500 kcal/day

As modern humans: 31,000 kcal/day

As U.S. citizens: 185,000 kcal/day

Population and Consumption

How many are we?

(about 7.5 billion, and growing...)

How big are we?

As hunter-gatherers: 2500 kcal/day

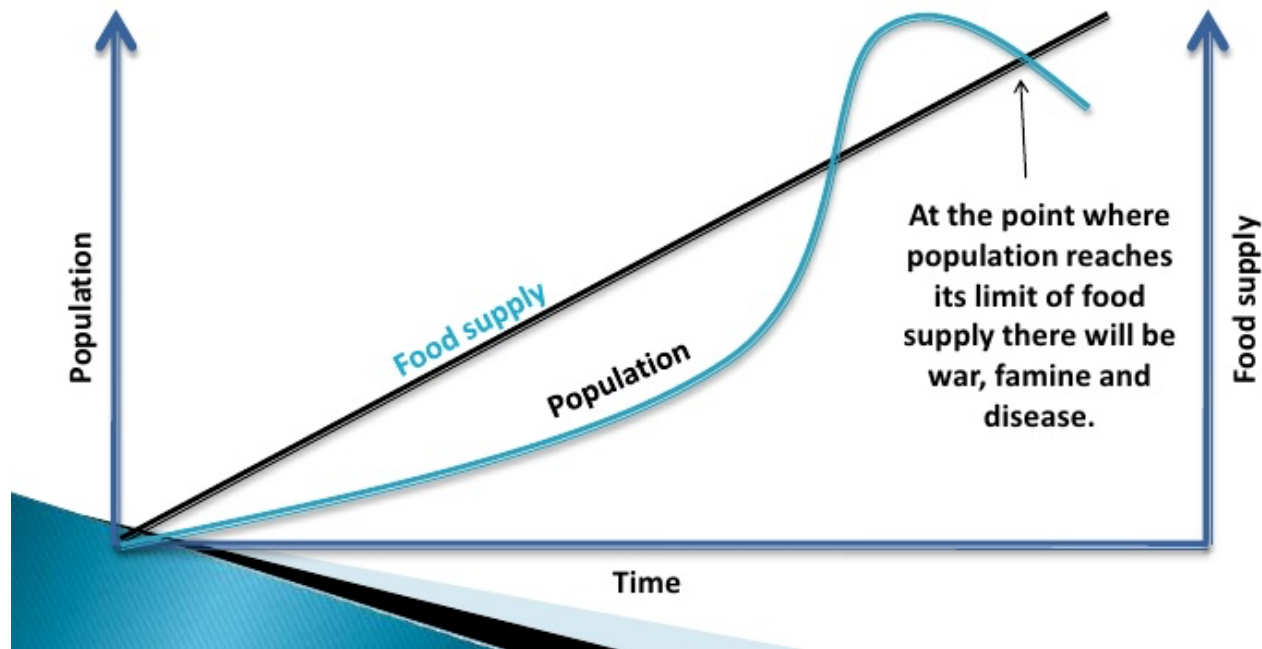
As modern humans: 31,000 kcal/day

As U.S. citizens: 185,000 kcal/day

How big is the earth?

Is There a Problem?

Malthusians: YES!



Thomas Malthus
(1766-1834)

Essay on the Principle of Population (1798)

Is There a Problem?

Cornucopians: Nah!

The Green Revolution (1960s)

Ester Boserup: The more people, the more resources!

Julian Simon: We will always find substitutes for depleted resources!



Norman Borlaug
(1914-2009)
Nobel Peace Prize 1970

But surely there are limits...

Biologist **Peter Vitousek** (1986): humans use 38.8% of the earth's "primary productivity."

Biologist **David Pimental** on our wasteful ways: one head of iceberg lettuce is 95% water and contains 50 kcal of energy. Yet we spend 400 kcal to grow the lettuce in California, and 1800 kcal to ship it to the east coast.

The largest world harvest of grain was in 1984.



Earth2

The regularities that we have learned and relied upon during the past 10,000 years of agricultural practice are disappearing.

That was **Earth1**.

We are depleting **resources**.

We are depleting **sinks**.

Local Pollution vs Global Pollution

Population and Pollution

In 2004:

U.S. population grew by **3 million**.

Indian population grew by **16 million**.

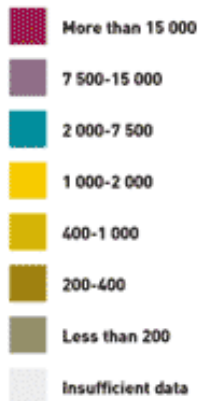
The U.S. added **15.7 million** tons of CO₂ to the atmosphere, while India added only **4.7 million** tons.

(Per capita pollution in the U.S. is 17x that in India.)

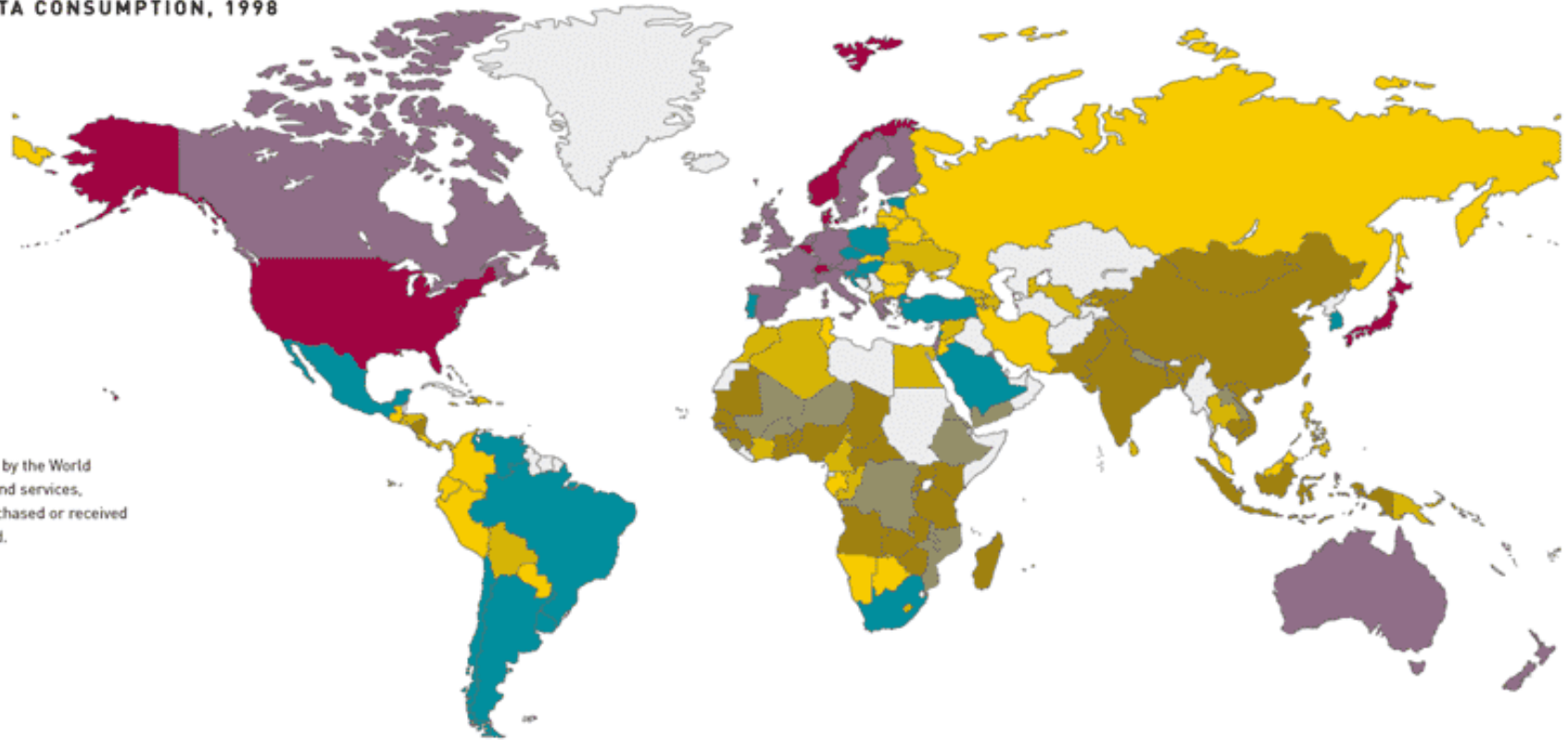
(With less than 5% of global population, the U.S. burns 1/4th of the world's fossil fuel resources.)

Population and Pollution

PRIVATE PER-CAPITA CONSUMPTION, 1998
Expressed as US\$



Private consumption, measured by the World Bank, is the value of all goods and services, including durable products, purchased or received by households as income in kind.



Source: World Bank, UNPO.

Source: AAAS Atlas of Population & Environment [http://atlas.aaas.org]

The Right to Pollute?

Do we have the **right to pollute** as much as we want?

Is there a **limit** to this right?

If so, **how much** is too much?

Property Rights

Property Rights

- (1) **use**: the right to use the property (and to consume the renewables...).
- (2) **exclusion**: the right to prevent others from trespassing on your land or otherwise making use of your property.
- (3) **transfer/alienation**: the right to transfer the property to others.
- (4) **compensation**: the right to reparation for damage or use by others.

[Renters have rights 1+2, but not 3+4, to the rented property.]

Moral Rights

A right is always a right *to something* and *against someone*.

“To what do I have the right?”

positive: an action / **negative**: an omission

“Against whom do I have the right?”

in personam: against an individual or group / **in rem**: against everyone

Rights	Positive	Negative	
		active	passive
in personam	Rights of Contract Rights of Reparation		
in rem	Rights of Beneficence	Rights of Liberty	Rights of Security

Waiving Rights and Forfeiting Rights

Classifying Property Rights

- (1) **use**: the right to use the property.
- (2) **exclusion**: the right to prevent others from trespassing on your land or otherwise making use of your property.
- (3) **transfer/alienation**: the right to transfer the property to others.
- (4) **compensation**: the right to reparation for damage or use by others.

Rights	Positive	Negative	
		active	passive
in personam	Rights of Contract Rights of Reparation		
in rem	Rights of Beneficence	Rights of Liberty	Rights of Security

What do you think?

Are there, or should there be, limits to these property rights?

- (1) **use**: the right to use the property.
- (2) **exclusion**: the right to prevent others from “touching” your property.
- (3) **transfer/alienation**: the right to transfer the property to others.
- (4) **compensation**: the right to reparation for damage or use by others.

Property Rights

- (1) **use**: the right to use the property.
- (2) **exclusion**: the right to prevent others from trespassing on your land or making use of your property.
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Some Limits to Use

The Harm Principle

Nuisance Law: cease or compensation for loss of use

High social value (of the cause of the nuisance): defendant pays **reparations** to the plaintiff.

Low social value: defendant must **cease and desist**.

The Harm Principle

“The sole end for which mankind are warranted, individually or collectively, in interfering with the liberty of action of any of their number, is self-protection.” [John Stuart Mill, *On Liberty* (1859), Ch. 1, §9]

This principle holds that liberty (autonomy in the sense of “liberty of action”) is a fundamental good to be compromised only with good reason; coercion is justified only when it prevents an evil greater than the coercion itself.

The private harm principle: justifies the restriction of one’s liberty to prevent injury to other specific individuals.

The public harm principle: justifies the restriction of one’s liberty to prevent injury to institutional practices or regulatory systems that are in the public interest.

Limits on Property Use?



I own this bow and these arrows. I like to shoot them in the air.
Do I have the right to shoot them where I please?

Limits on Property Use?



Smith built this coal-powered plant to generate electricity in his backyard to run his widescreen TV. Is that OK?

Limits on Property Use?



Smith also sells Jones some electricity for his hog barn, which he built in *his* backyard. The manure washes into the river. Is that OK?

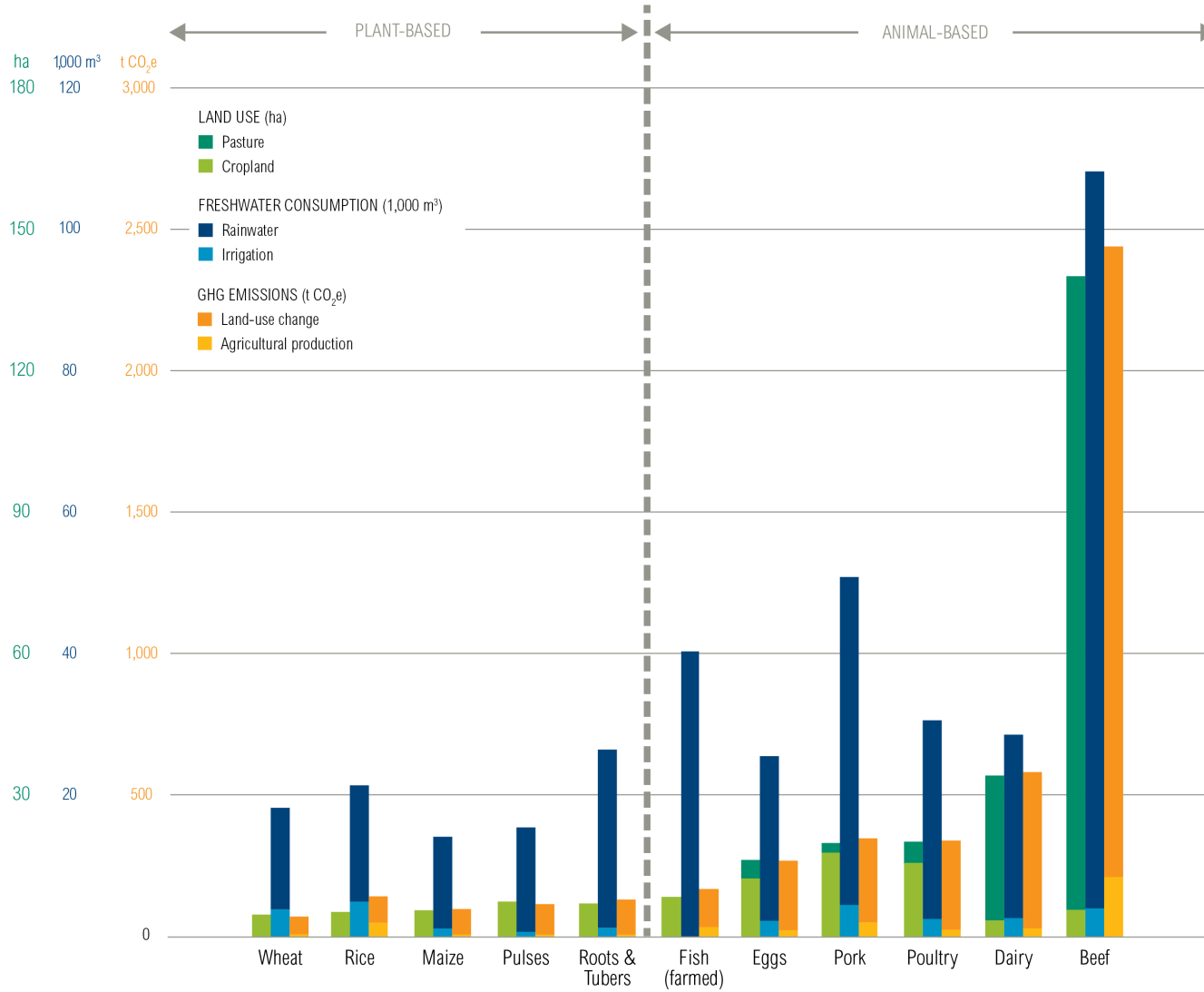
Limits on Property Use?



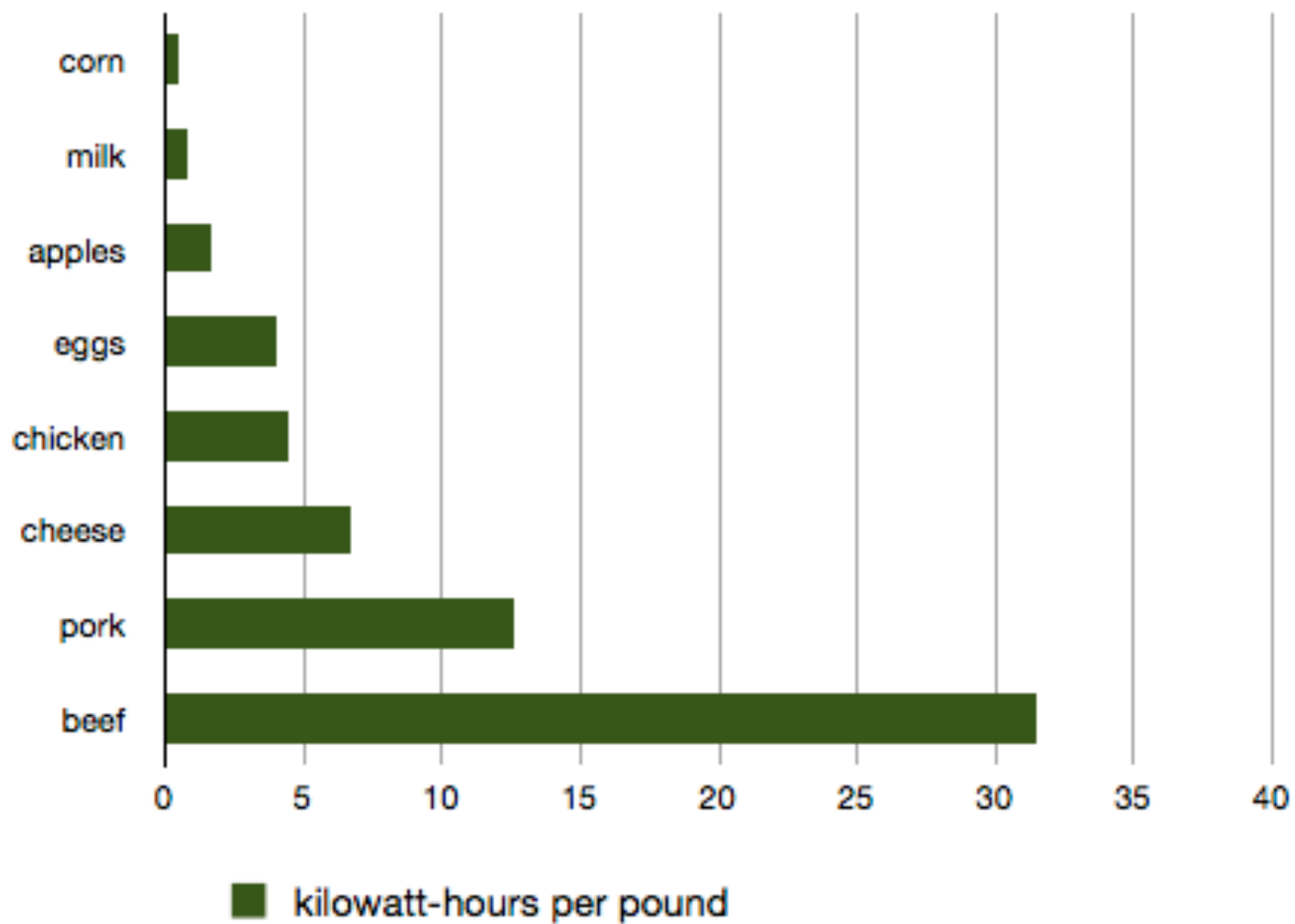
Miller sells tenderloins from Jones's hog operation, and powers his restaurant with electricity from Smith. Is that OK?

Animal-Based Foods Are More Resource-Intensive than Plant-Based Foods

PER TON PROTEIN CONSUMED



Energy Required to Produce one Pound



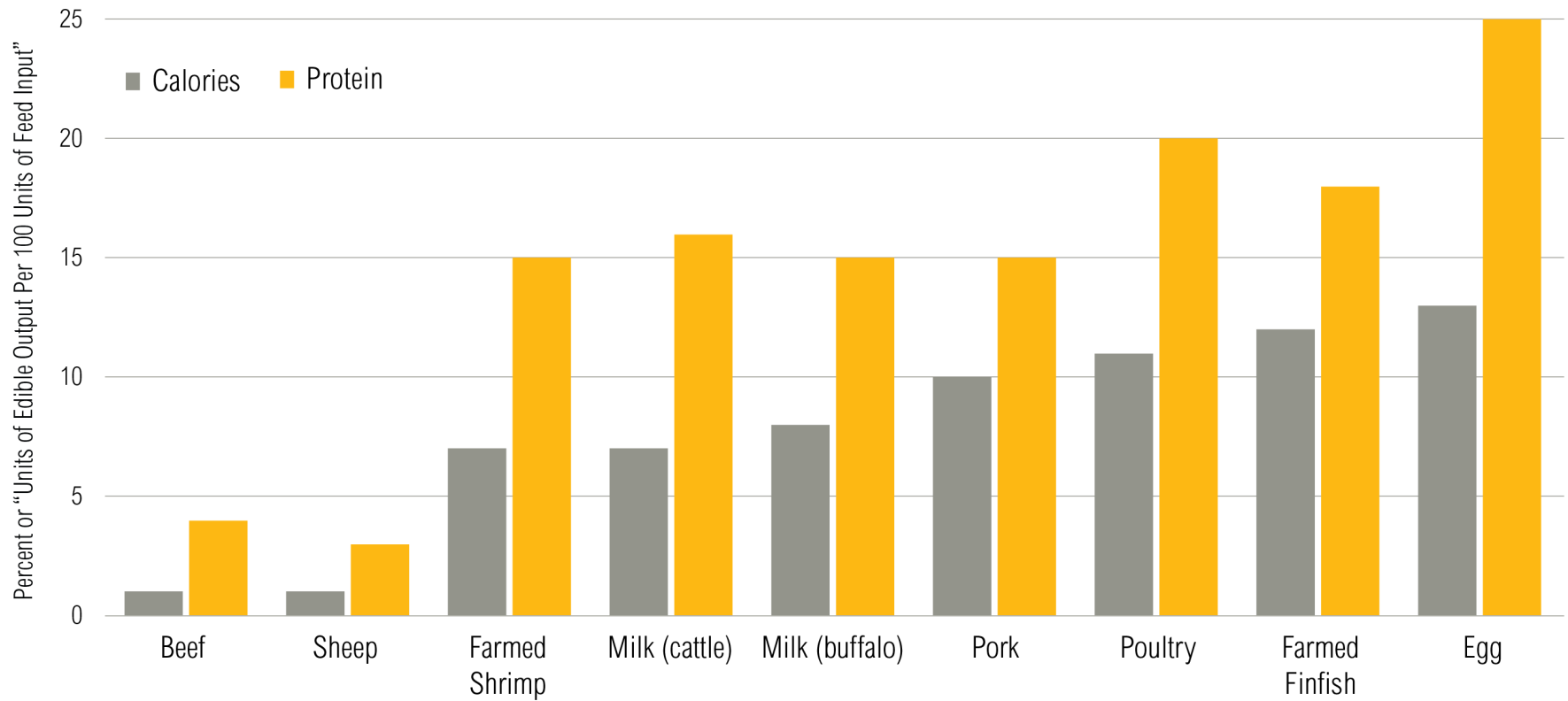
Protein Scorecard

	FOOD	IMPACT (GHG emissions per gram of protein)	COST (Retail price per gram of protein)
LOW	Wheat		\$
	Corn		\$
	Beans, chickpeas, lentils		\$
	Rice		\$
	Fish		\$\$\$
	Soy		\$
	Nuts		\$\$\$
	Eggs		\$\$
MEDIUM	Poultry		\$\$
	Pork		\$\$
	Dairy (milk, cheese)		\$\$
HIGH	Beef		\$\$\$
	Lamb & goat		\$\$\$

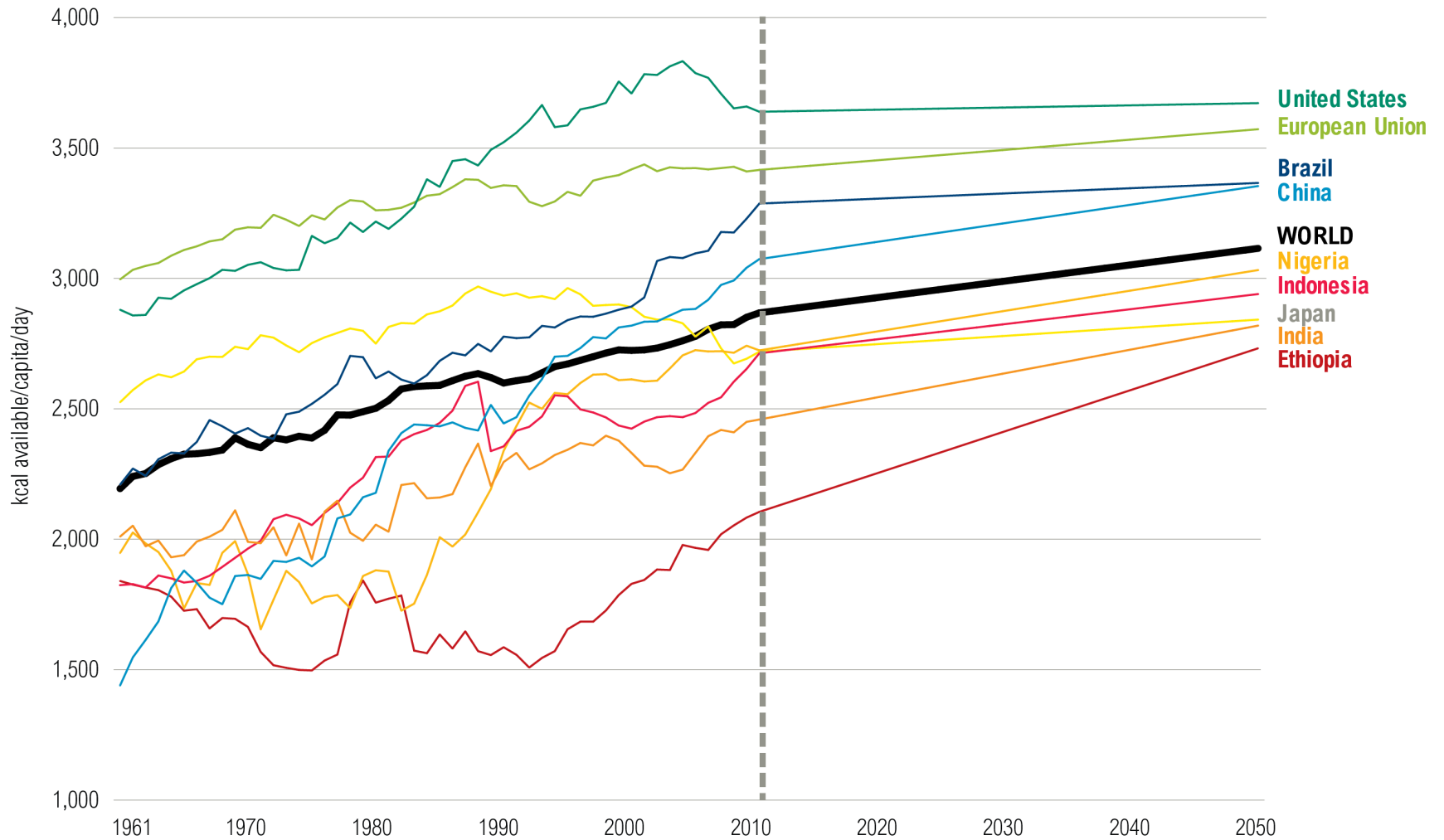
Lighter shade shows emissions from agricultural production, darker shade shows emissions from land-use change.

Sources: GlobAgri-WRR model developed by CIRAD, Princeton University, INRA, and WRI (GHG data); USDA and BLS (2016) (US retail price data).

Beef Is One of the Most Inefficient Sources of Calories and Protein



People Are Consuming More Calories



People Are Consuming More Animal-Based Protein

