Climate Mitigation Opportunities in Alternative Proteins

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Animals are fundamentally inefficient protein producers

9 ENERGY CALORIES

= **1** FOOD CALORIE

11% CONVERTED

25-30 ENERGY CALORIES

= **1** FOOD CALORIE

3-4% CONVERTED

Implications: lower agricultural inputs across the board (fertilizer, water, etc.) and more judicious use of resources, plus less impact on environment (nutrient runoff, etc.)

Cycling calories through animals is equivalent to >90% food waste in production.

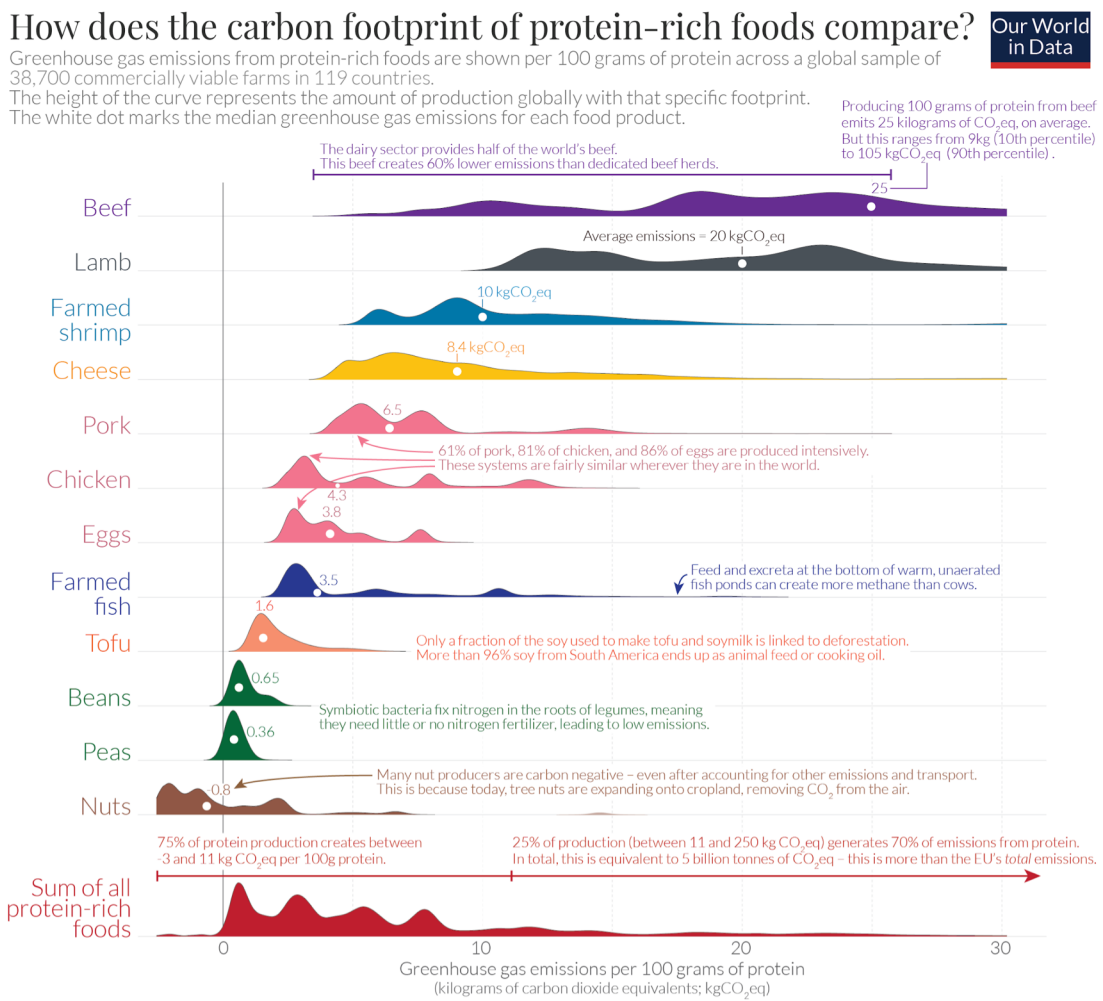
The climate implications are profound

Even the *lowest-carbon* forms of animal protein cause higher GHG emissions than even the *most carbon-intensive* plant proteins.

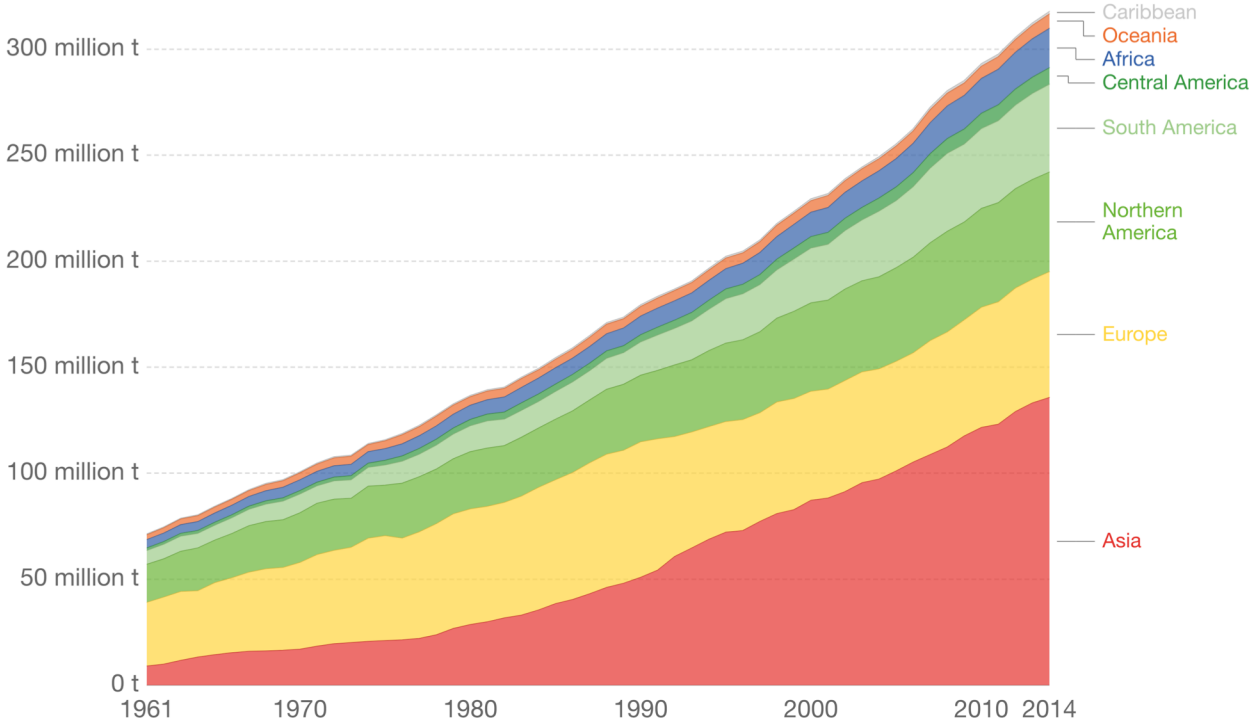
Figure at right is *per 100g protein.*

Plant-based meat offers 30-90% reduction in GHG.

Source: Our World in Data; Plant-based Meat for a Growing World factsheet, Growing Meat Sustainably factsheet



Yet despite decades of growing awareness, global meat demand shows no sign of slowing



Source: Our World in Data; FAO statistics

Alternative proteins present a tractable, viable solution

PLANT-BASED

Photo courtesy of Beyond Meat

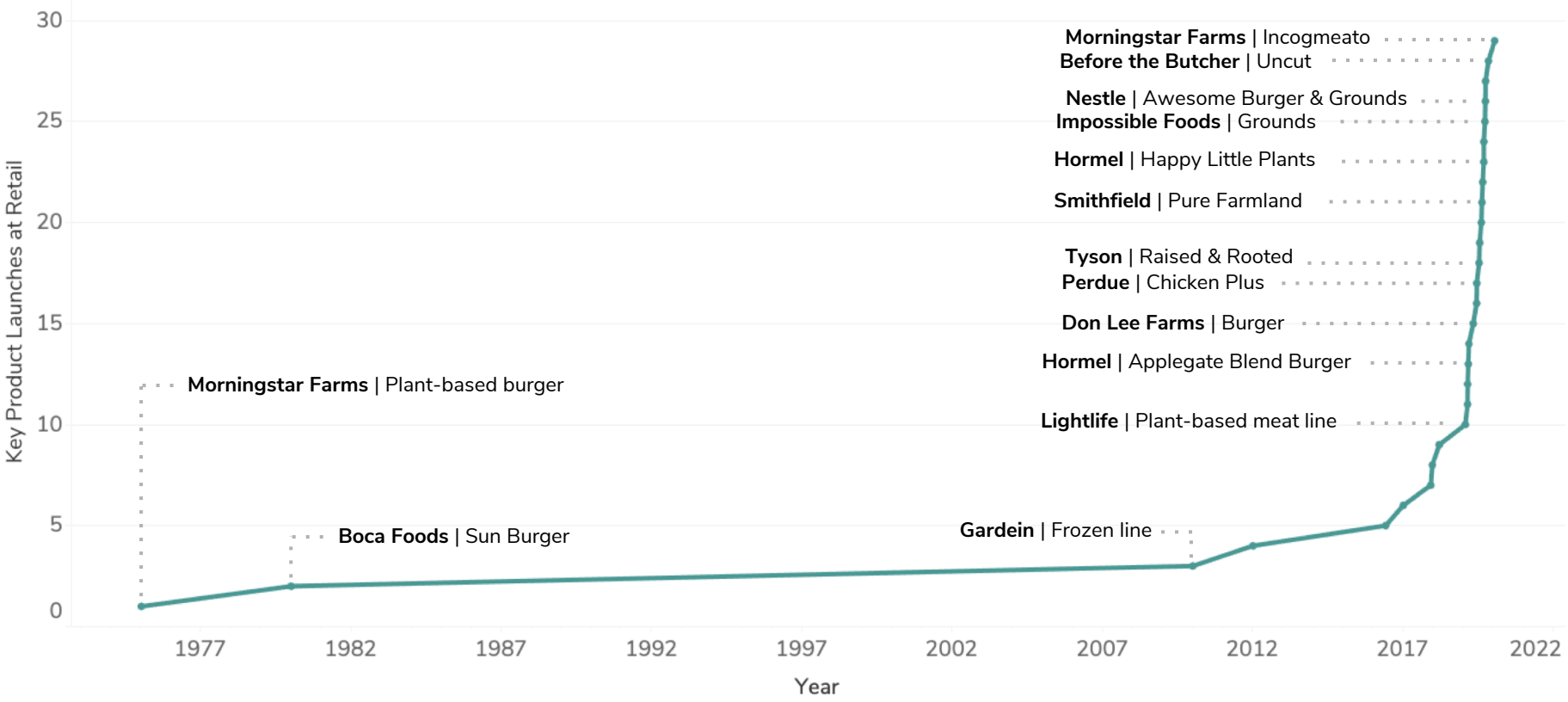
FERMENTATION

Photo courtesy of Ecovative Design: Atlast Food Co.

CULTIVATED

Photo courtesy of Memphis Meats

Alternative proteins have hit an inflection point



This is a global phenomenon

China is leading the meatless revolution with its vegetarian ‘mock meat’

Meat-loving Brazil joins the search for plant-based alternatives

Europe’s Vegan Meat Sales Increased 451% in 4 Years

Fake meat boom gets real in Korea as major players fight for a stake

One Woman's Quest To Help Africa Leapfrog To Plant-Based Foods

Plant power: More urban Thais and Indonesians consuming non-meat sources of protein

How can we accelerate this trend? What are the bottlenecks?

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Alternative proteins are handicapped not by consumer demand but by R&D resources and manufacturing capacity

Key market challenges that federal efforts can address

1) **Supply chain constraints**

Alternative proteins will require novel crop development, innovation in ingredient fractionation and processing methods, and new predictive tools for adaptability and robustness to shifting availability of — and demands for — various biomass fractions within food and agriculture and within the broader bioeconomy.

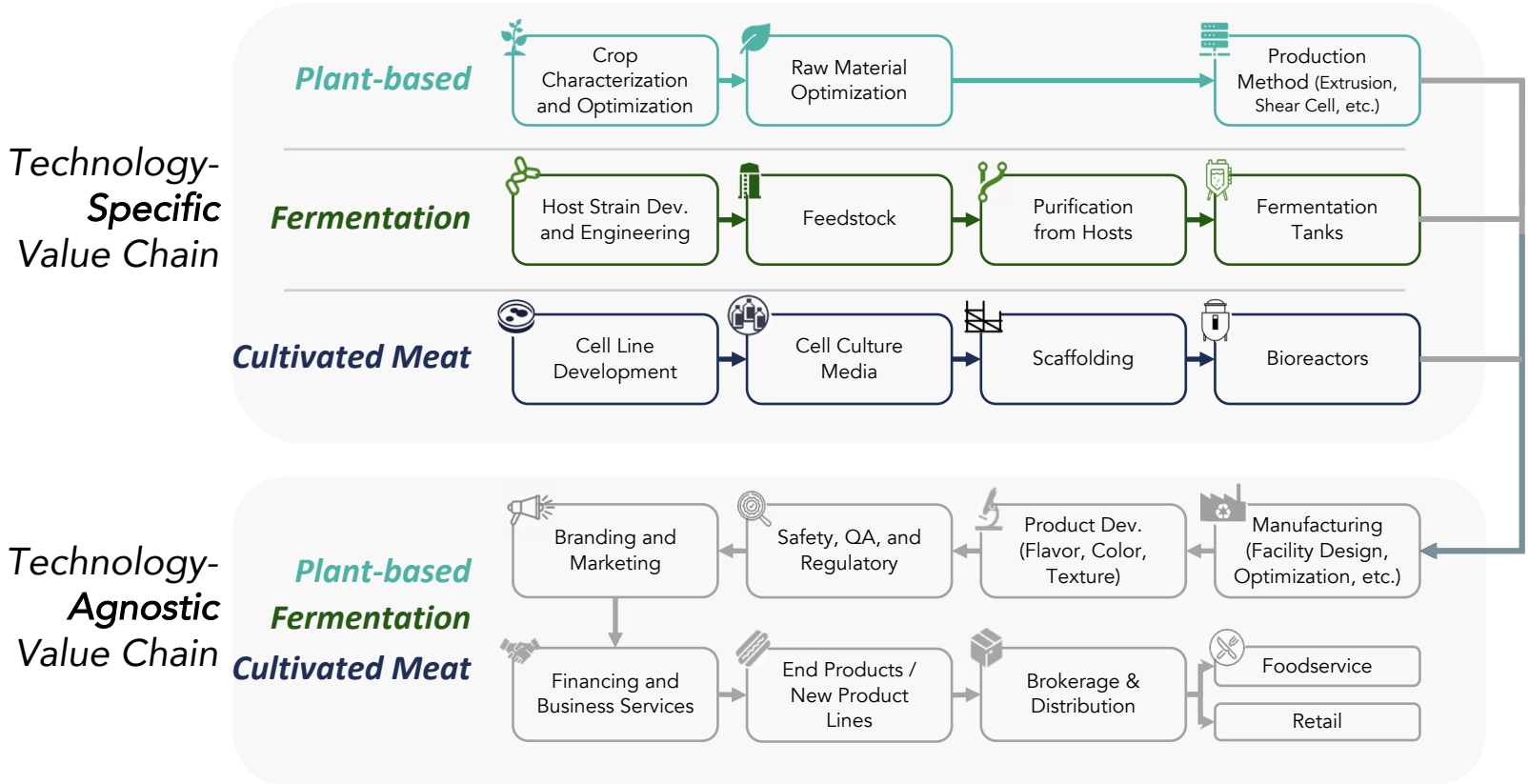
2) **Production capacity limitations**

Production capacity is one of the most significant constraints facing the alternative protein industry. Producers lack the right types and quantities of ingredients and other inputs, and production equipment is highly specialized and requires uncommon operational expertise.

3) **Information gaps**

Because the alternative protein sector is still nascent, gaps in fundamental research areas and poor market information lead to redundant efforts and high barriers to entry.

Opportunities to improve upon sustainability and scalability along the entire value chain



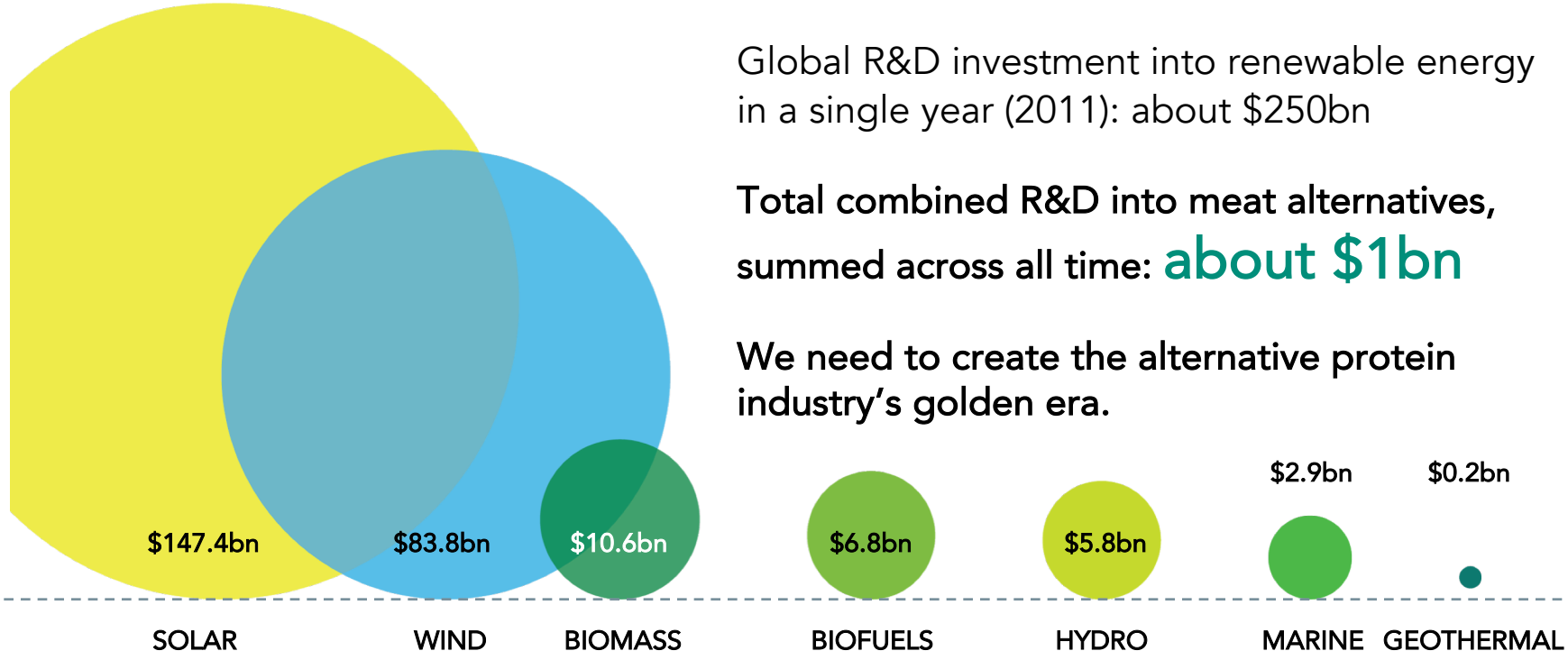
Source: GFI analysis; *value chain design inspired by Wild Type's Food for Thought Medium post.*

Interdisciplinary research centers and manufacturing innovation institutes are mission-critical

An interagency initiative to prioritize alternative protein-relevant research across many technical domains and to launch a manufacturing innovation institute could dramatically accelerate this sector.

NSF USDA NIFA DARPA arpa·e CHANGING WHAT'S POSSIBLE

Alternative protein development will benefit from increased investment (both public and private)



Global R&D investment into renewable energy in a single year (2011): about $250bn

Total combined R&D into meat alternatives, summed across all time: about $1bn

We need to create the alternative protein industry's golden era.

Source: Global Trends in Renewable Energy 2012

GFI's role in supporting the innovation ecosystem

GFI is a 501(c)(3)nonprofit working to create a sustainable, healthy, and just food system through three key areas of work:

Science and Technology

Bridging gaps in scientific research, funding, and talent across the alternative protein sector.

Corporate Engagement

Helping the food industry and investor communities put delicious, affordable alternative proteins on every menu and in every food retailer.

Policy

Advancing government investment in sustainable proteins as well as fair regulation and legislation.

GFI officially earned GuideStar's 2019 and 2020 Platinum Seal of Transparency—obtained by less than 1% of nonprofits—reflecting our commitment to maximum impact, efficiency, and inclusion.

Our international affiliates work as a force multiplier, bringing the expertise of our departments to the rest of the world.

United States
Brazil
India
Israel

Europe
Asia Pacific

100+ staff in 6 countries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