



Developments in Sustainable Proteins

Presentation for APPG Science & Technology Agriculture: 16th March 2022
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Agenda



Introduction to the Good Food Institute Europe & why we need sustainable proteins



Overview sustainable protein landscape, focus on plant-based meat



Research priorities with relevance to pulses & potential for UK leadership

The Good Food Institute

GFI is an international nonprofit organisation focused on accelerating the development of sustainable proteins.

We focus on three areas of work:



Science and Technology

We work with scientists to develop, fund and promote open-access research on plant-based and cultivated meat, eggs, dairy and seafood.



Policy

We advocate government investment in open-access sustainable protein R&D and infrastructure, as well as fair regulation and legislation.



Corporate Engagement

We engage with the food industry to make delicious and affordable alternative proteins available across the globe.

GFI is 100% funded by philanthropy.



United States
Brazil
India

Europe
Asia Pacific
Israel

140+ staff in 6 regions

Why sustainable proteins?

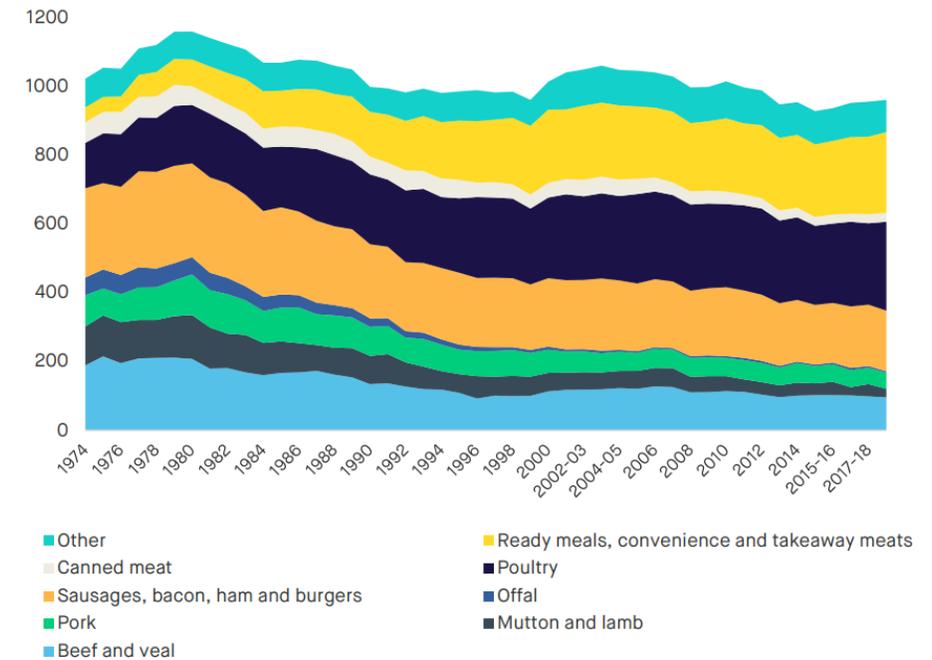
Two starting points

- 1) Animal agriculture is a serious contributor to the climate emergency, and other public health threats (AMR, zoonotic diseases).
- 2) Demand for meat is continuing to rise globally and in the UK, not reducing quickly enough to meet our climate targets.

To stay on track with our climate ambitions, demand for meat in the UK needs to reduce by 20% by 2030, and by 35% by 2050.
Climate Change Committee, June 2021

2021

Figure 1: Average weekly UK household purchases of meat products (g) since 1974, per person



Source: SMF analysis, Family Food Survey

GFI's theory of change

- Not only demand side, look at supply side too
- Provide people with the meat and dairy they want to eat, produced in vastly more sustainable ways.
- Studies consistently show that **taste, price and convenience** decide what most people eat.
- We're focussed on making these more sustainable options as **delicious, affordable and accessible** as conventional animal products.



The sustainable protein landscape

Plant-based



Photo courtesy of Beyond Meat

Fermentation

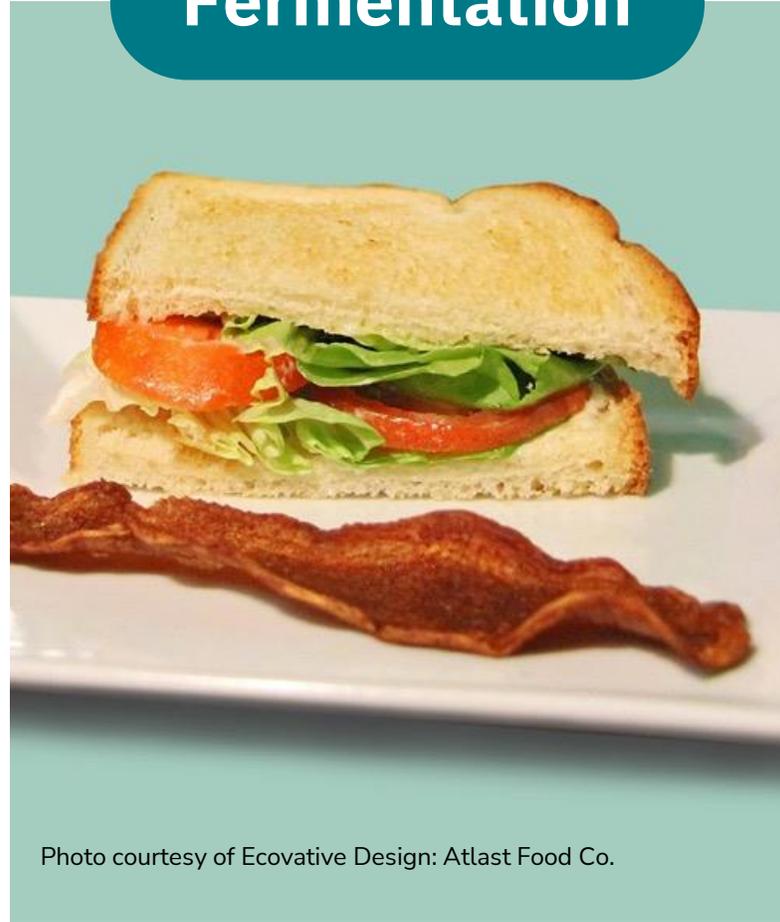


Photo courtesy of Ecovative Design: Atlast Food Co.

Cultivated

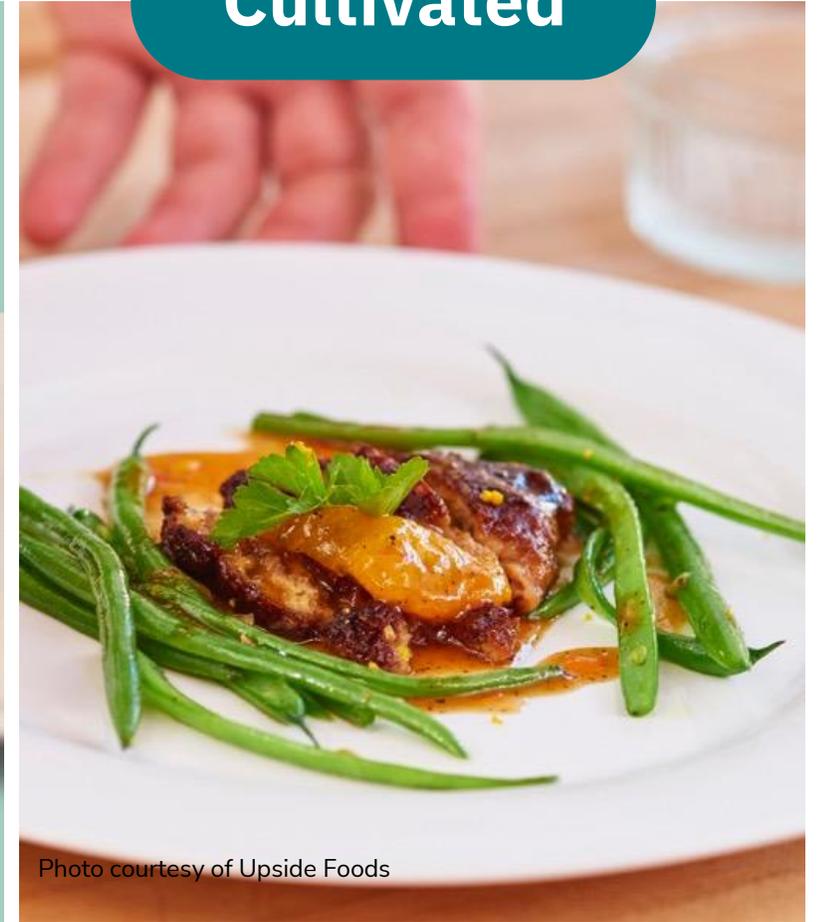


Photo courtesy of Upside Foods

The sustainable protein landscape

Plant-based



Photo courtesy of Beyond Meat



Photo courtesy of Ecovative Design: Atlast Food Co.

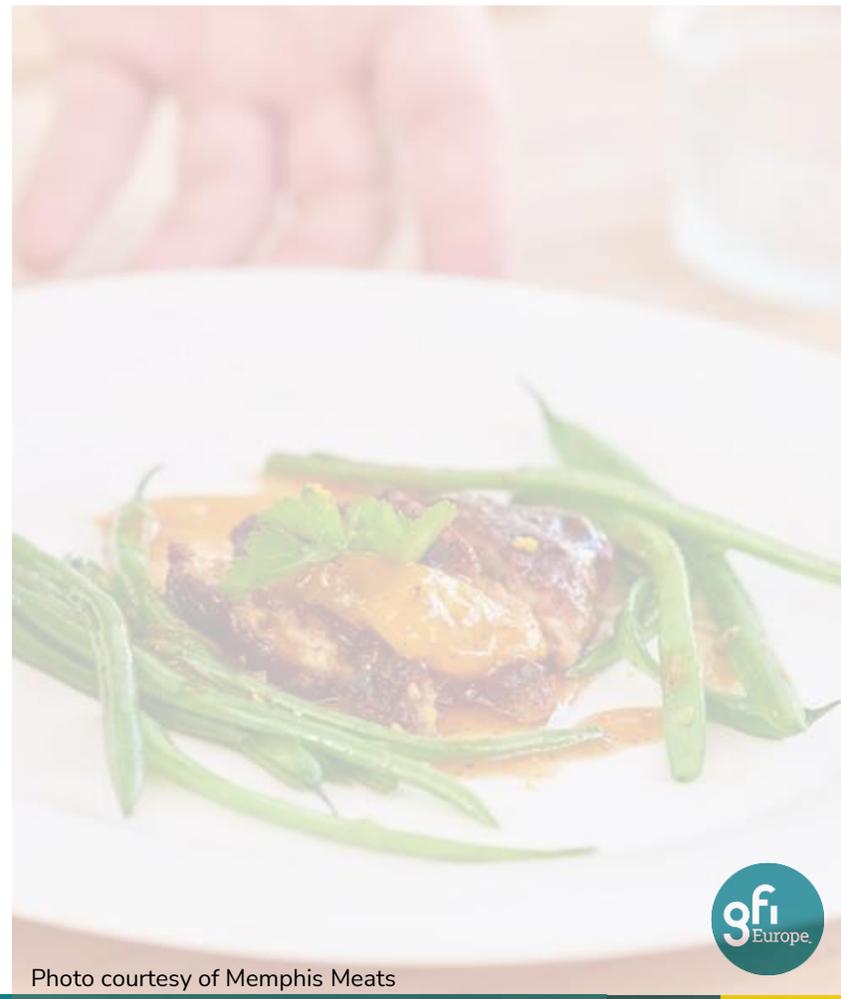
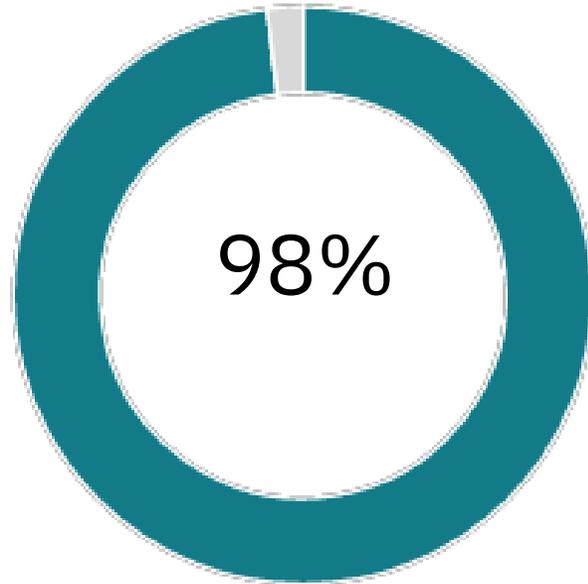


Photo courtesy of Memphis Meats

Meet Europe's new generation of plant-based meat

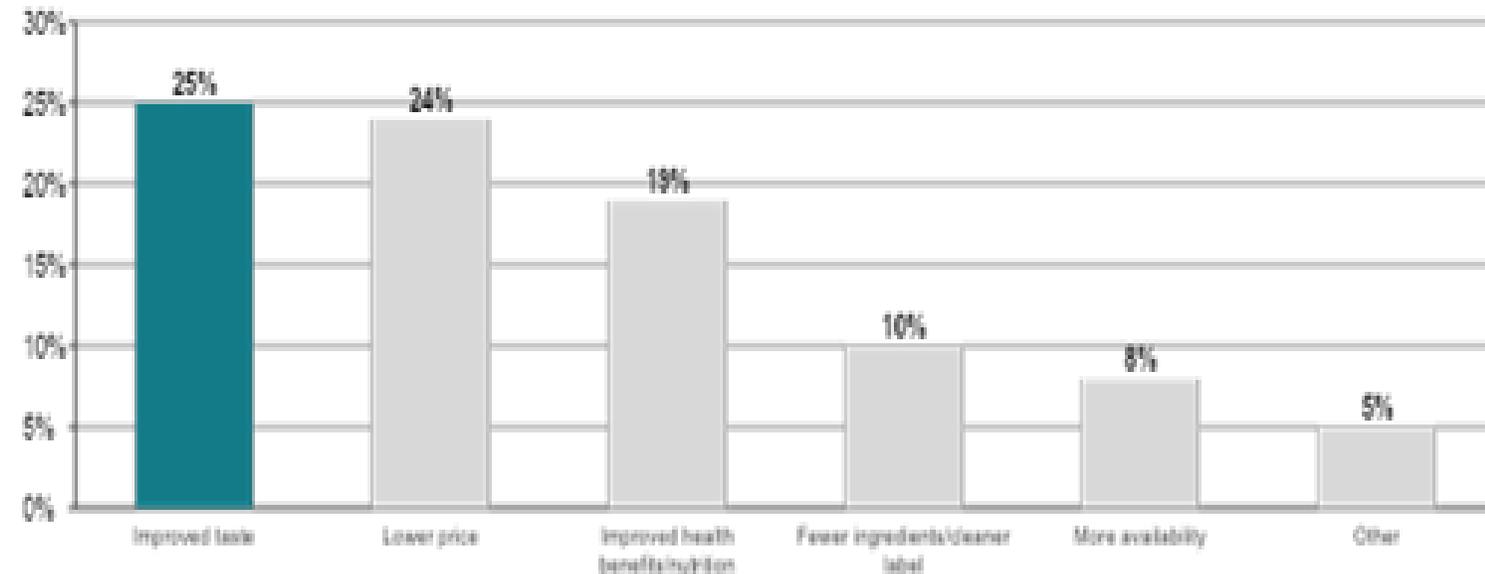


Plant-based meat purchasing is increasingly driven by omnivores, but improved taste and lower price are holding back broader uptake



Of plant-based meat buyers also purchase animal-based meat

European and US consumer responses to “What might convince you to eventually be interested in trying plant-based meat”
August 2020



Note: only those who have not tried plant-based meat were asked this question
Source: UBS, “UBS Evidence Lab inside: Insights from Q3 Survey of 3,000+ U.S. & European Consumers” (October 2020)

Source: Nielsen, “Meet the New ‘Meat’ Eater” (August 2019); Cultivate Insights, “Plant-Based Buyers and Their Favorite Brands” (September 2019)



R&D for improving plant-based meat highly neglected

- Sector has been mostly driven by private sector R&D
- Number of foundational gaps

Better raw materials



Protein fractionation



Plant fat profiles



Texturization methods



Research priorities with relevance to pulses

#1: Underexploration of crops for protein sources

- **Domination of plant-based meat by wheat and soy, but not necessarily for best reasons**

#2: Underexploration of traditional breeding focused on enhancing protein functionality

#3: Underexploration of processing methods for texturising pulse proteins

Protein source	Protein concentration	Nutrition	Allergenicity	Commercial stage	Flavor	Functionality	Cost	Global crop supply
Soy	●	●	●	●	●	●	●	●
Pea	●	●	●	●	●	●	●	●
Wheat	●	●	●	●	●	●	●	●
Mung bean	●	●	●	●	●	●	●	●
Chickpea	●	●	●	●	●	●	●	●
Lupin	●	●	●	●	●	●	—	●
Sunflower	●	●	●	●	●	●	●	●
Fava bean	●	●	●	●	●	●	●	●
Peanut	●	●	●	●	●	●	—	●
Rice	●	●	●	●	●	●	●	●

Legend	Protein concentration	PDCAAS*	Allergenicity	Commercial stage	Flavor	Functionality	Cost (/kg protein)	Global crop volume (MMT [†])
● Excellent	>30%	>0.08	Usually mild, low pop.	Commodity	Flavorless	Low conc. effect	<\$2	>100
● Good	20-30%	0.60-0.79	↓	Large	↓	↓	\$2-4	10-99
● OK	10-20%	0.40-0.59	↓	Small	Acceptable	↓	\$5-9	1-9
● Low	5-10%	0.20-0.39	↓	Start-up	↓	↓	\$10-19	0.1-0.9
● Poor	<5%	<0.20	Severe in sig. pop.	R&D	Objectionable	Water insoluble	>\$20	<0.1

*Protein digestibility corrected amino acid score
[†]Million metric tons

UK potential for leadership

- UK has scientific expertise in multiple relevant areas: eg. crop breeding, and industrial processing.
 - DIT identified [North East](#) as high potential area to develop plant-based meat
- But this expertise not yet leveraged towards plant-based meat
 - Underfunding to date (only £550,000 UKRI funding in last ~15 years towards academic research to improve functionality of plant-based meat)
 - **Earmark R&D funds for developing functionality of plant-based meat to unlock some of this potential**

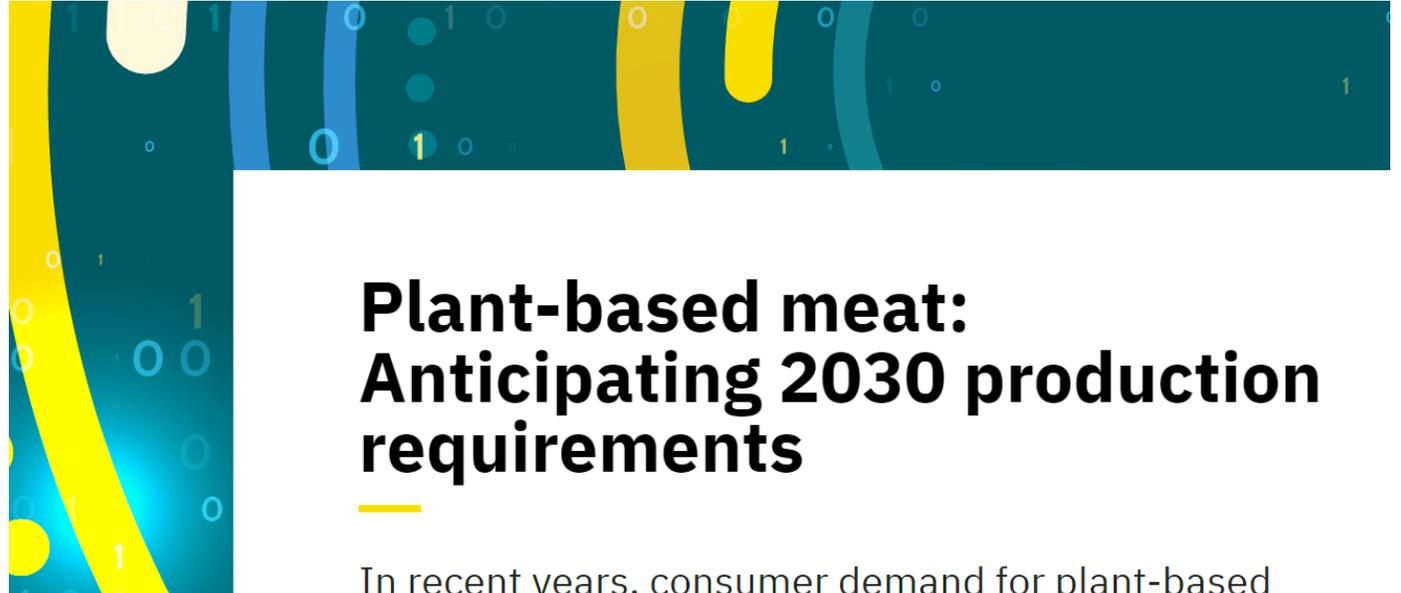




Appendix

Cross-cutting priority: scaling up supply chains

- Plant-based meat projected to make up **6%** of global meat market by **2030**.
- Would require: 5-10x more production capacity than we currently have
- Eg. 10x projected global supply of pea protein
- Supply chain scale up:
 - More, diverse crops
 - Scaling up existing infrastructure (eg. extruders)
 - Repurposing other infrastructure
 - Access to more “patient” capital (ie. not just venture capital)



Plant-based meat: Anticipating 2030 production requirements

In recent years, consumer demand for plant-based meat has often outpaced the industry’s supply chain capabilities. This scenario-based analysis outlines expected ingredient volume and manufacturing facility needs for the plant-based meat industry to identify and mitigate future production bottlenecks.

