



Alternative Protein: Unlocking Novel Technologies

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BRIDGE2FOOD
EUROPE





Introduction



Alternative protein – opportunities & challenges



Product innovation & emerging technologies



Hybrid alternative protein



Summary





- Centre for Food System Research
- Centre for Society, Environment & Development
- Centre for Sustainable Agriculture & Biodiversity
- **Medway Food Innovation Centre**



- Associate Professor, University of Greenwich (2020 -)
 - Research group lead, Food Processing & Innovation
 - Head, Medway Food Innovation Centre (<https://mfic.gre.ac.uk>)
 - PI, Bezos Centre for Sustainable Protein
- Science & Technology Manager, Unilever (2011-2020)

Product Development Kitchen



Food Processing & Analysis Laboratory



Algae Biotechnology



Plant-based Food Accelerator



Alternative Proteins: Opportunities and Challenges

Types



Plant & Seaweed



Fermented



Cultivated



Novel

Opportunities



Meat



Dairy



Egg



Seafood



Ingredients

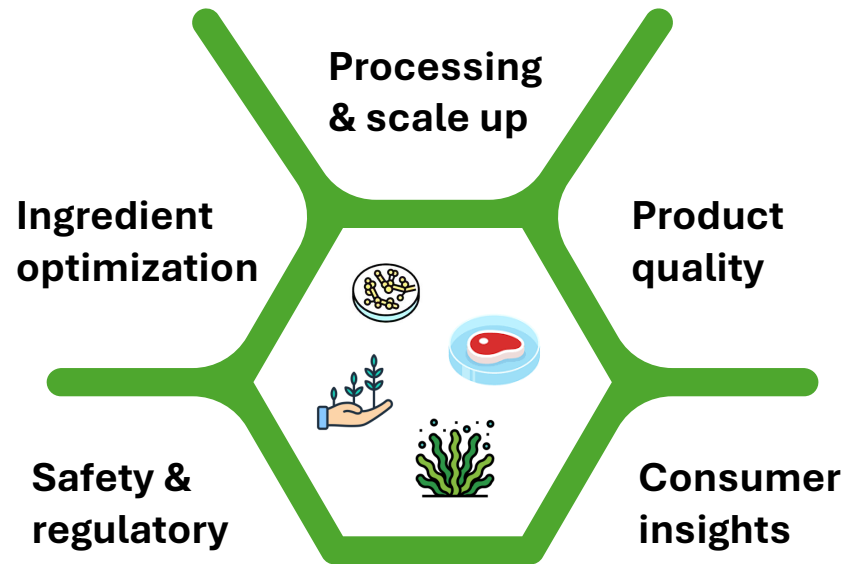
Challenges











- Total funding: \$18.6 billion since 2016
- In 2024: \$1.1 billion; Q1 2025: \$235 million



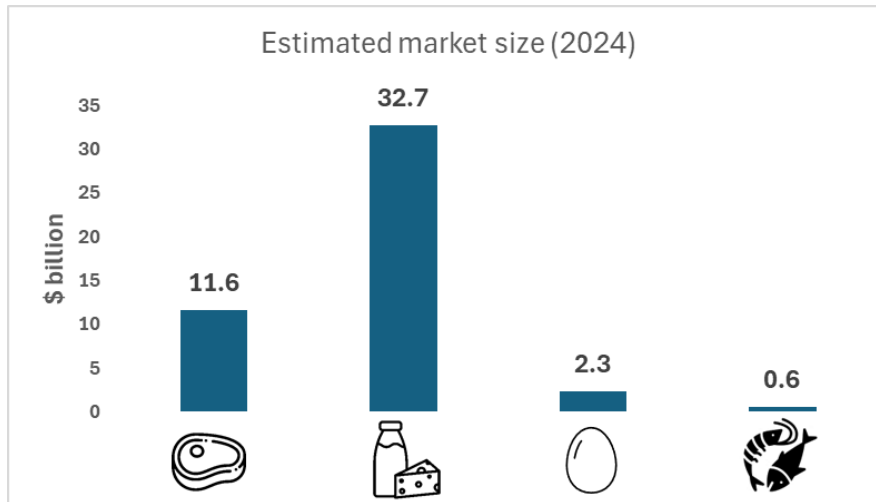
- **Consumer** acceptance
- **Regulatory** hurdles
- **Market** competition
- **Cost** of production
- **Technical** understanding
- Lack of **circularity**
- **Supply chain** complexity
- Scale-up **infrastructure**
- **Nutrition** gap

Alternative Protein: Knowledge Gaps

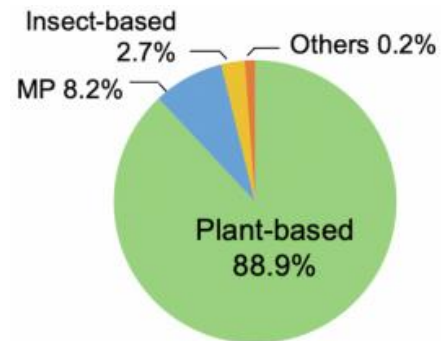


- **Protein diversification** at cost parity   
- **Mild process** for functional enhancement  
- Naturally deliver **nutritional equivalency**  
- **Clean label** ingredient – optimisation & sourcing  
- Data driven approach to address **UPF** related scepticism 

Alternative Protein Products



| Growth Forecast | |
|-------------------|-----------------|
| Reliable CAGR (%) | Forecast Period |
| 10.8% | 2025–2032 |
| 12.7–13.9% | 2025–2032/2035 |
| 5.9–8.0% | 2025–2035/2029 |
| 28.0–38.9% | 2024–2034/2035 |

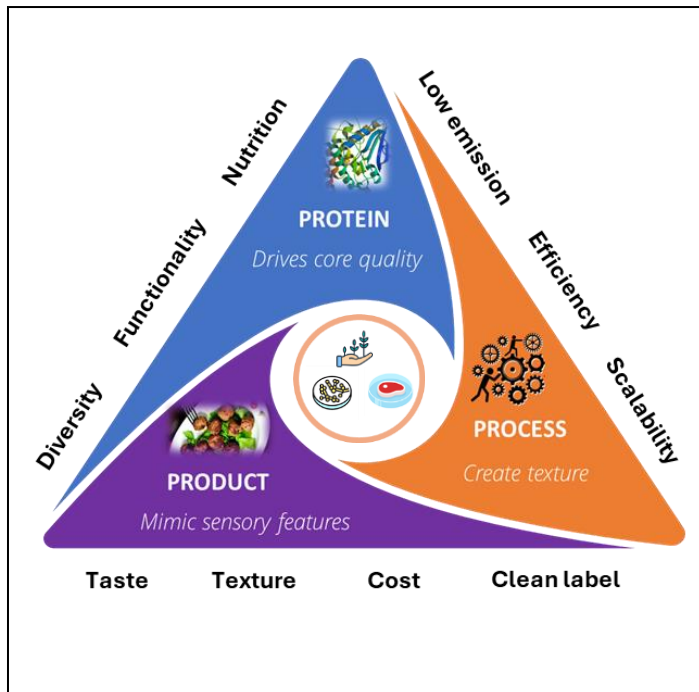


Malila, Y. et al., Nature Food (2024), 8, 53

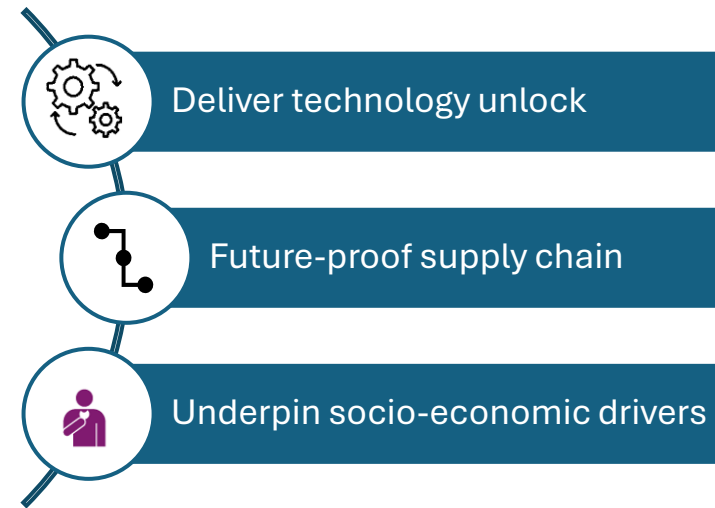


Alternative Protein: Product Innovation

Technical challenges



Innovation challenges

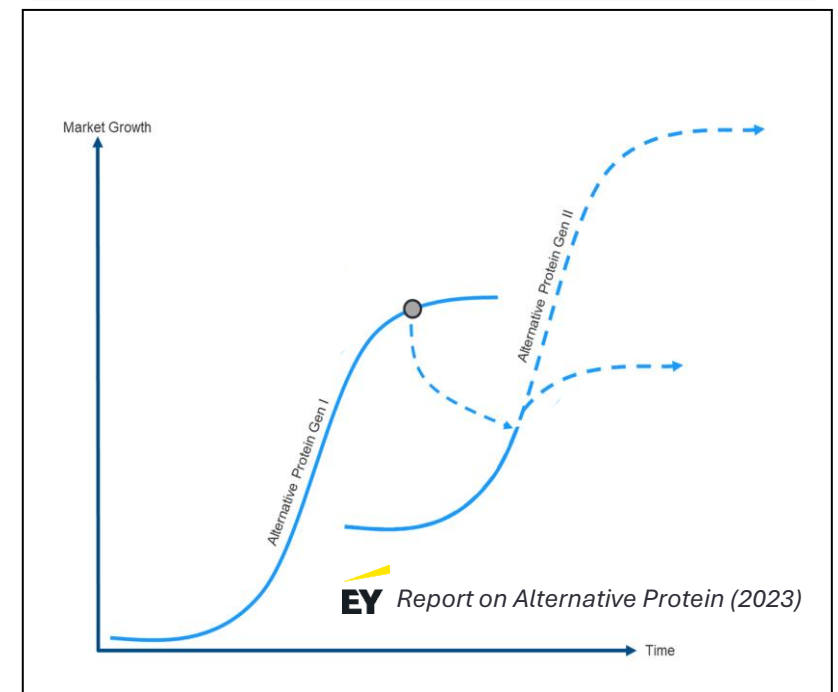


gfi / Good Food
Institute.

BCG

McKinsey
& Company

Future growth



Alternative Protein Products: Unlock and Impact

| Category | Key innovation | Influence on future market share |
|----------------------|--|--|
| Meat Alternatives | Clean label texture, HME, cellular agriculture | Substantial growth; <i>wider consumer adoption</i> |
| Dairy Alternatives | Precision fermentation, blended ingredients | Continued expansion; <i>plant-based cheese surge</i> |
| Egg Alternatives | AI formulation, fermentation, bioengineering | Rapid growth; <i>move from niche to mainstream</i> |
| Seafood Alternatives | Fermentation, cell cultivation, novel proteins | Fastest growth; <i>exponential market share rise</i> |



| Meat Alternatives | Dairy Alternatives | Egg Alternatives | Seafood Alternatives |
|-------------------|--------------------|------------------|----------------------|
| | | | |

Alternative Protein: Emerging Technologies



Precision fermentation



3D food printing



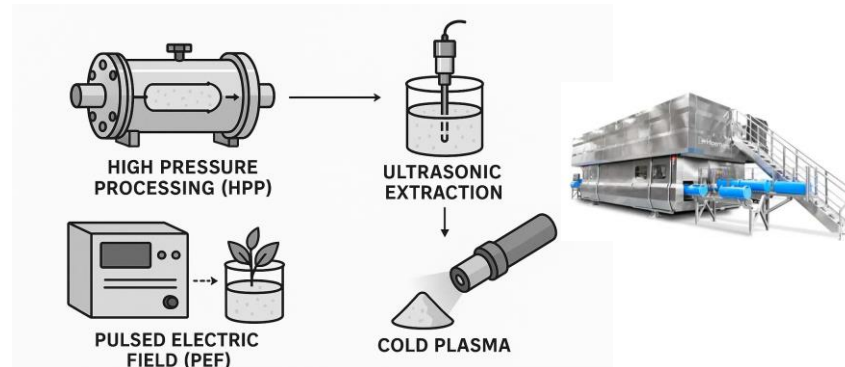
Novel protein



AI formulation



Eco-innovative extraction



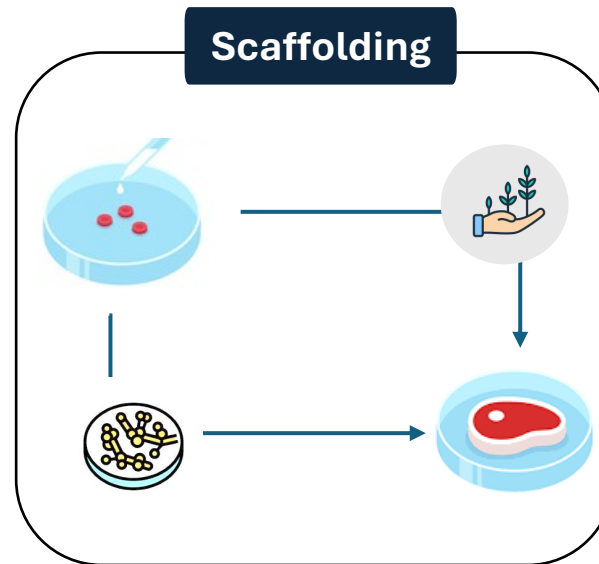
Non-thermal processing

Hybrid Alternative Protein

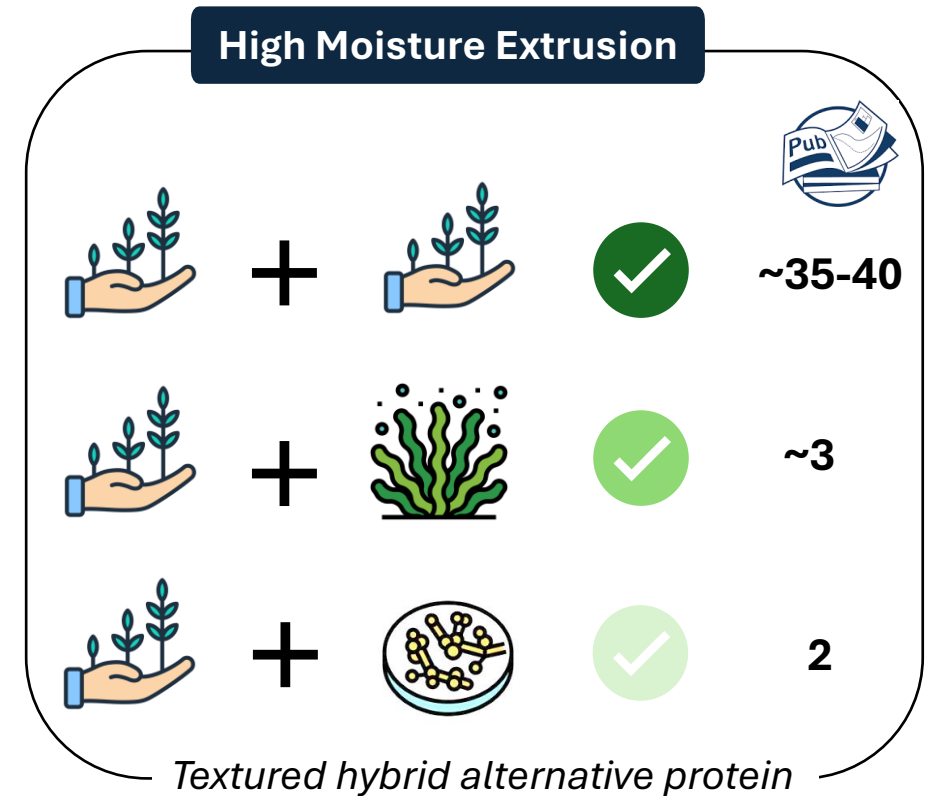
Technology Integration Approach

Advantages

- Better nutrition
- Improved functionalities
- Cost-effectiveness
- Risk mitigation across technologies

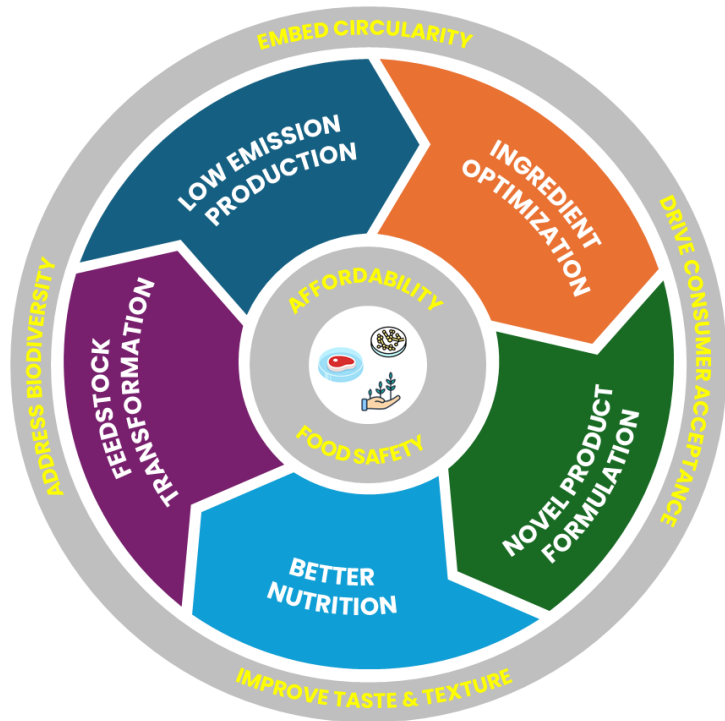


Kim et al. *Food Sci Anim Resource* (2024)
Lees, S. Y. et al *Food Bioprocess Tech* 16 (2023)
Bomkamp, C. et al. *Advanced Science* 9, (2022)



Summary

Research & innovation focus



Success factors

- Technology advancement
- Risk-free scale up and infrastructure access
- Cost competitiveness
- Reduced disparities between consumer need and satisfaction
- Enable digital transformation
- Supportive regulatory framework
- Robust supply chain



THANK YOU