

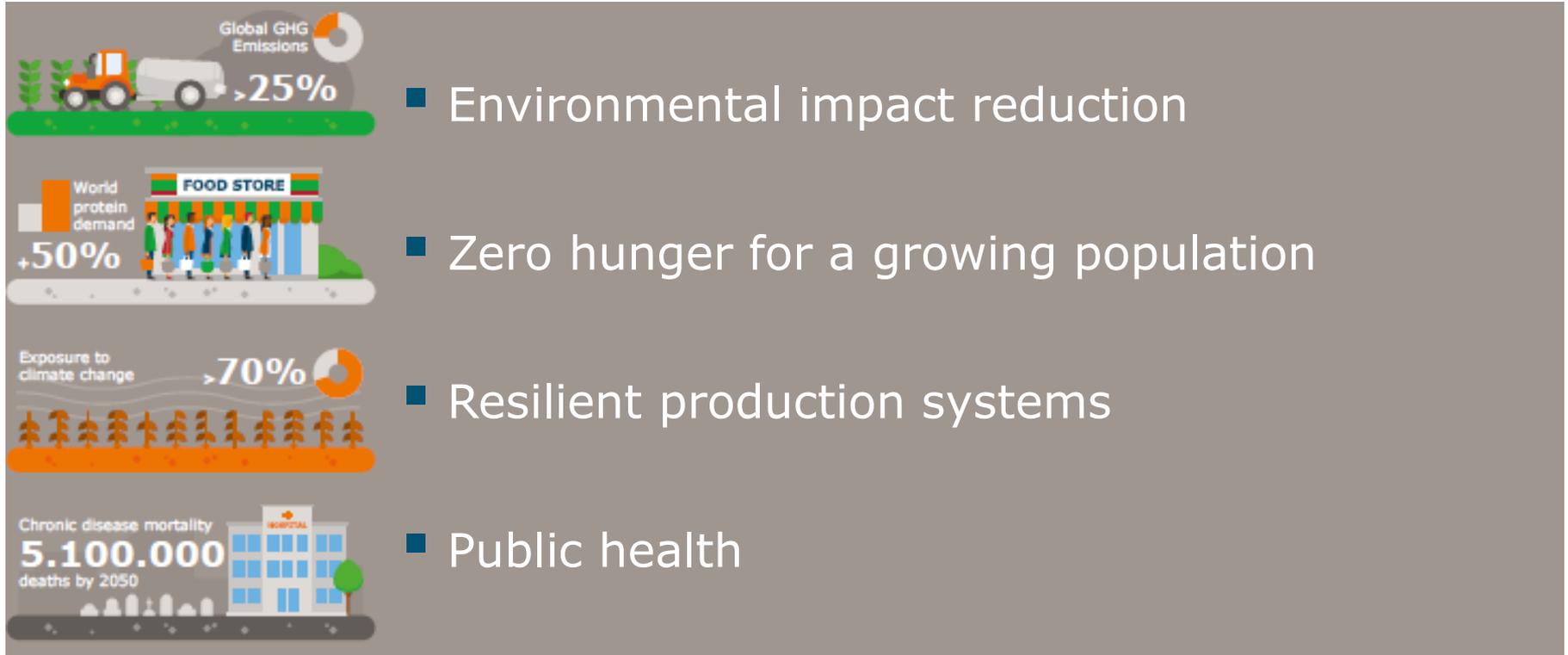
# Mansholt lecture 2019

## Our Future Proteins

#Mansholtproteins



# 4 drivers for of protein transition



# 4 trendy myths

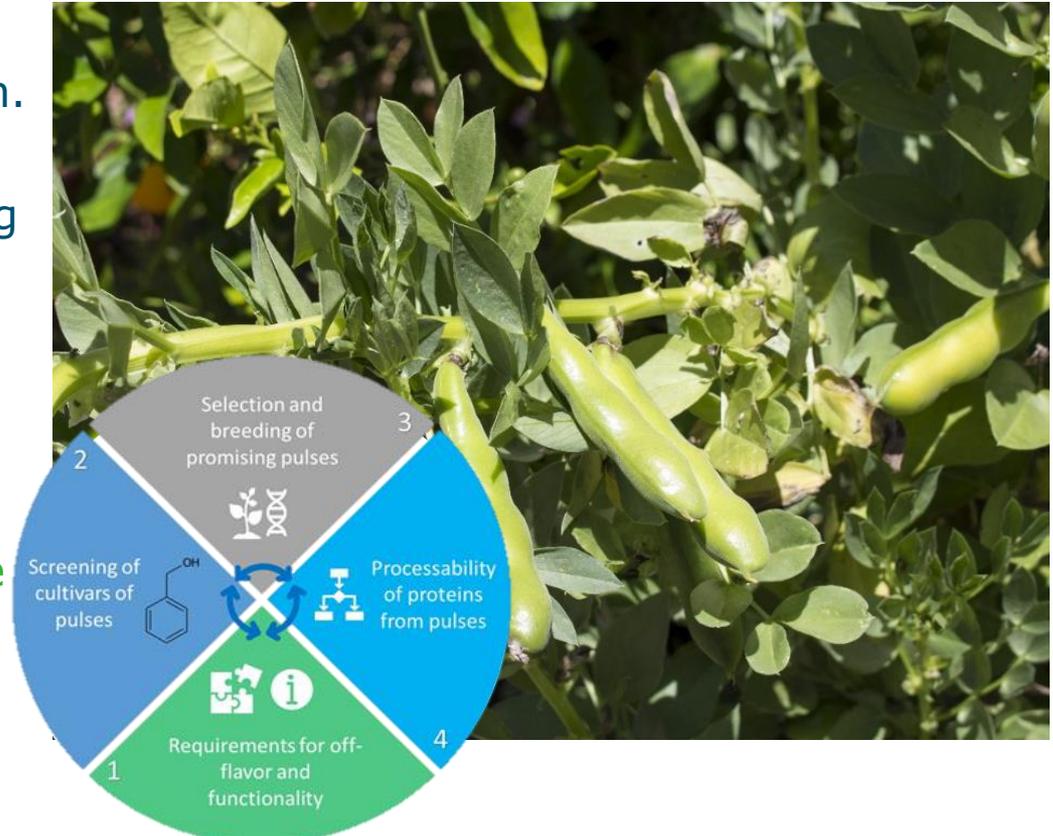
- We don't have enough protein to feed the world. **Not true.**
- Animals are inefficient: everyone should eat vegan. **Not true.**
- Plant-based alternatives have a lower footprint. **Partially true.**
- Plant proteins are of lower quality. **Partially true.**

# 4 technology routes to increased protein availability

# Improved crops

- Few breeding initiatives have focused specifically on protein.
- Collaboration between food technology and plant breeding presents an opportunity.
- Pulses are an efficient protein source for European cultivation.

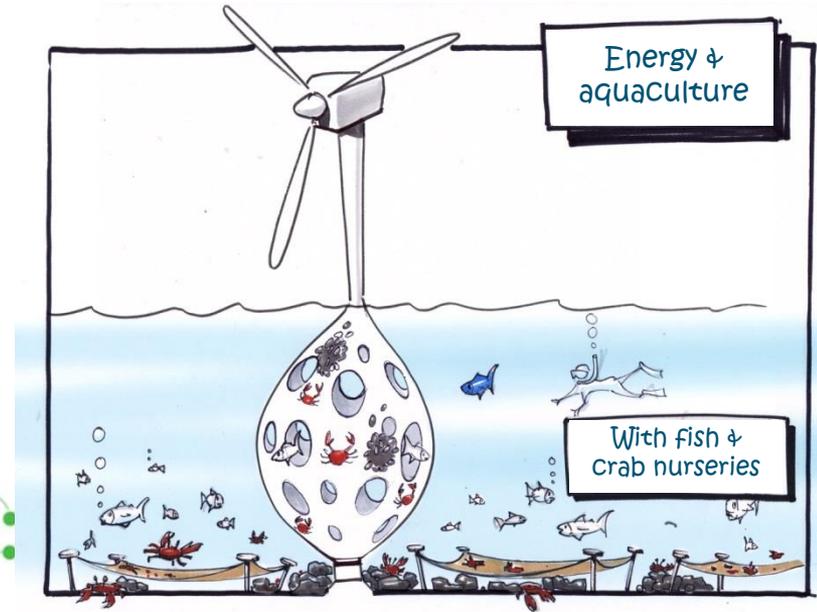
For example, faba beans have high potential yields per hectare but their flavour remains a challenge.



# Innovative aquatic production systems

- The oceans cover 71% of the earth's surface but provide only 7% of our protein.
- Smart oceanic farms can combine energy and food production.

Aquatic protein crops like seaweed and microalgae still require energy-intensive downstream processing; technology breakthroughs are needed.



Leaves



Grass



Algae



PEF

Bead Milling

Open cells

Digestability

Upscaling

Digestability

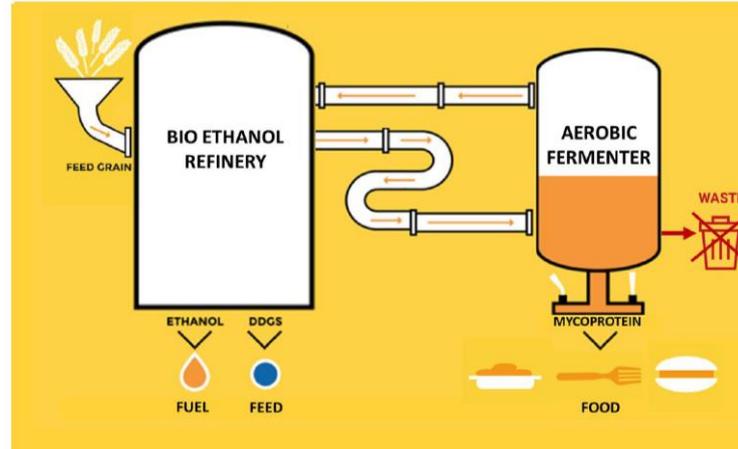
Characterization



# Biosynthesis and recombinant proteins

- Fungal and bacterial protein sources can be grown on a variety of substrates and thereby decouple production from resources.
- These sources can be integrated into no-waste energy-food production systems.

Mycoproteins have an appealing fibrous texture and are already accepted by consumers.



# Reduced food loss and waste

Protein recovery from agricultural side streams:

- increases European supply,
- strengthens the economic basis for farming,
- provides unique proteins with functional and nutritional benefits.

Potato proteins are already available and sugar beet leaf proteins are in development.

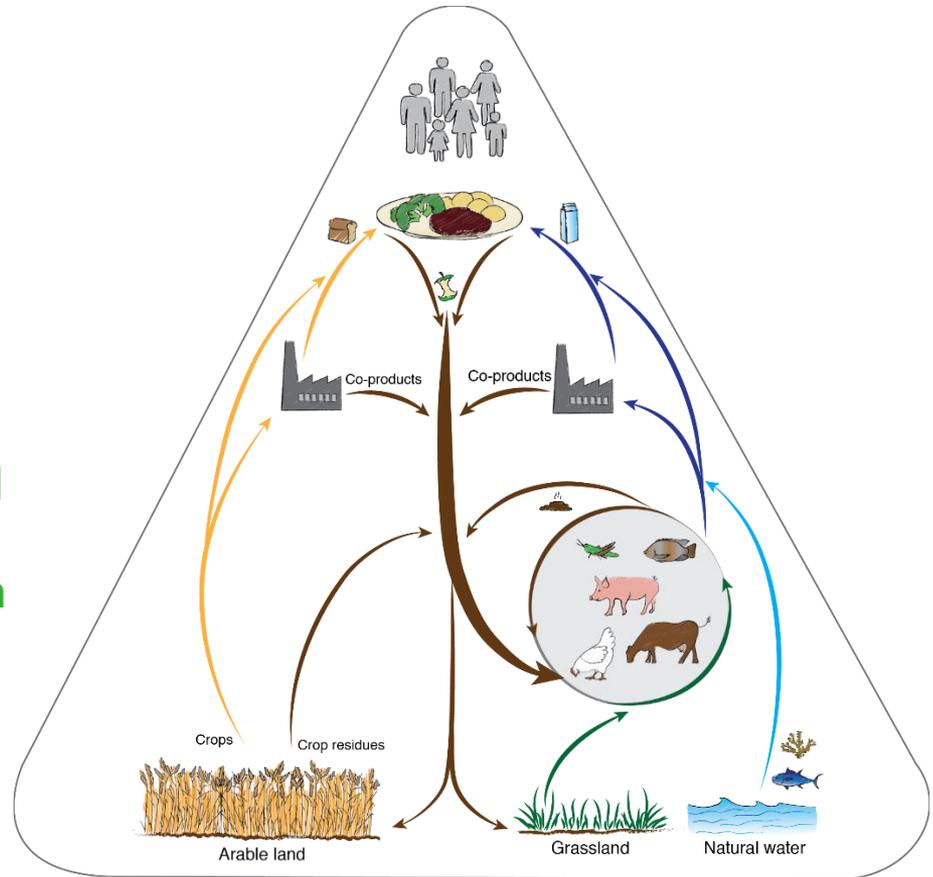


# 4 production system redesigns

# Animals in a circular system

- Animals play an important role in the most efficient global food system.
- They directly convert non-human-consumable residues into complete, food-quality protein.

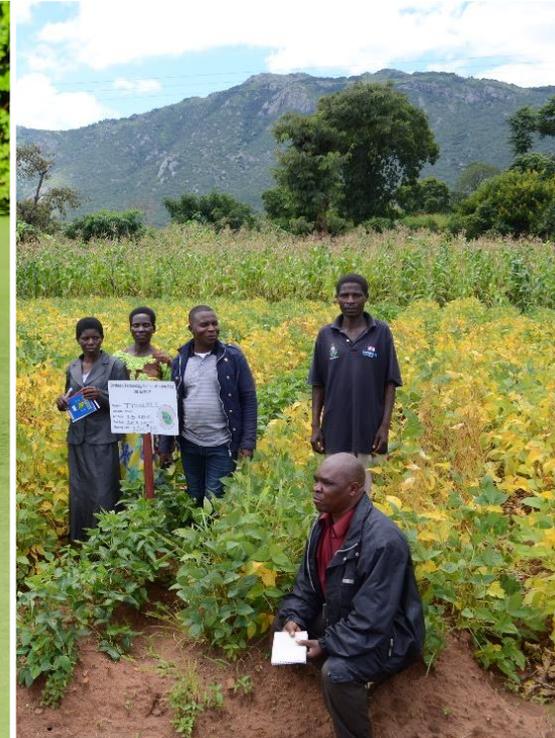
Producing animals only from residual streams and marginal lands could provide about 23 g terrestrial protein per person per day, and natural waters an additional 2 g.



# New nitrogen cycles

- Our current nitrogen imbalance leads to eutrophication in some areas and soil quality decline in others.
- Nitrogen-binding plants can improve soil quality.

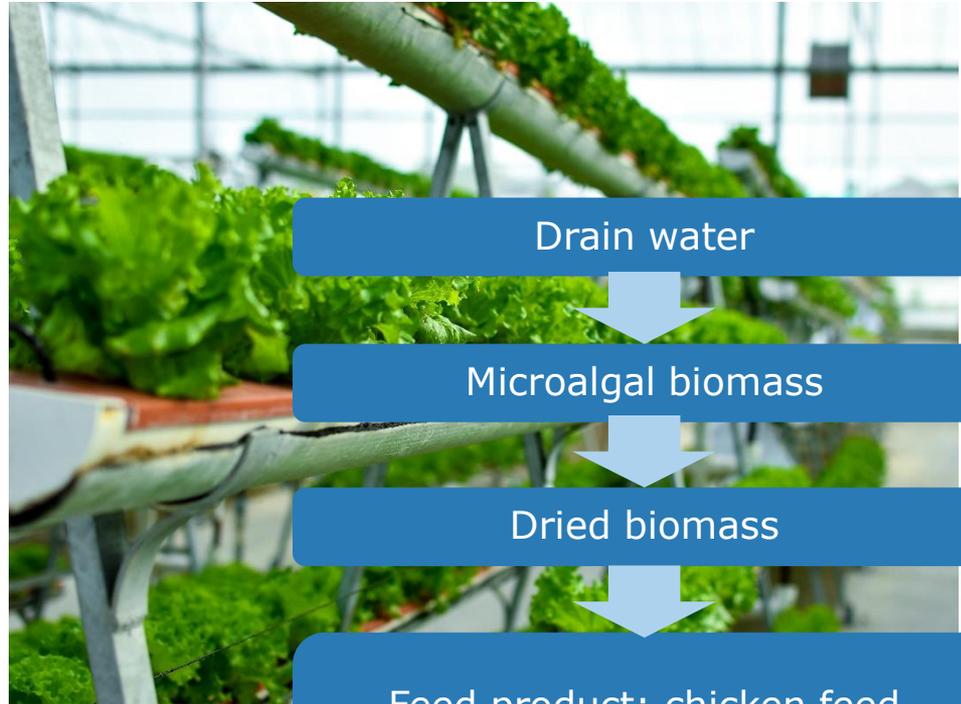
For example, legume cultivation benefits 600,000 smallholder farmers in 11 African countries.



# Production as part of the living environment

- Urban greenhouses address the global challenge of feeding the cities.
- Integration of protein production with fruit & vegetable production provides opportunities for nitrogen retention.

In Mexico, runoff from vegetable greenhouses is used to grow algae, which is in turn used as chicken feed.



# Global entrepreneurship toward sustainable systems

- Agricultural growth in the southern hemisphere is predicted to accelerate in the coming years.
- European knowledge in production efficiency and circular-by-design systems can be transferred to local businesses and entrepreneurs.

In Kenya and Uganda, cassava residues are used to rear crickets.



# 4 pillars of consumption shift

# A diverse palette of options

Diversify protein sources to:

- Make use of marginal lands
- Create equitable regional access
- Enhance variation for healthy diets
- Add resilience to production systems



# Consensus on a healthier aspiration

- Adverse health effects of “Western” diets are increasingly recognized
- In the OCED, aim for a healthier animal-plant consumption ratio...
- ...with care for group with special protein needs
- Increasing access in regions of scarcity



# Improved plant-based alternatives

- 12-18% OECD annual market growth
- Still, consumers are disappointed in the current options
- Less processed, better tasting alternatives
- Addressing consumer segmentation



# Attracting consumers, avoiding resistance

- Consumption routinized and habitual
- Rooted in social, physical and cultural factors
- Resistance to change
- Behaviour change with mixture of strategies



# 4 research agendas

# Plant breeding for nutrition and total use

- In a transdisciplinary context, plant breeding can be applied to improve:
  - biomass accessibility
  - soil quality/nitrogen binding
  - nutritional quality.

New research is needed to reposition plant breeding programs in the context of the total supply chain.



# Animal production in a circular food system

- Optimal production circles depend on numerous regional factors, such as
  - land and water resources,
  - available residue streams,
  - societal and social context.

Research is needed to design, develop and pilot regionally-optimized circular production systems.



# Mild processing

- No source is per-definition sustainable; yield losses & energy reduce environmental benefits.
- Highly refined, highly processed foods are increasingly associated with chronic disease risk.

To fully benefit from a change to a plant-based diet, milder processing technologies and less refined foods are needed.



# Shifting consumption

- In OCED countries, consumption of animal-sourced proteins increased in the last 50 years.
- Understanding of effective strategies to shift consumption is too low.
- Action without consideration may cause a backlash.

Best practices should be established through research and shared across borders.





governmental initiatives



priorities for private sector

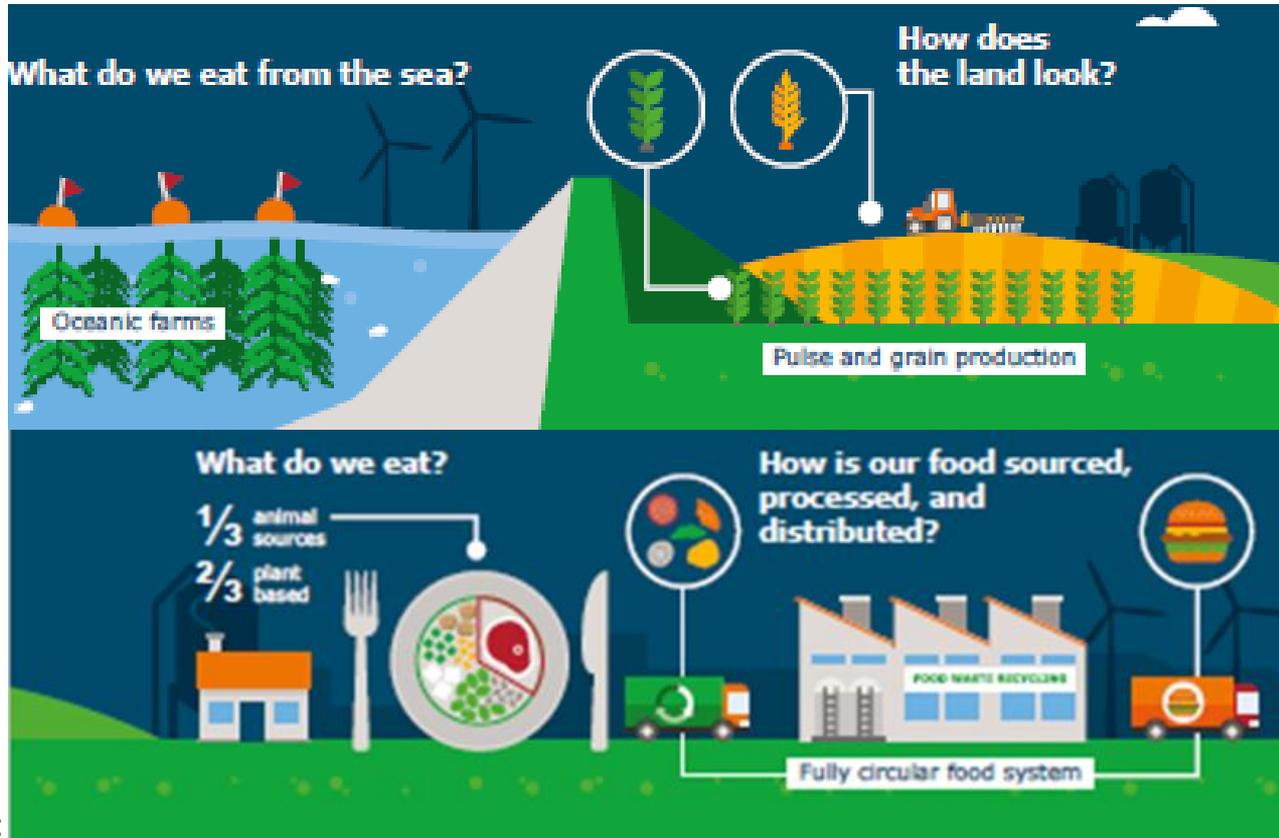


# How can the private sector help out?

- Create collaborations across supply chain
- Increase transparency in environmental impact
- Invest in protein functionality knowledge
- Design attractive, mildly processed plant-based offerings



# 4 snapshots of European food systems in 2050



# Thank you!

Especial thanks to co-authors Prof. Emely de Vet, Prof. Luisa Trindade, Dr. Hannah van Zanten, and Prof. Louise O. Fresco for shaping this vision.

The data, diagrams, and images presented today represent the work of many colleagues, working with numerous public- and private-sector partners. We thank them for their willingness to allow us to communicate about their work.

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