WELCOME TO THE 5TH FRAUNHOFER GREEN DEAL WEBINAR

2 December 2021 | 15:00 – 16:00 CET

AGENDA

15:00	**Moderation by Verena Fennemann** Head of Fraunhofer EU-Office Brussels
	Welcome and introduction by Prof. Dr. Stefan Schillberg Member of the Institute Management and Head of Division Molecular Biotechnology, Fraunhofer IME
15:10	**Setting the scene by Norbert Lins** Patron of the webinar; Member of the European Parliament
15:20	**Expert presentation I "Digitization of food production and agricultural value networks“ by Ralf Kalmar** Head of Business Development, Fraunhofer IESE
	Expert presentation II "FutureProteins – Coupled Agricultural Systems for a Resilient and Sustainable Production of High-quality Food Proteins“ by Susanne Naumann Food Process Development, Fraunhofer IVV
15:45	**Discussion**
16:00	**End of the event**

Welcome and introduction

by Prof. Dr. Stefan Schillberg

Member of the Institute Management and Head of Division
Molecular Biotechnology

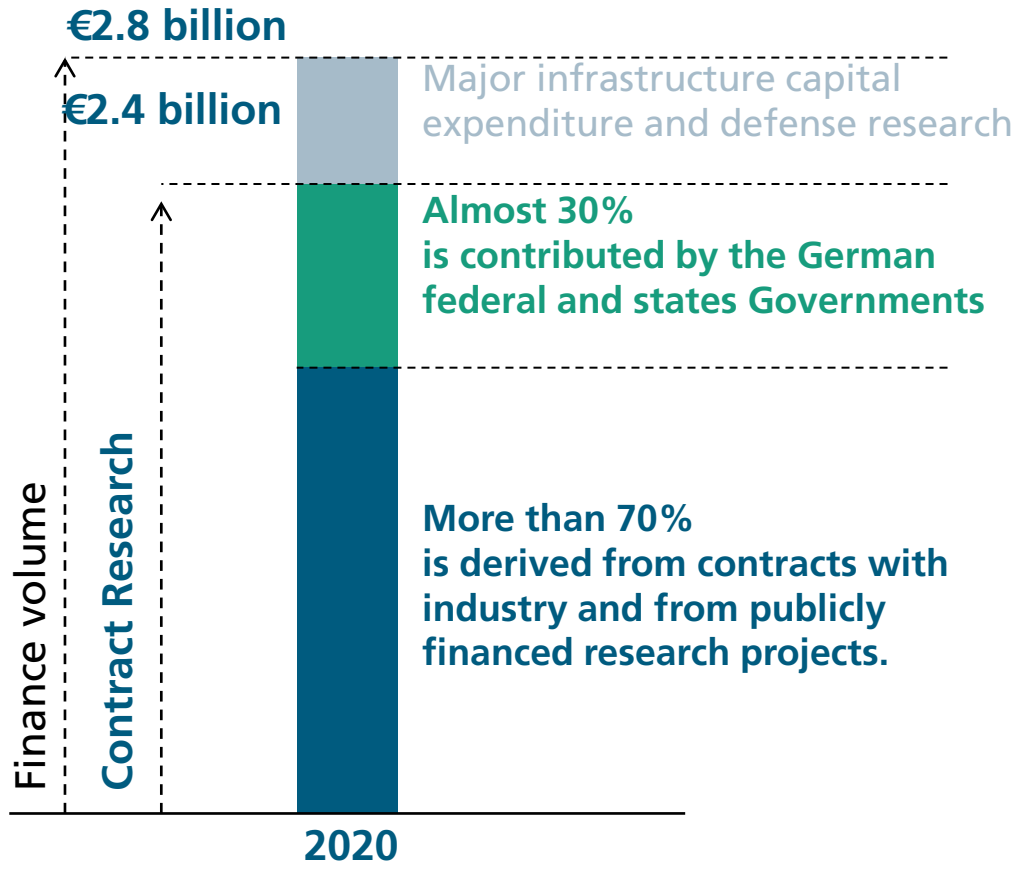
Fraunhofer Institute for Molecular Biology and Applied Ecology IME

The Fraunhofer-Gesellschaft at a Glance

The Fraunhofer-Gesellschaft undertakes applied research of direct utility to private and public enterprise and of wide benefit to society.

29,000 staff

75 institutes and research units



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Horizon 2020 projects with the participation of the Fraunhofer-Gesellschaft

demeter

- Promotes digitalization in the agriculture and food sector

  (www.H2020-demeter.de)

ATLAS
AGRICULTURAL INTEROPERABILITY AND ANALYSIS SYSTEM

- Development of an open interoperability network for agricultural applications and to build up a sustainable ecosystem for innovative data-driven agriculture

  (www.atlas-h2020.eu)

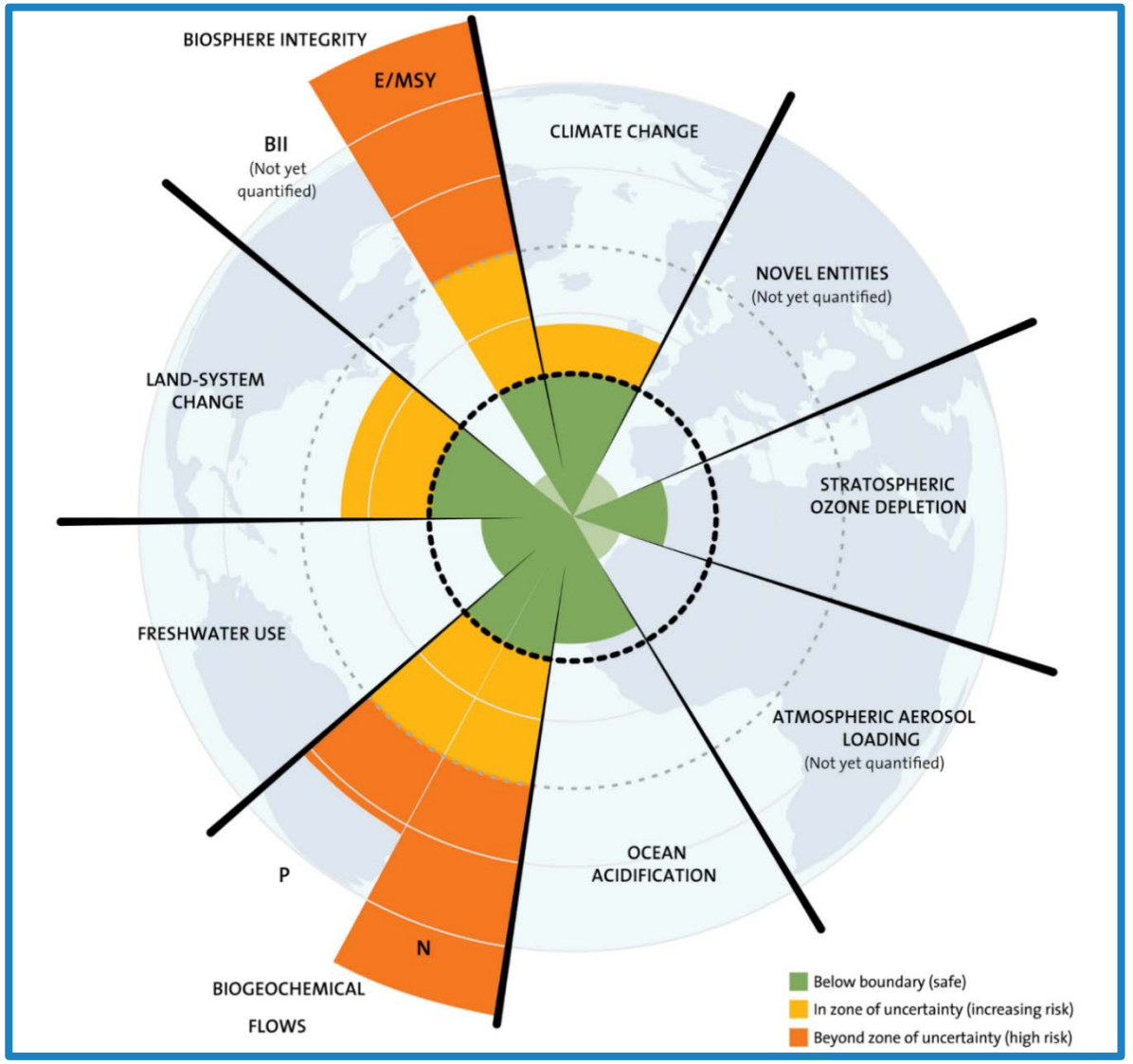
next level PHOTO BOOST photosynthesis

- Improving photosynthetic performance and productivity of C3 crops under diverse environmental conditions

  (www.photoboost.org)

We cross the planetary boundaries

2020: For the first time in history, there is more man-made matter than biomass on Earth (>1100 GT)



Elhacham et al. 2020 Nature 588, 442-444
Lokrantz/Azote based on Steffen et al. 2015.

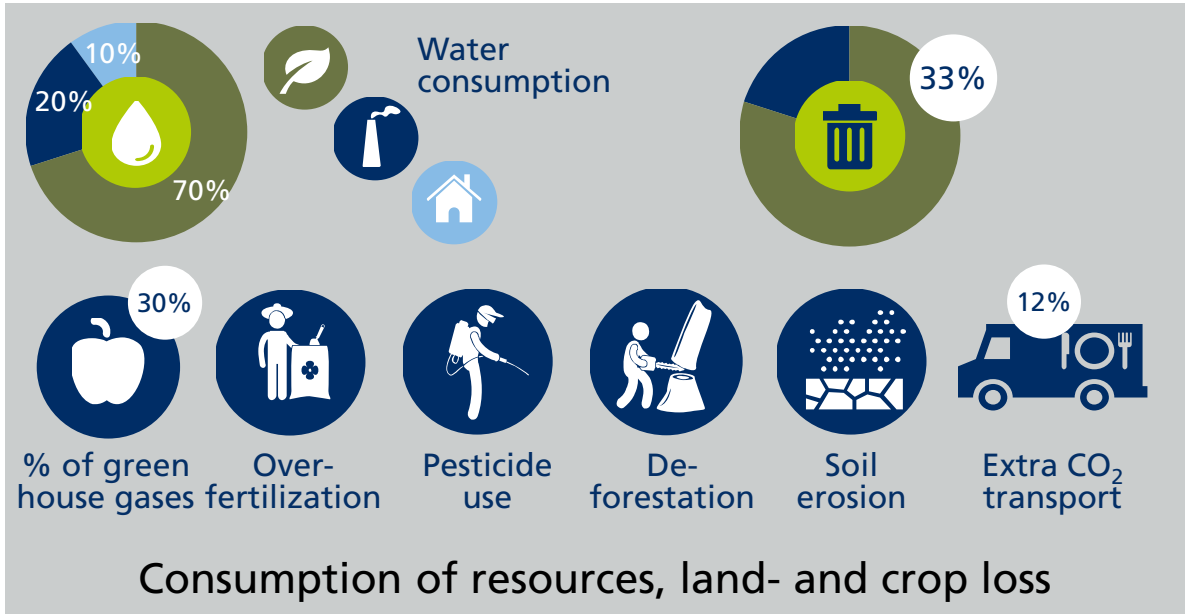
The European Green Deal

Achieving climate neutrality in 2050

https://euinasean.eu/eu-green-deal/

Challenges in agriculture

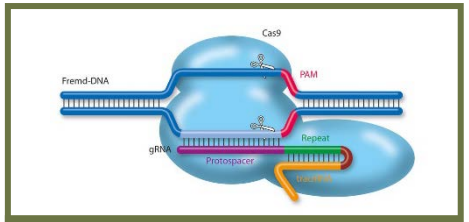
A global mission



Measures for sustainable agriculture[1]

- Reduction of food loss and waste
- Change in dietary habits
- Technological and management improvements

Food chain management



Modern breeding methods

Smart Farming

Contained agriculture

Smart processing and products

Modified based on: Urban farming in the city of tomorrow, Fraunhofer IAO

[1]Springmann et al. 2018 Nature 562, 519-525

Fraunhofer Lighthouse Projects

Addressing challenges in agriculture

- With its flagship projects, the Fraunhofer-Gesellschaft sets strategic priorities to develop concrete **solutions for the benefit of industry and society**. The aim is to quickly turn original scientific ideas into **marketable products**.

- COGNAC – Cognitive Agriculture
  Analysis of highly complex interactions between biosphere and production to create an »Agricultural Data Space«

- Sustainable, resilient and safe production of alternative protein sources in contained agricultural systems

Expert presentation I

“Digitization of food production and agricultural value networks”

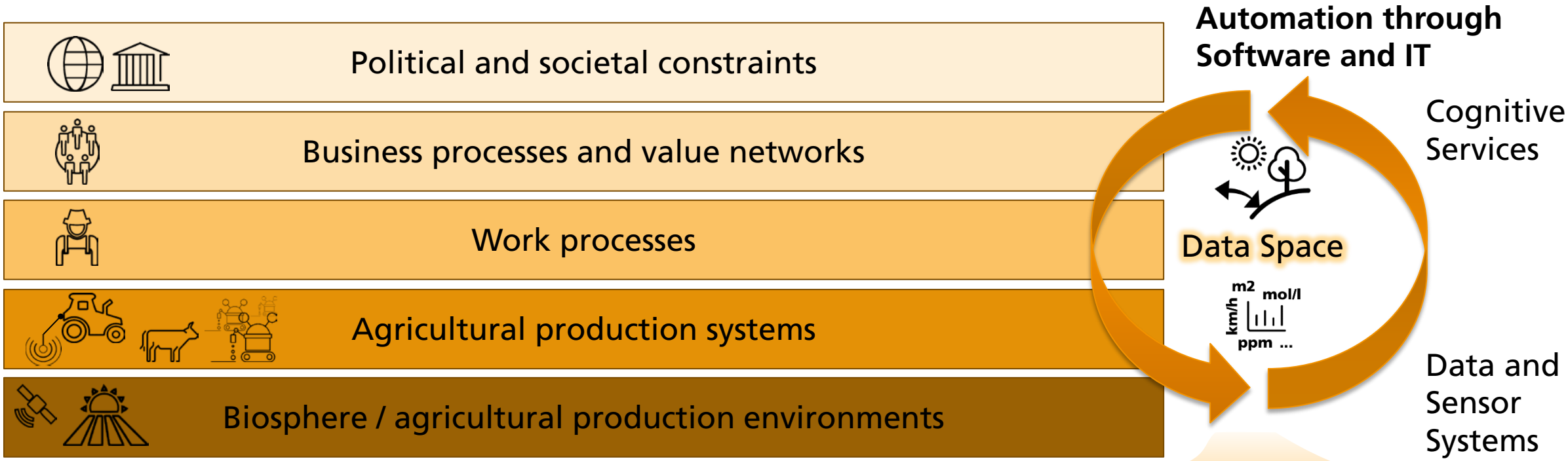
By Ralf Kalmar

Head of Business Development

Fraunhofer Institute for Experimental Software Engineering IESE

Digital Transformation in Agriculture – a Means for More Productivity and Optimized Use of Resources to Implement Agricultural Goals

A digital ecosystem encompasses different levels of abstraction and multiple stakeholders.



Interoperability and Trust: Two elements, which must be established.

Digital Twinning of all Assets can create an Interoperable Basis

	Animal Food	Breeding	Logistics	Production	Logistics	Commerce	Customers
Stakeholder	Farmer Seed Producer Agrochemical Business	Farmer Farm Equipment Provider	Forwarders Warehousemen	Slaughter House Food Production Butchers	Forwarders Warehousemen	Stores Groceries Markets	Consumers Restaurants
Information Needs	Weather Field Data (soil type, geometry, …) Seed Data Crop Status …	Position Nutrition Status Log Weight Development Health Status Log	Supply Chain Origin and Destination Race Weight, Size	Race Weight Certificate of Origin Transport Conditions	Supply Chain Origin and Destination Storage Condition Product Weight and Size	Certificate of Origin Transport Conditions Manufacturing Process Other product ingrediants	Certificate of Origin Nutrition Facts Manufacturing Process CO2 footprint
Information Added	Food type Production process Food Certificate Food CO2 footprint	Race Weight, Size Certificate of Origin CO2 footprint	Transport Conditions (Duration, …)	Manufact. Process Storage Condition Other product ingredients data Nutrition Facts	Transport Conditions (Temperature, …)	Purchase Date	Product Rating

Applied Research at Fraunhofer addressing Green Deal Goals

- The **Fraunhofer lighthouse project COGNAC** is developing solutions for an integrated domain ecosystem „agriculture“ and optimized farming processes – **Smart Farming**.
  - A **Data Space** concept for interoperable management of data and services using the digital twin concept.
  - **Data Sovereignty** rules and data usage control tied to **digital twins**.
  - **Cognitive Services** for decision support and process automation
  - Novel **sensor technologies** to yield new insights regarding soil and agricultural processes (e.g. N2O).
  - Automation concepts for **safe autonomous robotics**, e.g. for chemical-free weed-regulation

www.cognitive-agriculture.de

➢ **Digital Transformation in Ag can be used to support and achieve the Green Deal Goals**

Opportunities and Needs for European Development

- We need a solution for **interoperability** of data between platforms.
  - Linking the value network from farm to fork using digital twins would add an abstraction layer for it
  - Tying physical assets to virtual representations would also ease data governance and sovereignty, thereby establish trust

- **Food quality aspects** should be captured consistently along the value network.
  - This would, for example, allow comparison of traditional and alternative food production aspects
  - Interesting data to be tracked could be: CO2 footprint, nutrition facts, sustainability index

Image: IStock.com/Ekkasit919

Expert presentation II

“FutureProteins – Coupled Agricultural Systems for a Resilient and Sustainable Production of High-quality Food Proteins”

By Susanne Naumann

Food Process Development

Fraunhofer Institute for Process Engineering and Packaging IVV

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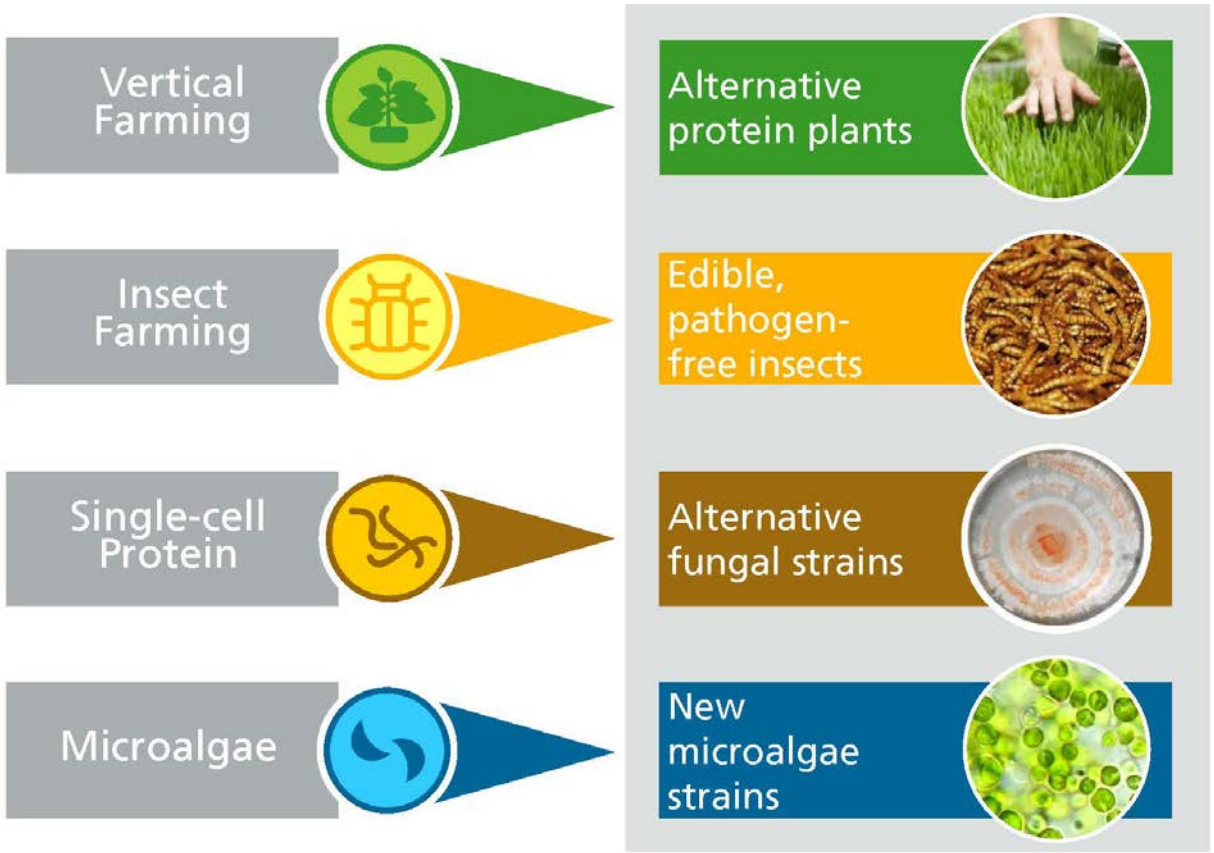
Project focus & partners



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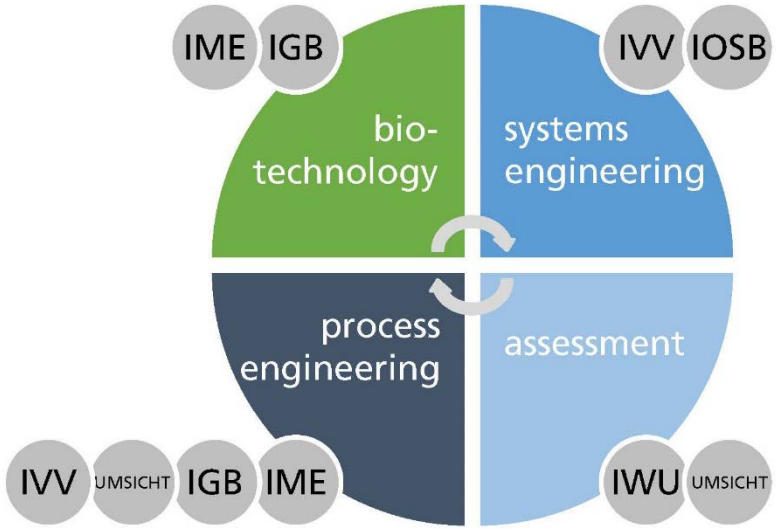


Project goals

Vertical farming

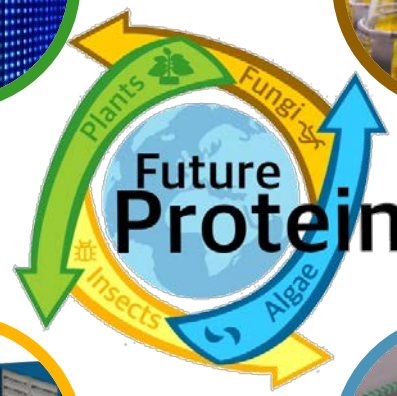
- Alternative protein plants: Alfalfa, wheat, potato
- Hybrid illumination

© Fraunhofer IME (Vogel, Schillberg 2018 EP17173370)

© Fraunhofer IME

Single-cell protein

- Submerged cultivation of Basidiomycetes
- Cost-efficient culture media



Insect farming

- Automated insect culture systems
- Molecular detection system for insect and food pathogens

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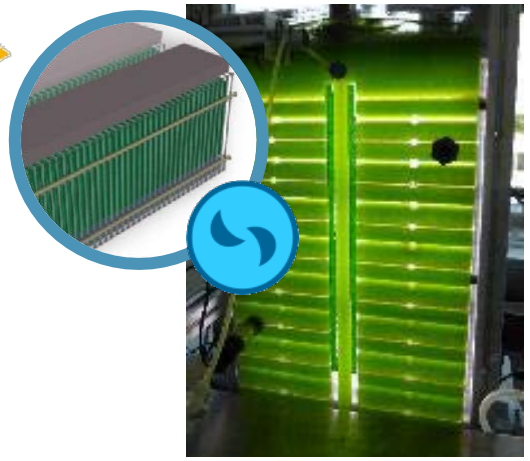
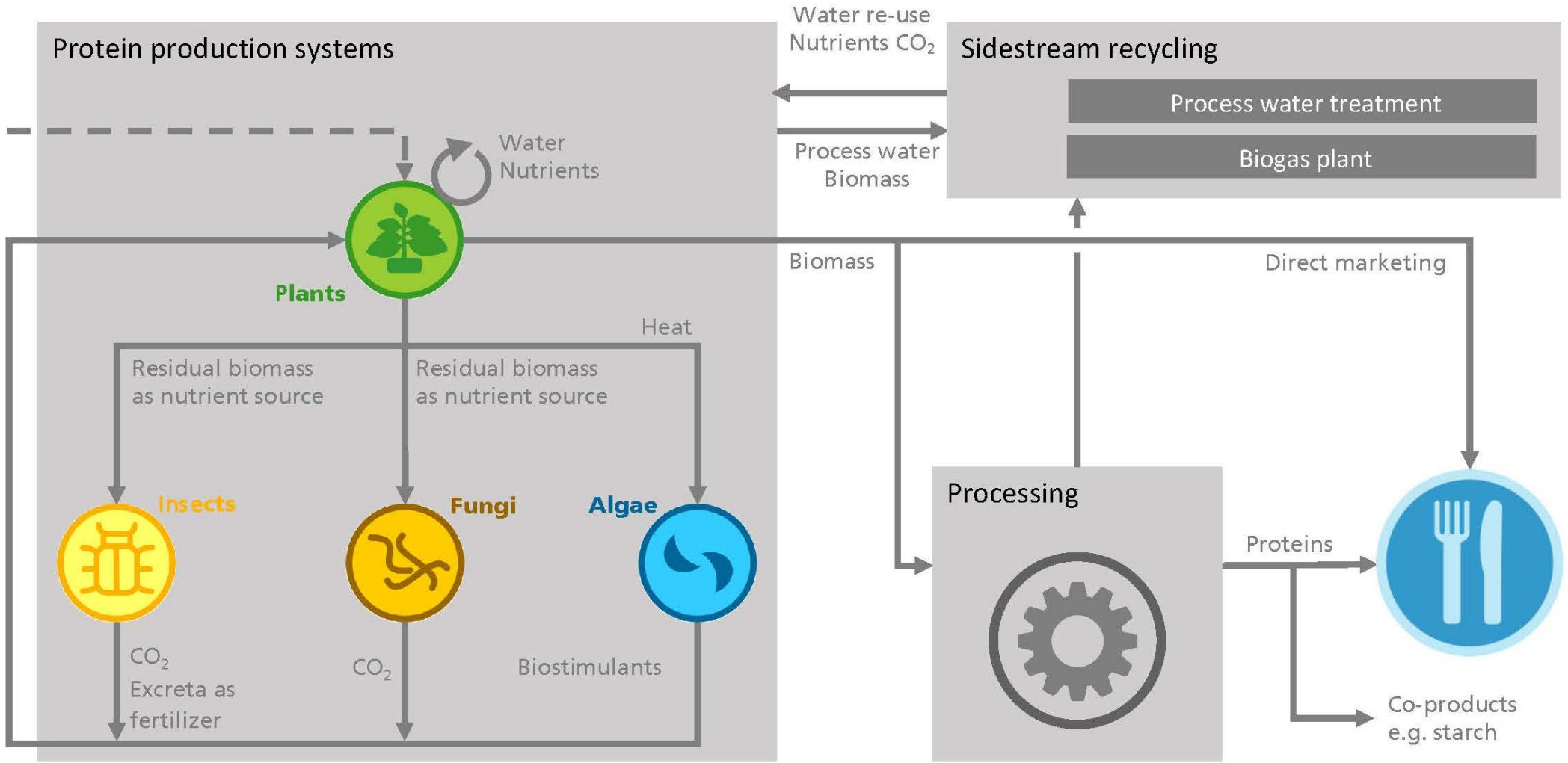


Microalgae

Compact photobioreactor with improved light and protein yields

© Fraunhofer IGB

Closed agricultural systems



Processing of alternative proteins

- Protein recovery

Raw material preparation (peeling, milling, pressing)	⇢ Side streams (e.g., peels)
Fractionation	⇢ Starch, Lipids, etc.
Cell disruption (ultrasound, high pressure)	
Protein extraction (salting, alkaline extraction)	⇢ Side streams (e.g., permeate)
Protein recovery (precipitation, filtration, drying)	→ Alternative protein

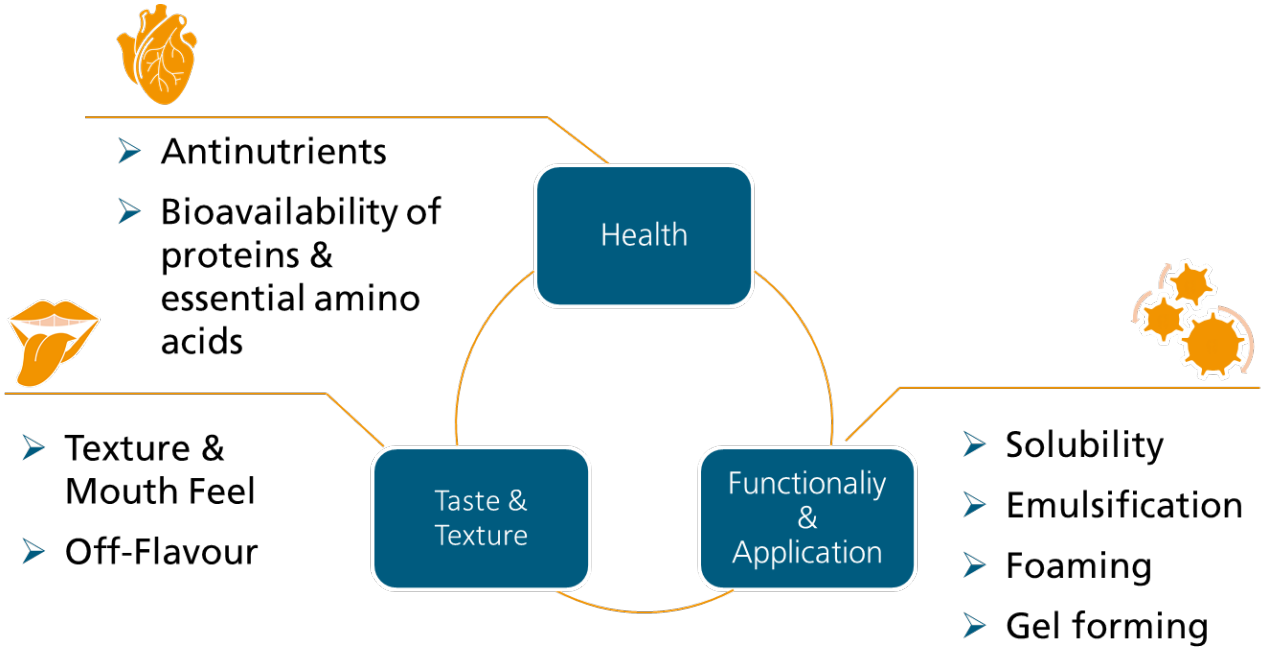


© Fraunhofer IVV

- Protein modification: Enzymatic hydrolysis, Fermentation, Extrusion

Product development for alternative protein applications

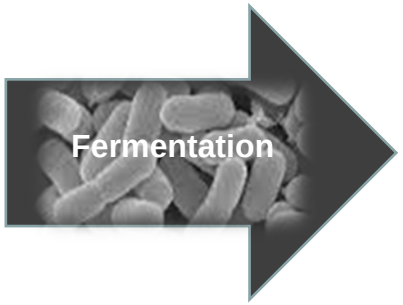
- Development targets



- Development strategies
  - Protein combinations
    - Nutritional complementation
    - Interaction effects on functional and sensory properties
  - Model foods
    - Dairy alternatives
    - Meat alternatives
    - Sausage surrogates
    - Baked goods and pasta

Alternative proteins for dairy products

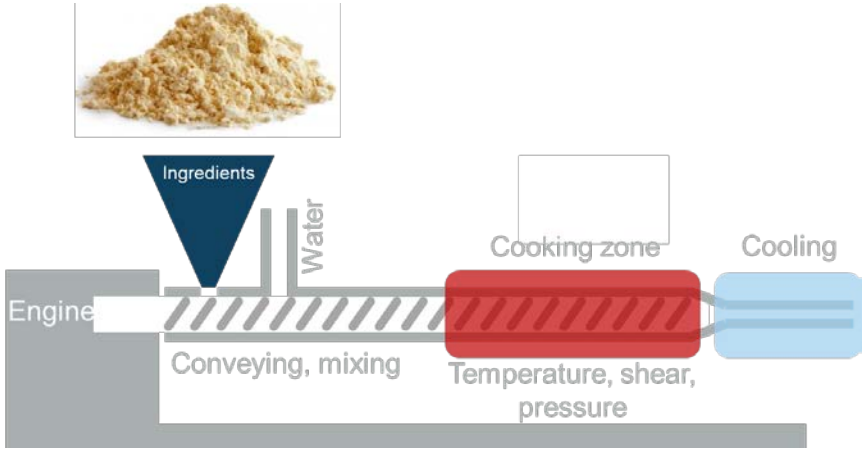
- Dairy alternatives are one of the fastest-growing product groups (CAGR 14%)
- Needed functionality
  - Emulsifying capacity
  - Gel formation
  - Foaming capacity



- Modified functionality
- Aroma formation and degradation
- Degradation of antinutritive substances

Alternative proteins for meat alternatives

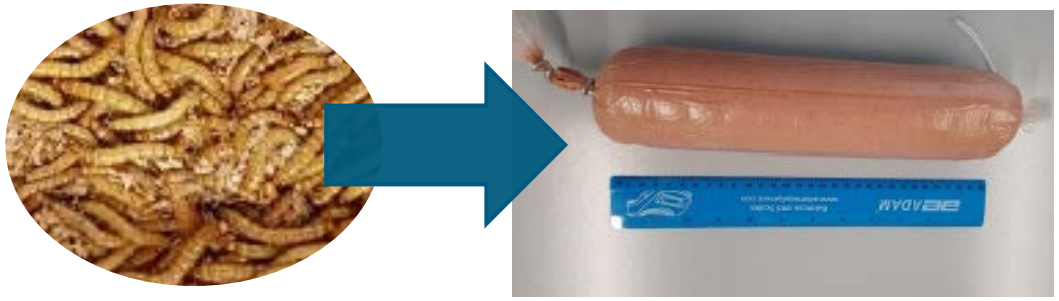
- Texturization processing
  - **High moisture extrusion**
    Texturing in a long cooling nozzle to form a fibrous network → lean meat-like products
  - **Thermoplastic low moisture extrusion**
    Texturing to a porous, floating network → Texturates are used to generate firmness and juicyness



Alternative proteins: Sausage surrogates & baked goods

- Production of sausage surrogates with vegan Basidio protein

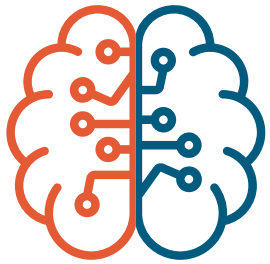
- Production of ‘liver sausage’ from mealworms



- Baked goods
  - Gluten-free bread making
  - Egg replacement

Challenges and recommended actions

Challenges



- Collaboration throughout the value chain
- Translation into commercial application
- Administrative effort
- Accelerated translation of novel technologies

Recommended actions

- Close the gaps between research areas: raw material – processes - application
- Provide tools for entrepreneurial thinking and action
- Reduce and simplify administrative procedures
- Guidelines/support for e.g. new breeding technologies and novel foods

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THANK YOU FOR ATTENDING THIS FRAUNHOFER GREEN DEAL WEBINAR

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