JOIN THE JOURNEY WITH US!

2nd ANNUAL SEMINAR

FOOD2.0 | Valio

We continue at 13:00

AGENDA
FOOD 2.0 ANNUAL SEMINAR

13.00   **Envisioning tomorrow's food system:** The big-picture perspective – Harri Kallioinen, Valio

13.15   **360 operational environment view and networked foresight**

- Insights from a 360-degree view: combining insights on global food market development, economic indicators, climate change, politics and regulation, consumer behavior and demographic shifts, as well as trade and supply chain dynamics - Sara Reponen and Kevin Deegan, Valio
- From field capacity to food security: Futures paths for Finland's primary production - Csaba Jansik and Anu Kaukovirta, LUKE

14.10   **Coffee break**

14.45   **Highlights of the second year of Valio Food 2.0 program** – Veera Virtanen and Riitta Partanen

15.10   **Leading company ecosystem collaboration:** Harnessing AI and partnerships to drive food industry success - Vilja Hannula, ADM Silo AI

15.30   **Outlook for Future** - National PhD work pitching session - chair: Mari Sandell, UH

- Towards reliable soil carbon balance estimates in agriculture - Johanna Vielmaa, Valio
- Self-supervised training for multispectral remote sensing imagery - Leon-Friedrich Thomas, UH
- Impact of food processing on plant-based protein-rich foods - Jasmin Raita, UTU
- Fibre-rich protein sources for gut-friendly plant-based foods: a nutritional investigation on food fermentation - Finlay Sim, UH
- Whole grain cereals, tryptophan metabolism, and the gut-brain axis - Vilma Liikonen, UEF
- Technologies enabling personalized food production and enhanced eating experiences - Alex Calton, VTT
- Making biodiversity impacts visible: effects of LCA-derived footprint labels on students´ meal selection - Aino Tarkkio, UTU

16.00   **Closing remarks**

ENVISIONING TOMORROW'S FOOD SYSTEM: BIG PICTURE PERSPECTIVE

HARRI KALLIOINEN
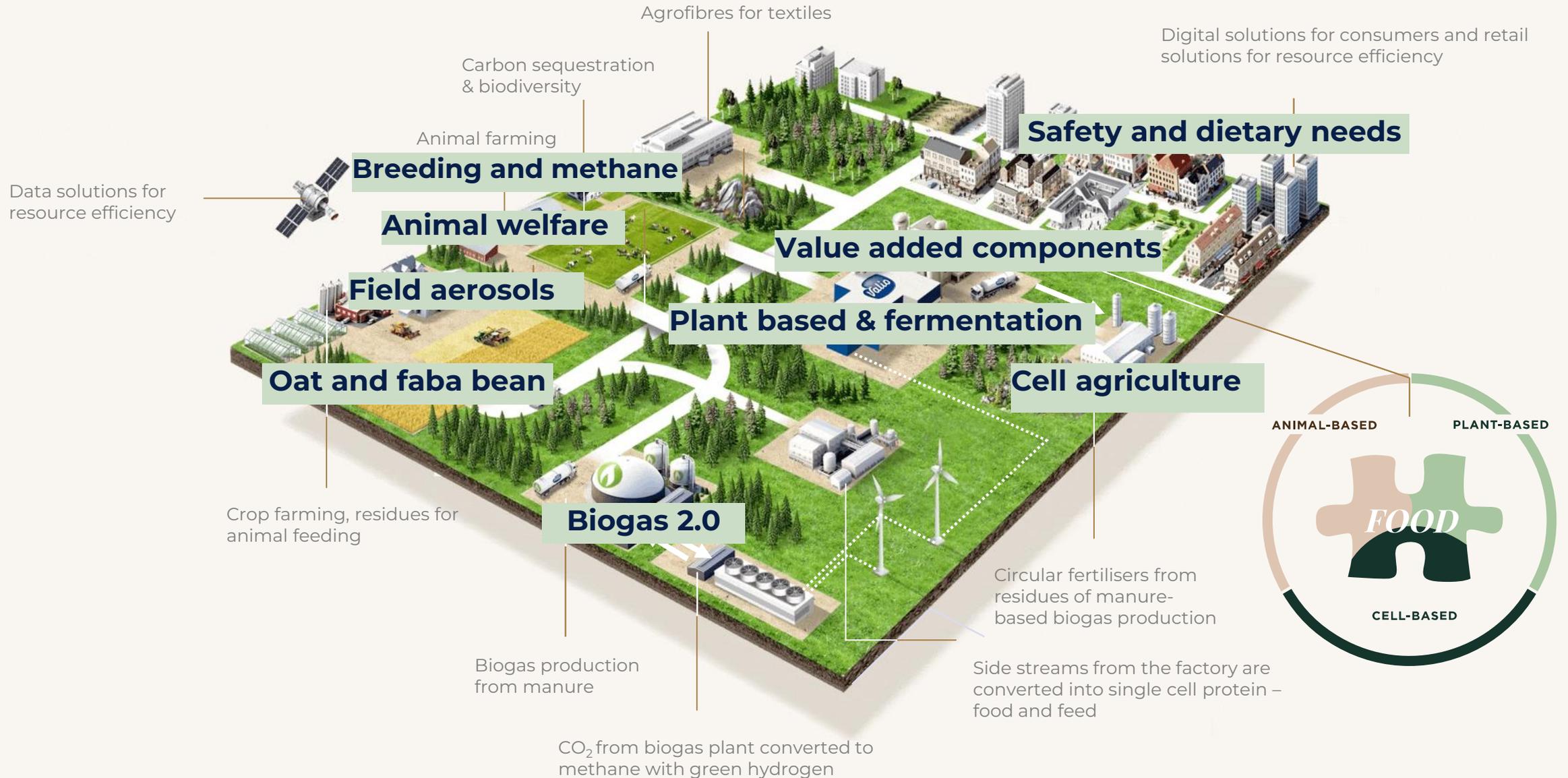Senior Vice President R&D
Valio

FOOD 2.O | Valio

FOOD 2.0 AND BUSINESS OPPORTUNITIES – EXAMPLES OF THE RESEARCH TOPICS

Agrofibres for textiles

Carbon sequestration & biodiversity

Digital solutions for consumers and retail solutions for resource efficiency

Animal farming

Safety and dietary needs

Data solutions for resource efficiency

Breeding and methane

Animal welfare

Value added components

Field aerosols

Plant based & fermentation

Oat and faba bean

Cell agriculture

Crop farming, residues for animal feeding

Biogas 2.0

Circular fertilisers from residues of manure-based biogas production

Biogas production from manure

Side streams from the factory are converted into single cell protein – food and feed

CO$_2$ from biogas plant converted to methane with green hydrogen

ANIMAL-BASED

PLANT-BASED

FOOD

CELL-BASED

THE FUTURE FOOD SYSTEM IS A COMBINATION OF DIFFERENT FOOD PRODUCTION METHODS THAT COMPLEMENT EACH OTHER OUR VIEW OF FOOD 2.0.

Agrofibres for textiles

Digital solutions for consumers and retail solutions for resource efficiency

Carbon sequestration & biodiversity

Valio carbo" partnership programme

Data solutions for resource efficiency

ODDLY-GOOD

Valio

GOLD & GREEN BY VALIO

HÄRKIS®

enifer™

MAL-BASED   PLANT-BASED

FOOD

CELL-BASED

Crop farming, residues for animal feeding

Suomen Lantakaasu

Circular fertilisers from residues of manure-based biogas production

At best, nutrients, energy and side streams circulate between different sites.

Biogas production from manure

Side streams from the factory are converted into single cell protein – food and feed

CO_2 from biogas plant converted to methane with green hydrogen

360 OPERATIONAL ENVIRONMENT VIEW AND NETWORKED FORESIGHT

COMBINING INSIGTS ON GLOBAL FOOD MARKET DEVELOPMENT, ECONOMIC INDICATORS, CLIMATE CHANGE, POLITICS AND REGULATIOS, CONSUMER BEHAVIOR AND DEMOGRAPHIC SHIFTS, AS WELL AS TRADE AND SUPPLY CHAIN DYNAMICS

SARA REPONEN
Vice President, Strategy & Market Intelligence
Valio

KEVIN DEEGAN
Vice President, Innovation
Valio

FOOD2.O | Valio

THE BEST WAY TO PREDICT THE FUTURE IS TO CREATE IT

Peter Drucker

1909–2005

When looking towards the future,
we are faced with

THREE UNIVERSAL CHALLENGES

too much DATA too little CLARITY

Relevant signals are buried

More data does not automatically mean better understanding

Increasingly hard to see what truly matters

no data from THE FUTURE

Future cannot be measured

Uncertainty always remains

Scenarios guide thinking
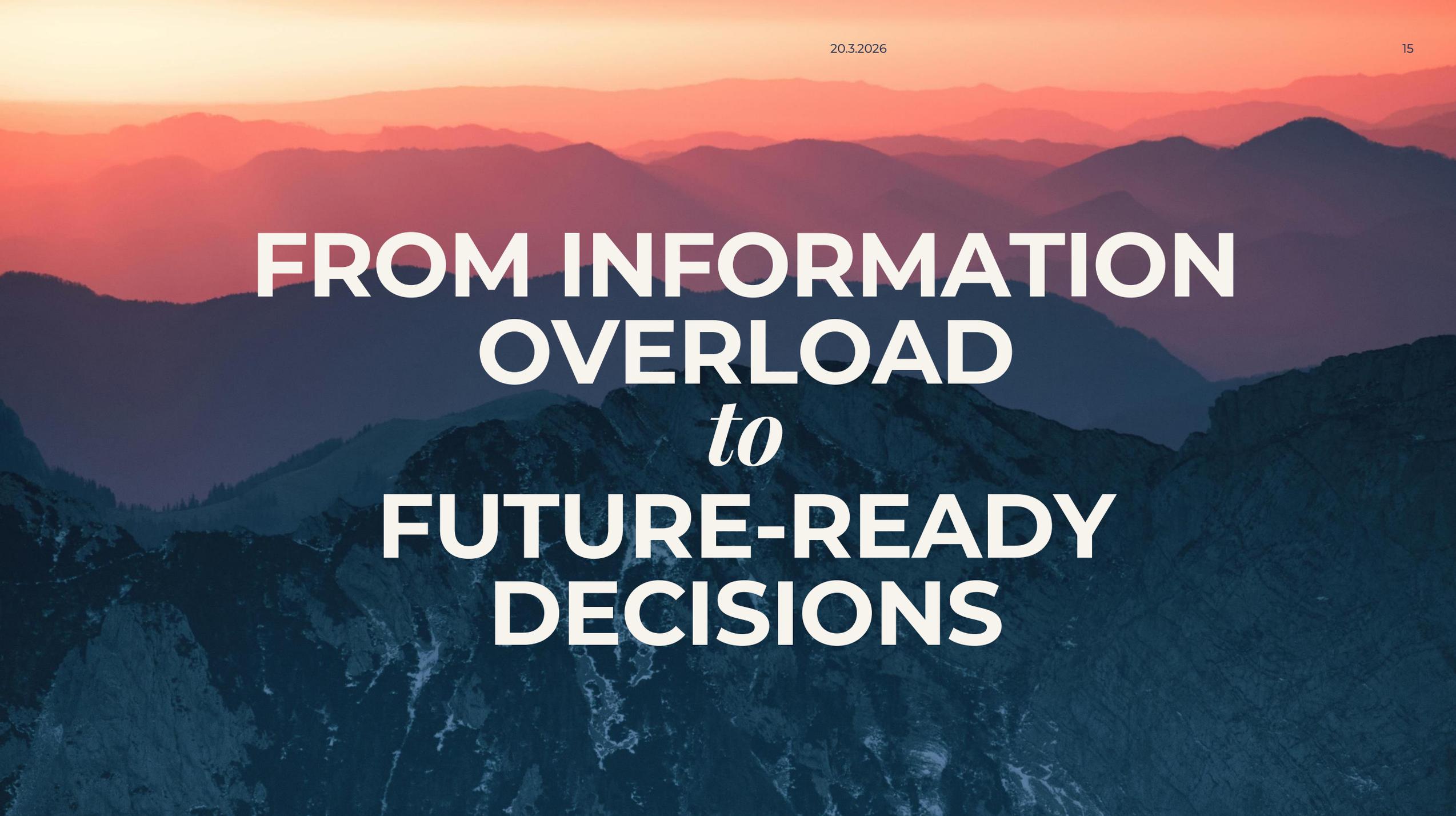
FROM INFORMATION OVERLOAD
to
FUTURE-READY DECISIONS

FROM INFORMATION OVERLOAD *to* FUTURE-READY DECISIONS

enabled by

- A 360 DEGREE MARKET ENGINE

- ARTIFICIAL INTELLIGENCE

- NETWORKED FORESIGHT

- WILLPOWER

the enablers:
A 360 DEGREE MARKET ENGINE

Valio

Economic indicators	*Technology landscape*
Regulation	*Supply chain dynamics*
Demographic changes	*Global food market development*
Consumer behaviour	*Business-specific operational and financial data*
Climate change	

A 360 DEGREE MARKET ENGINE

AUTOMATICALLY GENERATED PERSONALISED INSIGHTS

NEW PERSPECTIVES FOR FORESIGHT
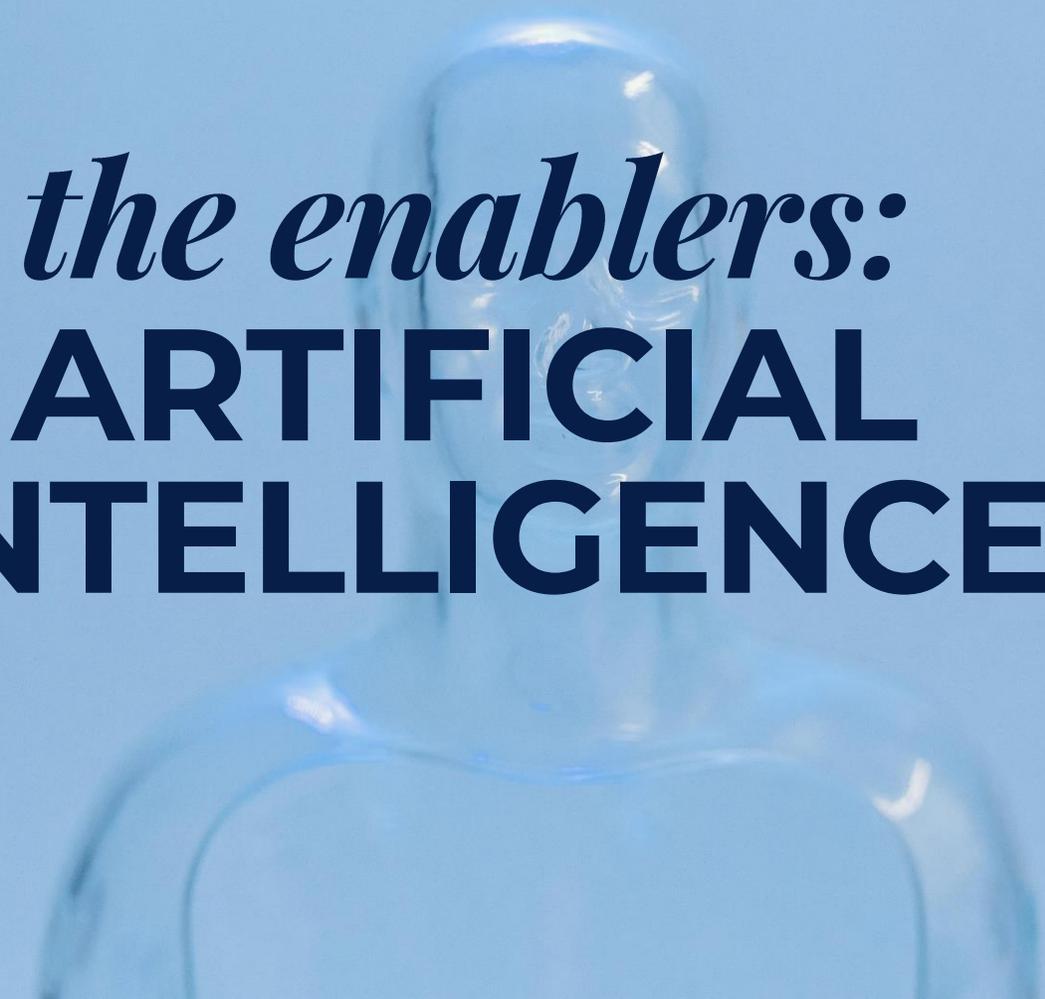
the enablers:
ARTIFICIAL INTELLIGENCE

Valio

the enablers:
NETWORKED FORESIGHT

the enablers:
WILLPOWER

In building Food 2.0 together, what is one capability or area of foresight that should be prioritised first?

Menti

Food 2.0 Annual Seminar

Select which slide to add

1. Climate change
2. Consumer behaviour
3. Global food market development
4. Technology landscape
5. Economic indicators
6. Trade and supply chain dynamics
7. Regulation
8. Demographic indicators
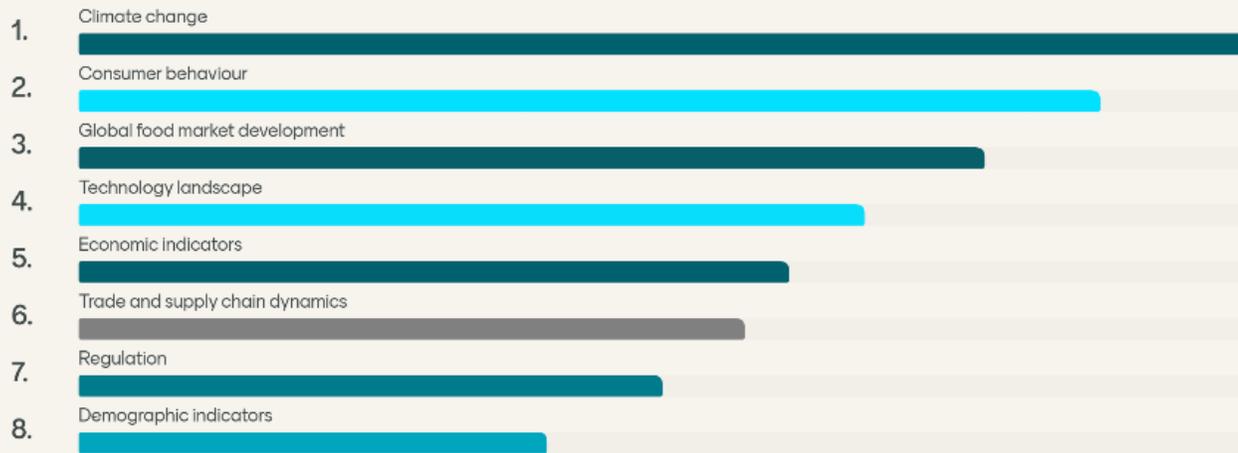
menti.com
4378 1844

103 of 123 responded

→ Start voting

What important signals do you think we are currently missing because we are too focused on today's data and problems?

Biodiversity loss	Dietary shifts globally	Emotions
Demographic change	Political instability	Viability of rural communities
Ai burnout	Disinformation	Complexity of biodiversity
Young people's attitudes	Food availability	Role of developing countries (markets)

menti.com
4378 1844

62 of **123** responded

→ Start voting

THE FUTURE DOES NOT JUST HAPPEN

we can make it

TOGETHER

WATCH THIS SPACE...

SARA REPONEN
VP, Strategy & Market Intelligence
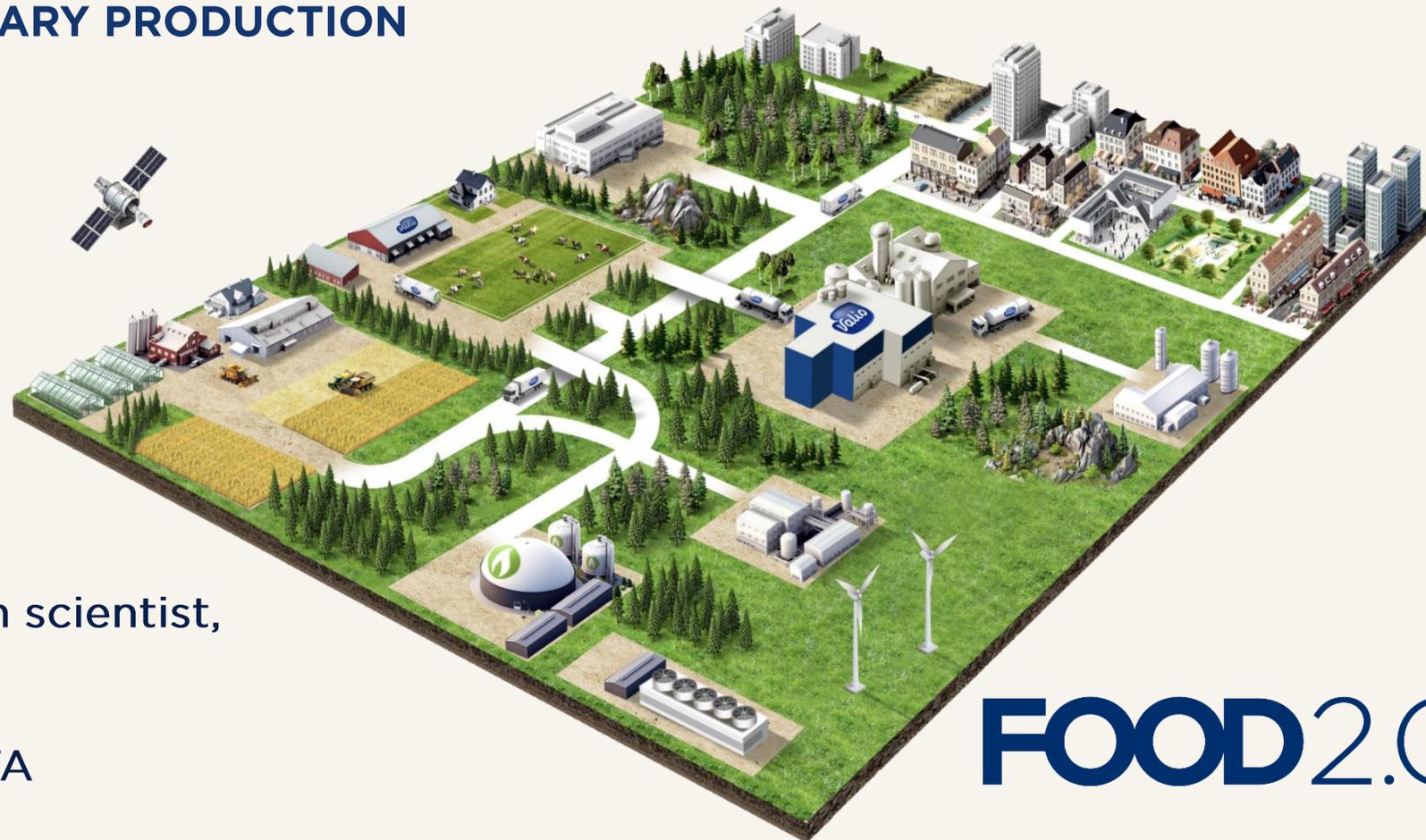Sara.reponen@valio.fi

KEVIN DEEGAN
VP, Innovation & Insight
Kevin.Deegan@valio.fi

360 OPERATIONAL ENVIRONMENT VIEW

FROM FIELD CAPACITY TO FOOD SECURITY: FUTURES PATHS FOR FINLAND'S PRIMARY PRODUCTION

CSABA JANSIK
Principal research scientist,
LUKE

ANU KAUKOVIRTA
Director, LUKE

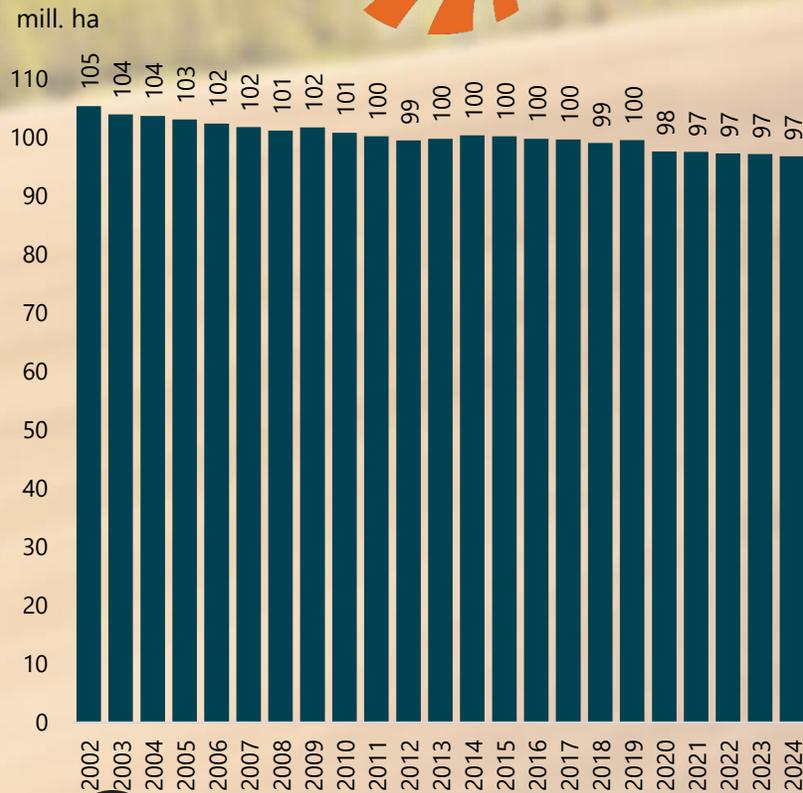FOOD2.0 | Valio

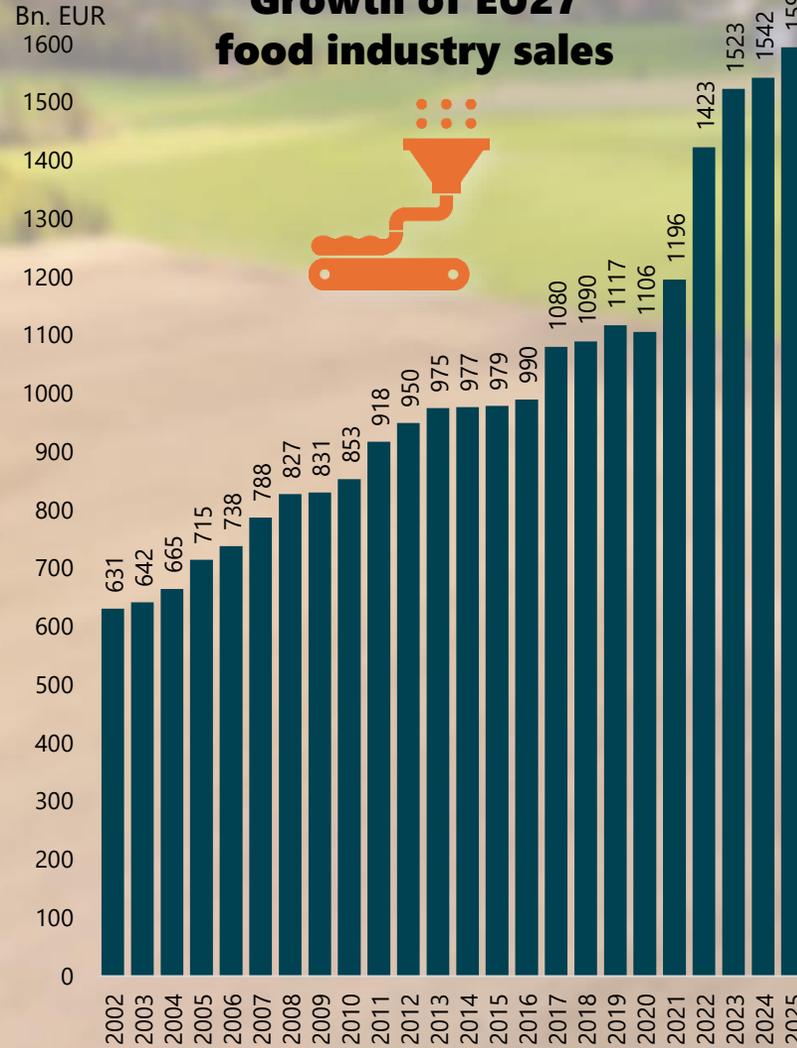# From field capacity to growth and food security

Csaba Jansik & Anu Kaukovirta

Field capacity, food industry sales and export value

Growth of EU27 utilised agricultural area

mill. ha

Year	Value
2002	105
2003	104
2004	104
2005	103
2006	102
2007	102
2008	101
2009	102
2010	101
2011	100
2012	99
2013	100
2014	100
2015	100
2016	100
2017	100
2018	99
2019	100
2020	98
2021	97
2022	97
2023	97
2024	97

Source: Eurostatin apro_cpsh1 dataset.

Growth of EU27 food industry sales

Bn. EUR

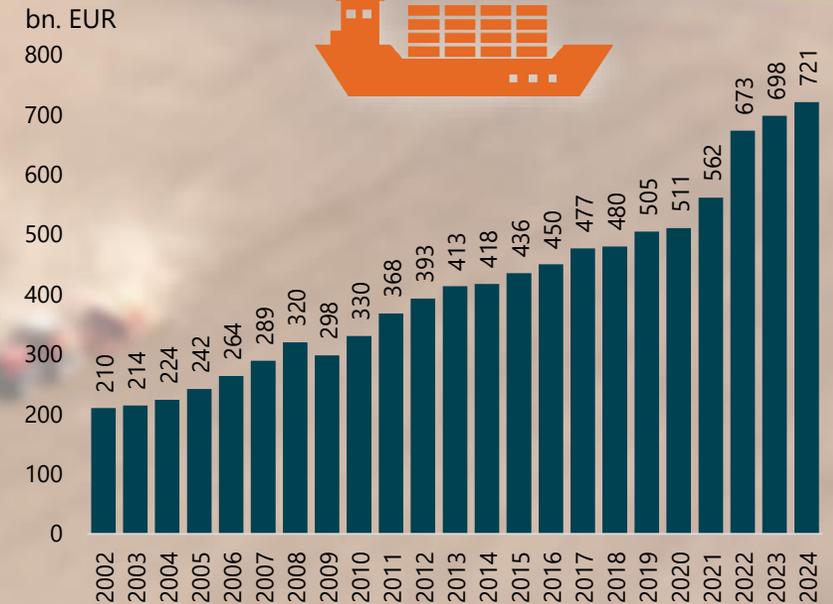| Year	Value
2002	631
2003	642
2004	665
2005	715
2006	738
2007	788
2008	827
2009	831
2010	853
2011	918
2012	950
2013	975
2014	977
2015	979
2016	990
2017	1080
2018	1090
2019	1117
2020	1106
2021	1196
2022	1423
2023	1523
2024	1542
2025	1594

Source: Eurostat, SBS dataset, CIAA and FoodDrink Europe.

The value of EU food exports has increased 2.5-fold while agricultural land has shrunk by a few percent between 2002 and 2024.

The value of EU food exports has increased 3.5 times over the same period.

Growth of EU27 food exports

bn. EUR

Year	Value
2002	210
2003	214
2004	224
2005	242
2006	264
2007	289
2008	320
2009	298
2010	330
2011	368
2012	393
2013	413
2014	418
2015	436
2016	450
2017	477
2018	480
2019	505
2020	511
2021	562
2022	673
2023	698
2024	721

Source: Eurostat, Comext dataset. Note: Figures include EU intra and extra trade CN groups 01-04, 07-12 and 15-24.

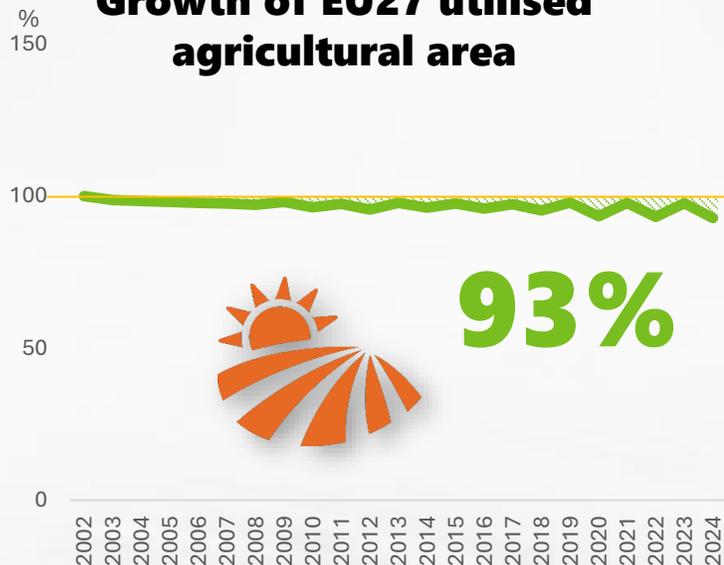Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2026

Growth indices
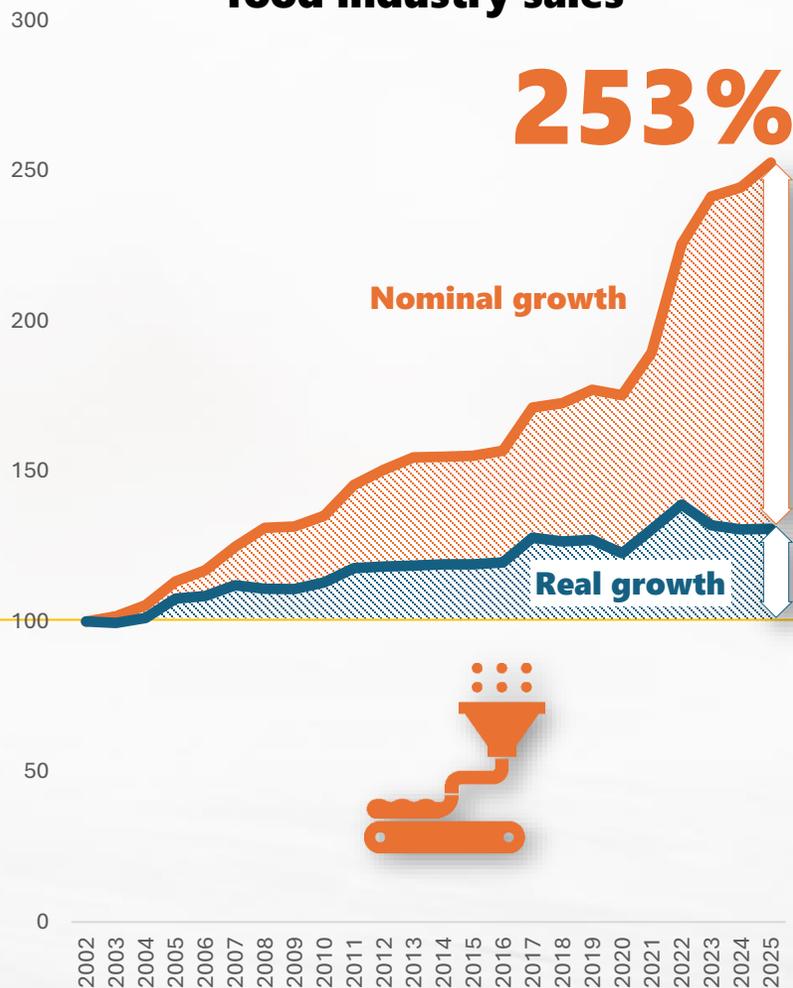

Legend

Price effect – consumer price change

Volume effect – Productivity, product portfolio changes

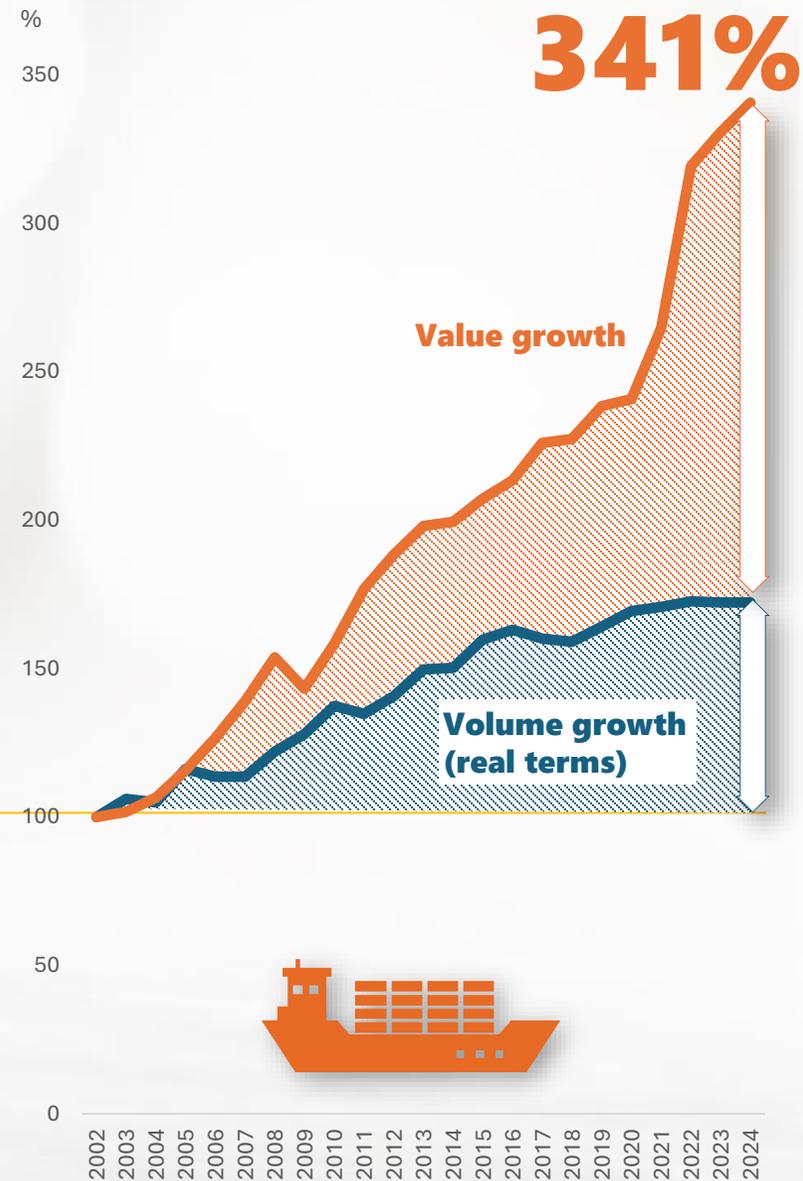**Growth of EU27 utilised agricultural area**

93%

Growth of EU27 food industry sales

253%

Nominal growth

Real growth

Growth of EU27 food exports

341%

Value growth

Volume growth (real terms)

Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2026

Luke
LUONNONVARAKESKUS

What is our field capacity?
How much is it changing?
Is there a risk for security?

Arable land in Finland: 2,264,800 ha

**Share of arable land: Finland and Sweden 7%, Norway 3%, Denmark ~70%**

Three aspects related to the sufficiency of the arable land

1. Restoration
2. Harvest gap, quality gap & harvest potential
3. Future structure of our agriculture

Luke
LUONNONVARAKESKUS

Estimated impact of the Nature Restoration Regulation on Finland's arable land area

- Restoration actions are voluntary
- Regional differences in the occurrence of peatlands are large
- The structural development of farms provides an opportunity to remove peatlands from active production
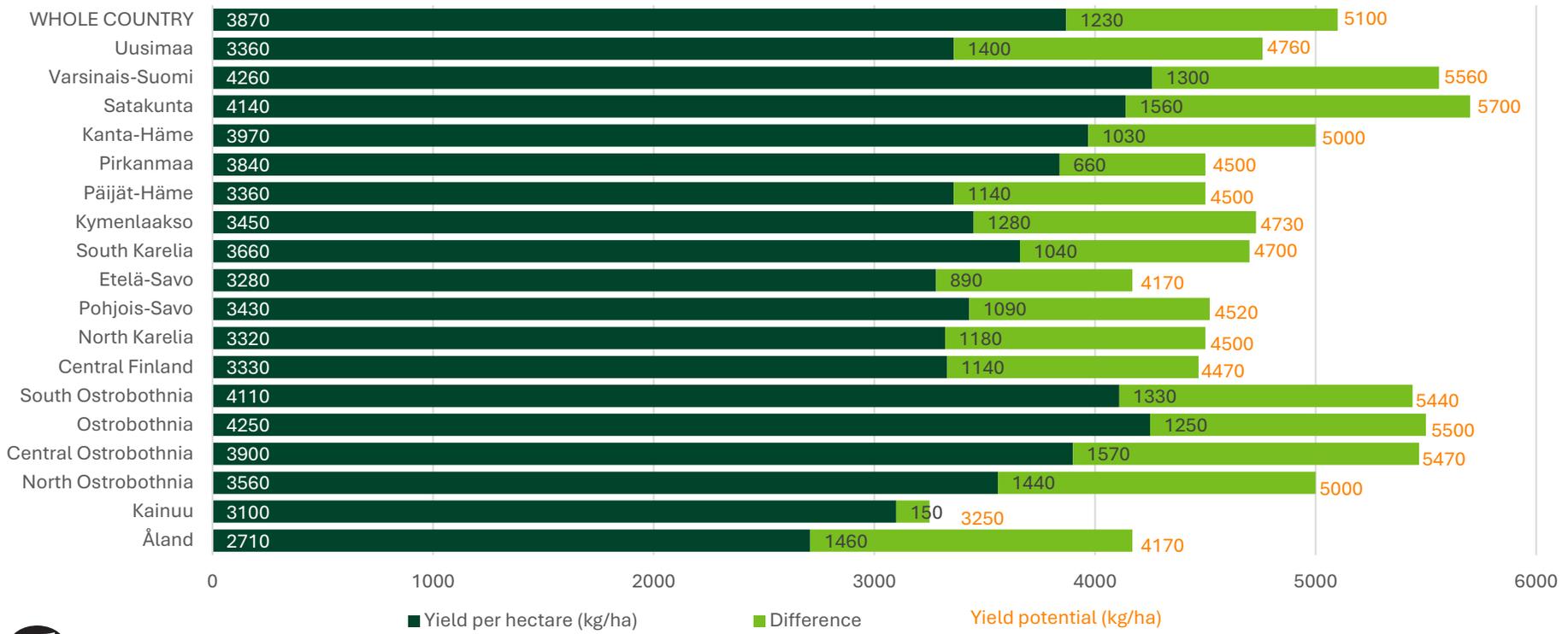
Agricultural land in use 2,257 million ha (2024)

Organic soils
12,5 %

Within the scope of restoration
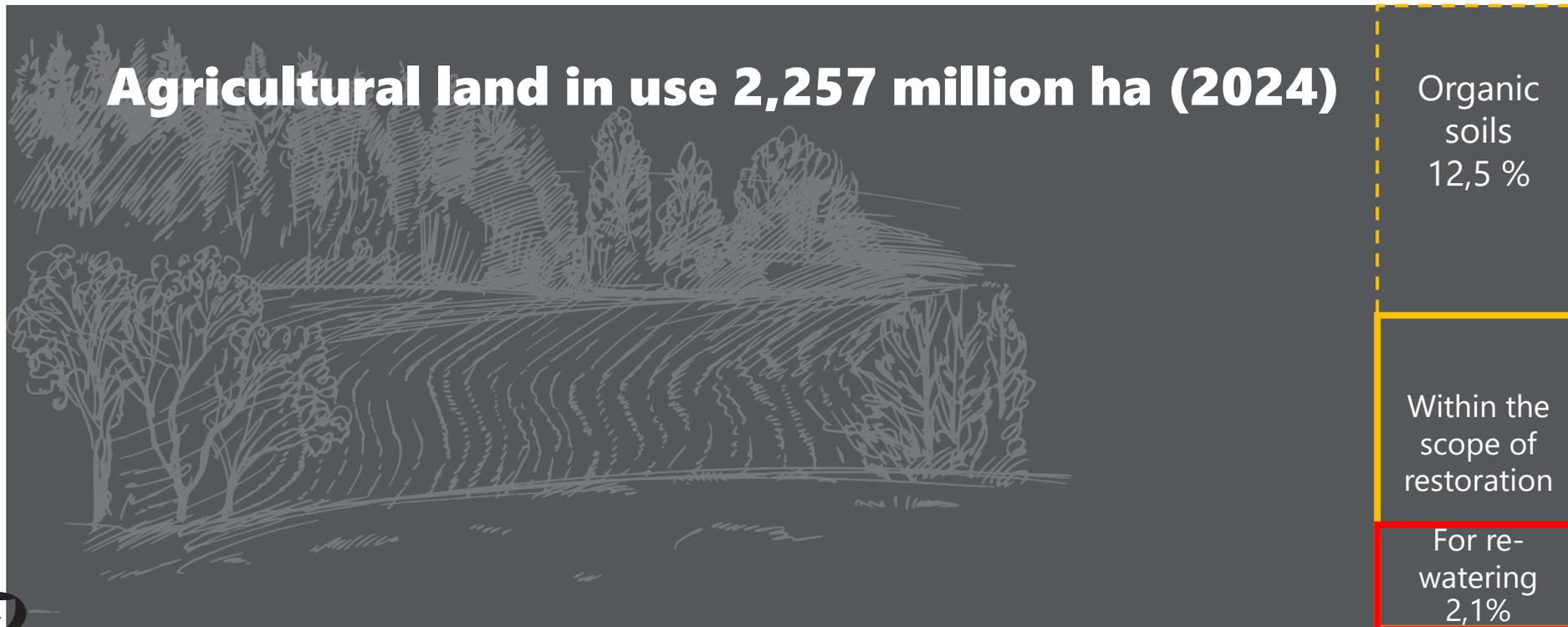
For re-watering
2,1%

If the re-watering of swamp forests and peat extraction areas is included, the share will decrease to well below one per cent.

Luke
LUONNONVARAKESKUS

Yield gap, crop potential – what are they?

- The difference between the yield and yield potential of an individual farm is the yield gap. The potential is defined as a yield per hectare, which is achieved by the best 10 per cent of the farms in the area during the growing season.

- The yield gap of an average farm is usually 30-35%, and in grass production it is about 50%.

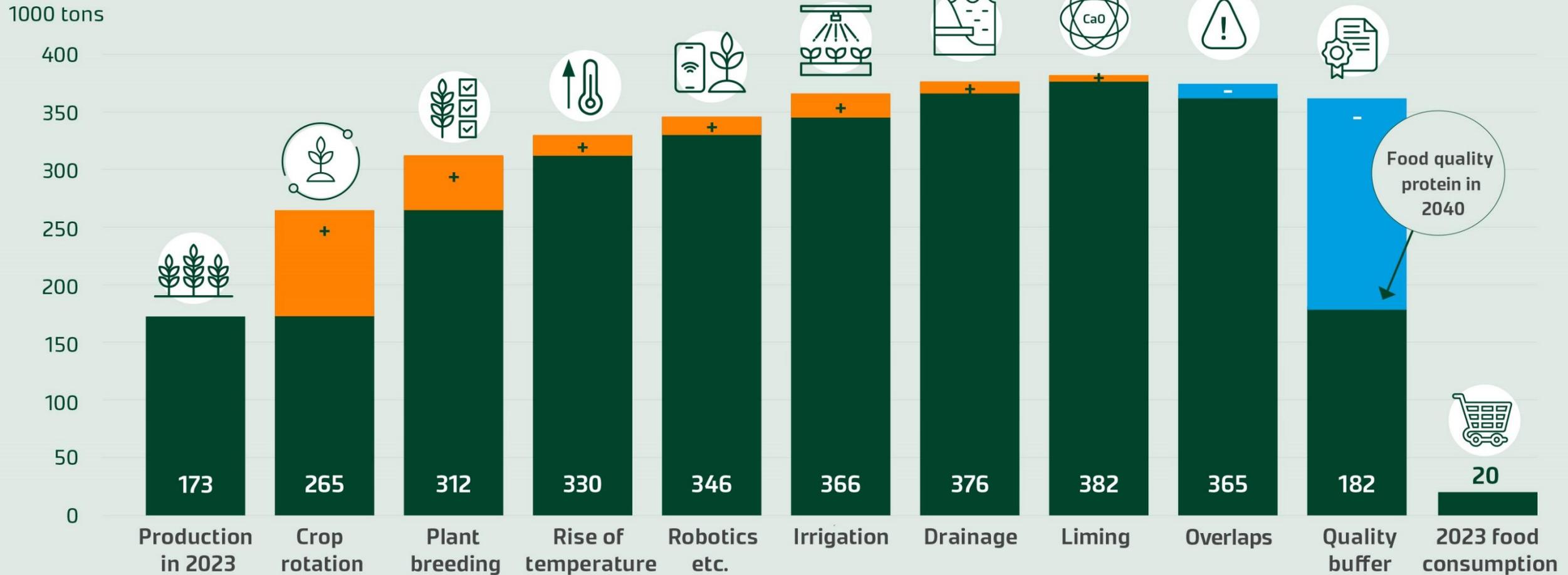**Crop potential of oats in different regions 2024**

Region	Yield per hectare (kg/ha)	Difference	Yield potential (kg/ha)
WHOLE COUNTRY	3870	1230	5100
Uusimaa	3360	1400	4760
Varsinais-Suomi	4260	1300	5560
Satakunta	4140	1560	5700
Kanta-Häme	3970	1030	5000
Pirkanmaa	3840	660	4500
Päijät-Häme	3360	1140	4500
Kymenlaakso	3450	1280	4730
South Karelia	3660	1040	4700
Etelä-Savo	3280	890	4170
Pohjois-Savo	3430	1090	4520
North Karelia	3320	1180	4500
Central Finland	3330	1140	4470
South Ostrobothnia	4110	1330	5440
Ostrobothnia	4250	1250	5500
Central Ostrobothnia	3900	1570	5470
North Ostrobothnia	3560	1440	5000
Kainuu	3100	150	3250
Åland	2710	1460	4170

Legend: Yield per hectare (kg/ha) · Difference · Yield potential (kg/ha)

Source: https://www.luke.fi/fi/blogit/satopotentiaalin-voi-nyt-tarkastaa-satotilastosta
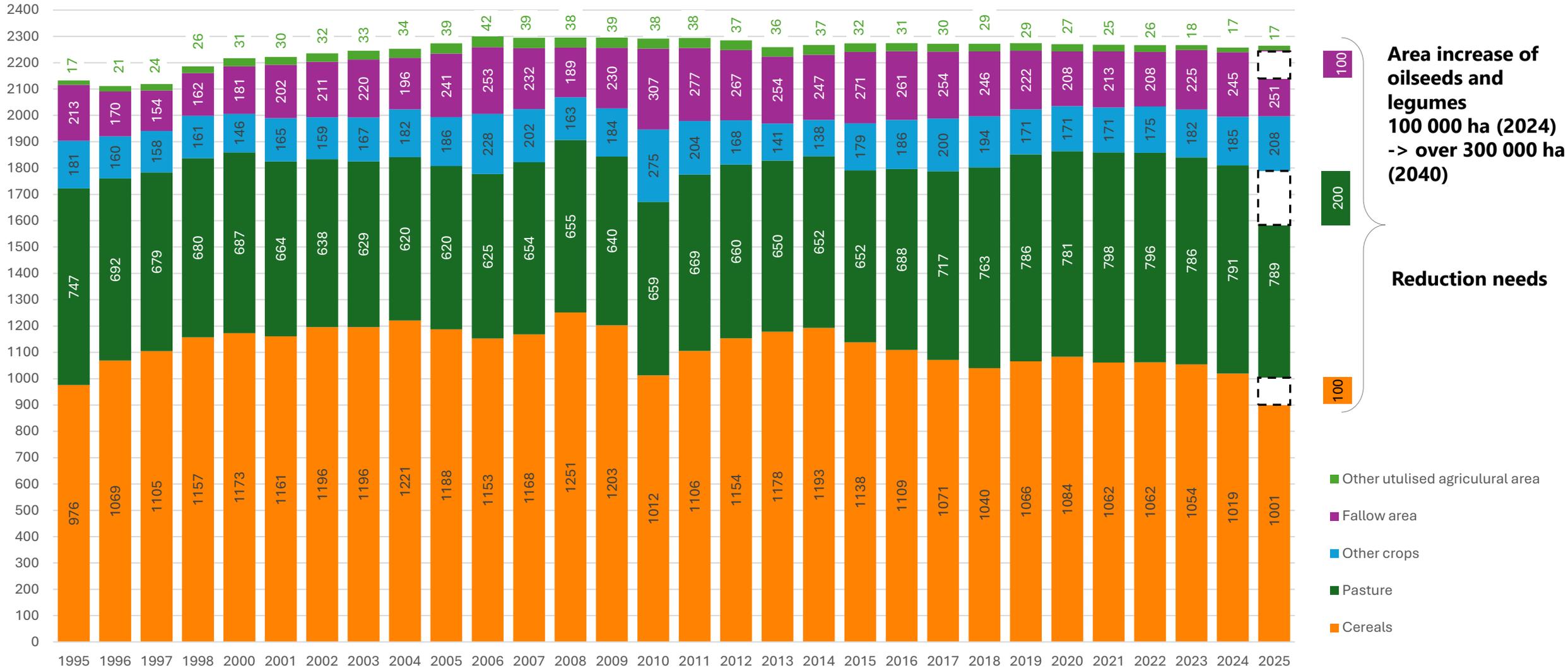
Luke
LUONNONVARAKESKUS

Potential development of plant protein production from the current situation to 2040

The calculations include the most important protein crops (legumes, oilseeds, oats, specialty crops)

1000 tons

Food quality protein in 2040

Production in 2023	Crop rotation	Plant breeding	Rise of temperature	Robotics etc.	Irrigation	Drainage	Liming	Overlaps	Quality buffer	2023 food consumption
173	265	312	330	346	366	376	382	365	182	20

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Luke
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Impact of structural change

Utilised agricultural area in Finland by major crops and use

Area increase of oilseeds and legumes
100 000 ha (2024)
-> over 300 000 ha (2040)

Reduction needs

Legend:
- Other utilised agricultural area
- Fallow area
- Other crops
- Pasture
- Cereals

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Luke LUONNONVARAKESKUS

Does field capacity limit growth or food security?

Self-sufficiency of agricultural products in Finland

- Total average self-sufficiency for Finnish food is 78% by euro terms (2024) and 80 % by protein terms (2023).

- Self-sufficiency for wheat was achieved in the early 2000s and for rye in the 2010s.

- There is good potential to increase the self-sufficiency of oilseeds, pulses and horticultural products.

Self sufficiency rates of major agricultural products (three-year average)

Self-sufficiency rates (%)

Product	Rate
Wheat	119
Barley	100
Oats	159
Rye	96
Milk*	119 / 96
Beef	89
Pork	103
Poultry	87
Eggs	118

100%
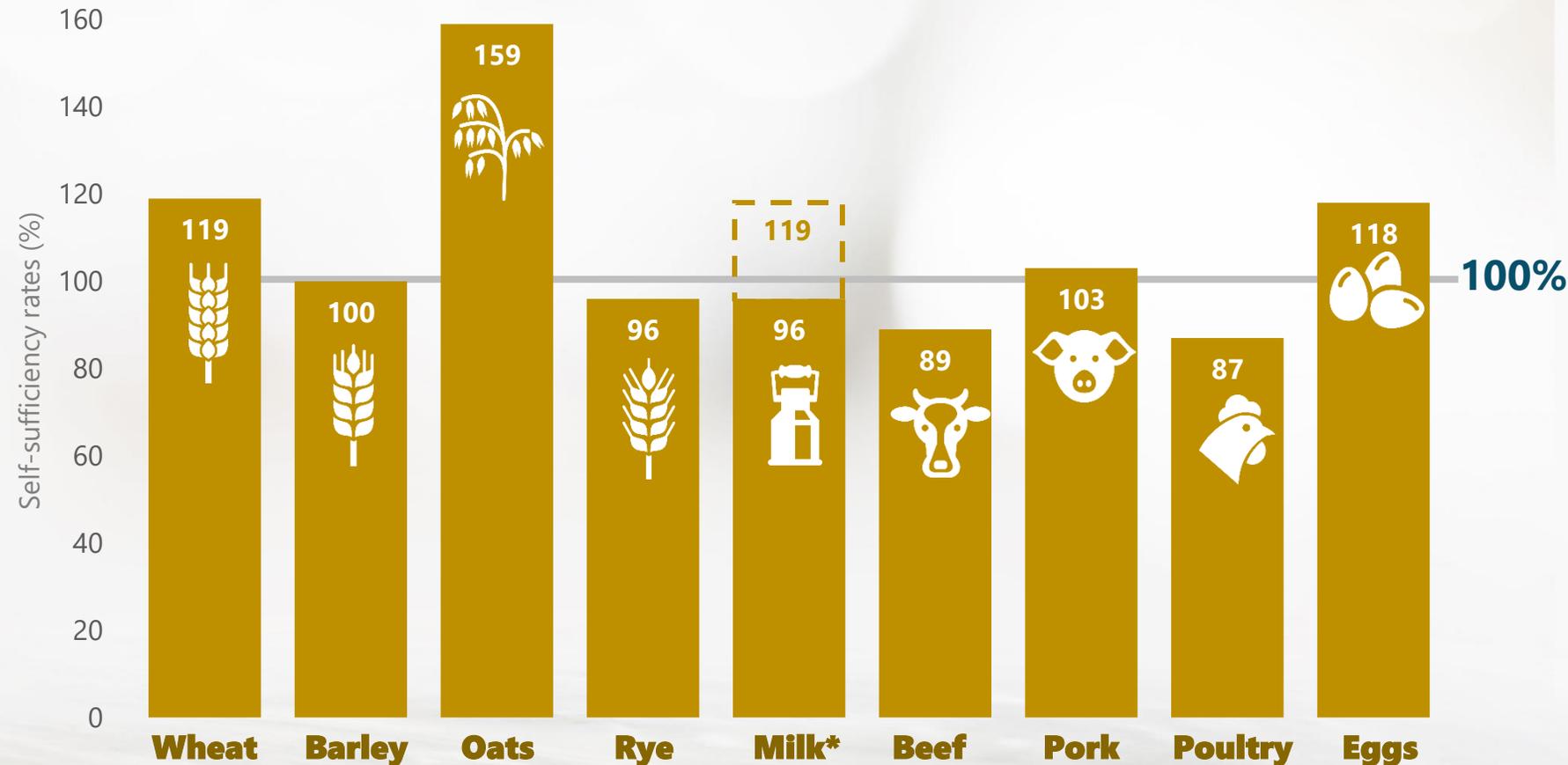
Source: own calculations from data of Natural Resources Research Finland (Luke) and Kantar TNS Agri. Note: calculation formula of SSR = production/(production + imports - exports). Changes in stock is part of the formula for cereals. Rates indicate the average of recent three years available. * The self-sufficiency rate (SSR) of milk is 96% calculated by milk equivalents 2022-2024 and 119% calculated for milk fat and protein, 2024.

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Self sufficiency of agricultural inputs

35%
of primary energy

Energy

0-99%
Vegetables 0%; grass 60-65%; special crops 92%, grains 99%

Seed

under 20%

nitrogen 0%,
kalium below 15%,
fosphorus over 100%

Fertilisers

0%

Plant protection agents

Self-sufficiency rates of agricultural inputs

20%-110%
Complementary protein feed 20%, feed grain ~110%

Feed

Equipment and spare parts

Labour

45%-98%
Field vegetable farms 45%; greenhouse farms 65%; pig farms 85%; poultry farms 93%; milk farms 97%; grain farms 98%

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Luke
LUONNONVARAKESKUS

A steady growth of export value per hectare UAA

Driving factors

- Price increase of production inputs and food
- Value added growth of food and drinks
- Cross border trade within the value chains
- The significance of livestock-based products
- The growth of industries with indirect land use
- Distribution hubs of foreign trade

EU27 food export value per utilised agricultural land

7,5

2,0

1000 EUR/ha

8

6

4

2

0

2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

Source: own calculations based on Eurostat Comext and apro_cpsh1 datasets.

Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2025

Luke
LUONNONVARAKESKUS

Food export value per agricultural land in the EU27 member states

Huge discrepancy across countries

Driving factors

- Price increase of production inputs and food
- Value added growth of food and drinks
- Cross border trade within the value chains
- The significance of livestock-based products
- The growth of industries with indirect land use
- Distribution hubs of foreign trade

7,5

EU

HOPE-scenario

BASELINE-scenario

Luonnonvara- ja biotalouden tutkimus 7/2024

Ruoka-ala kasvuun viennin ja ruokainnovaatioiden vetämänä

Keskustelunavaus ruokasektorin arvonlisän kasvattamiseen

Csaba Jansik, Anu Kaukovirta, Marja Knuuttila, Johanna Kohl, Anu Koivisto, Heikki Lehtonen, Jyrki Niemi, Liisa Pesonen, Pasi Rikkonen, Kaija Saarni, Jari Setälä ja Henrik Wejberg
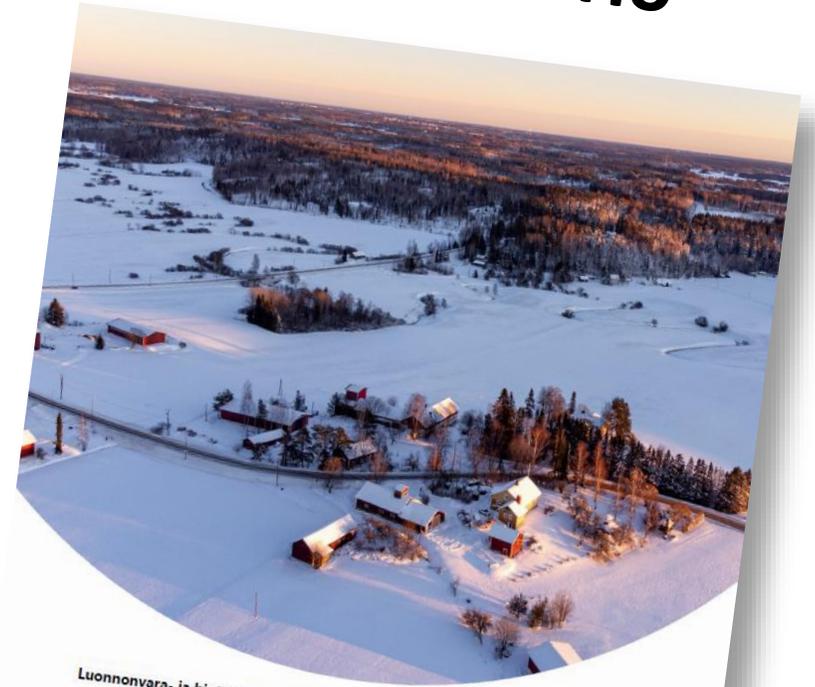
Luonnonvara- ja biotalouden tutkimus 22/2025

Ruokasektorin kasvunäkymät nykyisellä toimintamallilla

Perusskenaario sektorin kasvusta vuoteen 2035

Csaba Jansik, Jyrki Niemi, Kaija Saarni ja Jukka Tauriainen

https://jukuri.luke.fi/handle/10024/554653

https://jukuri.luke.fi/handle/10024/556186

HOPE-scenario

Sales revenues   +4 819 mill. EUR

EUR 3.8 billion would come from exports and **EUR 1.0 billion** from the domestic market.

Value added   +1 735 mill. EUR

893 milj. euroa

Viennin kasvu

Kauratuotteiden ryhmä koostuu 12 eri tuotteesta. Makeisiin sisältyy suklaat ja karkit. Panimo sisältää myös virvoitusjuomat. Muiden elintarvikkeiden ryhmään kuuluvat mm. kahvi, tee ja mausteet, hunaja, vesi, jäätelöt, tärkkelys ja maltaat, erinäiset elintarvikkeet, homogenisoidut tuotteet, rehu ja lemmikkieläinten ruoat. Osa kalan, kauratuotteiden ja marjojen arvonlisän noususta tulee kotimaasta.

857 milj. euroa

Uudet arvoketjut

Solumaatalouden tuotteet suuntautuvat täysimääräisesti vientiin. Kasviproteiiniketju sisältää puolivalmisteiden ja lopputuotteiden jalostusasteet. Raaka-aineina vat palkokasvit, öljykasvit, viljat ym. Kasviproteiiniketjun puolivalmisteet ja lopputuotteet myydään sekä kotimaan että ulkomaan markkinoille.

4501 milj. euroa

BASELINE-scenario

Sales revenues +2 046 mill. EUR

EUR 1.1 billion would come from exports and **EUR 0.9 billion** from the domestic market.

The growth in value added is less than a third compared to HOPE scenario.

Value added   +571 mill. EUR

500 milj. euroa   **Viennin kasvu**

71 milj. euroa   **Uudet arvoketjut**

4501 milj. euroa

Luke
LUONNONVARAKESKUS

Oats

Oat production outlook – BASELINE-scenario

	Production in 2035	Change 2035/2024
	1217	+17 %
	1025	-1 %
	941	-9 %

Legend: —— Kaura – – Kaura 30v – – Kaura 20v – – Kaura 10v

Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2026

Why is value-added important in food export?

The export volumes of oats, milled oat products and muesli & granola, 2001-2025

Finland

Sweden

Germany

UK
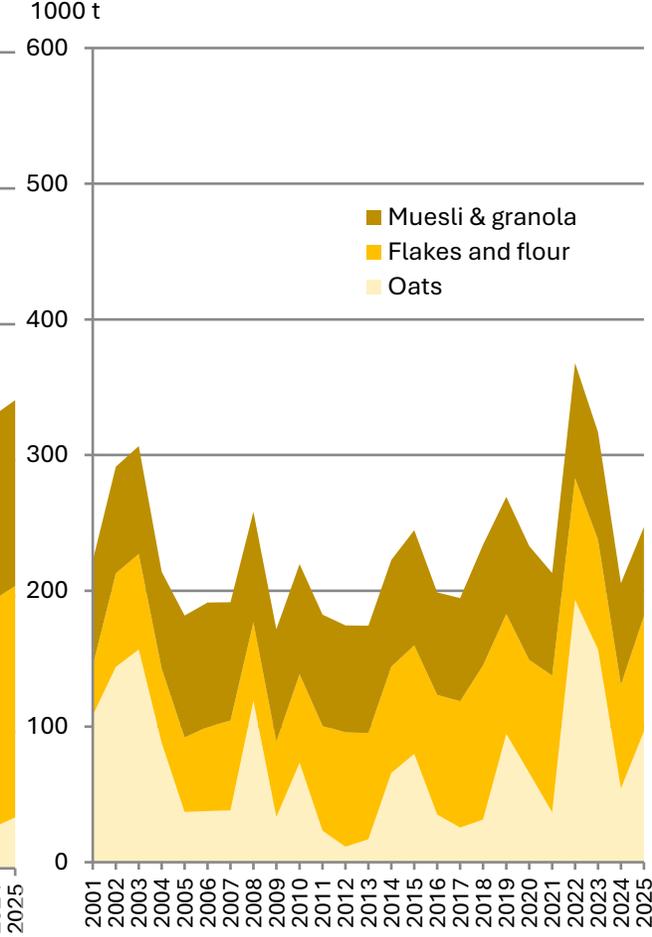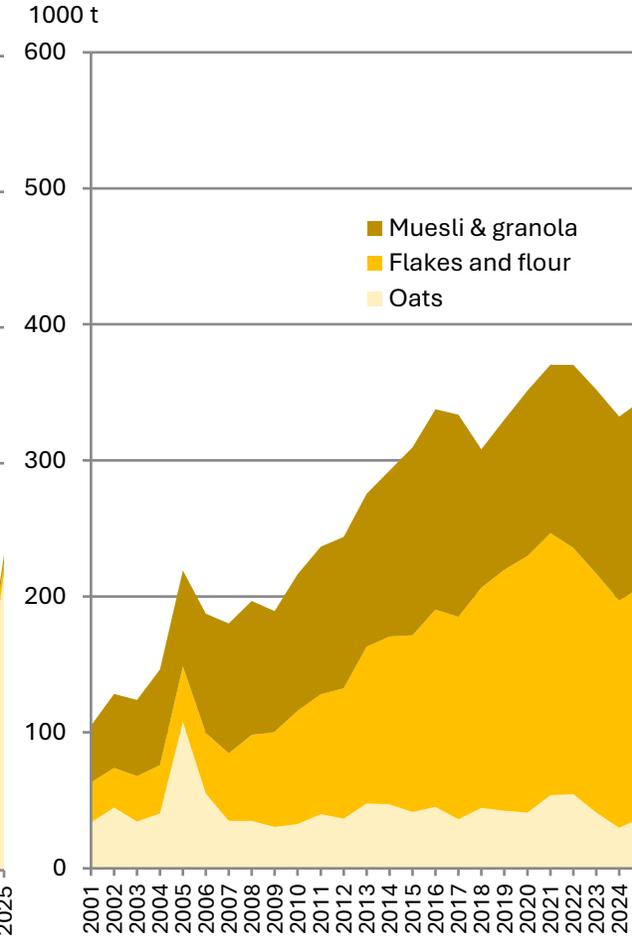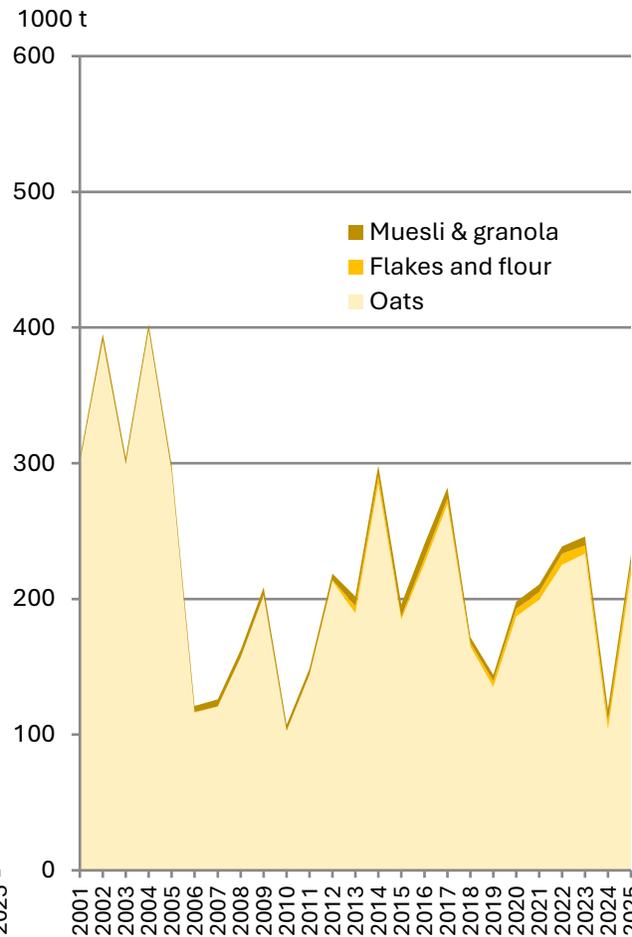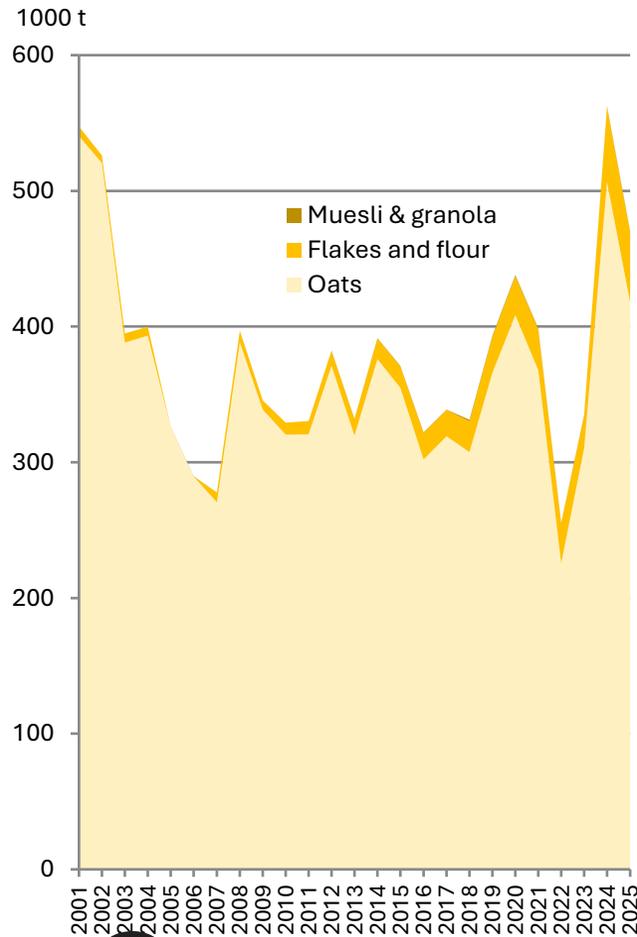
■ Muesli & granola
■ Flakes and flour
□ Oats

Source: Csaba Jansik/Luke. Own calculations based on Eurostat Comext dataset. Note: 2025 figures are preliminary. Source for UK of years 2021-2025 is International Trade Center.

Luke
LUONNONVARAKESKUS

Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2026

Why is value-added important in food export?

The export value of oats, milled oat products and muesli & granola, 2001-2025
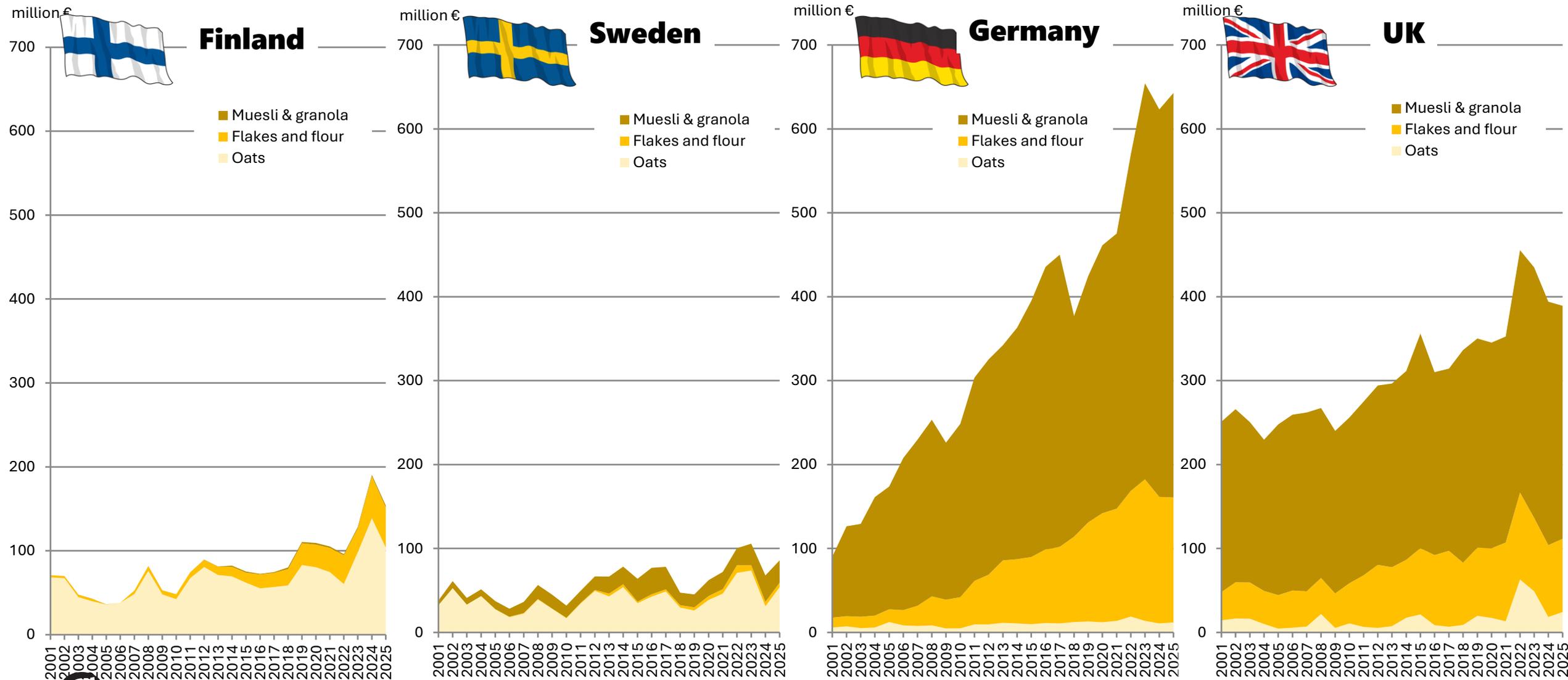
Source: Csaba Jansik/Luke. Own calculations based on Eurostat Comext dataset. Note: 2025 figures are preliminary. Source for UK of years 2021-2025 is International Trade Center.

Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2026

Oat supply chain

Ingredients

Consumer products

Flakes and flour

Oat drinks

Oatgurts

Plant-based cheese

Sport concentrates

Porridge

Muesli & granola

Cereal bars

Fractionating

Second stage processing

Side dishes

Biscuits

Oat bread

Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2026

Luke
LUONNONVARAKESKUS

mill. EUR
150
100
50

Oat drinks

Flakes & flour

Sport concentrates

Fractionating

Biscuits

Oat bread

Porridge

Muesli & granola

Cereal bars

Oatgurts

Side dishes

Plant-based cheese

Luke
LUONNONVARAKESKUS

Sales price and export value increase hand in hand with the level of processing and differentiation

Raw material export

Value-added raw material export

Ingredient export

Value added ingredient export

Product export

Highly processed, high value product export

Sales price and export value

Level of processing and differentiation

Csaba Jansik & Anu Kaukovirta – Food 2.0. – 19.3.2026

Luke
LUONNONVARAKESKUS
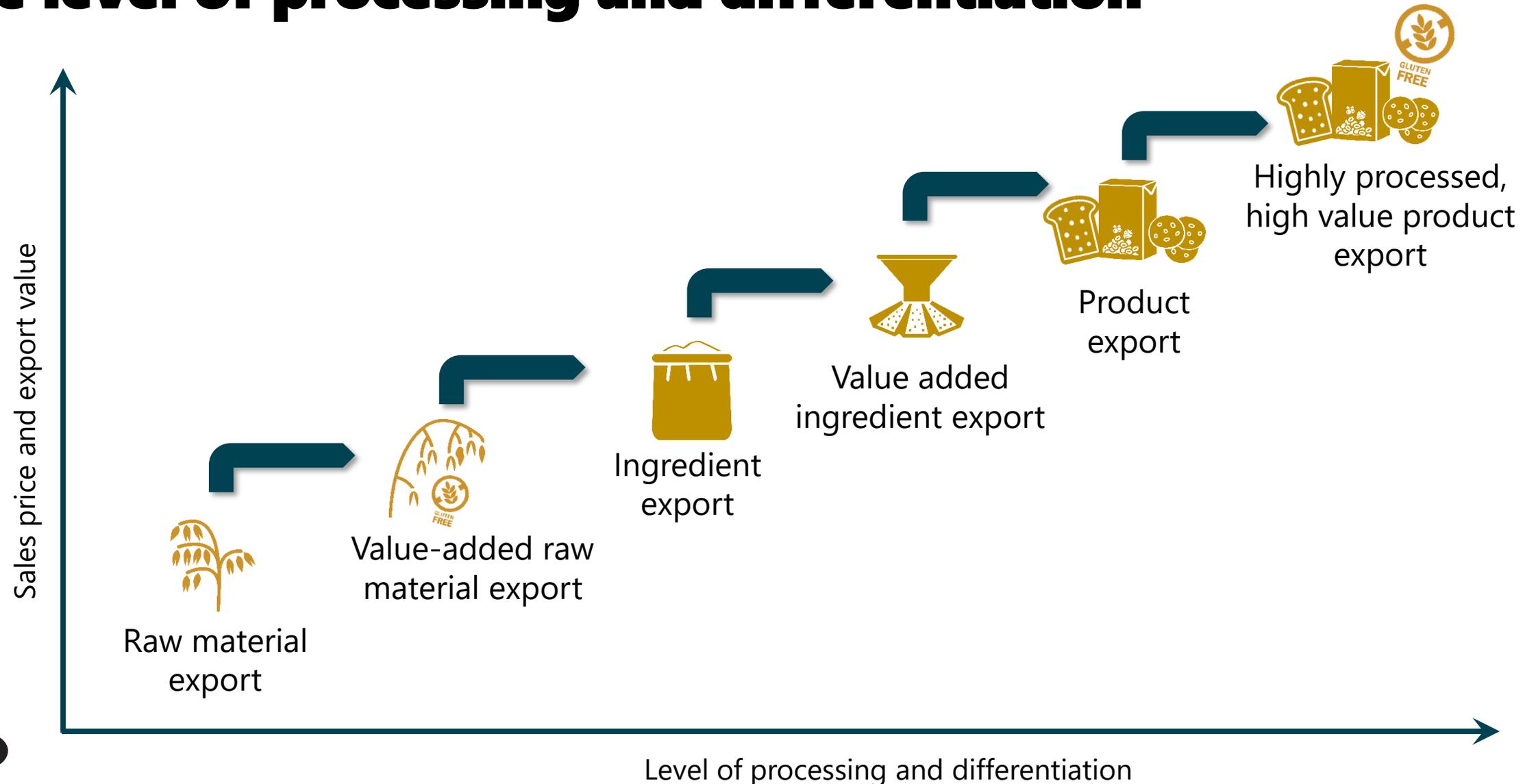
The availability of agricultural land does not endanger food security or limit growth.

Thank you!

anu.kaukovirta@luke.fi

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HIGLIGHTS OF THE SECOND YEAR OF FOOD 2.0

VEERA VIRTANEN
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RIITTA PARTANEN
Head of research, Valio
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FOOD2.0 | Valio

FOOD 2.0 ECOSYSTEM – MARCH 2026
212 MEMBERS
AND LINKS TO THE OTHER VETURI COMPANIES

Valio

ENERGY AND TRANSPORT

Kuljetusliike Järvimäki Oy · Suomen Lantakaasu · KEMPOWER · HETE · Patria eALLIANCE · XYLO GAS · CarbonReUse · st1 · WÄRTSILÄ · ZERO EMISSION MARINE 2030 · nokian TYRES · FUTUREPROOF · NESTE · Novel sustainable & scalable solutions for transportation and chemicals

MATERIALS AND CHEMICALS

WOODGROW · KAPASITY · KEMIRA · Valmet · Beyond Circularity · NORDIC BIOPRODUCTS GROUP · GRANULOUS · MEYER TURKU · NEcOLEAP · AB Enzymes, an AZT ingredients company · BOREALIS · MIRKA · Shape · CANATU · CarbonAge · SPIRIT

CONSULTANCY

ULTRA LEAN BUSINESS · MEDFILES · AFRY · INVENIRE · HE Health & Experience Finland Ltd · HONKAJOKI · Pumento · Deloitte · gaia part of Sweco · SWECO · BIOSAFE · RAVISTAMO · toDD · Ihan parasta! · ideascout CO·DESIGN·EXECUTE · KPMG · VIEXPO · NORDICHUB · OPEN CONET · DataBites · blic · Young Finnish Design · VISINTUM · ELAP · CLANED · PUHI · CARBONS · SÄHKÖPOJAT · HIILIPÖRSSI · ÄRO-TANNER OY · ALUKE · AISTILA · innolact · BioName DNA analyses as turnkey solutions · afekta TECHNOLOGIES · eurofins · KeinoX · inmec instruments · NANKO

FOOD AND FEED, PROCESS TECHNOLOGY

YARA · MAANVAALIJA · BERNER · JEPO · Luonnosta · Kinnarin Tila 1667 · ROSTEN · Porokylän · mäsli · BIO KASVU · BOR · Hankkija · VERMAN · Bonne Arctic Happy Juicery · HEINO · aevia HEALTH · Kekkilä BVB · KIERTORAVINNE part of Biolan Group · Vöner Plant based food · DAVA Foods · ARCTIC · FILTSON · faba · linseed · Lantmännen · Sinebrychoff part of the Carlsberg Group · SENSON More by Nature · NESTELANNOITE OY · EOD EUROPE · DTS FINLAND · JUUSTO · VIKINGGENETICS innovative breeding · JEPRO · Apetit · VIHREÄ KEIJU · VIKING MALT · Atria · Champ · 10 KYMPPI · LAIHIAN MALLAS · foodwest · NPHARVEST · SuperGround · RAISIO · GOVA · Halal FoodTech SIMPLY TRADITIONAL · Locusia · Osuuskunta Pohjolan Maito · HKFOODS · Fazer · ODDLY GOOD · Mö · FERM FOODS · THREE Mushketeers · JUUSTOPORTTI · Aimo Valio · HAPPY PLANT PROTEIN co. · FrostDry · ORIGIN OCEAN · Volare · Planet Amino · LYOGIX · Benerg · ROCSOLE · Powdea MASTERS OF INGREDIENTS · VAISALA · ORFER GROUP · 3DSTEP · TM SYSTEMS · AQUAMONI · METABAR · Probitat · enifer · GEA · LIQUM · AIRCOHOL IN GOOD SPIRITS · ELOMATIC · FIELD LINE AUTOMATION · PROTO RHINO · LAPELA · SUVILUMI · Alimetrics RESEARCH

Food 2.0
Food · Energy · Materials · Feed · nitrogen · water · carbon · phosphorus
Animal-based · Plant-based · Cell-based

DIGITAL, DATA, AI

YIELD SYSTEMS · Semantum · SIEMENS · ATR · codeo · ORION · A Digital Boost for the Pharmaceutical R&D · IBM · CENSE ANALYTICS · digia · MONAD · Mtech · POLAR · GOFORE · emblica · Biomensio · DIGISALIX · 4DBARN · Bittium Seamless and secure connectivity · SECOND THOUGHT · brillian · avoin · Amazon · NaturAI · Data Space Europe · FLYBYME · datasense smart environment solutions · GS1 Finland · VIHERLINKKI Optimized greenhouse growth · AKVAMARIINI · LIITOS SOLUTIONS · UPPILOG

RESEARCH AND EDUCATION

UNIVERSITY OF EASTERN FINLAND · Luke LUONNONVARAKESKUS · VTT · A" · TURUN YLIOPISTO · OULUN YLIOPISTO · YSAO · Vaasan yliopisto UNIVERSITY OF VAASA · Tampereen yliopisto Tampereen ammattikorkeakoulu · ILMATIETEEN LAITOS · LUT University · JYVÄSKYLÄN YLIOPISTO · XAMK · GTK · Metropolia · LAB University of Applied Sciences · LAUREA · NOVIA UNIVERSITY OF APPLIED SCIENCES · SYKLI · Haaga-Helia · kpedu · HAMK–Hämeen ammattikorkeakoulu · jamk University of Applied Sciences · SeAMK · TURKU AMK · RUOKAVIRASTO Livsmedelsverket · Finnish Food Authority · SAVONIA · SOKERIJUURIKKAAN TUTKIMUSKESKUS · TF TAK · OAMK · PTT · Sven Hallinin tutkimussäätiö

FINANCIERS AND ENABLERS

BUSINESS FINLAND · Maa- ja metsätalous-ministeriö · SITRA · JOHN NURMISEN SÄÄTIÖ · VAIKUTTAVUUS SÄÄTIÖ · eit Food · INNOVESTOR

ORGANIZATIONS

BSAG Baltic Sea Action Group · MAA akatemia · ETT · MTK · KEHITTYVÄ ELINTARVIKE · ETL · SLC · ProAgria · ETELÄ-POHJANMAAN LIITTO Regional Council of South Ostrobothnia · ETS ELINTARVIKETIETEIDEN SEURA RY · SALAOJITUKSEN TUTKIMUSYHDISTYS RY · DYNAMO Närpes · Pyhäjärvi-instituutti · AgriFood Pohja · Satafood · PIETARSAAREN SEUTU JAKOBSTADSREGIONEN · into SEINÄJOKI · Posintra · BUSINESS VANTAA · ROVANIEMI

FOOD 2.0 PROGRAM IN NUMBERS – MARCH 2026

Ecosystem partners

212

Participating entities in ecosystem projects

91
15 research institutes,
76 companies/organizations

On-going Business Finland projects

5 co-innovation
5 co-research

Connections with European food ecosystems

7
Sweden, Norway, Denmark, Estonia, Netherlands, France, Switzerland

Total volume of ecosystem projects

54 M€

On-going MMM funded projects

2 Makera projects
9 R&D projects

Ecosystem events
live or webinars

11

International funding

2 M€

On-going other R&D projects

1 EU project
1 RCF project
2 FRIF projects

Tot. Number of projects: 25

ROADMAP

Nature-smart food system

TARGETS:

100 PARTNERS
involved in the ecosystem

EUR 100 MILLION
investments in RDI
across the ecosystem

**EUR 1 BILLION
GROWTH**
in food exports
by 2032

FOOD 2.0

THEME 1:
**FUTURE
PRODUCTS**
Animal- and plant-based nature-
smart products and ingredients,
Exploratory products from
integrated value chains

THEME 2:
**TECHNOLOGY
TRANSFORMATION**
Emerging process and measuring technologies,
Cellular agriculture, Biomonitoring,
Gene technologies, Artificial
Intelligence, Digitalisation

THEME 3:
**REGENERATIVE
PRODUCTION**
Biodiversity, Land use efficiency,
Restoration, Water management
Crop rotation, Animal welfare

THEME 4:
**CIRCULAR ECONOMY &
RESOURCE EFFICIENCY**
Green NH_3 and biogas,
Nutrient efficiency & circulation (C, N, P),
CCS&CCU, Water efficiency, Feedstock
optimisation (C, N), Grass biorefinery, Side
stream valorization, Systemic modelling

**COMPETITIVE
FUTURE**

**ENABLING
CHANGE**

**PREREQUISITES
FOR GROWTH**

FOOD2.O | Valio

Nature-smart food system

6
Ecosystem projects

23
Partners in the projects

BF Co-innovation: FoodID (VTT)
• Hybrid food & cellular agriculture

BF Co-research: FABulOATS (LUKE)
• Production of uniform and high-quality oats and faba beans

BF Co-innovation: MetaFerm (UTU)
• Plant based-material fermentation and metabolomics

FRIF: (UTU)
• Milk Membrane Lipids for Enhancing Elderly Nutrition

MMM Makera: FINNUTRI (LUKE)
• Domestic food production and dietary needs

MMM Makera: PROTETURVA (Finnish Food Authority)
• Safety of plant-based meat analogues

THEME 1:
FUTURE PRODUCTS

Mikko

FOOD 2.0

THEME 1:
FUTURE PRODUCTS

THEME 2:
TECHNOLOGY TRANSFORMATION
AI

THEME 3:
REGENERATIVE PRODUCTION

THEME 4:
CIRCULAR ECONOMY & RESOURCE EFFICIENCY

BIOGAS

Second year highlights

FOOD2.0 | Valio

Nature-smart food system

THEME 2:

TECHNOLOGY TRANSFORMATION

2
Ecosystem projects

10
Partners in the projects

RCF: AI in food R&D (VTT)
- Linked to FoodID: Hybrid food & cellular agriculture

FRIF: (LUKE)
- Methane mitigation by animal breeding

Niina

FOOD 2.0

THEME 1:
FUTURE PRODUCTS

THEME 2:
TECHNOLOGY TRANSFORMATION
AI

THEME 3:
REGENERATIVE PRODUCTION

THEME 4:
CIRCULAR ECONOMY & RESOURCE EFFICIENCY

BIOGAS

Second year highlights

FOOD 2.0 | Valio
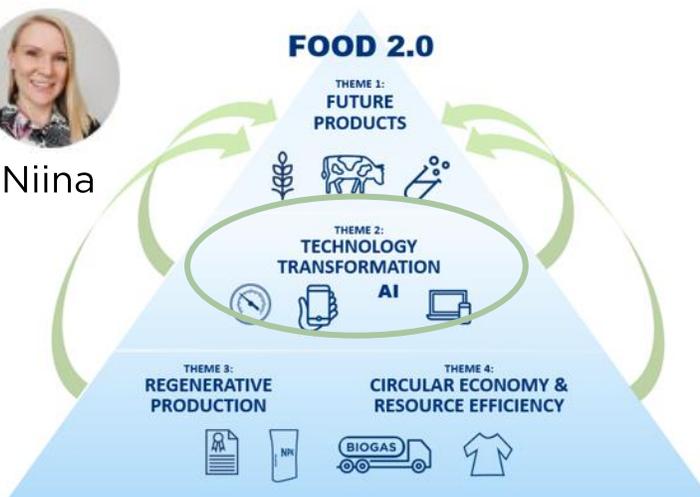
Nature-smart food system

THEME 3:

REGENERATIVE PRODUCTION

9
Ecosystem projects

BF Co-innovation: **AWVS** (LUKE)
- Animal welfare verification system

BF Co-innovation: **AGCLIMATE** (FMI)
- Field plot-based climate impacts

BF Co-research: **CARBON+** (UH)
- Agricultural aerosols

MMM: **SOMA** (LUKE)
- Changing world, adaptable farm

MMM: **MARHA** (PTT)
- Agricultural policy, market and financial risks and means to manage them

27
Partners in the projects

MMM: **Vesilienssi** (LUKE)
- Water management as a resilience solution for garden production

MMM: **GENOVA** (LUKE)
- Genome-based solutions for variety breeding

MMM: **Multipurpose Grazing** (UH)
- Effects of dry cow grazing on animal welfare and biodiversity

MMM: **UUSTILA** (Syke)
- Farm level transition to regenerative farming

Virpi
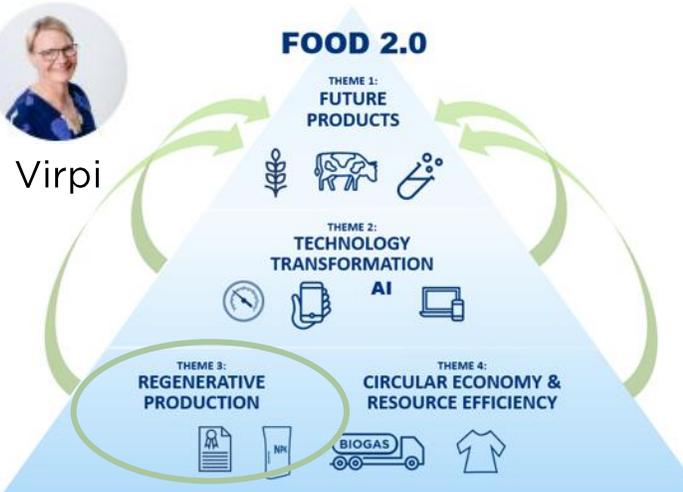
Second year highlights

FOOD 2.0 | Valio
Nature-smart food system

THEME 4:
CIRCULAR ECONOMY & RESOURCE EFFICIENCY

8
Ecosystem projects

BF Co-innovation: Bio2Max (LUKE)
- Advanced biogas plant

BF Co-research: AlgaCircle (UTU)
- Microalgae & circular economy

BF Co-research: Meri-News (VTT)
- Conversion of NOx emissions to nitrogen fertilizers

BF Co-research: HELO (VTT)
- Hydrogen economy: green urea and ammonia fertilizers, e-SAF, e-CH4

55
Partners in the projects

MMM: FoVi (TAU)
- Phosphorus smart farming

MMM: SCiLF (LUKE)
- Smart circular economy on livestock farms

MMM: NutrientEffect (Syke)
- Effects of nutrient cycle at regional, value chain and farm level

EU: PRIMARY (VTT)
- New business from agricultural sidestrems

Ehsan

FOOD 2.0

THEME 1: FUTURE PRODUCTS

THEME 2: TECHNOLOGY TRANSFORMATION AI

THEME 3: REGENERATIVE PRODUCTION

THEME 4: CIRCULAR ECONOMY & RESOURCE EFFICIENCY

BIOGAS

Second year highlights
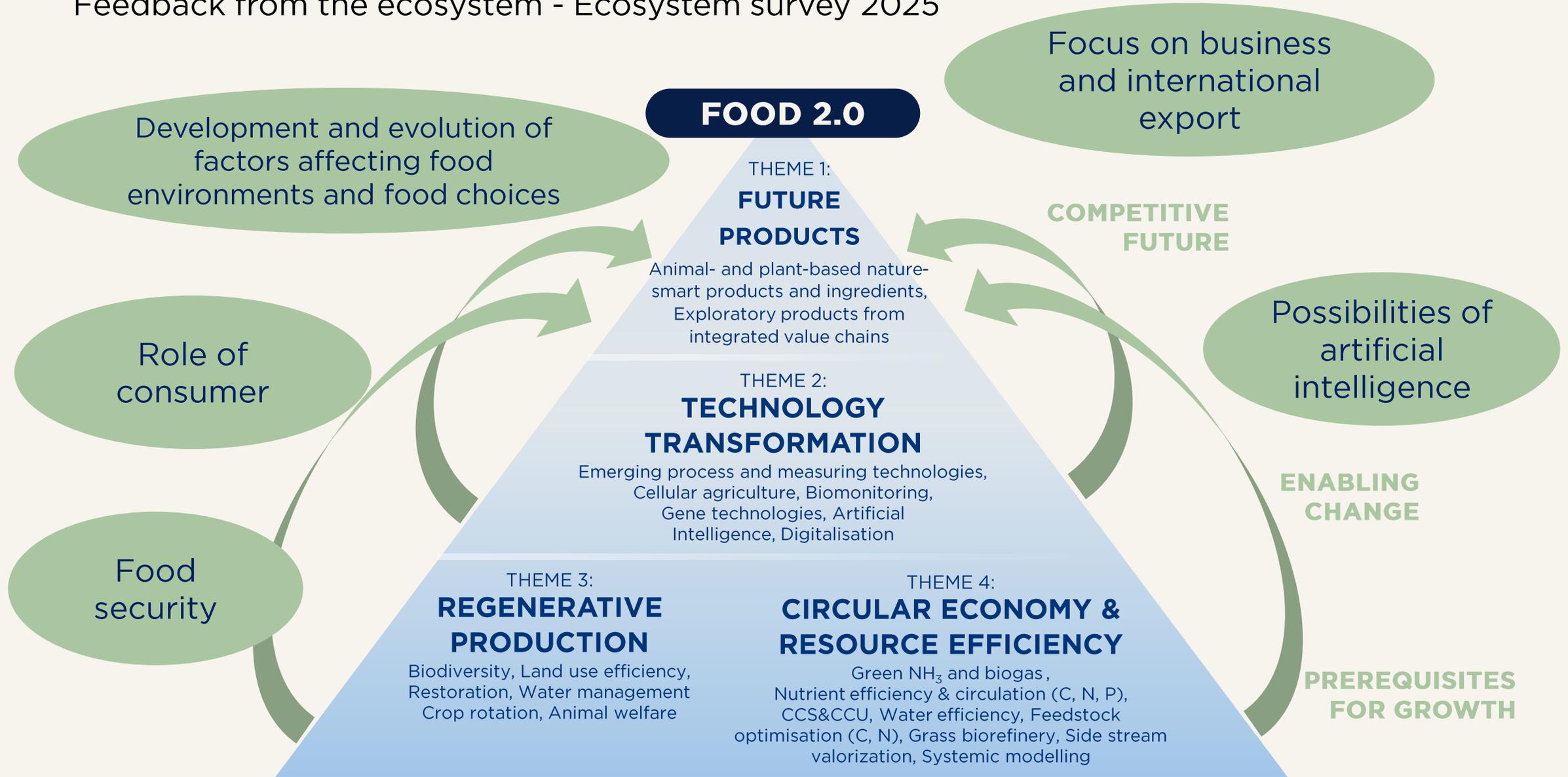
SUPPORT FOR EXPORT ACTIVITIES - CONTACT PERSONS

✦ Ruokatieto
- Jyrki Karlsson, jyrki.karlsson@ruokatieto.fi

✦ SUVI ry
- Jarmo Talasrinne, jarmo.talasrinne@su-vi.fi

✦ Foreign ministry, Global food and food tech. Team
- Lili Lehtovuori, lili.lehtovuori@gov.fi

✦ Business Finland
- Eeva Salminen, eeva.salminen@businessfinland.fi

✦ Ruokavirasto / Finnish food authority
- vienti@ruokavirasto.fi
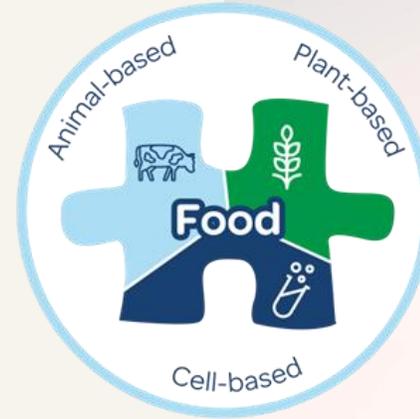
WORKING TOGETHER TO BUILD A NEW, SUSTAINABLE FOOD SYSTEM

Agrofibers for textiles

Digital solutions for consumers and retail solutions for resource efficiency

Carbon sequestration

Animal welfare

Data solutions for resource efficiency

Crop farming, residues for animal feeding

Animal-based

Plant-based

Food

Cell-based

FOOD 2.0

THEME 1:
FUTURE PRODUCTS

THEME 2:
TECHNOLOGY TRANSFORMATION

AI

THEME 3:
REGENERATIVE PRODUCTION

THEME 4:
CIRCULAR ECONOMY & RESOURCE EFFICIENCY

BIOGAS

Biogas production from manure (cows' poo)

CO_2 from biogas plant converted to methane with P2X hydrogen

Circular fertilisers from manure biogas production residue

Side streams from the factory are converted into single cell protein – food and feed

LEADING COMPANY ECOSYSTEM COLLABORATION: HARNESSING AI AND PARTNERSHIPS TO DRIVE FOOD INDUSTRY SUCCESS

VILJA HANNULA
Senior Project Manager
AMD Silo AI

FOOD2.0 | Valio

Mission

Making Finland the world-leading AI hub

Building an ecosystem where the next generation AI solutions are developed and commercialized through open collaboration between computing infrastructure, industry partners and research institutions.

AMD
together we advance_

COMPUTE TO IMPACT

Making Finland The World-Leading AI Hub

- ✓ **DEMANDING COMPUTE**
- ✓ **HIGH COMPLEXITY**
- ✓ **OPEN SOURCE**
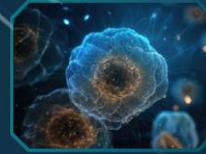
Life Sciences **+** Robotics & Autonomous Systems **+** Scientific AI, HPC & Quantum **+** Visual Media and Gaming

WORKSTREAM 1:
FROM COMPUTE TO APPS — Developing step-changing tools that unlock tangible breakthroughs in our strategic verticals.

WORKSTREAM 2:
AGENTIC & FOUNDATIONAL AI — Breaking the limitations by rethinking how AI is built, trained and used in the future.

WORKSTREAM 3:
EFFICIENT AI — Ensuring radically more scalable, sustainable and affordable compute globally.

AMD Silo AI Veturi Initiative 2025-2030

Stay in the loop

JOIN ECOSYSTEM

Sign up for future events, communication, thematic deep dives and matchmaking.

Compute to Impact: Finland as a World-Leading AI Hub

AMD Silo AI
Vilja Hannula
Senior Program Manager

Compute to Impact: Finland as a World-Leading AI Hub

AMD Silo AI
Vilja Hannula

OUTLOOK FOR FUTURE – NATIONAL PhD WORK PITCHING SESSION
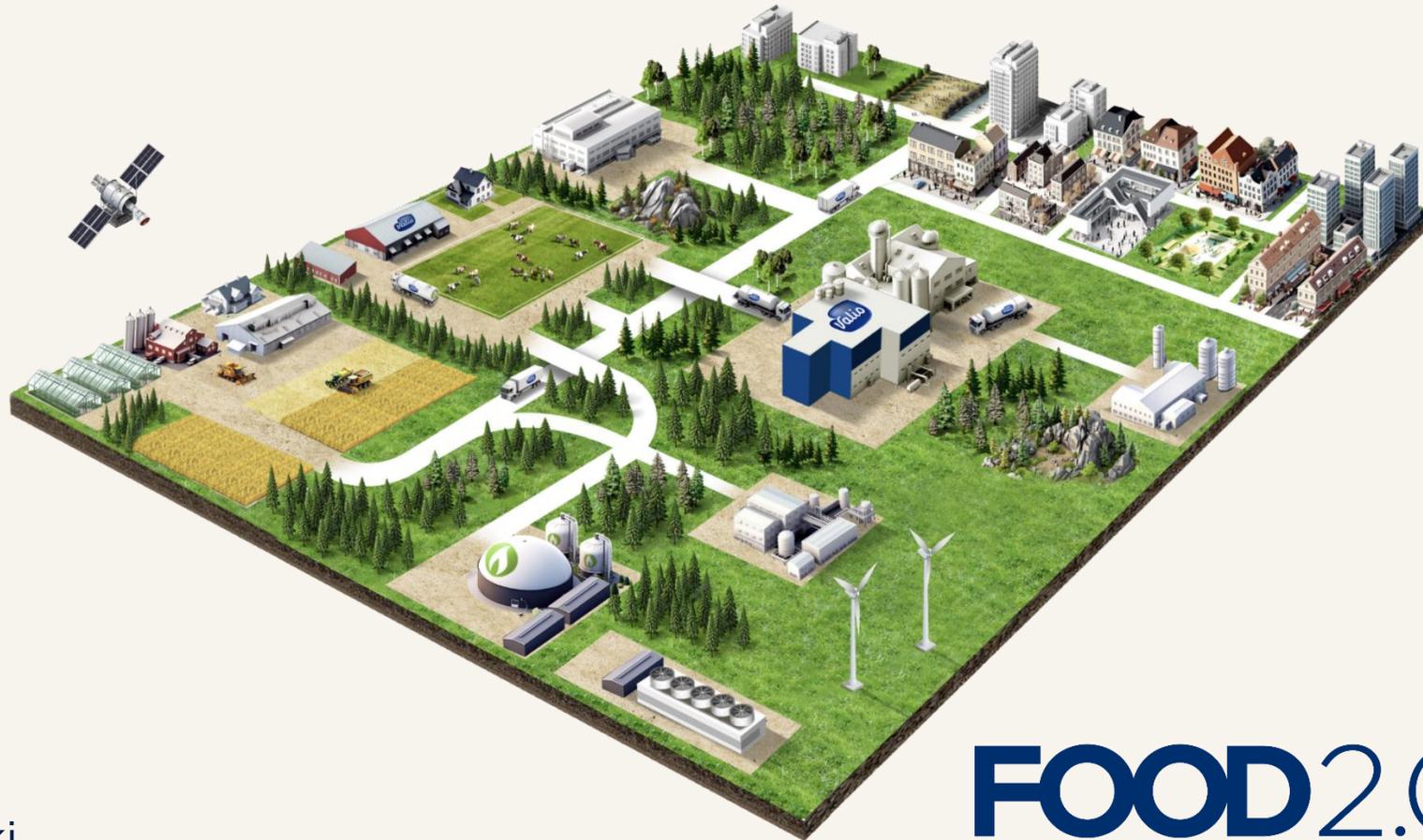
Chair
MARI SANDELL
Dean
University of Helsinki

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OUTLOOK FOR FUTURE –
National PhD work pitching session

- Towards reliable soil carbon balance estimates in agriculture
  - **Johanna Vielmaa, Valio**
- Self-supervised training for multispectral remote sensing imagery
  - **Leon-Friedrich Thomas, UH**
- Impact of food processing on plant-based protein-rich foods
  - **Jasmin Raita, UTU**
- Fibre-rich protein sources for gut-friendly plant-based foods: a nutritional investigation on food fermentation
  - **Finlay Sim, UH**
- Whole grain cereals, tryptophan metabolism, and the gut-brain axis
  - **Vilma Liikonen, UEF**
- Technologies enabling personalized food production and enhanced eating experiences
  - **Alex Calton, VTT**
- Making biodiversity impacts visible: effects of LCA-derived footprint labels on students´ meal selection
  - **Aino Tarkkio, UTU**

TOWARDS RELIABLE SOIL CARBON BALANCE ESTIMATES IN AGRICULTURE

Johanna Vielmaa

Food 2.0 Seminar 19.3.2026

SOIL CARBON PLAYS A CRUCIAL ROLE IN CLIMATE CHANGE MITIGATION

Balance of sources and sinks

Fossil carbon

Land-use change

Ocean sink

Land sink

Atmosphere

©①Global Carbon Project
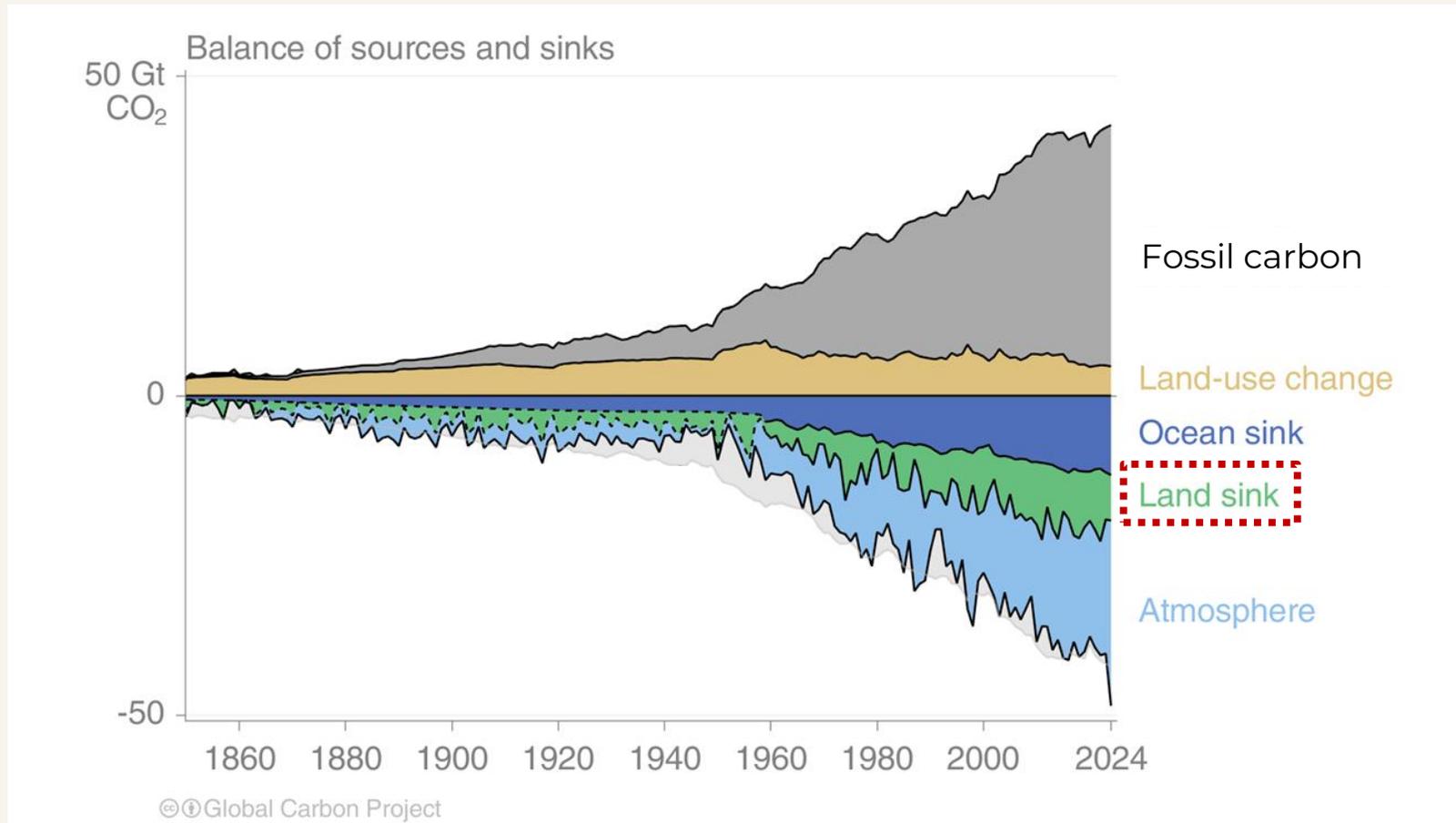
Carbon stocks:
(gigatons of carbon)

Atmospheric CO_2
885 GtC

Vegetation
450 GtC

Soils
1700 GtC

Permafrost
1400 GtC

Source: Friedlingstein et al 2025; Global Carbon Project 2025. Modified.   Source: Global Carbon Project 2025. Modified.

SATELLITE-BASED PLANT PRODUCTIVITY MODEL ENABLES RELIABLE SOIL CARBON INPUT MONITORING IN FIELD-SCALE

✦ Satellite-based estimates are validated against field measurements

FROM RELIABLE DATA

→ to sustainable agriculture

→ and reduced carbon footprints and GHG emissions
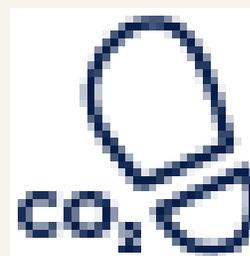
GREENHOUSE GAS EMISSIONS IN FINLAND
1990 to 2023

National Inventory Document
under the UNFCCC and Paris Agreement

TOWARDS RELIABLE SOIL CARBON BALANCE ESTIMATES IN AGRICULTURE

Johanna Vielmaa

Supervisors: Juha Nousiainen (Valio), Mari Pihlatie (HY), Jari Liski (FMI)
Organization: Valio Ltd; University of Helsinki, Faculty of Agriculture and Forestry
Funding: Business Finland, Valio Ltd

2025-2028
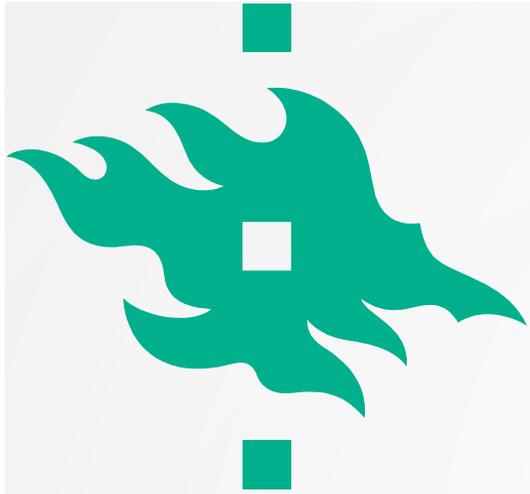
SELF-SUPERVISED TRAINING FOR MULTISPECTRAL REMOTE SENSING IMAGERY

By Leon-Friedrich Thomas
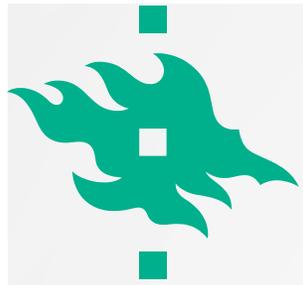
GOAL & APPROACH

- Main Goal:

    Develop robust weed detection models with minimal labeled data
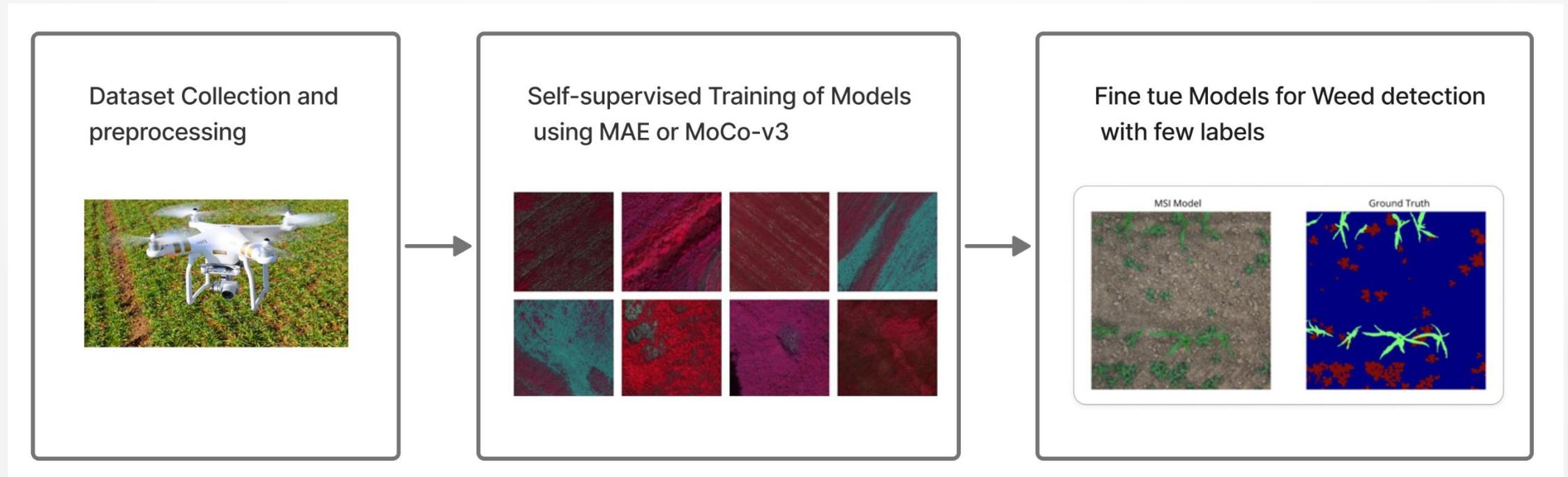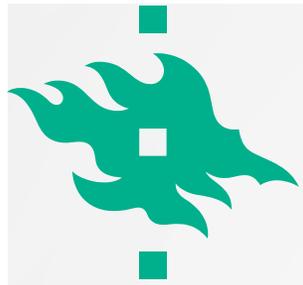
CONTRIBUTION & BENEFITS

- **Scientific Contribution**
Advancement of computer vision models for plant detection in UAV imagery.

- **Industry Application**
Enables development of precision weeding robotics and selective spraying UAV systems.

- **Societal Benefit**
Reduces herbicide and pesticide use through site-specific weed treatment within crop fields.
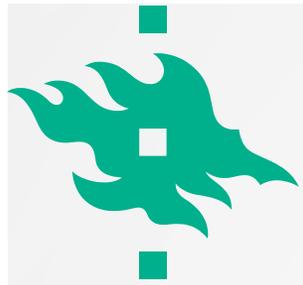
CONTACT & DETAILS

- Title: Self-supervised training for multispectral remote sensing imagery

- Name: Leon-Friedrich Thomas

- E-mail: leon-friedrich.thomas@helsinki.fi

- Organisation: University of Helsinki, Faculty of Agriculture and Forestry, Department of Agricultural Sciences

- Supervisor: Associate Professor Antti Lajunen

- PhD schedule: 2021-2026

- Funding: Maatalouskoneiden tutkimussäätiö (Agricultural Machinery Research Foundation)

Main goal of the research

- Part of a larger research entity focusing on plant-based protein-rich foods

- Biochemical composition of commercial plant-based foods

- Impact of fermentation on lupin-based beverages

- Non-targeted LC-MS metabolomics approach
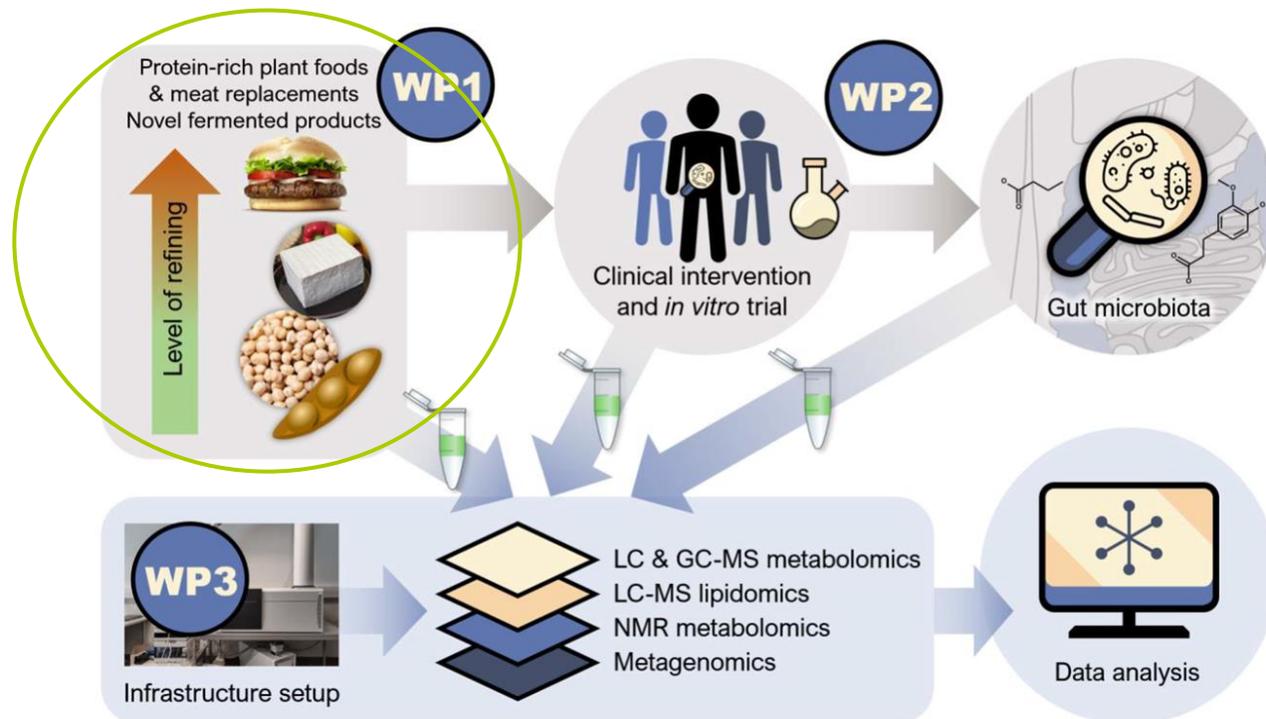
Main findings

- Fermentation can increase the abundances of bioactive phytochemicals in plant-based protein-rich foods

- More processed foods made from refined plant-based materials had lower abundances of these bioactive compounds

nature food

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nature > nature food > articles > article

Article | Open access | Published: 24 March 2025

Existing food processing classifications overlook the phytochemical composition of processed plant-based protein-rich foods

Jasmin Raita, Hany Ahmed, Kang Chen, Veera Houttu, Retu Haikonen, Anna Kårlund, Maaria Kortesniemi, Baoru Yang, Ville Koistinen & Kati Hanhineva ✉

Nature Food **6**, 503–512 (2025) | Cite this article

UNIVERSITY OF TURKU

Societal importance of the study

➤ Impact of processing on the biochemical composition of plant-based foods
- Some processing techniques result in loss of possibly beneficial compounds

➤ Provide information to the discussion related to food processing classification systems and "ultra-processed" foods

➤ Selection of beneficial processing techniques
- Fermentation

➤ Use locally grown protein-rich sources to produce sustainable plant-based foods
- Lupin

UNIVERSITY OF TURKU

Impact of food processing on plant-based protein-rich foods

Jasmin Raita

University of Turku, Faculty of Technology, Department of Life Technologies, Food Sciences

Supervisors: Prof. Kati Hanhineva, Dos. Ville Koistinen, Prof. Baoru Yang

Thesis defense in June 2026
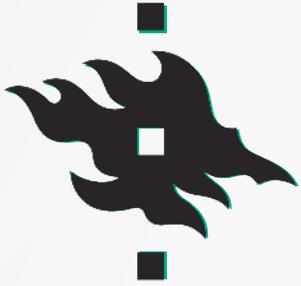
Valio Food 2.0 PhD Pitch – Finlay Sim
Fibre-rich protein sources for promoting gut-friendly plant-based
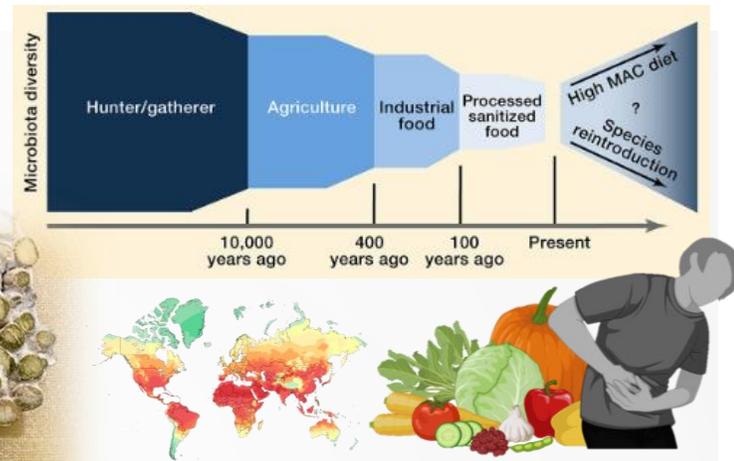
Background

- Raffinose-family **oligosaccharides** (RFOs) are dietary **fibres** in legume foods that can cause **gut symptoms**.

- **Food fermentation**, such as tempeh production, can lower RFOs and enhance legume digestibility.

- Cross-utilisation of different food fermentation practices can enhance **RFO-degradation**.

Aims

1. Cross-utilisation of tempeh and koji fermentation practices for **enhanced degradation of anti-nutritional factors** in Finnish-grown faba bean and pea legume crops

2. Effects of Nordic-legume tempeh consumption on the molecular mechanisms behind **gut sensitivity to plant foods** through human gut microbiome and metabolome interchanges.
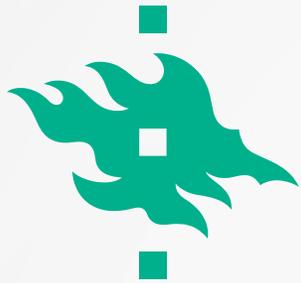
Progress

~45% project completion

2024	2025	2026	2027	2028
Screening	*Profiling*	*RCT*	*Meta-omics*	

Faba bean / Pea Tempeh
Rhizopus spp. / *Aspergillus* spp.

Short-chain carbohydrates
Microbial community dynamics

12-week cross-over
human nutritional intervention

Metagenomics
Metabolomics
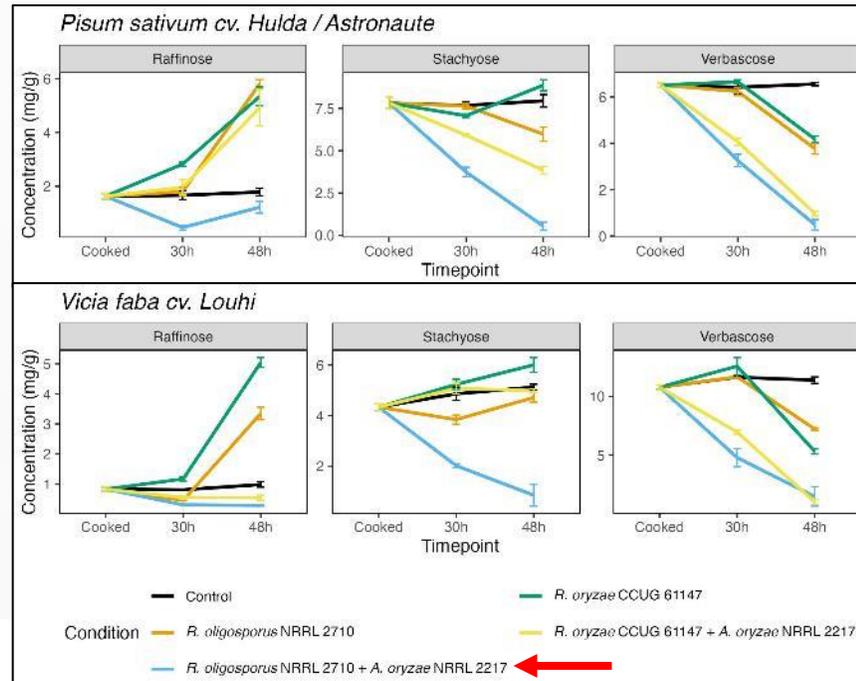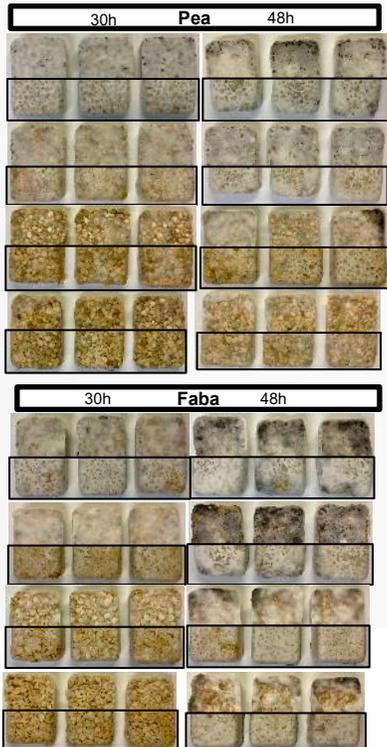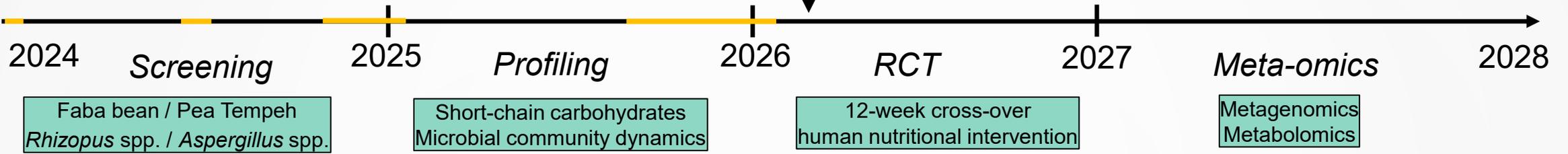
Manuscript in writing:
Short-chain carbohydrate profiles and microbial community dynamics of tempeh and koji-tempeh with faba bean (*Vicia faba* L.) and pea (*Pisum sativum* L.)
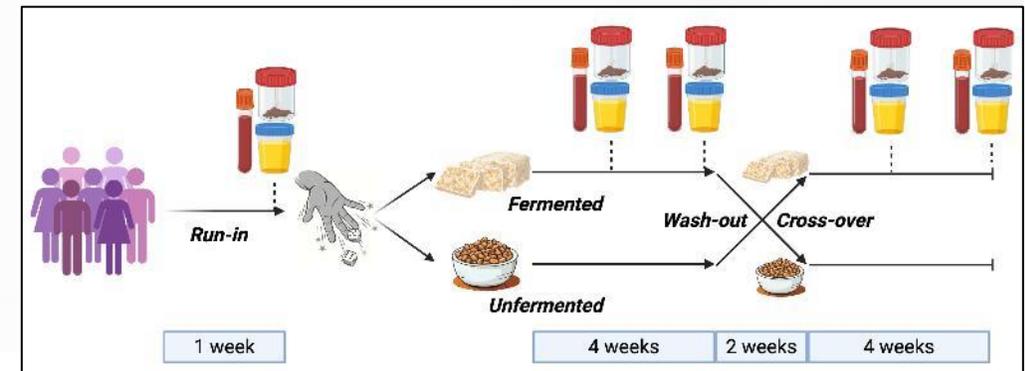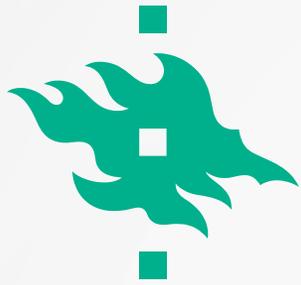
Potential

➢ Societal impact:

- **Interdisciplinarity** along the **field-to-fork-to-faeces** axis, combining molecular nutrition, food science and microbiology

- Promotes **sustainable use** of natural resources, in particular food security & food supply for population health.

- Enhances **areas of strength** in research of resilient food systems, and health & wellbeing, in addition to emerging research themes in new foods.

➢ Industrial applications:

- Exhibit **food processing techniques** that can promote a **gut-friendly plant-based diet**.

- Provide Finnish food industry **new business opportunities** giving renewed value to local crop varieties

THANK YOU!

Fibre-rich protein sources for promoting gut-friendly plant-based foods: a nutritional investigation on food fermentation

Finlay Sim, Doctoral researcher

Department of Food & Nutrition

Department of Microbiology

Faculty of Agriculture & Foresty, University of Helsinki

Supervisors

Anne-Maria Pajari, Professor

Susanna Kariluoto, Docent

Antti Karkman, Docent

Timeline → 2024 – 2028

Funding

VIIKKI MOLECULAR NUTRITION GROUP

Finnish Food and Drink Industries' Federation ETL

UNIVERSITY OF HELSINKI Leg4Life

FACULTY OF AGRICULTURE AND FORESTRY

Vilma Liikonen

Whole grain cereals, tryptophan metabolism, and the gut-brain axis

2023-2027

University of Eastern Finland, Institute of Public Health and Clinical Nutrition

Supervisors: **Prof. Marjukka Kolehmainen, Dr. Carlos Gómez-Gallego, Dr. Anu Ruusunen**

UEF// University of Eastern Finland

Gut-Brain Axis

Tryptophan

Serotonin

Kynurenine

Indoles derivates

HealthFerm

n = 56
with mild
metabolic
deterioration

First results

Tryptophan metabolism:
IAA ↑ (porridge)
IAld gurt < porridge
Kynurine ↓ (both)

Psychological distress ↓ (gurt)

Ongoing analyses
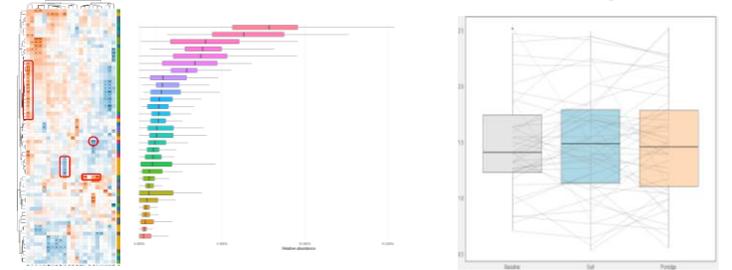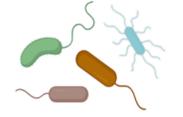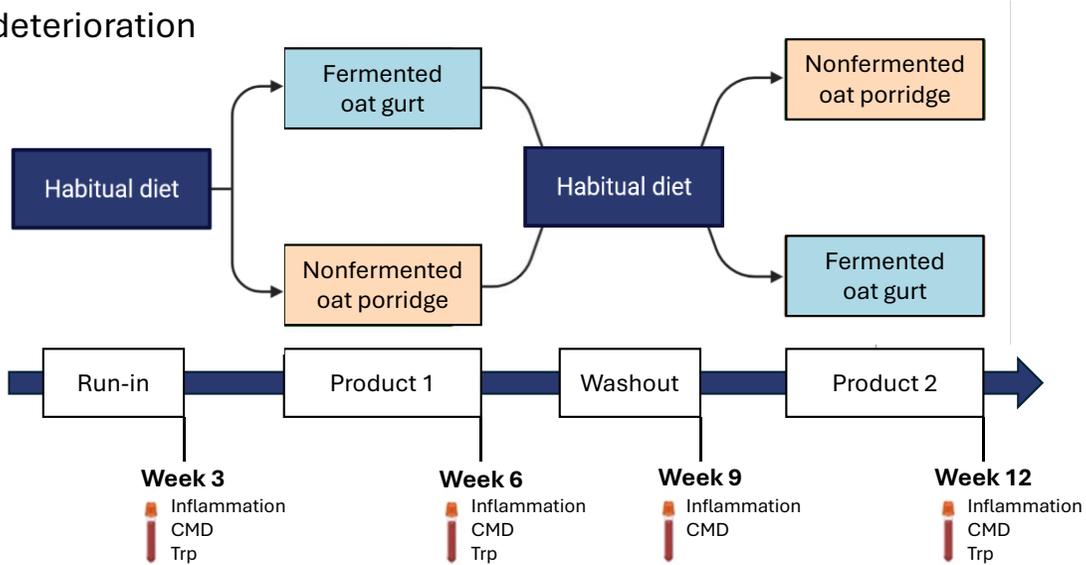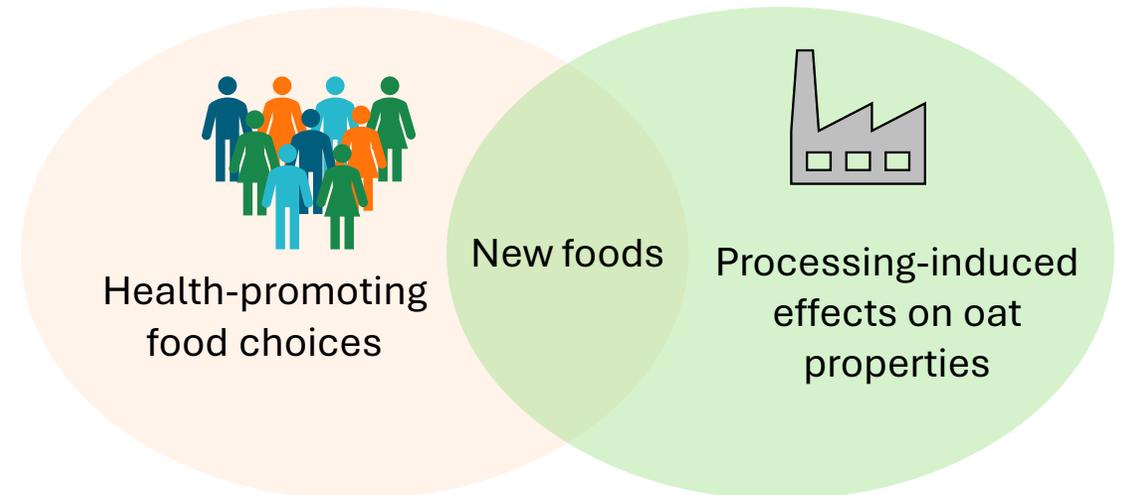
Habitual diet → Fermented oat gurt → Habitual diet → Nonfermented oat porridge

Habitual diet → Nonfermented oat porridge → Habitual diet → Fermented oat gurt

| Run-in | Product 1 | Washout | Product 2 |

Week 3
Inflammation
CMD
Trp

Week 6
Inflammation
CMD
Trp

Week 9
Inflammation
CMD

Week 12
Inflammation
CMD
Trp

Societal impacts

Health-promoting food choices

New foods

Processing-induced effects on oat properties

UEF// University of Eastern Finland

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Main funder: the European Union under the Horizon Europe grant agreement (No. 101060247)

Why do healthier snacks still lose out?

Snack choices are fast and reward-driven

What governs preparation and texture

1: On-demand production

    Powder properties → mixing behaviour → rheology

    Outcome: Drinks and spoonables (vending context)

2: Structured alternative proteins

    Formulation + 3D printing paths → mechanical properties

    Outcome: anisotropic, whole-muscle-like structure

Shaping sensory reward without formulation change

3: Sweetness perception

Intrinsic → aeration

Extrinsic → externally delivered aroma

Outcome → altered temporal sweetness perception

Why this matters

Industry

Society

To me

Technologies enabling personalized food production and enhanced eating experiences

Alex Calton

Research Scientist, Grain Processing Technologies, VTT

University of Helsinki, Faculty of Agriculture and Forestry, Department of Food and Nutrition
Doctoral Programme in Food Chain and Health

Responsible professor: Kirsi Mikkonen

Primary supervisors: Nesli Sözer (VTT), Roope Raisamo (Tampere University)

PhD Schedule: 2021 – 2026

What proportion of animals are still wild?
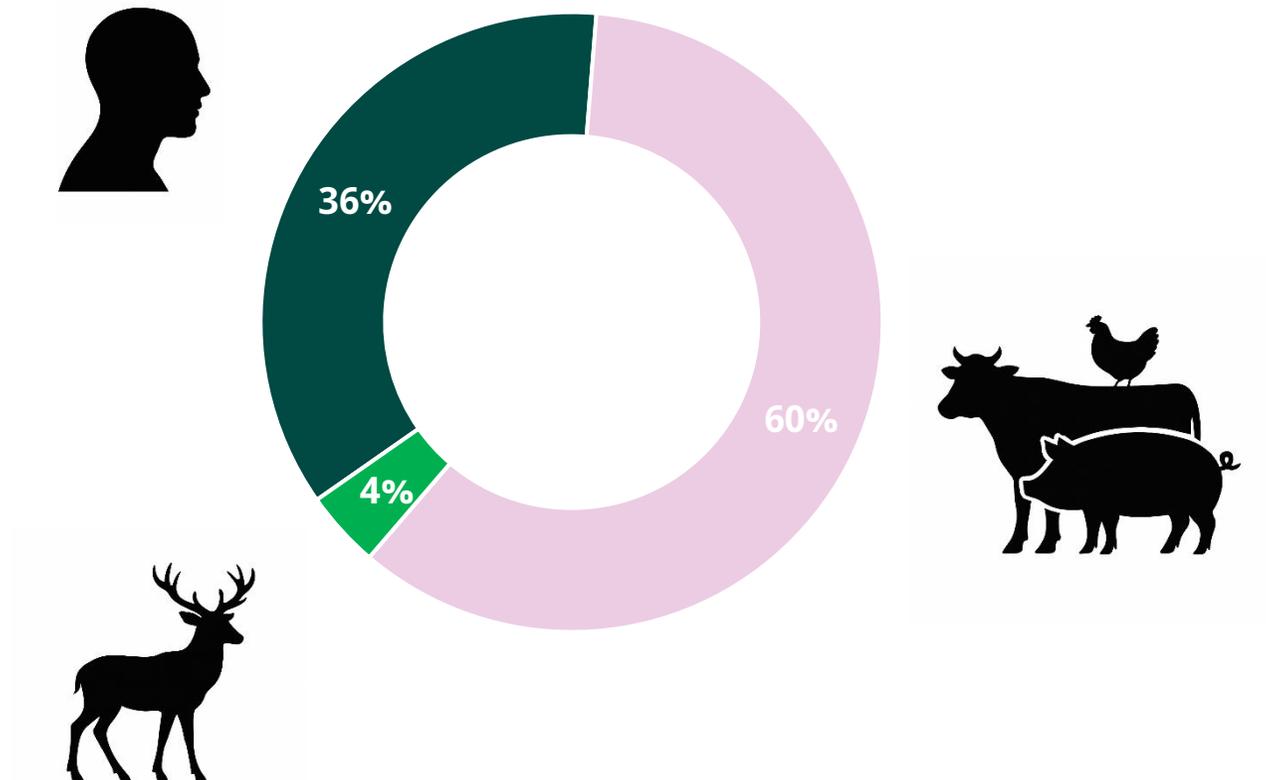
Planetary boundaries
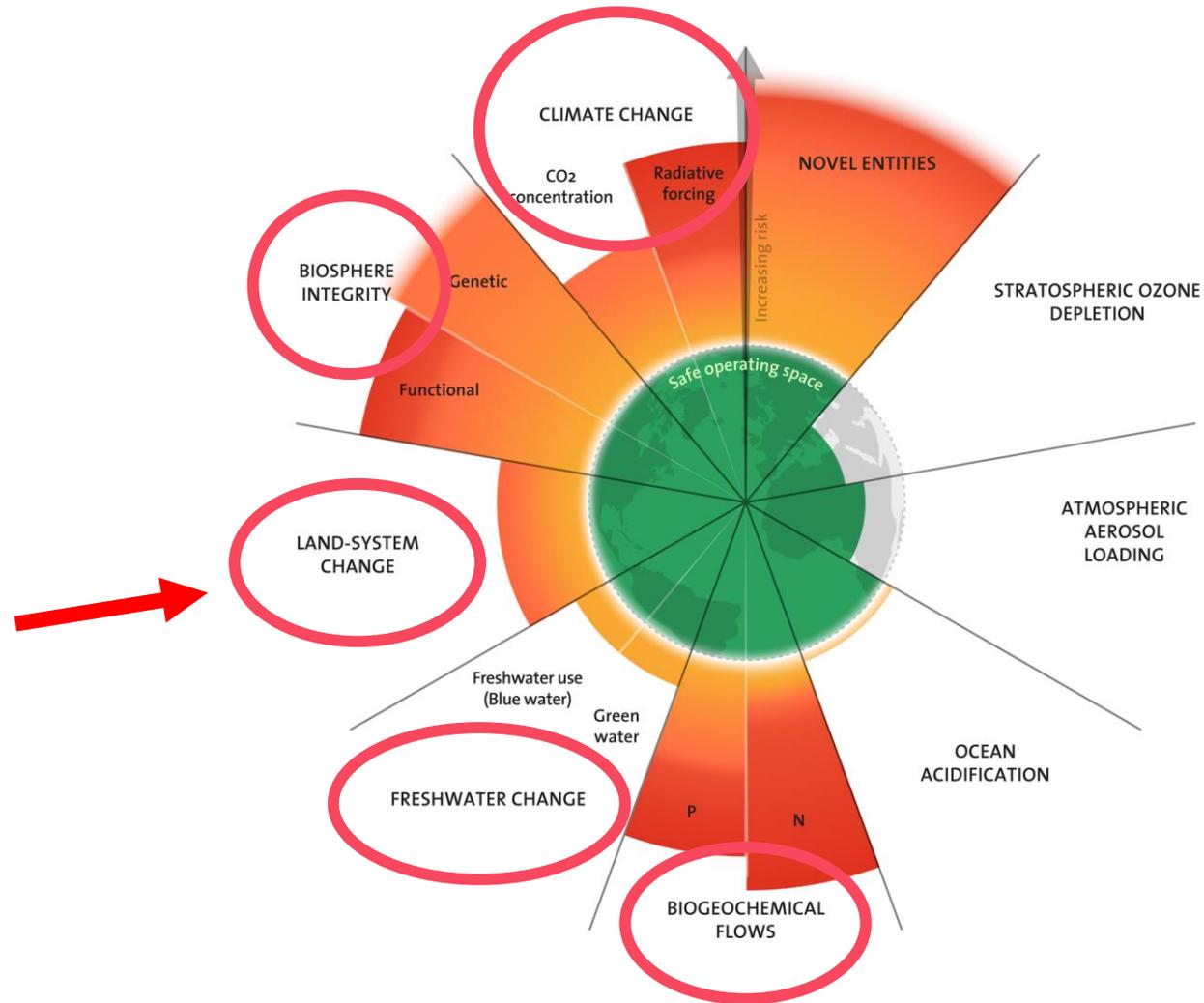
Azote for Stockholm Resilience Centre, based on analysis in Sakschewski and Caesar et al. 2025

The Study Design
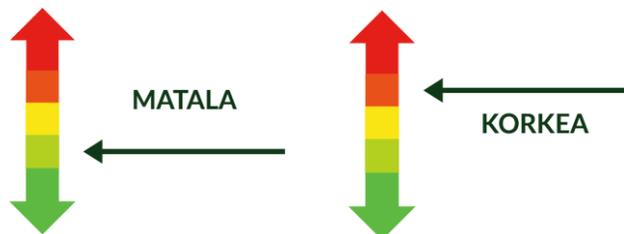
Making Biodiversity Impacts Visible: Effects of LCA-Derived Footprint Labels on Students' Meal Selection

Aino Tarkkio – aaktar@utu.fi

> University of Turku, Faculty of Medicine

> Nutrition and Food Research Center

> Doctoral Programme in Clinical Research (DPCR)

Schedule for PhD: 2024-2028
Main funding resources:
>Maj and Tor Nessling Foundation
>Biodiful
>Biodiversity on the plate (LuLa) -project

Supervisors:
Anu Hopia, research professor, Ph.D. anuhop@utu.fi
Saska Tuomasjukka, senior researcher, Ph.D. sastuoma@utu.fi

TURUN YLIOPISTO

OUTLOOK FOR FUTURE –
National PhD work pitching session

- Towards reliable soil carbon balance estimates in agriculture
  - **Johanna Vielmaa, Valio**
- Self-supervised training for multispectral remote sensing imagery
  - **Leon-Friedrich Thomas, UH**
- Impact of food processing on plant-based protein-rich foods
  - **Jasmin Raita, UTU**
- Fibre-rich protein sources for gut-friendly plant-based foods: a nutritional investigation on food fermentation
  - **Finlay Sim, UH**
- Whole grain cereals, tryptophan metabolism, and the gut-brain axis
  - **Vilma Liikonen, UEF**
- Technologies enabling personalized food production and enhanced eating experiences
  - **Alex Calton, VTT**
- Making biodiversity impacts visible: effects of LCA-derived footprint labels on students´ meal selection
  - **Aino Tarkkio, UTU**

THANK YOU!
HAVE A GREAT SPRING!

2nd ANNUAL SEMINAR

FOOD2.0 | Valio