The Circular Food Systems model

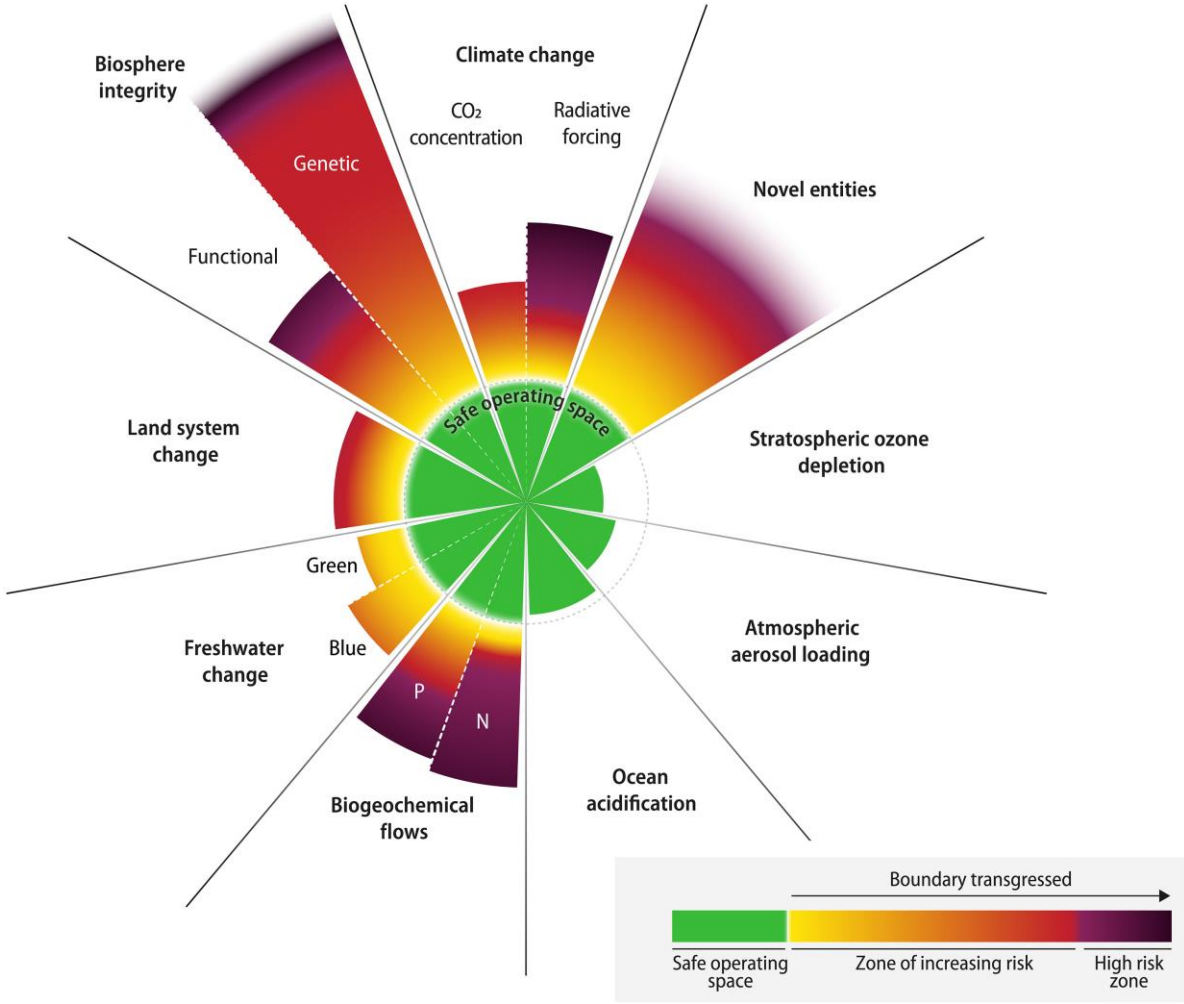
Felipe Cozim Melges – Wageningen University & Research

*Ci*rcular *Fo*od *S*ystems – Een circulair voedselsysteem in Vlaanderen

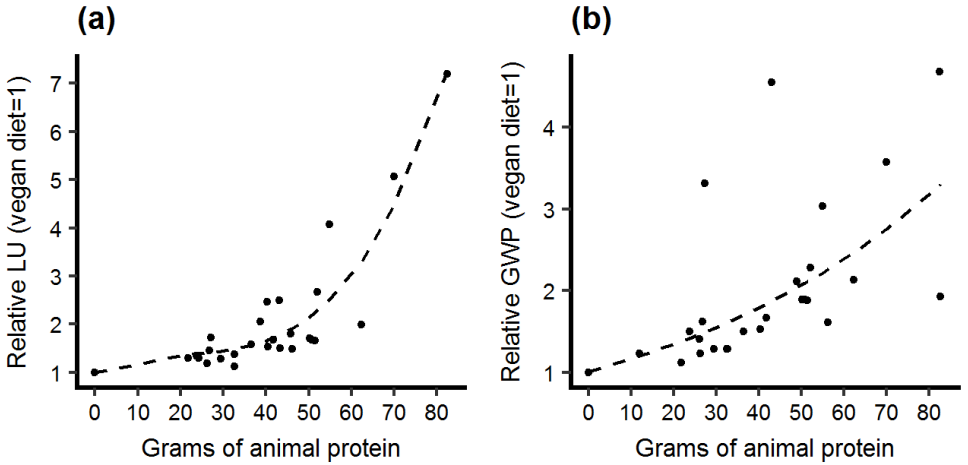
"Biodiversity is the best insurance policy to maintain sustainable food systems"
Felipe Cozim Melges

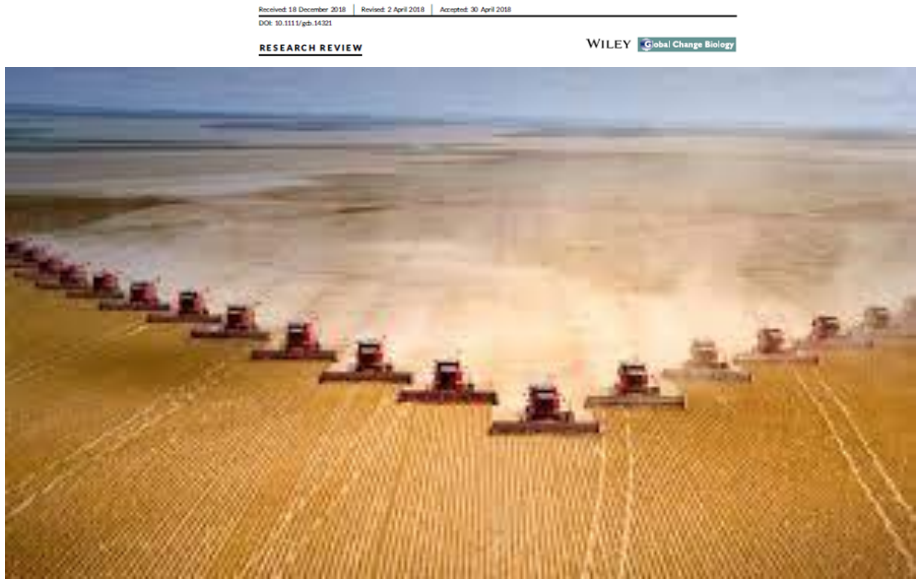
Hannah van Zanten's CiFoS group
Chair Holder, Environmental System Analysis group
Visiting Professor, Cornell University

WAGENINGEN UNIVERSITY & RESEARCH
Circular Food Systems
AVINA
NIOO



Katherine Richardson et al. ,Earth beyond six of nine planetary boundaries.Sci. Adv.9,eadh2458(2023).DOI:10.1126/sciadv.adh2458





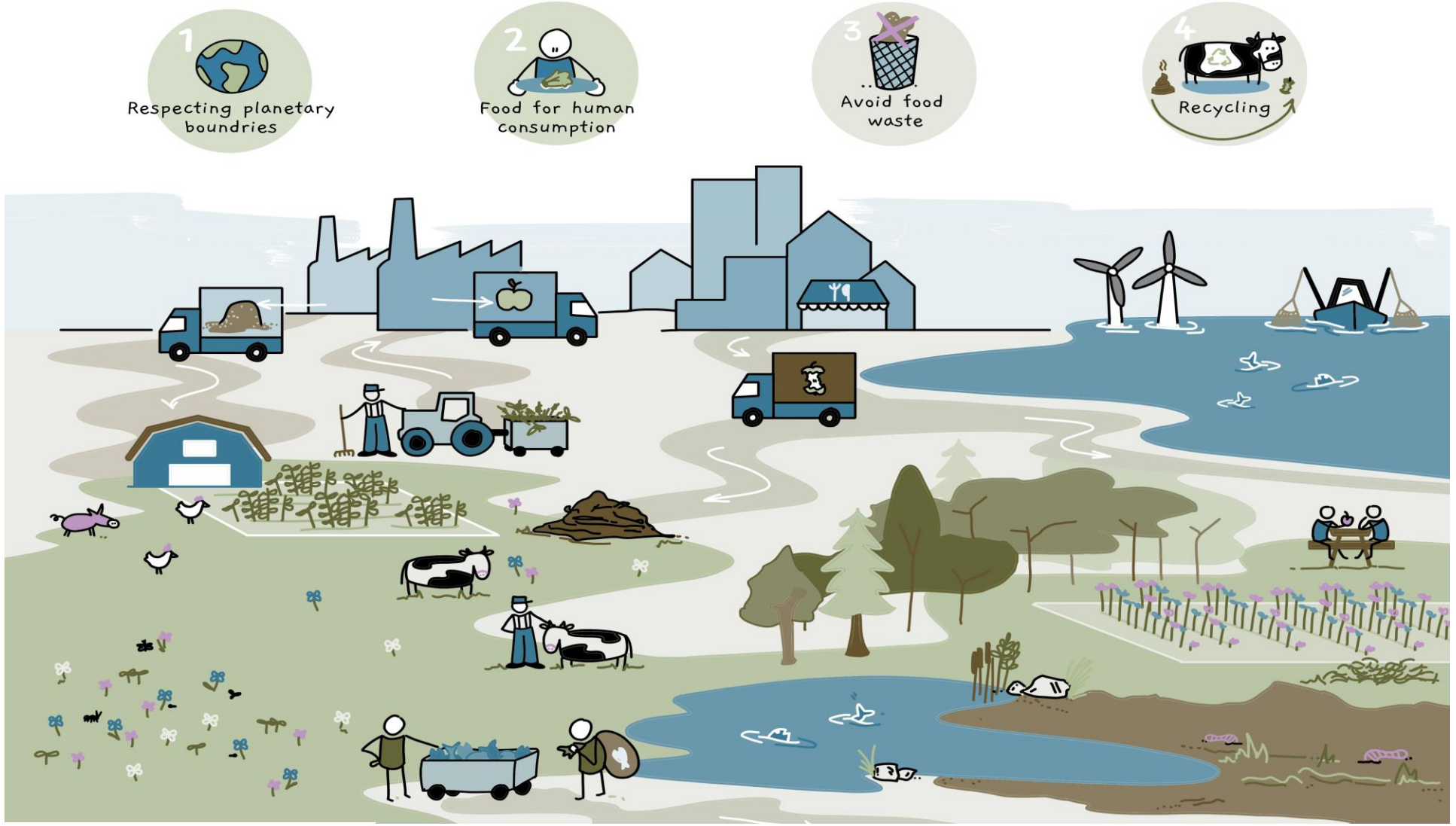
Solutions are locked within the current linear food system

Redesigning the food system

10 Billion in 2050

FUTURE FOOD SYSTEMS REDESIGN

van Zanten, 2020, WUR



Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/gfs

The role of farm animals in a circular food system

Hannah H.E. Van Zanten[a,*], Martin K. Van Ittersum[b], Imke J.M. De Boer[a]

[a] Animal Production Systems Group, Wageningen University & Research, P.O. Box 338, 6700 AH, Wageningen, the Netherlands
[b] Plant Production Systems Group, Wageningen University & Research, P.O. Box 430, 6700 AK, Wageningen, the Netherlands

Circular Food Systems

nature food

PERSPECTIVE

Principles, drivers and opportunities of a circular bioeconomy

Abigail Muscat[1], Evelien M. de Olde[1], Raimon Ripoll-Bosch[1], Hannah H. E. Van Zanten[2], Tamara A. P. Metze[3], Catrien J. A. M. Termeer[3], Martin K. van Ittersum[4] and Imke J. M. de Boer[1]

1. Safeguarding and regenerating the health of our (agro)ecosystems

Sustainable fisheries

Halting finite resources

Restoring soil carbon stocks

Enhancing biodiversity

2. Use biomass streams for basic human needs

Healthy foods

Fuel, Fiber

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Circular Food Systems


nature food

PERSPECTIVE

Principles, drivers and opportunities of a circular bioeconomy

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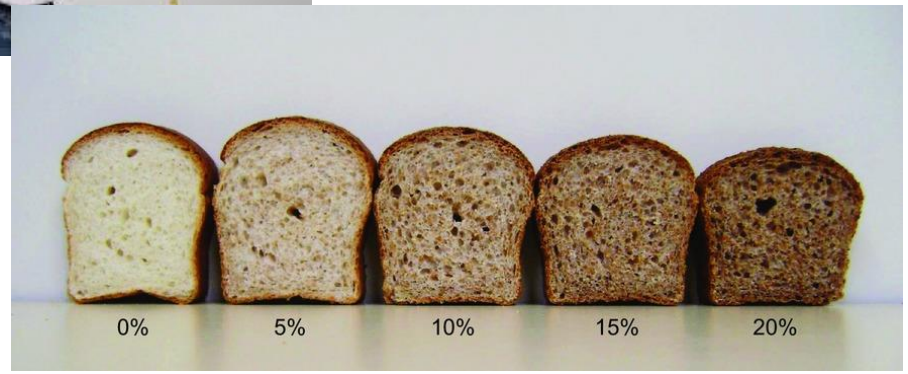
3. Avoiding non-essential products and the waste of essential ones

Food waste

Overconsumption

By-products



4. Utilizing and recycling losses of (agro)ecosystems

Crop residues

Human excreta

Livestock on leftovers

5. Using technologies to e.g. produce renewable energy

Sustainable energy sources

Future foods

ARTICLES nature sustainability

The potential of future foods for sustainable and healthy diets

A. Parodi[1], A. Leip[2], I. J. M. De Boer[1], P. M. Slegers[3], F. Ziegler[4], E. H. M. Temme[5], M. Herrero[6], H. Tuomisto[7,8], H. Valin[9], C. E. Van Middelaar[1], J. J. A. Van Loon[3] and H. H. E. Van Zanten[1]

Animals in circular food systems

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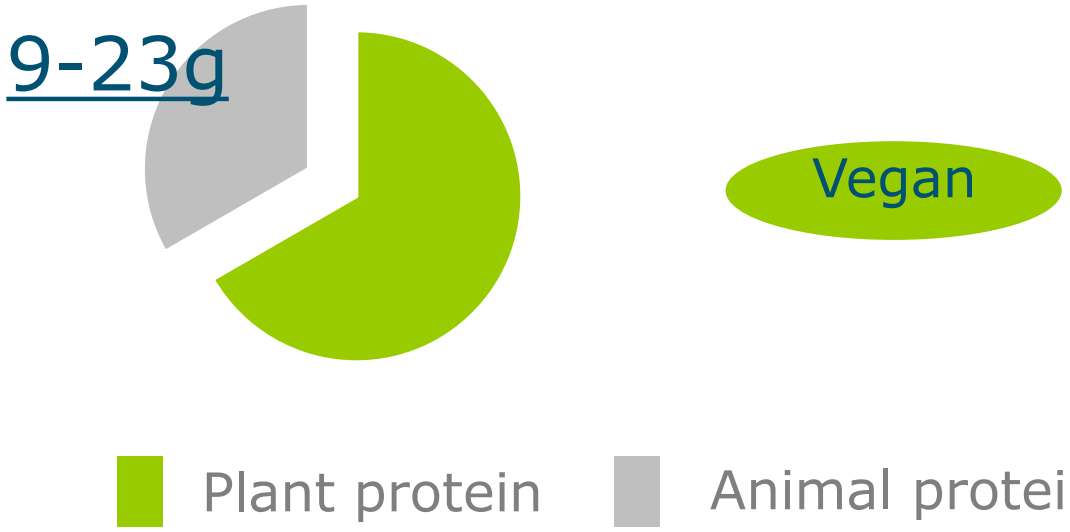
Circular Food Systems

Animals fed with the ‘leftovers’ from the food system

Daily protein requirement (60g)



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Circular Food Systems

Received: 18 December 2018 | Revised: 2 April 2018 | Accepted: 30 April 2018
DOI: 10.1111/gcb.14321

RESEARCH REVIEW

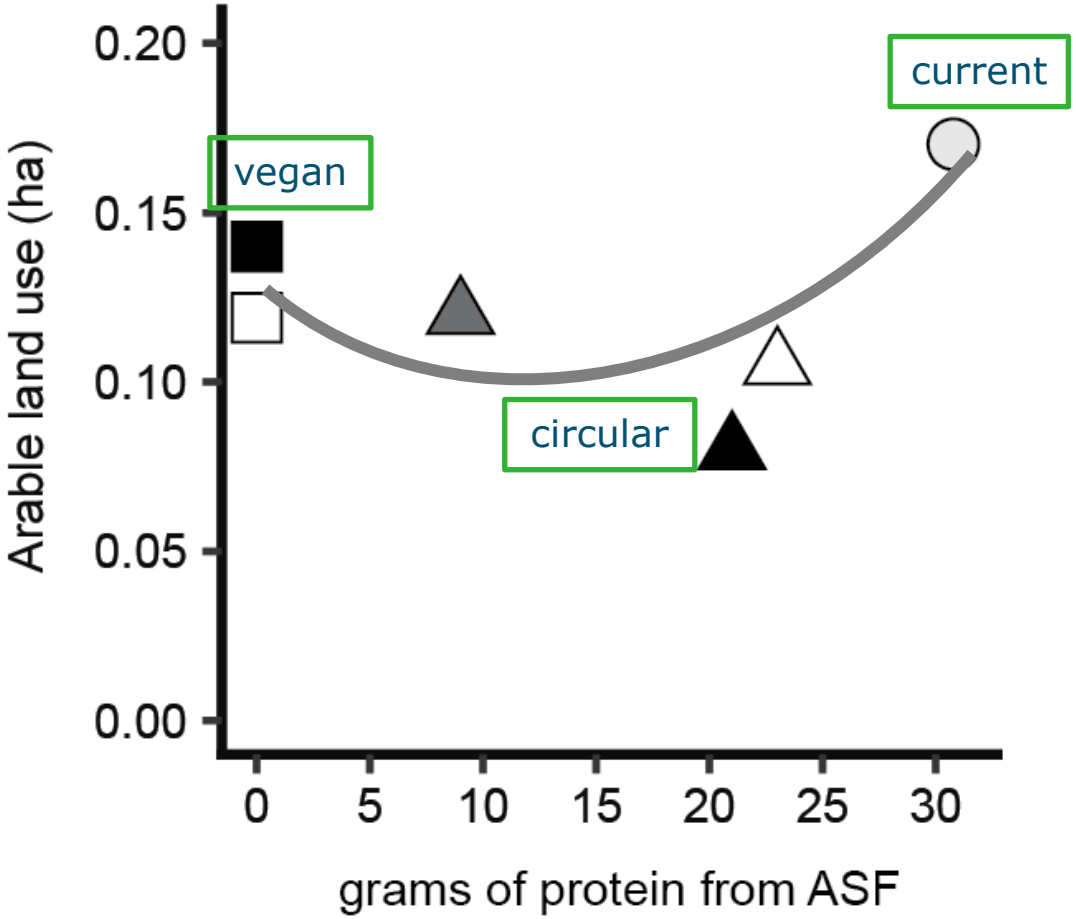
WILEY Global Change Biology

Defining a land boundary for sustainable livestock consumption

Hannah H. E. Van Zanten[1] | Mario Herrero[2] | Ollie Van Hal[1] | Elin Röös[3] | Adrian Muller[4,5] | Tara Garnett[6] | Pierre J. Gerber[1,7] | Christian Schader[4] | Imke J. M. De Boer[1]

There are examples of that in practice

Eating food from recyclers results in lowest land use



Schader et al. 2015

Van Zanten et al. 2016

Roos et al. 2017

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RESEARCH REVIEW

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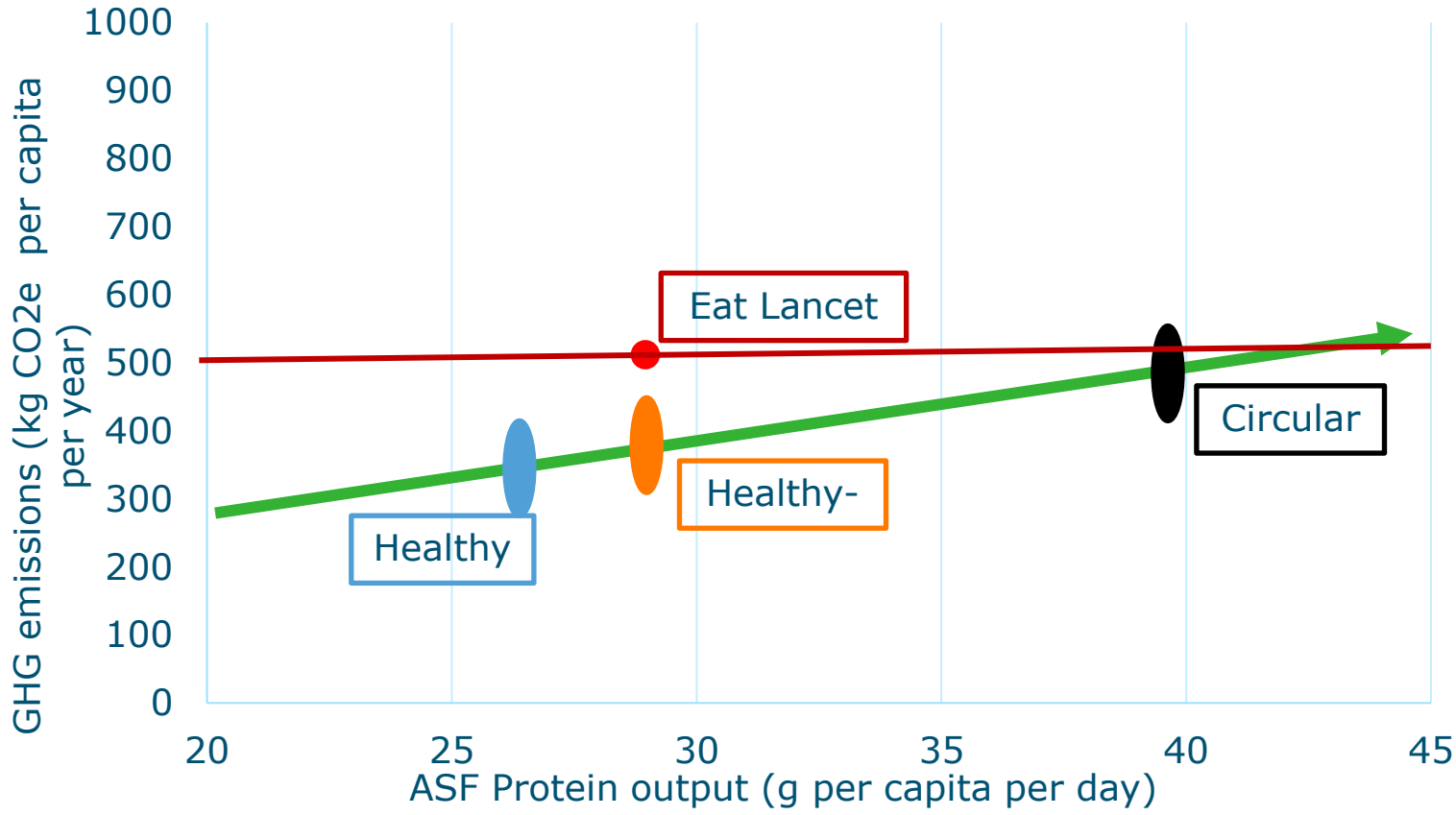
Circular Food Systems

GHG emissions reduced but healthy diets ≠ circular diets



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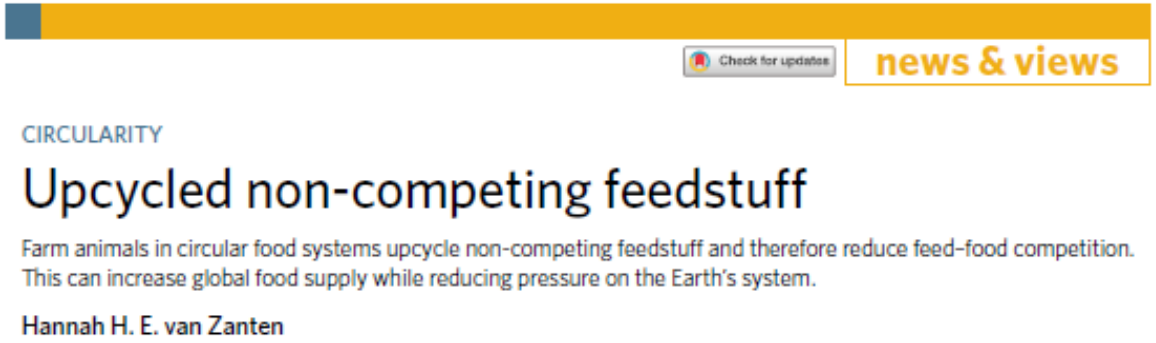
Circular Food Systems

nature food
ARTICLES
OPEN

Circularity in animal production requires a change in the EAT-Lancet diet in Europe

Benjamin van Selm, Anita Frehner, Imke J. M. de Boer, Ollie van Hal, Renske Hijbeek, Martin K. van Ittersum, Elise F. Talsma, Jan Peter Lesschen, Chantal M. J. Hendriks, Mario Herrero and Hannah H. E. van Zanten

Recycling livestock no-regret solution



Check for updates

news & views

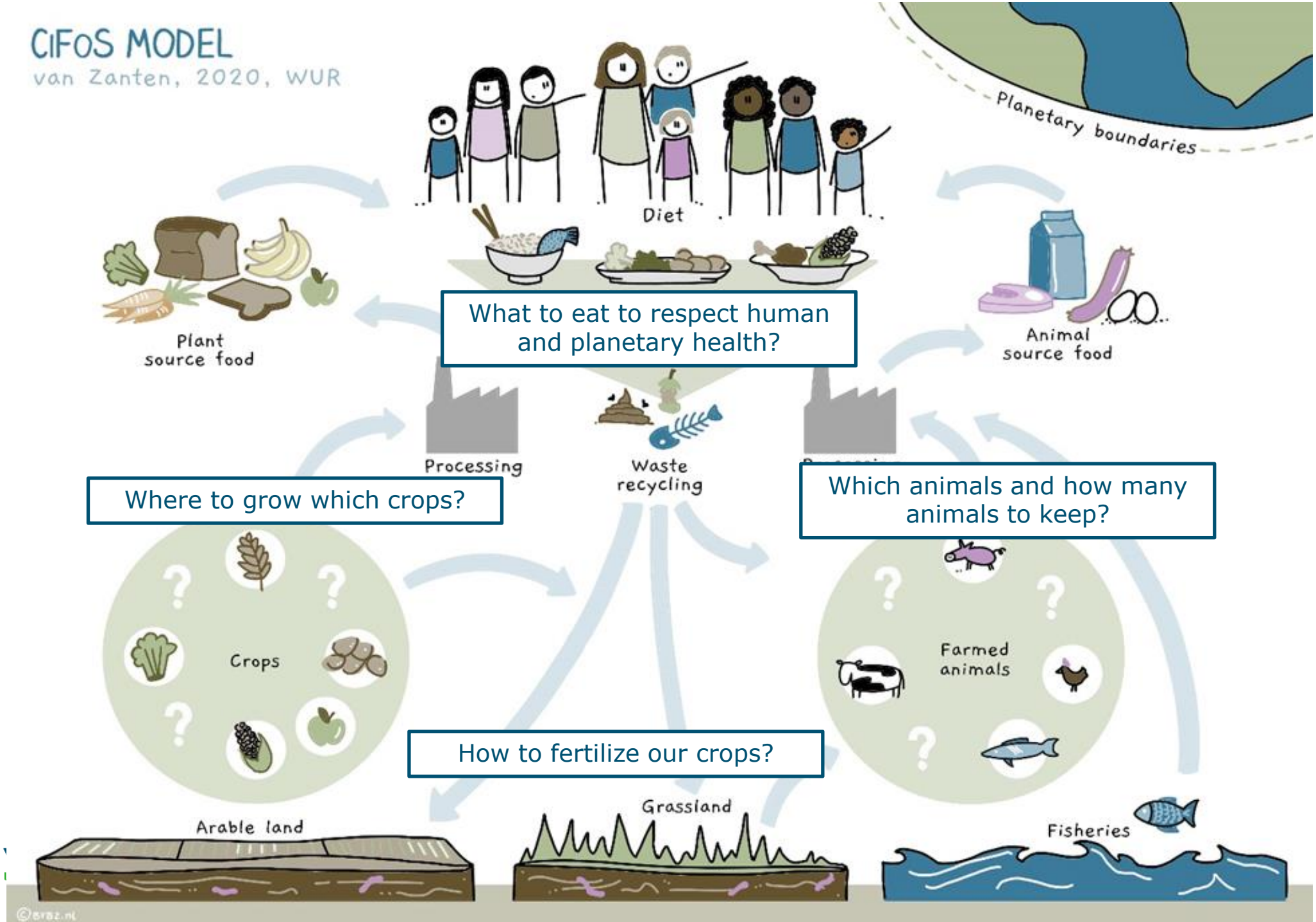
CIRCULARITY

Upcycled non-competing feedstuff

Farm animals in circular food systems upcycle non-competing feedstuff and therefore reduce feed–food competition. This can increase global food supply while reducing pressure on the Earth's system.

Hannah H. E. van Zanten

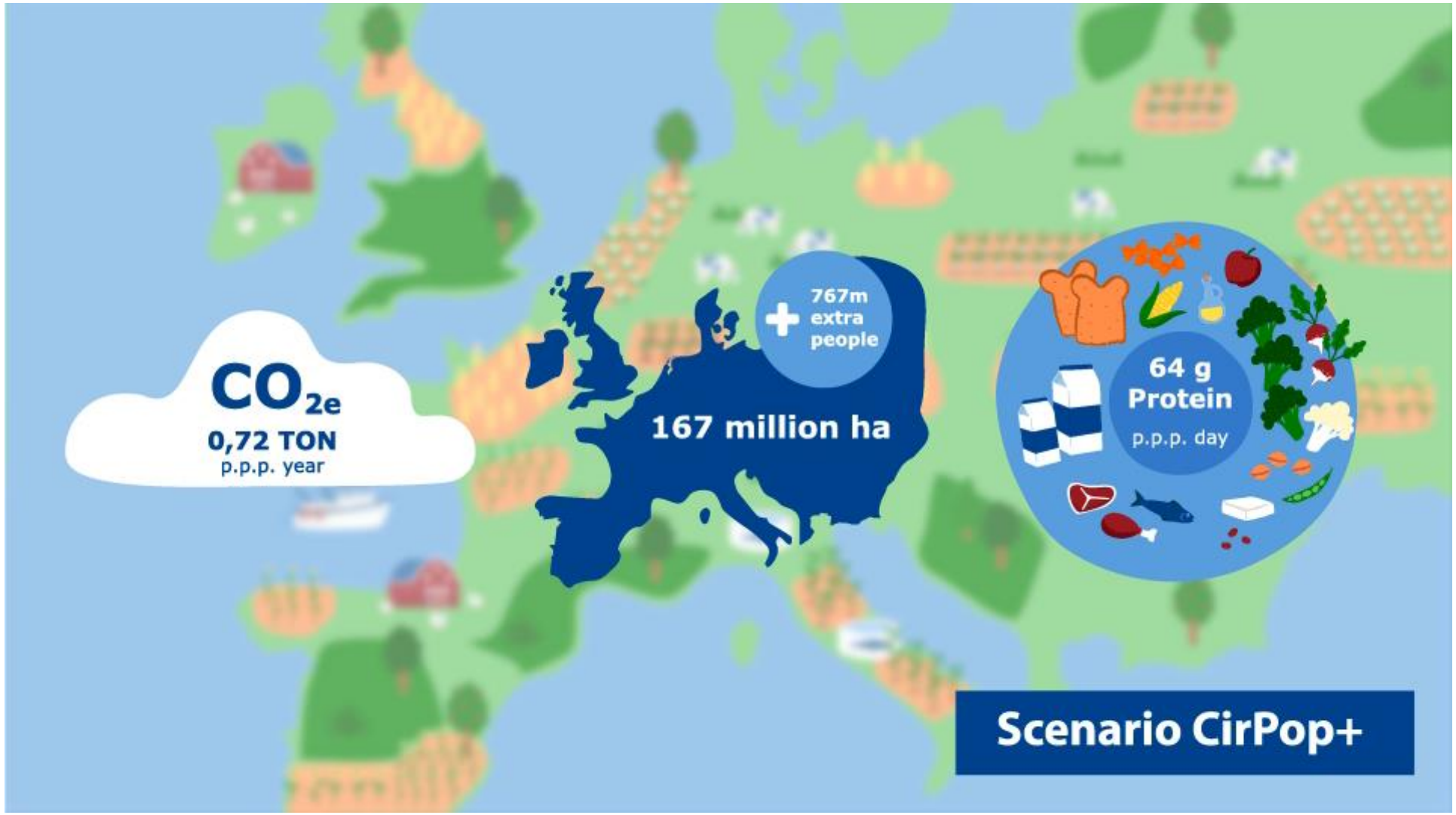
But their role depends on how we redesign the food system

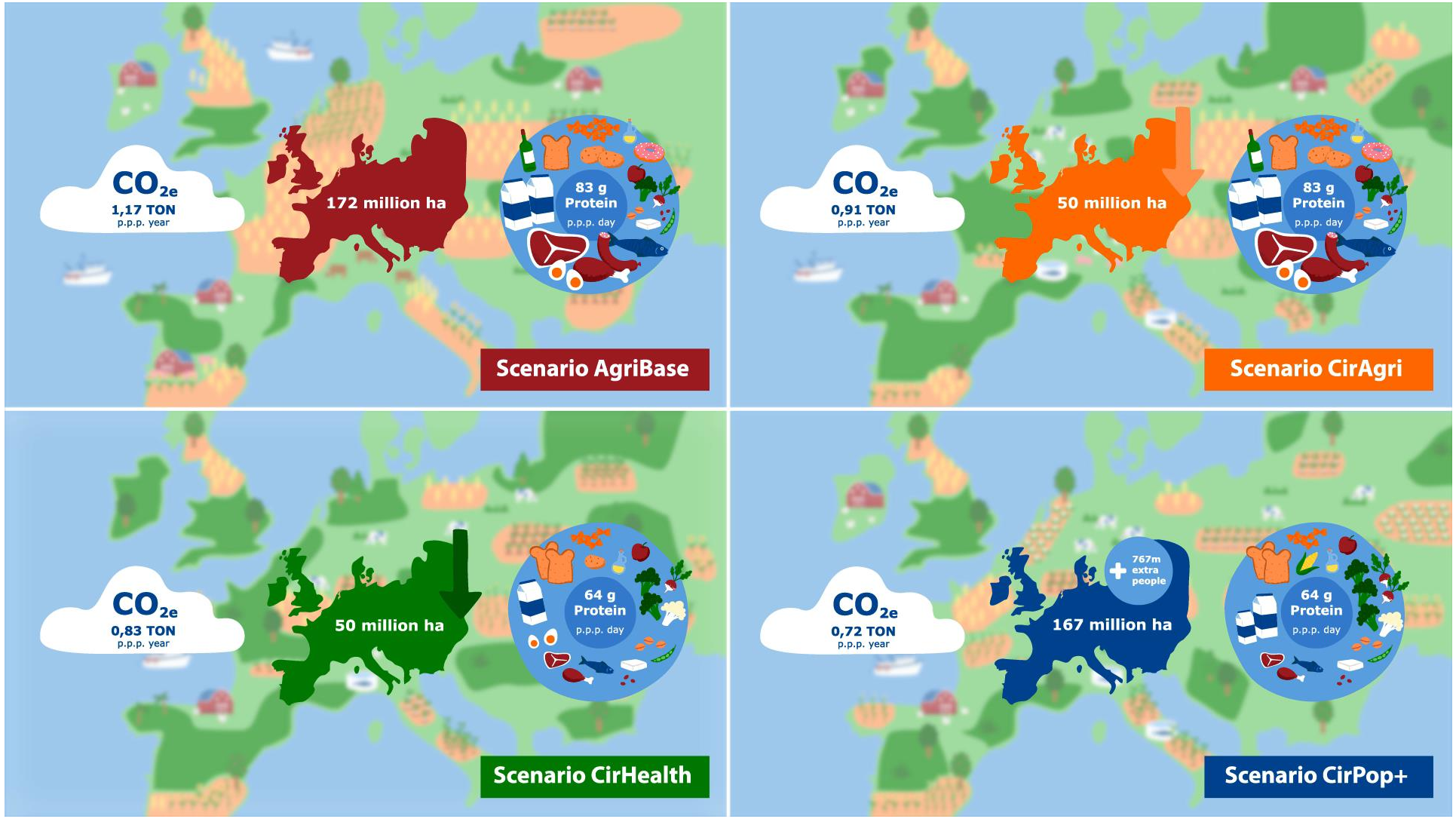

CIFOS MODEL
van Zanten, 2020, WUR
Planetary boundaries
Diet
What to eat to respect human and planetary health?
Plant source food
Animal source food
Processing
Waste recycling
Where to grow which crops?
Which animals and how many animals to keep?
Crops
Farmed animals
How to fertilize our crops?
Arable land
Grassland
Fisheries


CO_{2e}
1,17 TON
p.p.p. year
172 million ha
83 g
Protein
p.p.p. day
Scenario AgriBase


CO_{2e}
0,91 TON
p.p.p. year
50 million ha
83 g
Protein
p.p.p. day
Scenario CirAgri


CO_{2e}
0,83 TON
p.p.p. year
50 million ha
64 g
Protein
p.p.p. day
Scenario CirHealth


CO_{2e}
0,72 TON
p.p.p. year
+ 767m extra people
167 million ha
64 g Protein
p.p.p. day
Scenario CirPop+


CO2e
1,17 TON
p.p.p. year
172 million ha
83 g
Protein
p.p.p. day
Scenario AgriBase
CO2e
0,91 TON
p.p.p. year
50 million ha
83 g
Protein
p.p.p. day
Scenario CirAgri
CO2e
0,83 TON
p.p.p. year
50 million ha
64 g
Protein
p.p.p. day
Scenario CirHealth
CO2e
0,72 TON
p.p.p. year
767m
extra
people
167 million ha
64 g
Protein
p.p.p. day
Scenario CirPop+

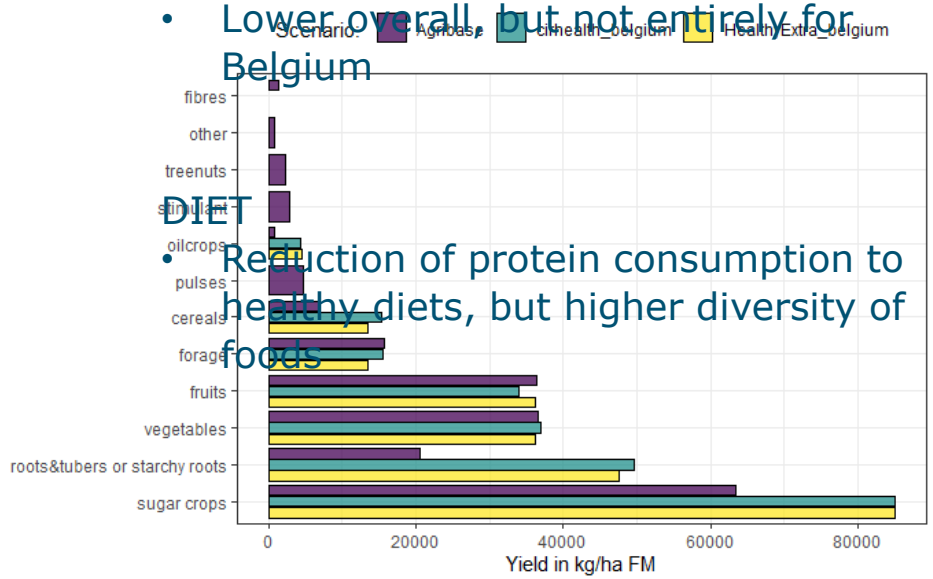
Where to close the loop? Scale matters – a quick exercise

CIRCULAR EUROPE BELGIUM

LAND USE
- Less land use, particularly grasslands

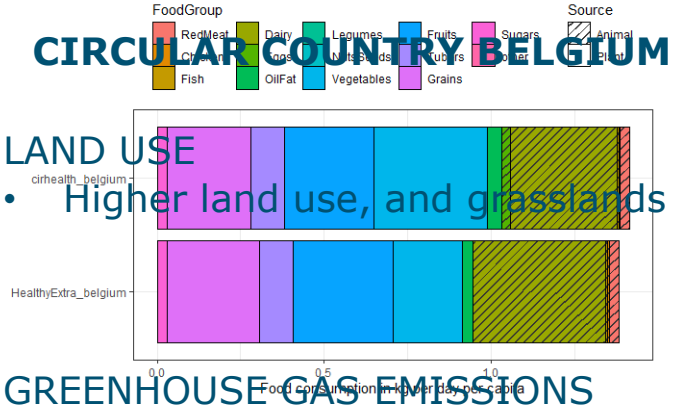
GREENHOUSE GAS EMISSIONS
- Lower overall, but not entirely for Belgium

DIET
- Reduction of protein consumption to healthy diets, but higher diversity of foods

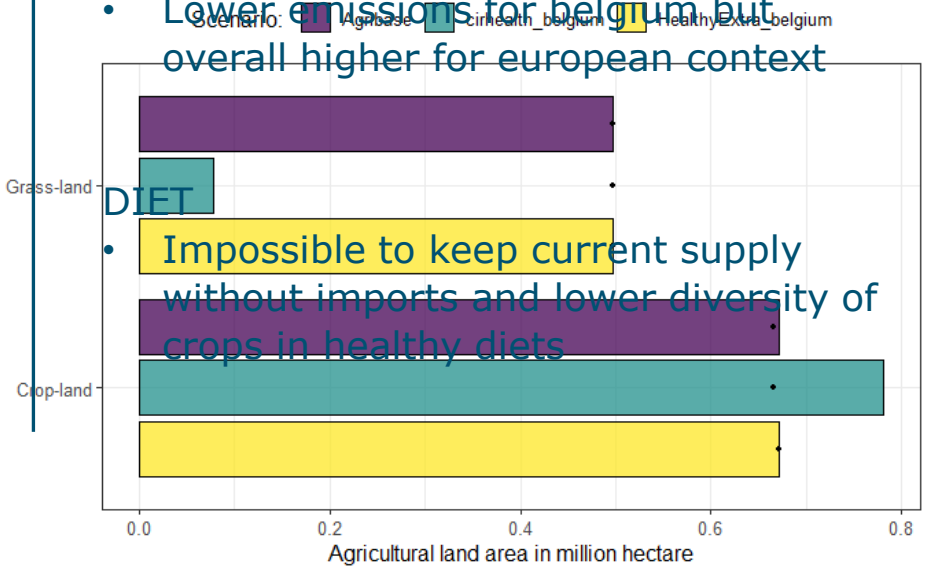


CIRCULAR COUNTRY BELGIUM

LAND USE
- Higher land use, and grasslands



GREENHOUSE GAS EMISSIONS
- Lower emissions for belgium but overall higher for european context



DIET
- Impossible to keep current supply without imports and lower diversity of crops in healthy diets

Circular food systems – closing the loop in Belgium

Circular food systems have also different aspects that are much needed for sustainability

nature food

Article

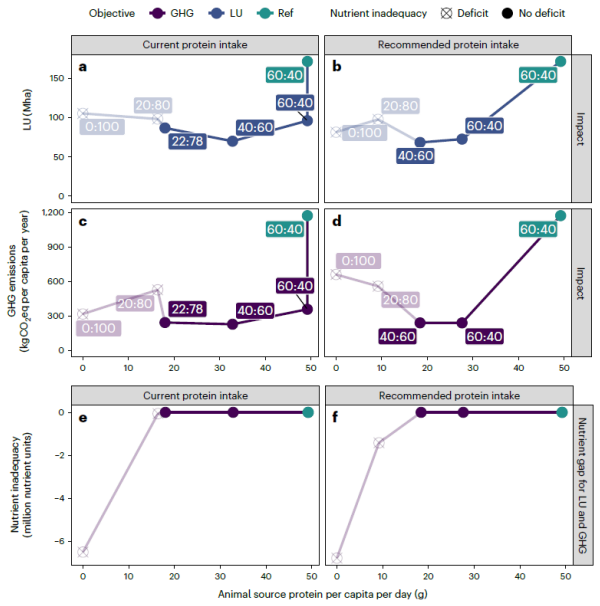
https://doi.org/10.1038/s43016-024-00975-2

Circular food system approaches can support current European protein intake levels while reducing land use and greenhouse gas emissions

Received: 2 May 2023

Accepted: 8 April 2024

Wolfram J. Simon[1], Renske Hijbeek[2], Anita Frehner[3], Renee Cardinaals[1], Elise F. Talsma[4] & Hannah H. E. van Zanten[1]



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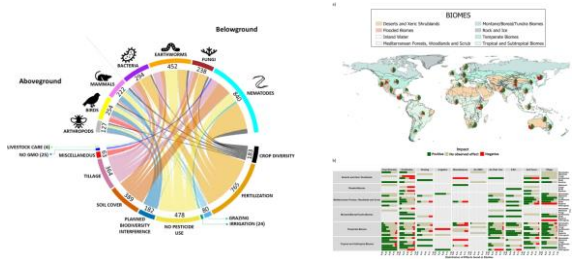
Review Article | Open access | Published: 09 January 2024

Farming practices to enhance biodiversity across biomes: a systematic review

Felipe Cozim-Melges, Raimon Ripoll-Bosch, G. F. (Ciska) Veen, Philipp Oggiano, Felix J. J. A. Bianchi, Wim H. van der Putten & Hannah H. E. van Zanten

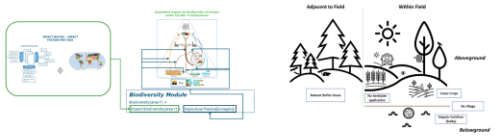
npj Biodiversity 3, Article number: 1 (2024) | Cite this article



Enhancing biodiversity with circular food systems

Felipe Cozim-Melges[1,2,3,4], Raimon Ripoll-Bosch[3], G. F. (Ciska) Veen[2], Merel Hofmeijer[1], Wolfram J. Simon[1,2], Dirk van Apeldoorn[4], Hannah H.E. van Zanten[1,2,5]

[1] Farming Systems Ecology group, Wageningen University & Research, Wageningen, the Netherlands
[2] Earth Systems and Global Change group, Wageningen University & Research, Wageningen, the Netherlands
[3] Netherlands Institute of Ecology (NIOO-KNAW), Wageningen Gelderland, Netherlands
[4] Animal Production Systems group, Wageningen University & Research, Wageningen, the Netherlands
[5] Crop Systems Analysis group, Wageningen University & Research, Wageningen, the Netherlands
[6] Department of Global Development, College of Agriculture and Life Sciences, and Cornell Atkinson Center for Sustainability, Cornell University, Ithaca, USA



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Circular Food Systems

Consuming a healthy diet

Avoiding the waste present in our food system

Using in the system human excreta and leftovers we have available

Going to a more diverse cropping system

Transitioning to sustainable energy sources and use

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Dr. Hannah van Zanten

CiFoS team leader

Chair
Environmental Systems Analysis group
Wageningen University

Visiting Professor
Department Global Development
Cornell University

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Thank you!

"All models are wrong, but some are useful"

– **George E. P. Box**

CiFoS team leader
Chair of ESA/WUR

Hannah van Zanten

PostDoc Researcher

Felipe Cozim Melges

Circular Food Systems

www.circularfoodsystems.org