Research Institute of Organic Agriculture FiBL
info.suisse@fibl.org | www.fibl.org




The Incompatibility of Large-scale Bioenergy with Large-scale Organic Agriculture

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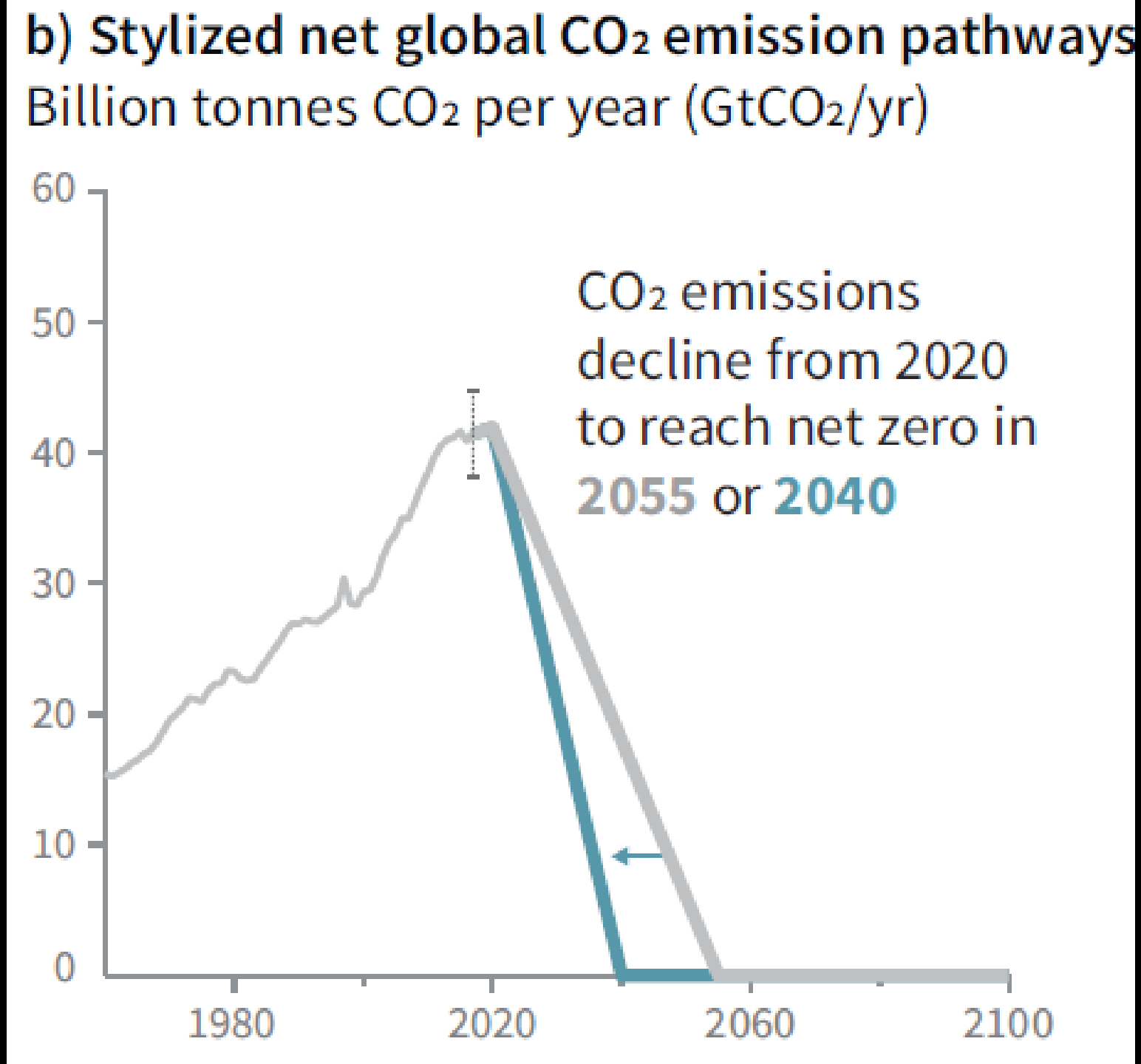
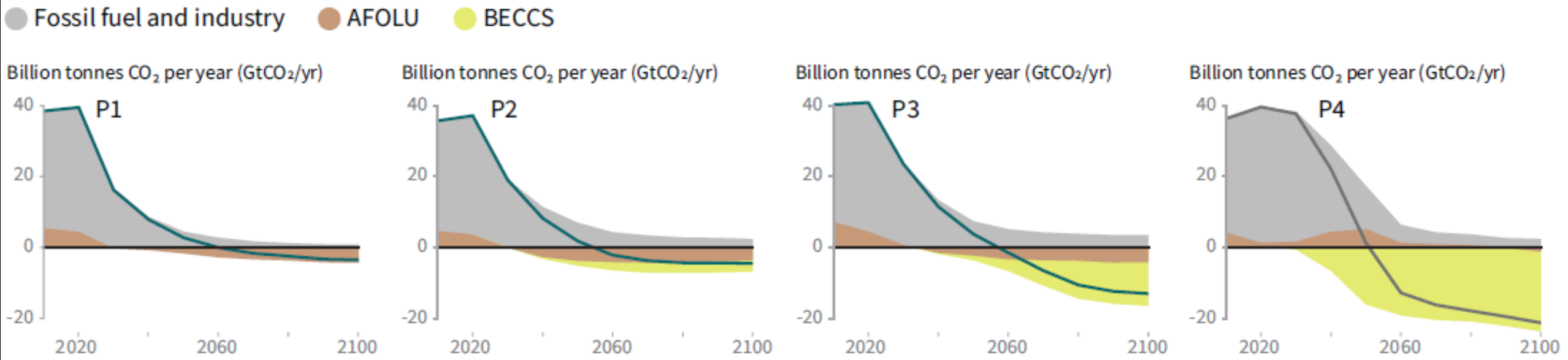
Adrian Muller, adrian.mueller@fibl.org
Selina Fürst, Renée Cardinaals, Fei Wu



IPCC SR15 2018

Breakdown of contributions to global net CO_2 emissions in four illustrative model pathways



P1: A scenario in which social, business and technological innovations result in lower energy demand up to 2050 while living standards rise, especially in the global South. A downsized energy system enables rapid decarbonization of energy supply. Afforestation is the only CDR option considered; neither fossil fuels with CCS nor BECCS are used.

P2: A scenario with a broad focus on sustainability including energy intensity, human development, economic convergence and international cooperation, as well as shifts towards sustainable and healthy consumption patterns, low-carbon technology innovation, and well-managed land systems with limited societal acceptability for BECCS.

P3: A middle-of-the-road scenario in which societal as well as technological development follows historical patterns. Emissions reductions are mainly achieved by changing the way in which energy and products are produced, and to a lesser degree by reductions in demand.

P4: A resource- and energy-intensive scenario in which economic growth and globalization lead to widespread adoption of greenhouse-gas-intensive lifestyles, including high demand for transportation fuels and livestock products. Emissions reductions are mainly achieved through technological means, making strong use of CDR through the deployment of BECCS.

IPCC SR15 2018

800 million ha grassland converted to cropland (Miscanthus)

2.5 times as much mineral fertilizers used

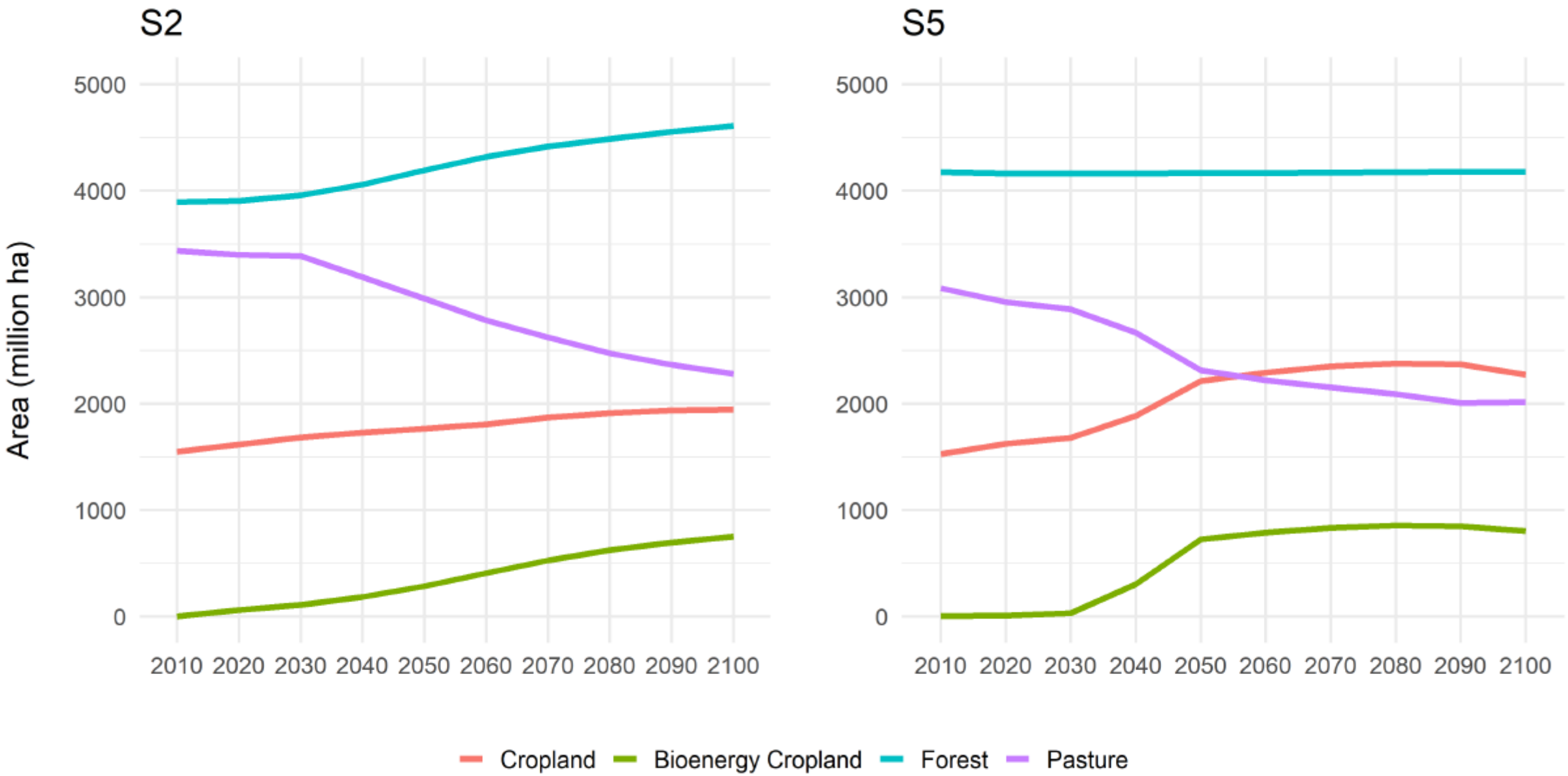
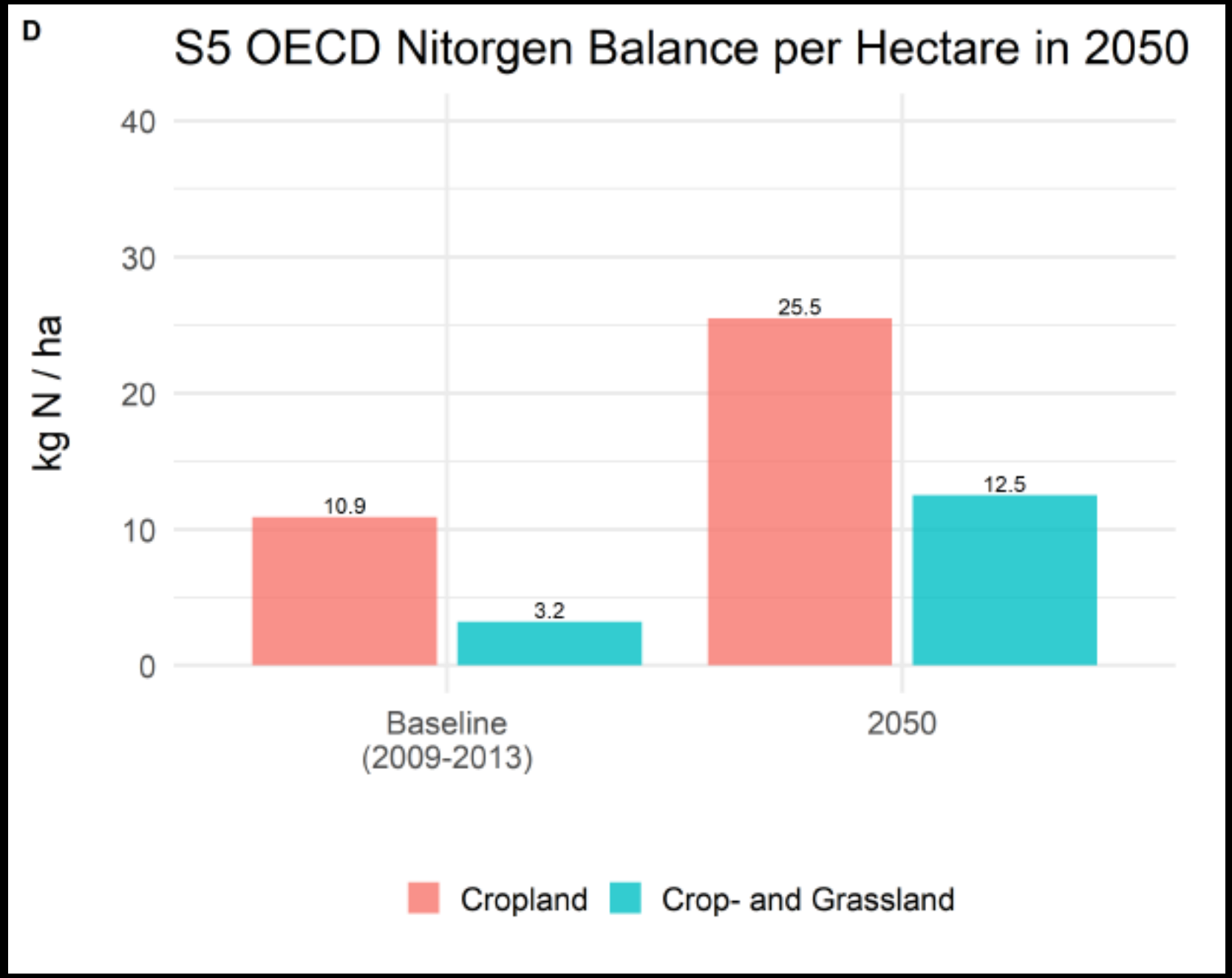
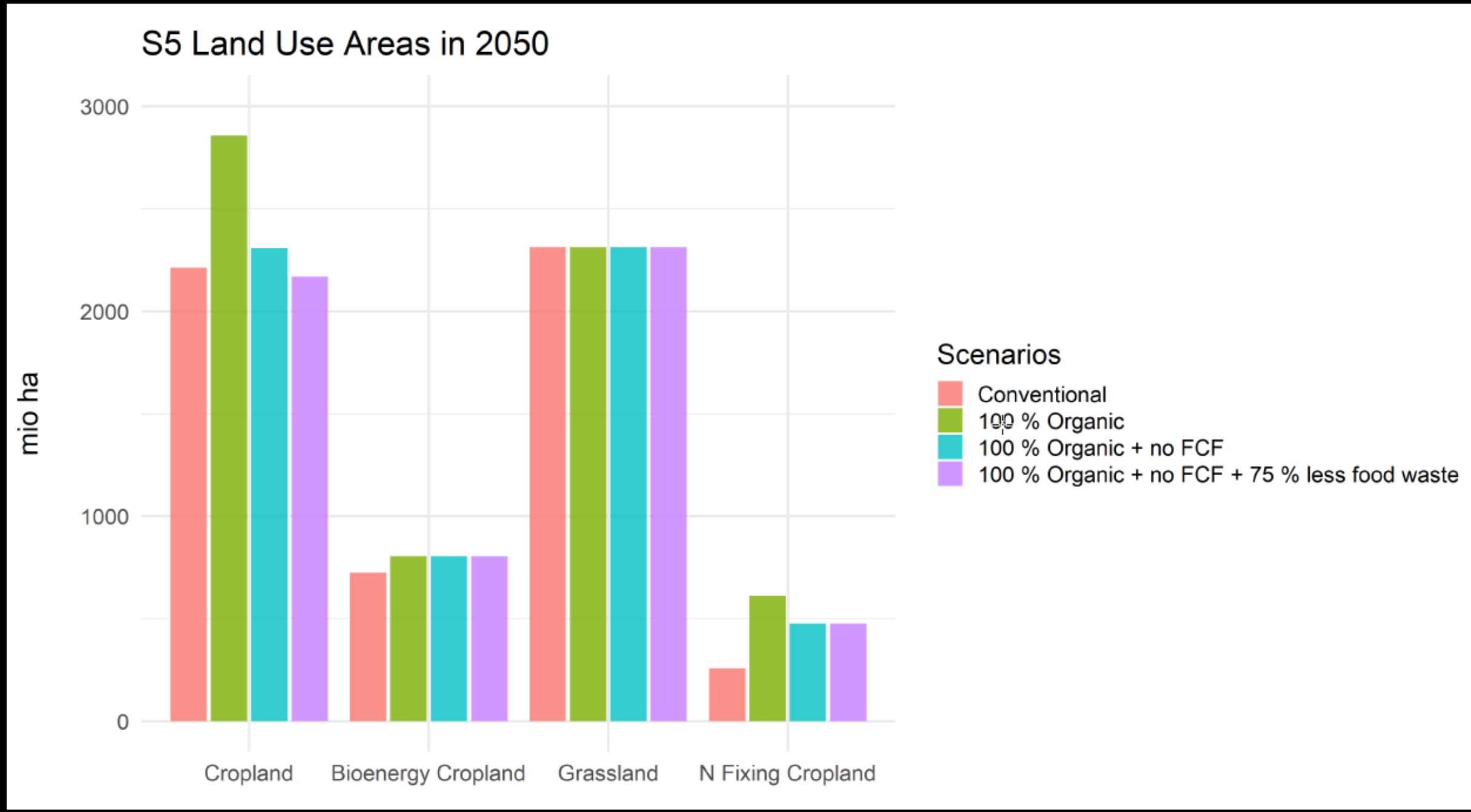


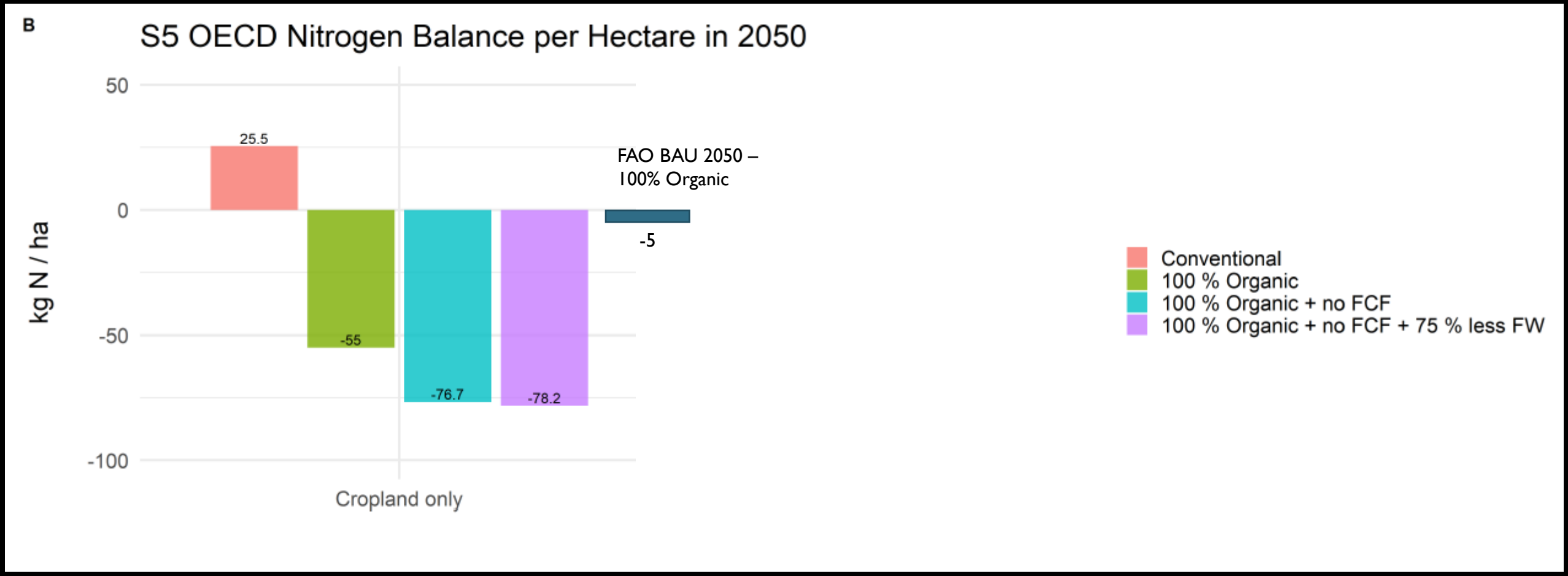
Figure 1: Changes in land use in S2 and S5 throughout the 21^{st} century.


D
S5 OECD Nitorgen Balance per Hectare in 2050
kg N / ha
40
30
20
10
0
10.9
3.2
25.5
12.5
Baseline
(2009-2013)
2050
Cropland
Crop- and Grassland

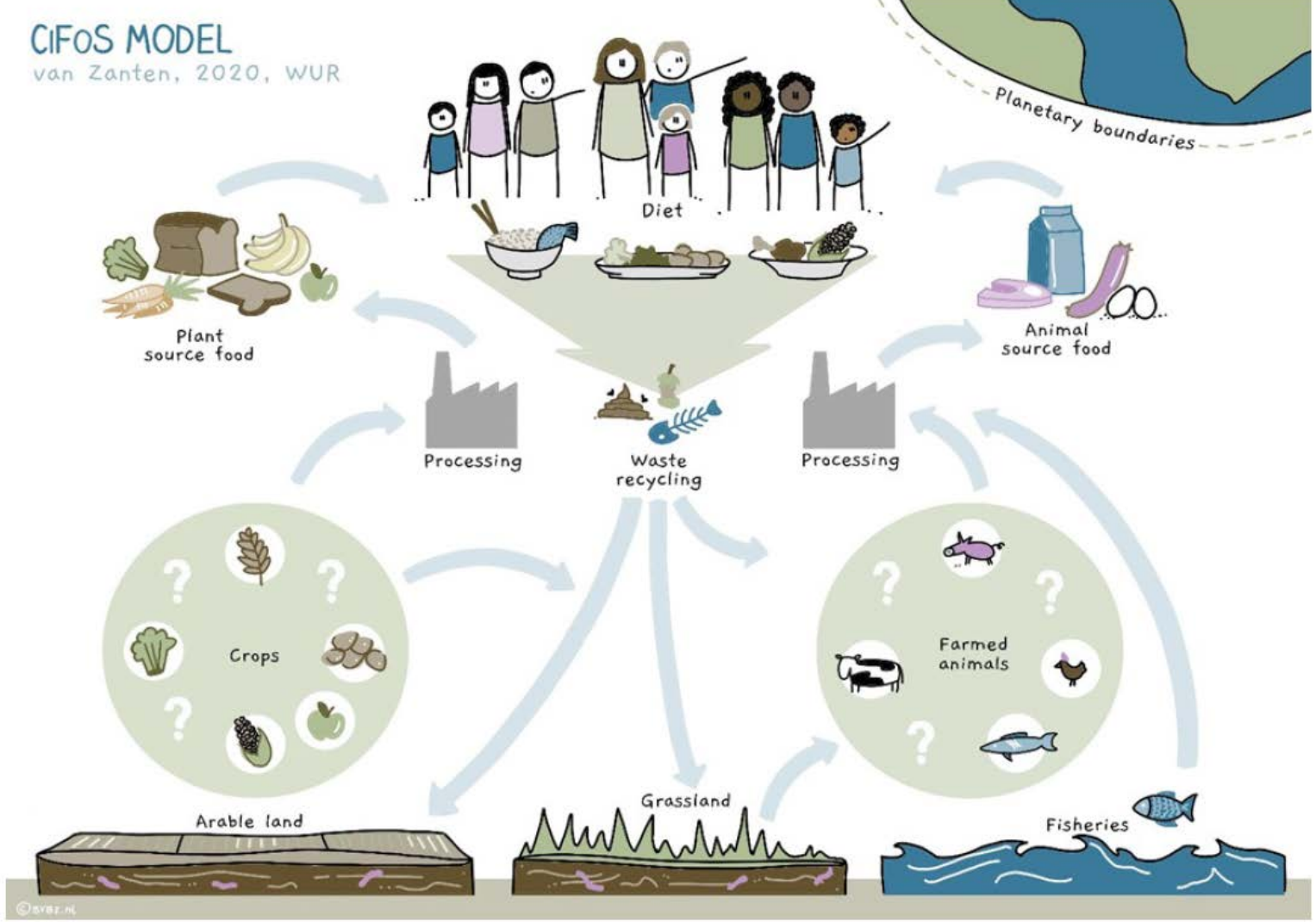
Fürst 2019


S5 Land Use Areas in 2050
mio ha
3000
2000
1000
0
Cropland
Bioenergy Cropland
Grassland
N Fixing Cropland
Scenarios
Conventional
100 % Organic
100 % Organic + no FCF
100 % Organic + no FCF + 75 % less food waste

Fürst 2019



Fürst 2019
Muller et al. 2017



Bioenergy in a Circular Food System

Mainly Biogas digesters
Recycling of N to the fields

About 5-10% of the future EU energy demand

Cardinaals 2020
Van Zanten 2020

Table A8 Nitrogen availability and deficiency on EU level for the CFS and the CFSAD plus the relative change

Process	CFS (tN)	CFSAD (tN)	Relative change
N input organic fertilizer*	1997852	4145950	+ 97%
N fixation	5301420	6380929	+ 20%
N deposition	293002	252115	+ 3%
N deficiency	-2086138	-94791	-95%

- Large-scale Bioenergy (50% and more of energy demand) is not compatible with organic agriculture: land use and N deficit
- Biogas from waste streams with recycling of N has a decent potential: 5-10%
- This may correspond to the share of biomass energy needed to stabilise renewable energy systems (wind, water, solar).

Contact

Adrian Muller

Research Institute of Organic Agriculture FiBL
Ackerstrasse 113, Box 219
5070 Frick
Switzerland

adrian.mueller@fibl.org

Phone (direct) +41 62 865 72 52

info.suisse@fibl.org
www.fibl.org

FiBL online

www.fibl.org

www.bioaktuell.ch

fiblfilm

@fiblorg

@FiBLaktuell

linkedin.com/company/fibl

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