



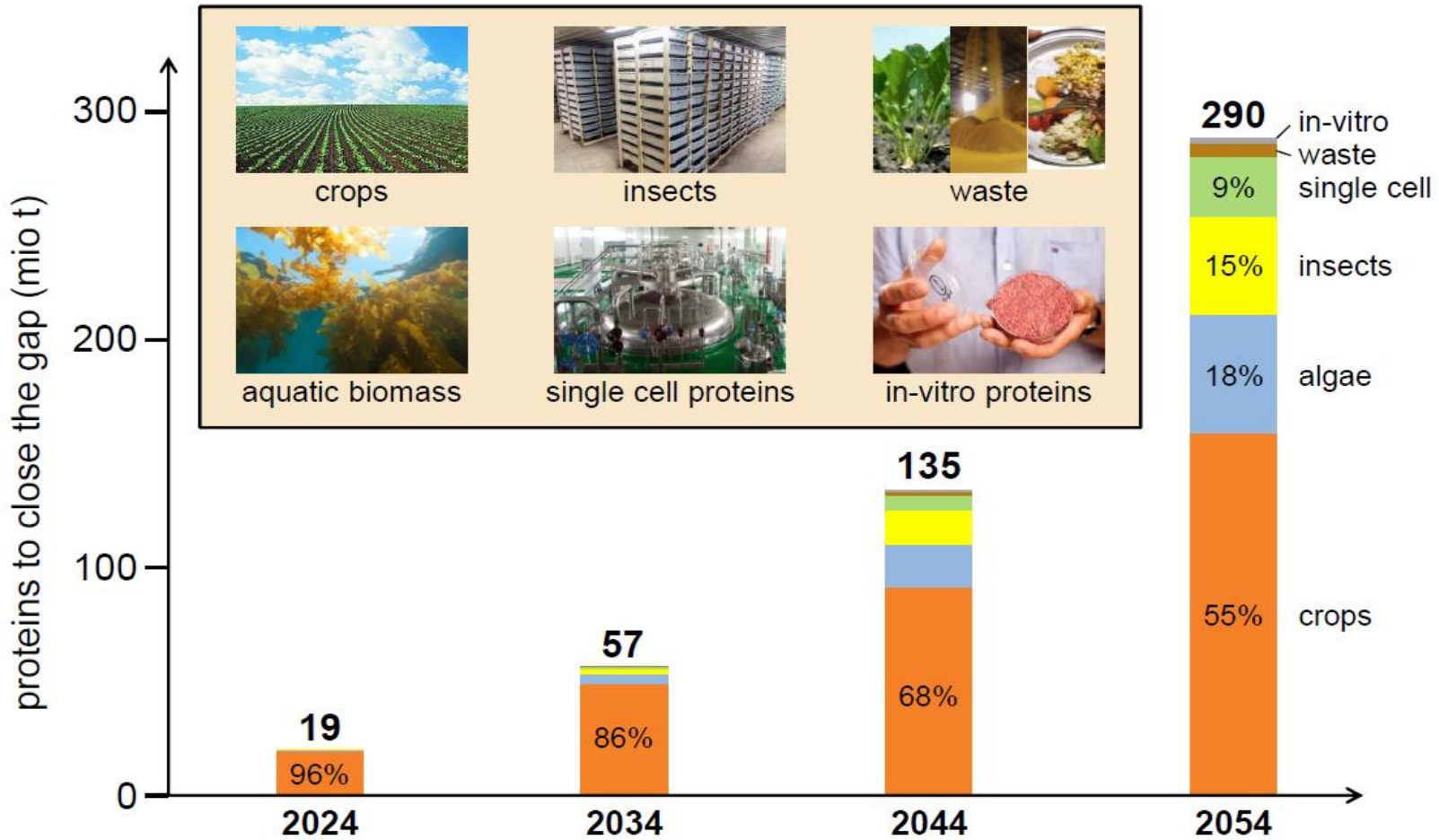
Grillen im Kopf – und im Bauch?

Lukas Böcker

ETH Zürich Sustainable Food Processing

4.Nov 2020, Migros Konsumententagung

Proteinmarkt wird diversifizieren

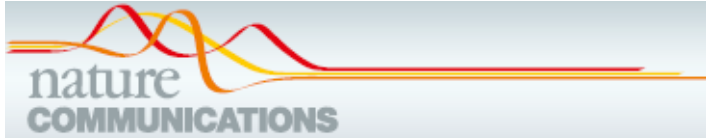


(Buhler AG, Dr. Andreas Baumann; Lux Research Report 2016)

Globales Lebensmittelsystem relevant für 12 der 17 Zielen für nachhaltige Entwicklung



Multi-Indikator Nachhaltigkeitsanalyse des globalen LM-systems



Global food system sustainability performance
...a 5.65 trillion USD market

Food Nutrient Adequacy (1)

Waste and loss reduction (7)

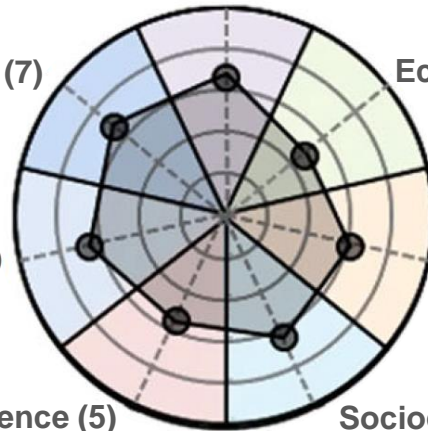
Ecosystem stability (2)

Food safety (6)

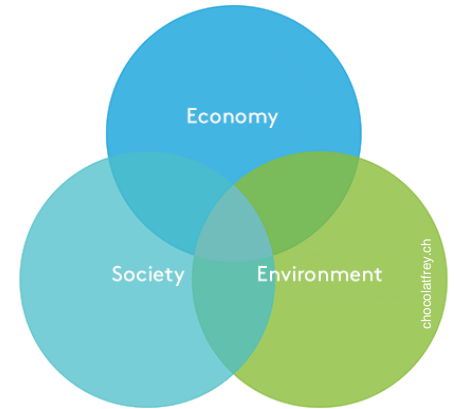
Affordability and Availability (3)

Resilience (5)

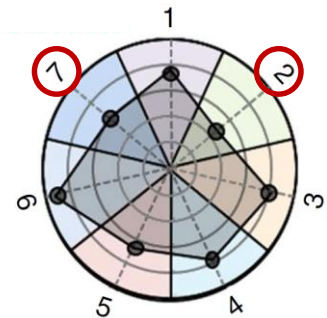
Sociocultural well-being (4)



HIC score well on most social indicators, but poorly on environmental, food waste and health sensitive nutrition indicators



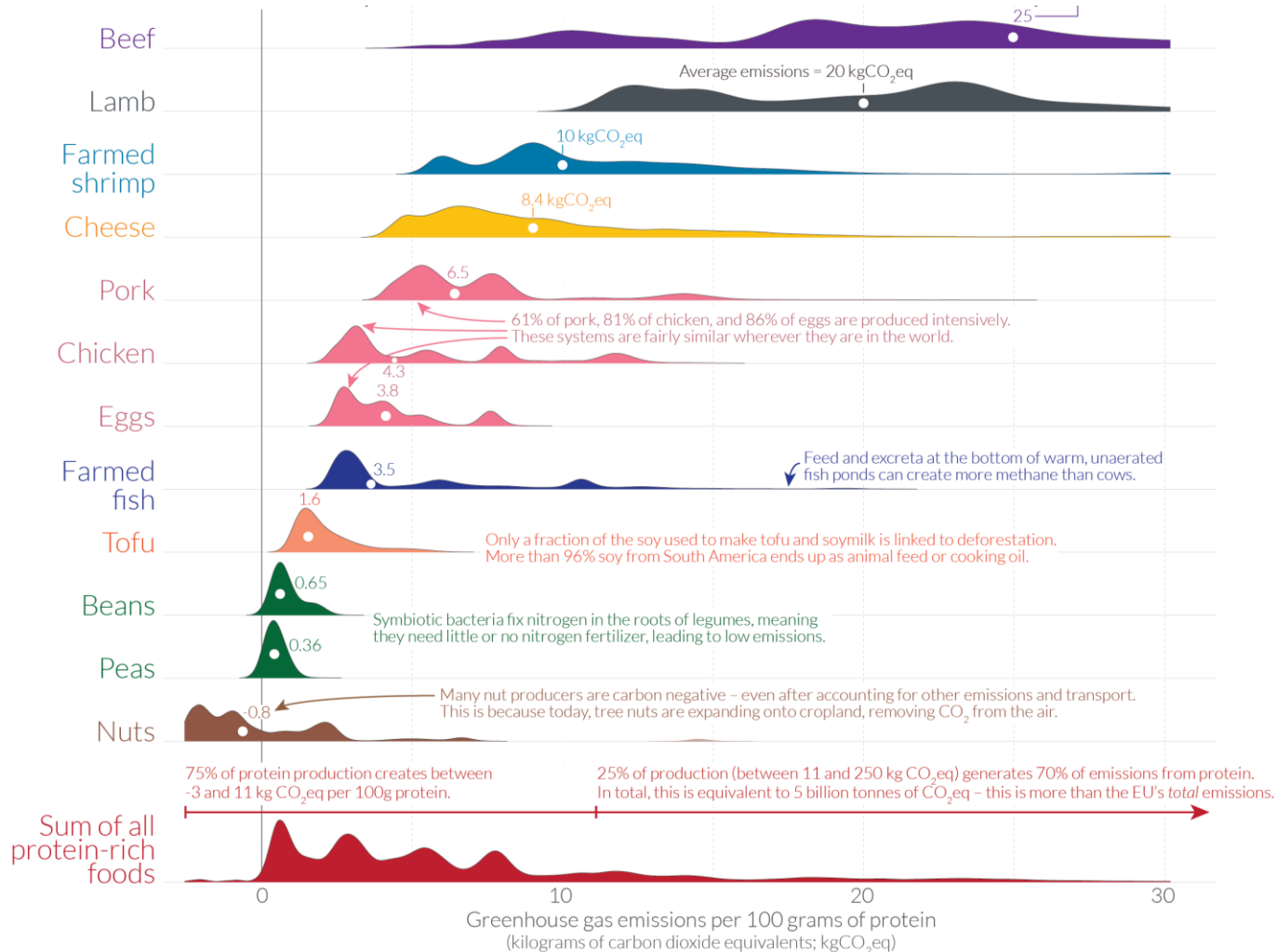
High income regions



Abhishek Chaudhary, Former PostDoc; Canxi Chen, Doctoral candidate; Ashley Green, Doctoral candidate

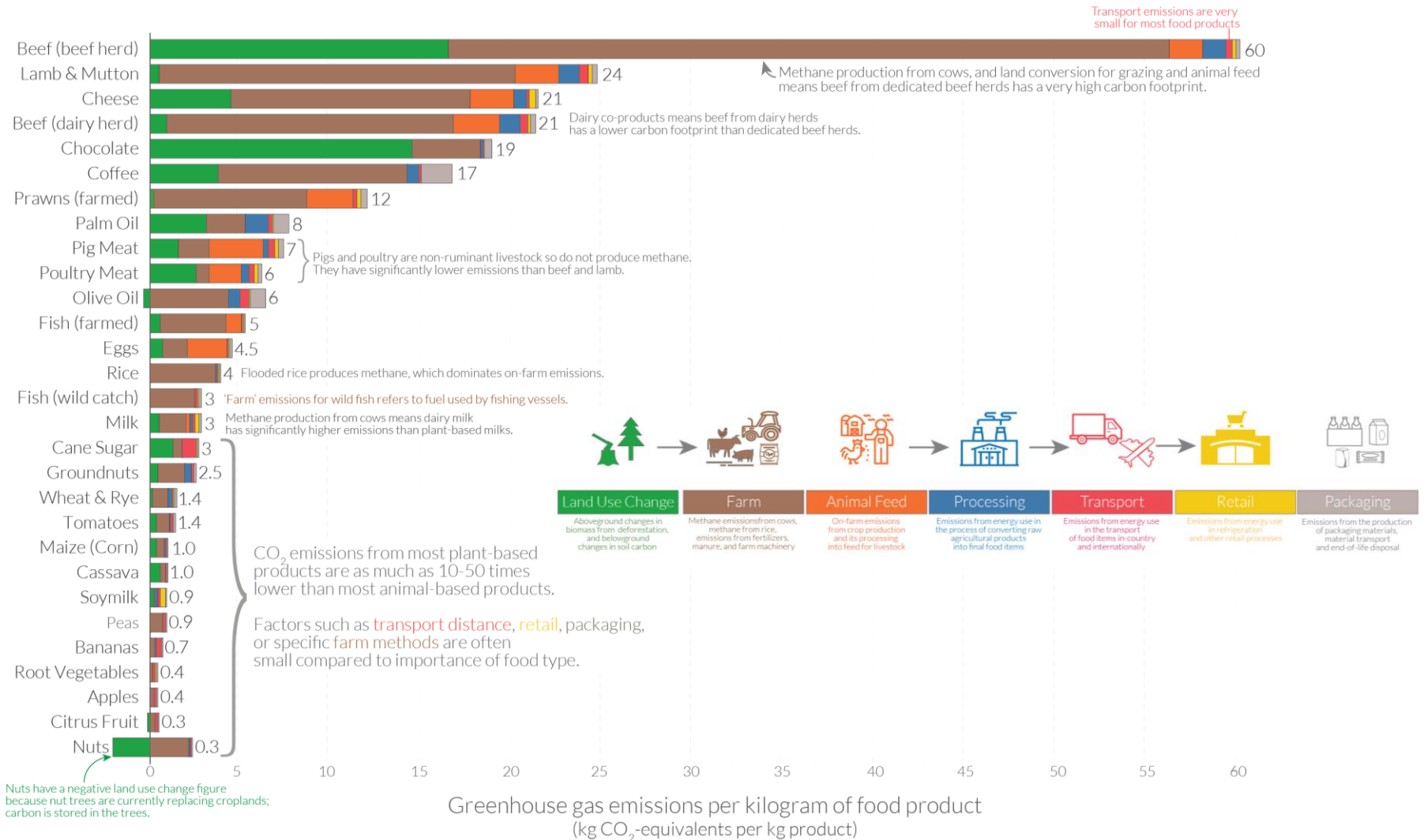
Chaudhary, Gustafson & Mathys (2018) Nature Communications.

Wie schneiden proteinreiche LM im Vergleich zueinander bzgl Treibhausgasemissionen ab?



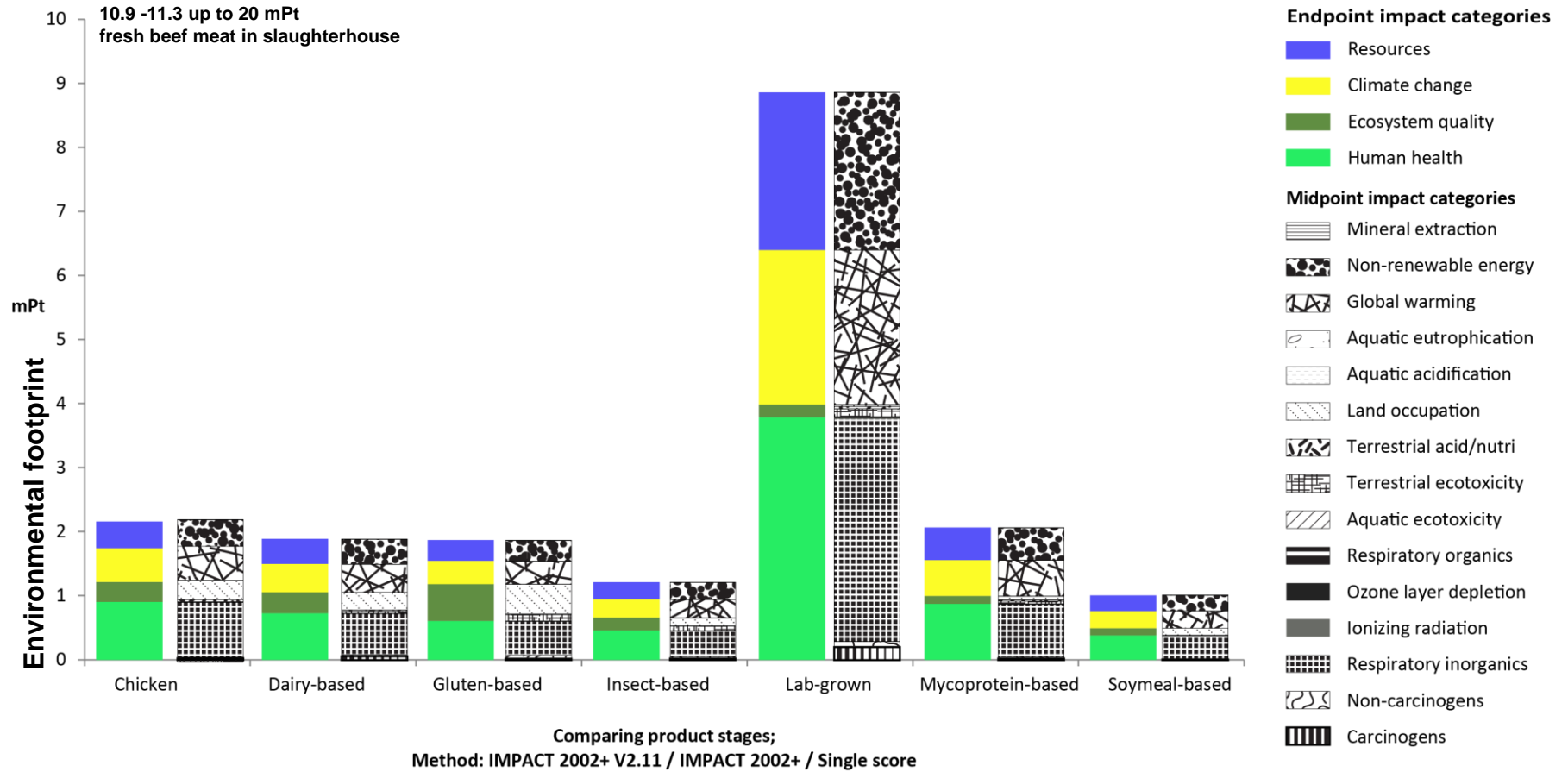
OurWorldInData.org; Data: Poore & Nemecek (2018) Science.; Graphic: licensed by Hannah Ritchie

Ursprung Treibhausgasemissionen für verschiedene LMs



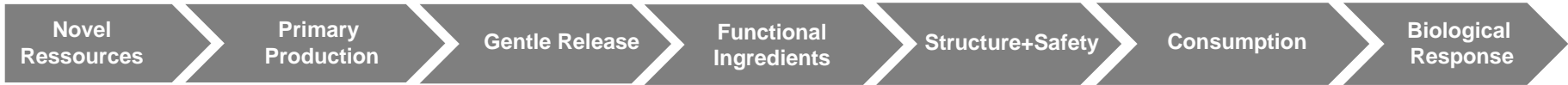
OurWorldInData.org; Data: Poore & Nemecek (2018) Science.; Graphic: licensed by Hannah Ritchie



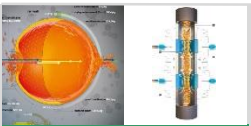



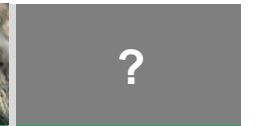
Ökologischer Fussabdruck von alternativen Eiweissquellen als auch Benchmark Produkten

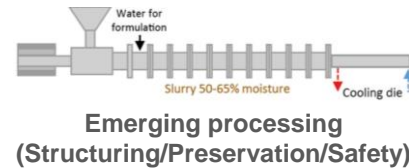
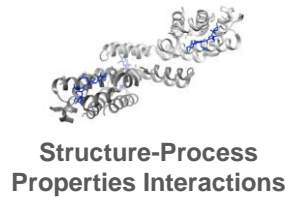
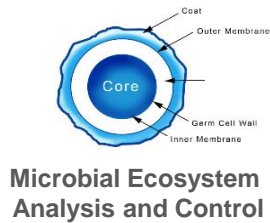




Smetana, Mathys et al. (2015). International Journal of Life Cycle Assessment

ETH Sustainable Food Processing – Forschungsfokus



						
Microalgae	Algae Bioreactors	Disintegration	Proteins & Lipids	Processing	Quality Foods	Nutritive Foods



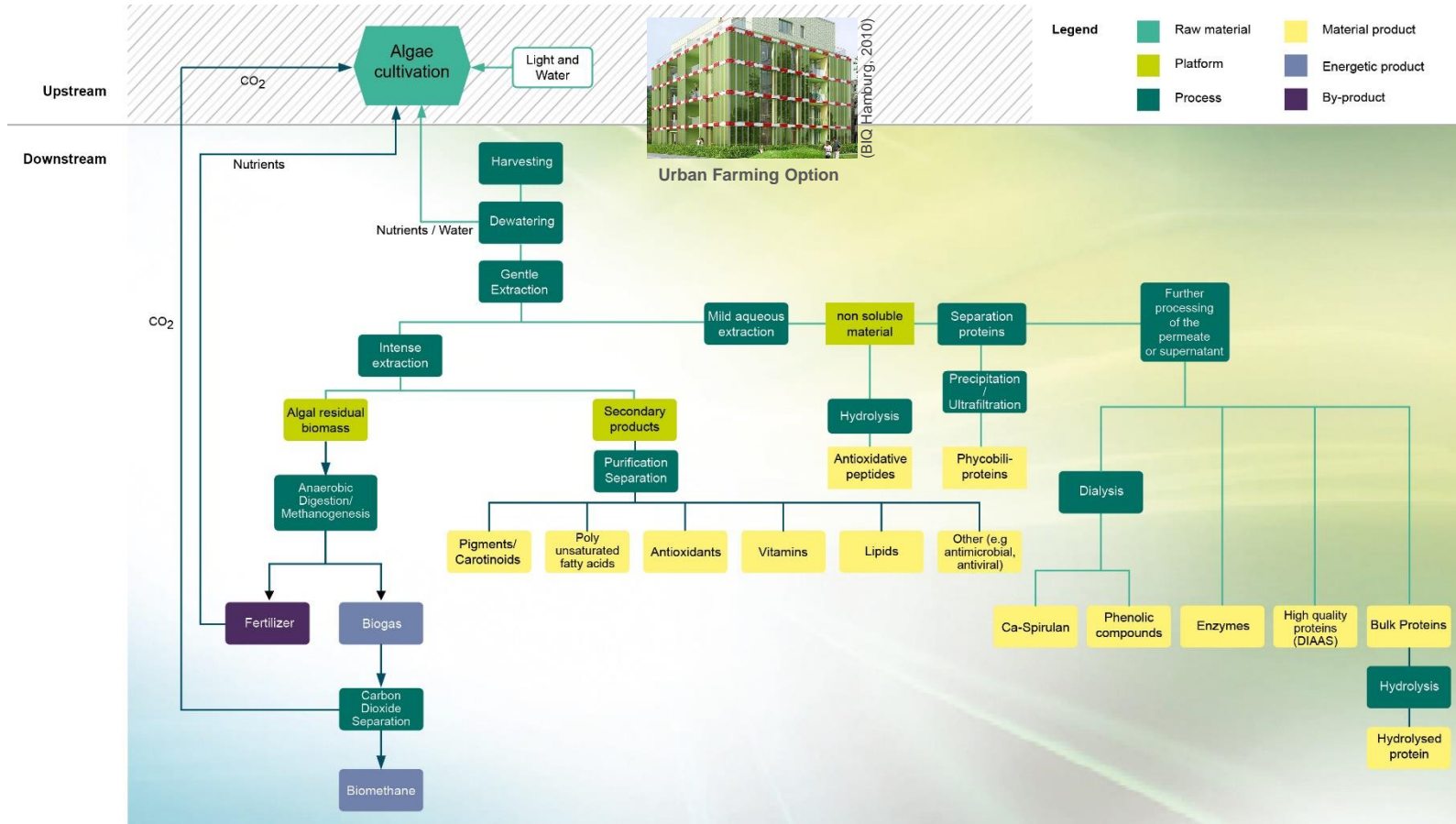
						
Insects	Rearing	Separation	Protein & Lipids	Processing	Quality Food/Feed	Nutritive Foods



Multi Indicator Sustainability Assessment - Method Development and Case Studies



Innovative Microalgen Bio Raffinerie mit neuartigen Up- & Downstream



Greta Canelli
Doctoral candidate



Iris Haberkorn,
Doctoral candidate



Leandro Buchmann
Ex Doctoral candidate

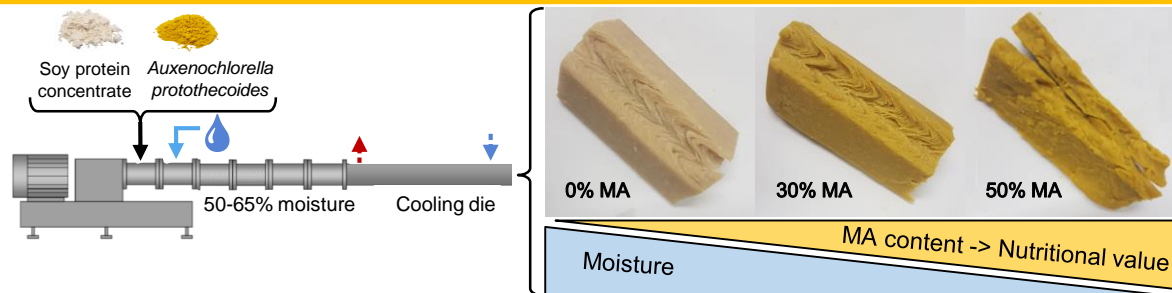


Lukas Böcker,
Doctoral candidate

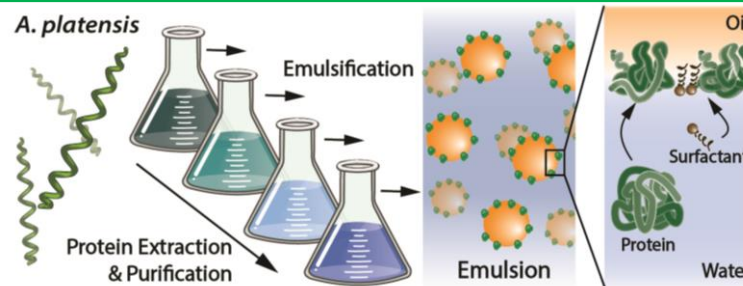
- 1) Buchmann, Frey, Gusbeth, Ravaynia & Mathys (2019). *Bioresource Technology* 271, 402-408.
- 2) Böcker, Ortmann, Surber, Leeb, Reineke & Mathys (2019). *Innovative Food Science and Emerging Technologies*, 52, 116-121.
- 3) Buchmann, Bloch & Mathys (2018). *Bioresource Technology* 265, 268-274.
- 4) Buchmann, Böcker, Frey, Haberkorn, Nyffeler & Mathys (2018). *Innovative Food Science and Emerging Technologies* 47, 445-453.
- 5) Caporgno & Mathys (2018). *Frontiers in Nutrition* 5:58.
- 6) Caporgno, Haberkorn, Böcker & Mathys (2019). *Bioresource Technology*, 288, 121476.
- 7) Buchmann, Bertsch, Böcker, Krähenmann, Fischer & Mathys (2019). *Food Hydrocolloids*, 105182.
- 8) Buchmann, Brändle, Haberkorn, Hiestand & Mathys (2019). *Bioresource Technology*, 291, 121870.
- 9) Haberkorn, Buchmann, Hiestand & Mathys (2019). *Bioresource Technology*, 122029.
- 10) Haberkorn, Böcker, Helisch, Belz, Schuppler, Fasoulas & Mathys (2020). *Journal of Phycology*.
- 11) Böcker et al. (2020) *Food Chemistry*. 316, 126374.
- 12) Canelli et al. (2020). *Algal Research*. 45, 101754.

Funktionelle Mikroalgen-Proteine kreieren Mehrwert

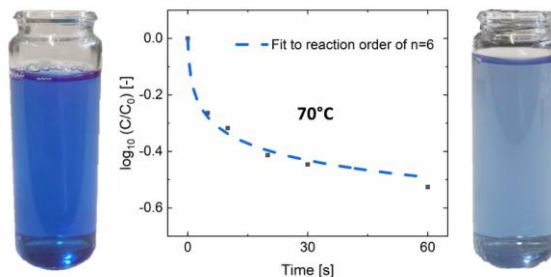
Extrusion



Emulsion






Color



Caporgno*, Böcker*, Müssner, Stirnemann, Haberkorn, Adelman, Handschin, Windhab & Mathys (2020). *Innovative Food Science and Emerging Technologies*, 59, 102275.
 Böcker, Bertsch, Wenner, Teixeira, Bergfreund, Eder, Fischer & Mathys (2021) *Journal of Colloid and Interface Science*, 584, 344-353.
 Böcker, Ortmann, Surber, Leeb, Reineke & Mathys (2019). *Innovative Food Science and Emerging Technologies*, 52, 116-121.
 Böcker, Hostettler, Diener, Eder, Demuth, Adamcik, Reineke, Leeb, Nyström & Mathys (2020) *Food Chemistry*, 316, 126374.

Schweizer Ernährungsszenarien und ihr Einfluss auf Gesundheits-, Ernährungs-, Umwelt- und Kosten-Indikatoren

Scenario	Human Health	Nutritional			Environmental					Economic
	Reduced DALYs *	NBS	DNS	PAN	GHG	WFP	LFP	NFP	PFP	Cost
 REF	-	93.82	0.00	96	2.27	0.59	4.38	29.0	5.23	10.58
HGD	953	95.93	1.35	87	1.20	0.40	3.24	21.0	3.75	7.23
RSN	15,756	98.77	0.00	91	1.04	0.44	2.96	19.3	3.45	6.89
 VGN	20,986	88.08	15.41	87	0.38	0.60	4.08	23.6	4.33	9.04
VGT	8049	91.37	0.00	94	0.78	0.61	4.27	25.7	4.61	8.38
PST	10,679	92.68	0.00	95	0.78	0.61	4.21	25.7	4.62	9.21
FXT	5259	93.09	0.00	94	1.24	0.59	4.16	26.0	4.69	8.85
PTO	-23,699	88.76	0.00	95	3.33	0.60	5.04	32.5	5.93	11.76
 MTO	-24,788	88.56	0.00	92	3.92	0.58	4.94	33.0	5.98	12.67
TAX	706	93.82	0.00	96	2.20	0.59	4.37	29.0	5.22	10.56

The scenarios are as follows: current Swiss diet (REF), Healthy Global Diet (HGD), diet following the recommendation of Swiss Society in Nutrition (RSN), Vegan diet (VGN), lacto-ovo Vegetarian diet (VGT), lacto-ovo Pescatarian diet (PST), Flexitarian diet (FXT), protein-oriented diet (PTO), meat-oriented diet (MTO) and food greenhouse gas tax diet (TAX). For each of the 10 indicators, the best and worst scores are marked in green and red, respectively.* See Supplementary Tables S4–S6 for the food group specific results and 95% confidence intervals. * A negative value under health indicator (i.e., change in DALYs per year) means the diet is bad for human health relative to the current diet. The nutrition quality indicators are: nutrient balance score (NBS), disqualifying nutrient score (DNS) and % population share with adequate nutrients (PAN). The nutrition indicators vary from 0–100 with a higher score signifying a nutritious diet meeting recommended levels. Five food related environmental footprints (per capita per day) are: greenhouse gas (GHG in kg CO₂eq), water (WFP in m³), land (LFP in m²), nitrogen (NFP in gN) and phosphorus (PFP in gP). Cost is the daily expenditure on food in Swiss Francs (CHF).

#5 - Towards a sustainable food system



RESEARCH FINDINGS

WHAT ARE THE MOST RELEVANT INFLUENCING FACTORS TOWARDS A MORE SUSTAINABLE FOOD SYSTEM IN SWITZERLAND?

IMPACT OF SWISS FOOD CONSUMPTION AND TRADE

ACHIEVING A MORE SUSTAINABLE DIET IN SWITZERLAND

SUSTAINABLE DIET SCENARIOS OF SWISS DIET

	HUMAN HEALTH	NUTRITIONAL	ENVIRONMENTAL	ECONOMY
MEAT-DOMINANT	++	++	-	-
VEGAN DIET	++	++	+	+
MEAT-ORIENTED	++	++	-	-

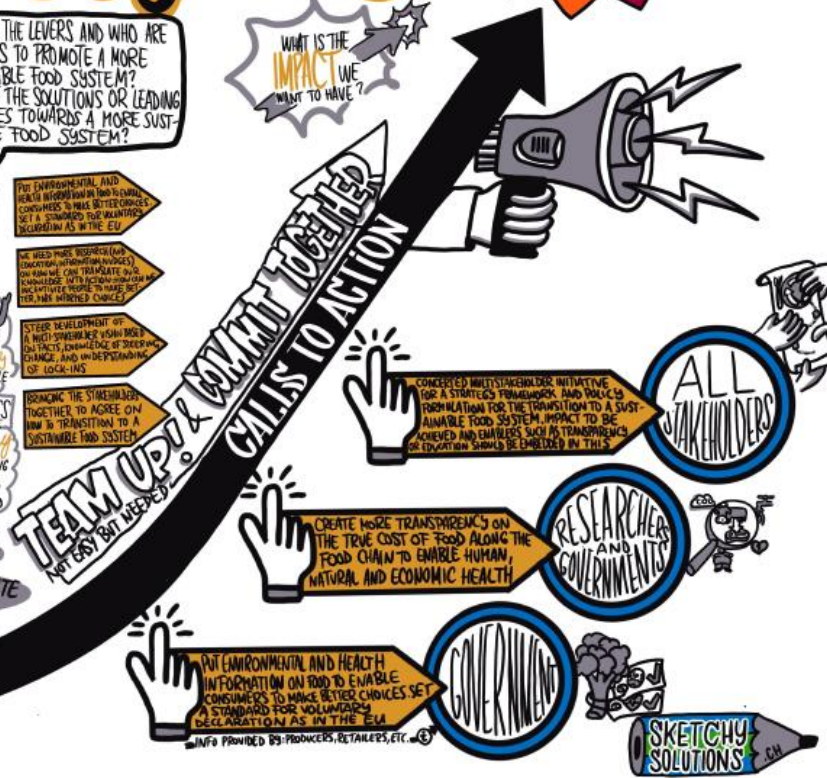
Worse: compared to current Swiss diet. Better: better.

HOW CAN WE OVERCOME THE BARRIERS TOWARDS A MORE SUSTAINABLE FOOD SYSTEM? HOW CAN WE ENSURE A MORE SUSTAINABLE FOOD SYSTEM WITHOUT COPING MEAT?

?????

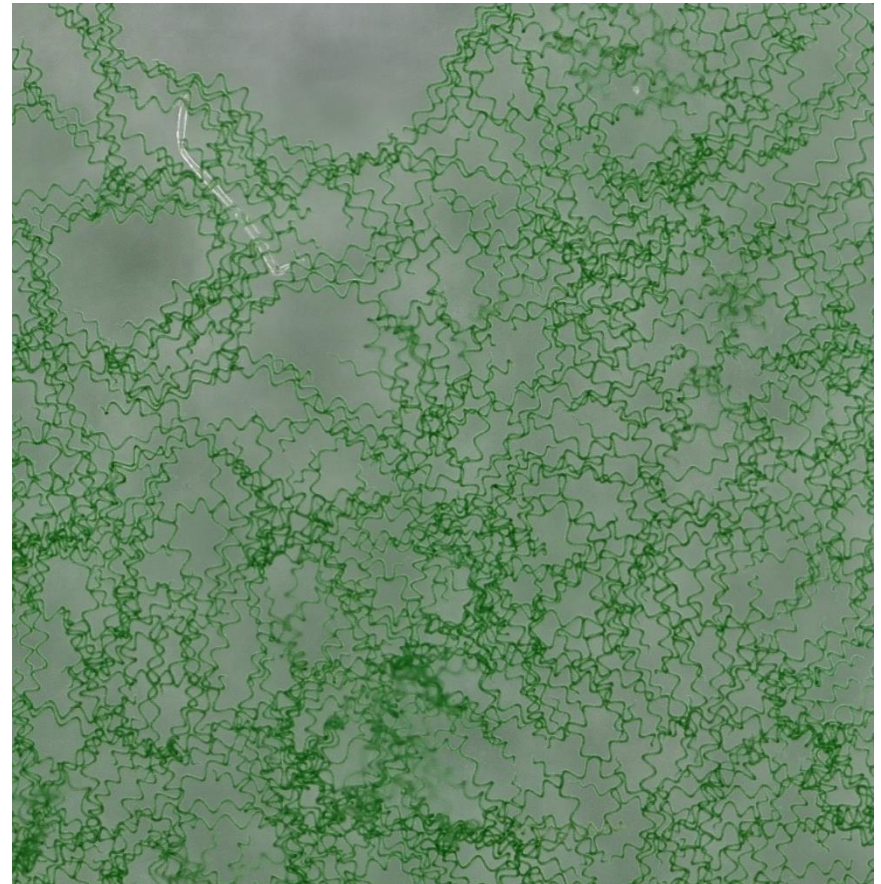
WHAT ARE THE LEVERS AND WHO ARE THE ACTORS TO PROMOTE A MORE SUSTAINABLE FOOD SYSTEM? WHAT ARE THE SOLUTIONS OR LEADING PRACTICES TOWARDS A MORE SUSTAINABLE FOOD SYSTEM?

WHAT IS THE IMPACT WE WANT TO HAVE?



Zusammenfassung und Aufruf

- Nachhaltige Schweizer Ernährung erfordert
 - Starke Reduktion des Fleischkonsums (derzeit 129 g vs 33 g empfohlen)
 - Starke Zunahme von Gemüse, Obst, Früchte, Nüsse und Samen
- Reduktion von Foodwaste
- Innovative, schmackhafte, proteinreiche, nicht-tierisch basierte Produkte



Danke für ihre Aufmerksamkeit und dem ganzen SFP-Team



Danksagung



ETH; Department of Health Sciences and Technology & Institute of Food, Nutrition and Health



ETH Sustainable Food Processing & Food Process Engineering Teams



Donors Buhler AG & Migros Industry Support, ETH Foundation, SNF



Partners





SFP

SUSTAINABLE **FOOD**
PROCESSING

The logo features the letters 'SFP' in a bold, sans-serif font. The 'S' is black, the 'F' is grey, and the 'P' is blue. A circular arrow, colored in a gradient from blue to green, is superimposed over the right side of the 'P'. Below the letters, the text 'SUSTAINABLE FOOD' is written in a smaller, black, sans-serif font, with 'FOOD' in bold. Underneath that, the word 'PROCESSING' is written in the same font and color.