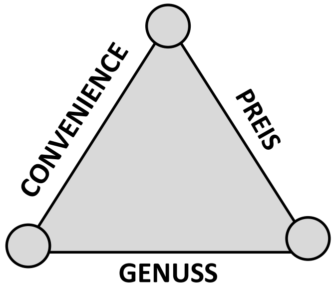
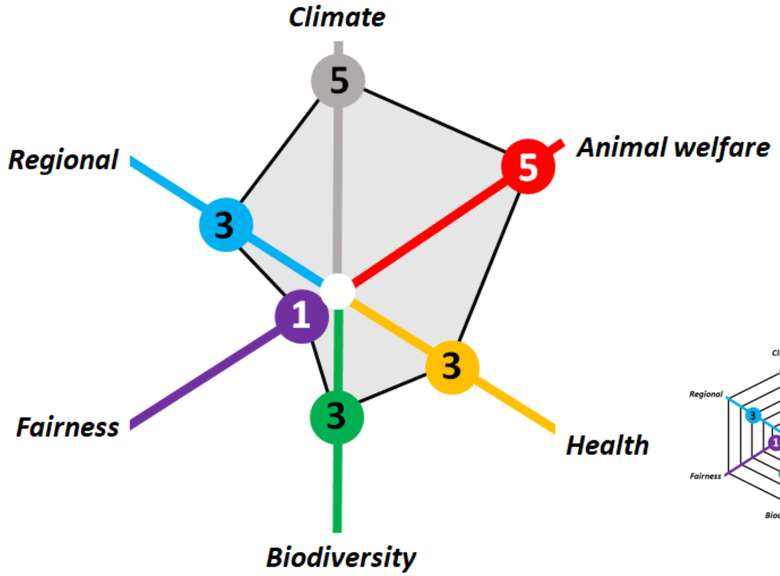
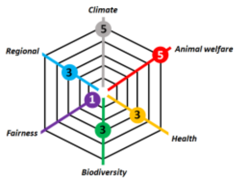


Neuartige Lebensmittel und das NEUE NEUE





ERNÄHRUNG

GLOBAL

NOVEL FOOD

MENU nature International journal of science

News & Comment Research

How to feed a hungry world

Producing enough food for the world's population in 2050 will be easy. But doing it at an acceptable cost to the planet will depend on research into everything from high-tech seeds to low-tech farming practices.

The UN's Food and Agriculture Organization estimates that world food production needs to increase by 70% by 2050.

MENU nature International journal of science

Transforming the global food system

Can the predicted rise in global food demand by 2050 be met sustainably? A modelling study suggests that a combination of interventions will be needed to tackle the associated environmental challenges.

Options for keeping the food system within environmental limits

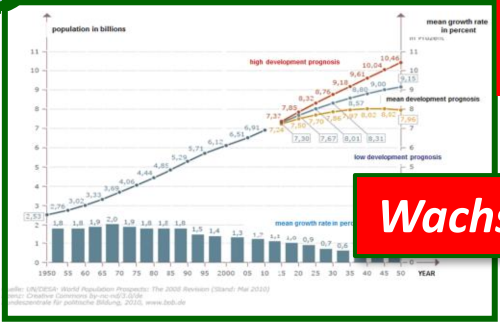
Nature 562(7728):501-502, October 2018

DEMAND

PRODUCTION

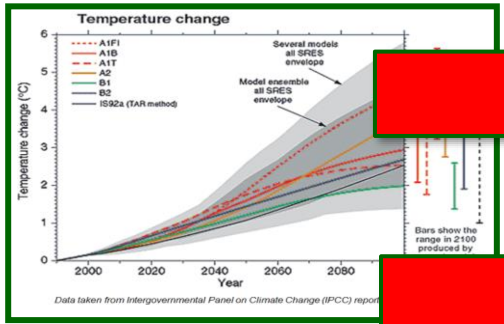
HERAUSFORDERUNGEN

LÖSUNGSANSÄTZE



Wachsende Weltbevölkerung

Lebensmittel zuerst

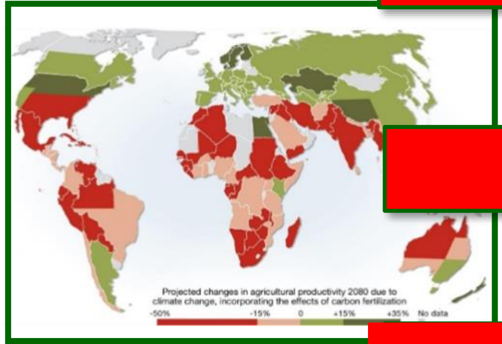


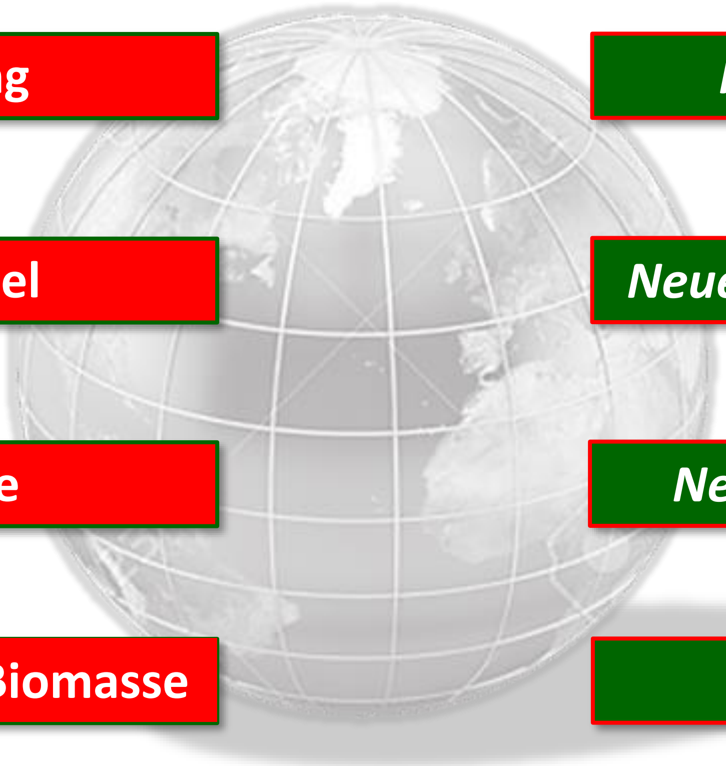
Urbanisierung

Neue Züchtungen

Klimawandel

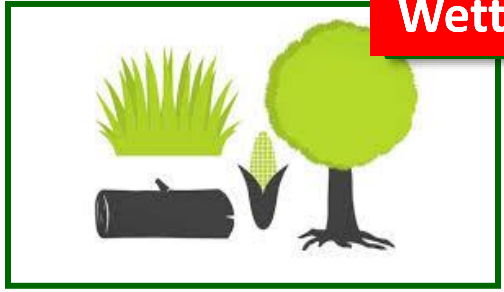
Neue Produktionssysteme





Ernteerträge

Neue Rohstoffquellen



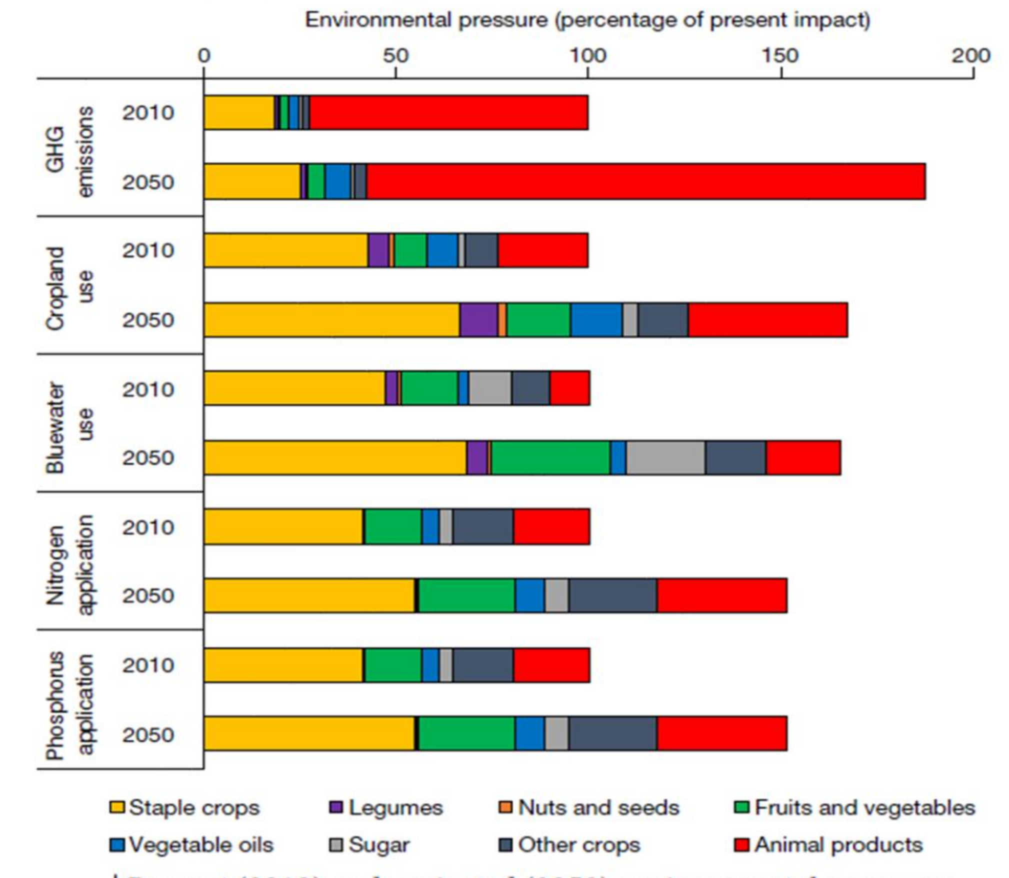
Wettbewerb um Biomasse

Weniger Abfall

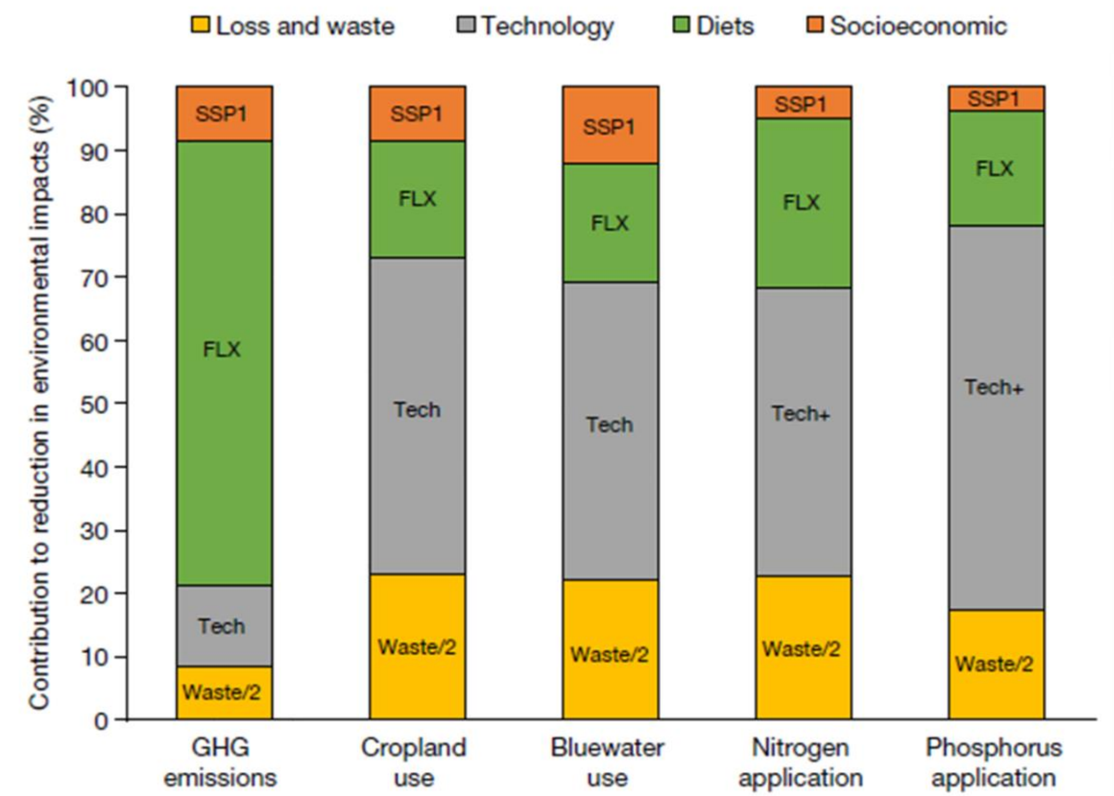
Options for keeping the food system within environmental limits

Marco Springmann[1,2*], Michael Clark[3], Daniel Mason-D'Croz[4,5], Keith Wiebe[4], Benjamin Leon Bodirsky[6], Luis Lassaletta[7], Wim de Vries[8], Sonja J. Vermeulen[9,10], Mario Herrero[5], Kimberly M. Carlson[11], Malin Jonell[12], Max Troell[12,13], Fabrice DeClerck[14,15], Line J. Gordon[12], Rami Zurayk[16], Peter Scarborough[2], Mike Rayner[2], Brent Loken[12,14], Jess Fanzo[17,18], H. Charles J. Godfray[1,19], David Tilman[20,21], Johan Rockström[6,12] & Walter Willett[22]

Nature 562(7728):501-502, October 2018



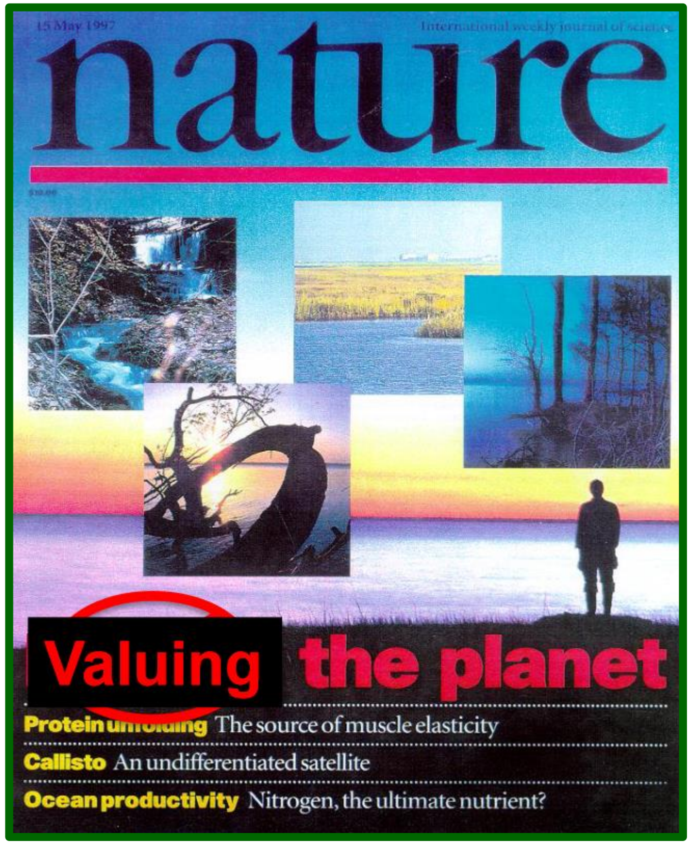
| Present (2010) and projected (2050) environmental pressures on five environmental domains divided by food group.



| Combination and relative contributions of mitigation measures that simultaneously reduce environmental impacts below the mean values of the planetary-boundary range.

… wie kann man die PLANETARY BOUNDARIES einpreisen ??

Was kostet die Natur ?



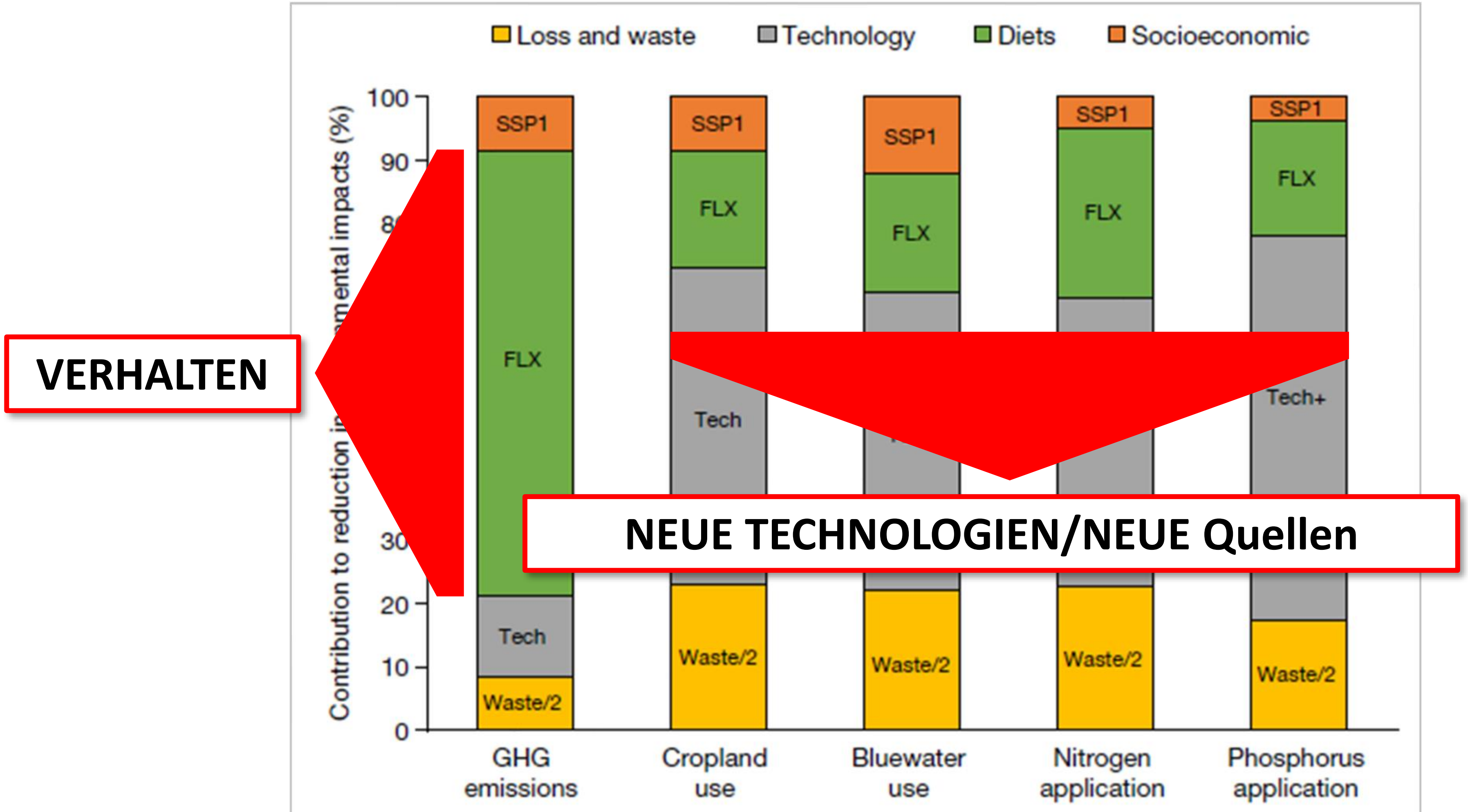
The value of the world's ecosystem services and natural capital

The services of ecological systems and the natural capital stocks that produce them are critical to the functioning of the Earth's life-support system. They contribute to human welfare, both directly and indirectly, and therefore represent part of the total economic value of the planet. We have estimated the current economic value of 17 ecosystem services for 16 biomes, based on published studies and a few original calculations. For the entire biosphere, the value (most of which is outside the market) is estimated to be in the range of US $ 14 – 46 Trillion per year, with an average of

1.000.000.000.000 Euro per year.

Because of the nature of the uncertainties, this must be considered a minimum estimate.

Robert Constanza et al. Changes in the global value of ecosystem services. Global Environmental Change26:152-158



| Combination and relative contributions of mitigation measures that simultaneously reduce environmental impacts below the mean values of the planetary-boundary range.

Änderung von Ernährungsstilen

Nudge 18:

Verkauf von Lebensmitteln mit äußerlichen Makeln mit verschiedenen Slogans gegen Nahrungsmittelverschwendung

Nudge 15:

Bereitstellung von „Doggy Bags“ zur Mitnahme von Essensresten

Nudge 14:

Reduzierung der Portions- oder Tellergröße

Nudge 2:

Platzieren einer fleischlosen Alternative

Nudge 11:

Interaktive Displays in Supermärkten zur vergleichenden Anzeige des CO_2-Fußabdrucks

Nudge 10:

Vergleich der Nachhaltigkeit durch eine CO_2-Ampel auf Lebensmitteln

Nudge 5:

Prominente Positionierung regionaler Gerichte auf Speisekarten oder Aushängen in öffentlichen Kantinen

Nudge 6:

Vegetarische Gerichte als Standard bei Mittagsangeboten in Restaurants oder öffentlichen Kantinen

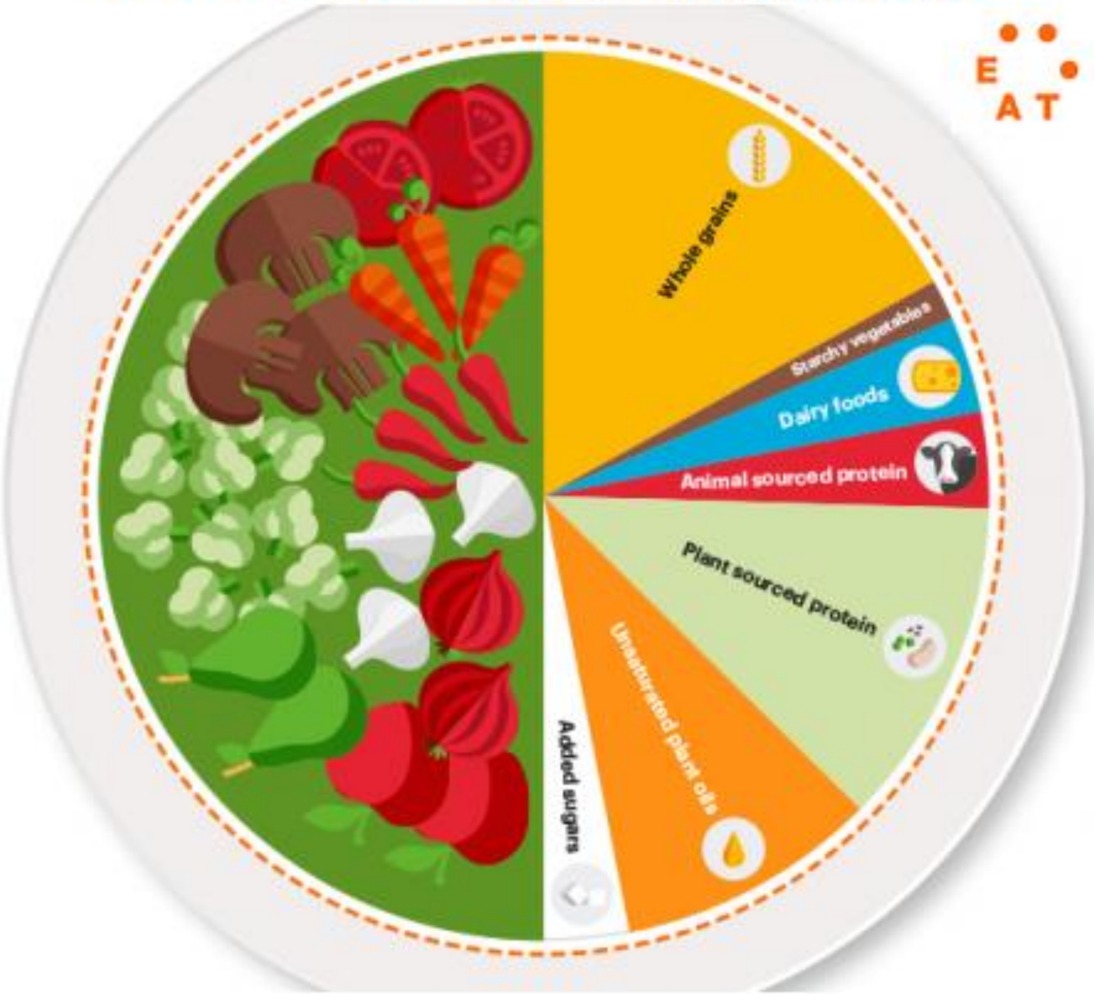
Lancet EAT Commission: the most sustainable and health promoting diet

Was nach der Planetary Health Diet auf den Teller kommt

Gemüse	300 Gramm
Milchprodukte	250 Gramm
Vollkornprodukte, Reis, Mais	232 Gramm
Obst	200 Gramm
Hülsenfrüchte	75 Gramm
Nüsse	50 Gramm
Kartoffeln	50 Gramm
Ungesättigte Fette	40 Gramm
Zucker	31 Gramm
Geflügel	29 Gramm
Fisch	28 Gramm
Rotes Fleisch (Rind, Lamm, Schwein)	14 Gramm
Eier	13 Gramm
Gesättigte Fette	11,8 Gramm

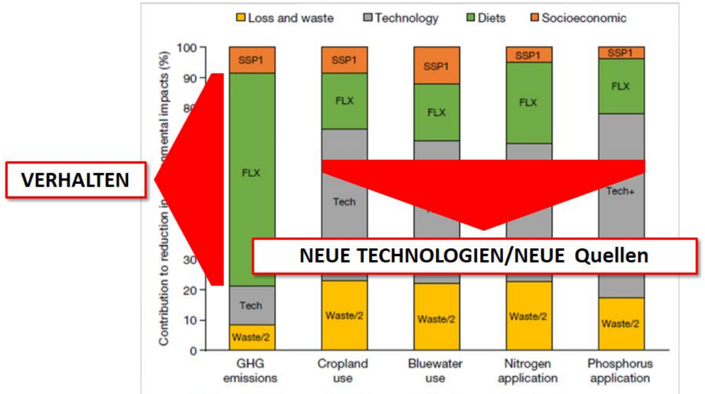
Planetary Health Diet: Gesund für Mensch und Klima | #BeatYesterday

The Planetary Health Plate



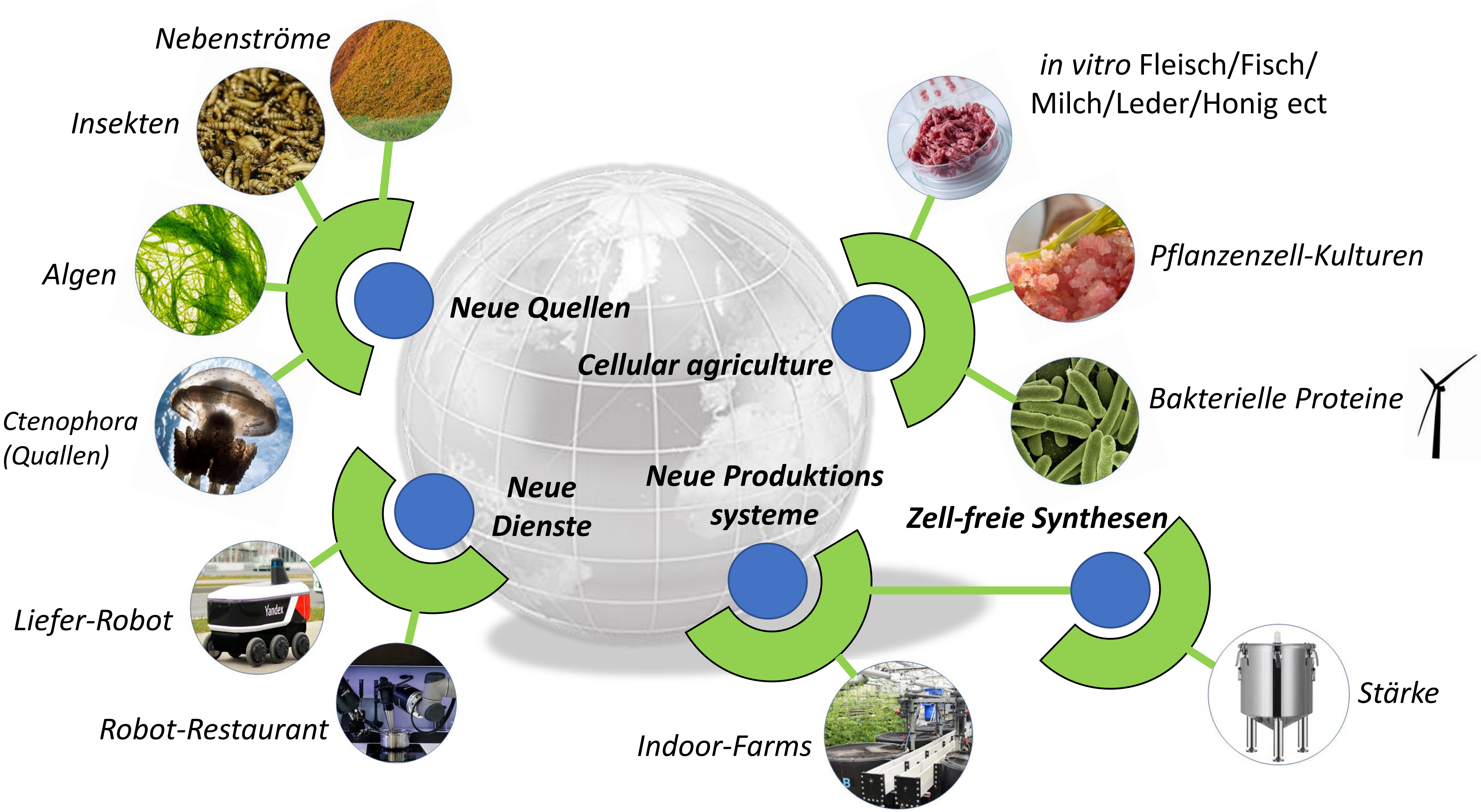
Food in the Anthropocene: the EAT–*Lancet* Commission on healthy diets from sustainable food systems
www.thelancet.com Published online January 16, 2019 http://dx.doi.org/10.1016/S0140-6736(18)31788-4

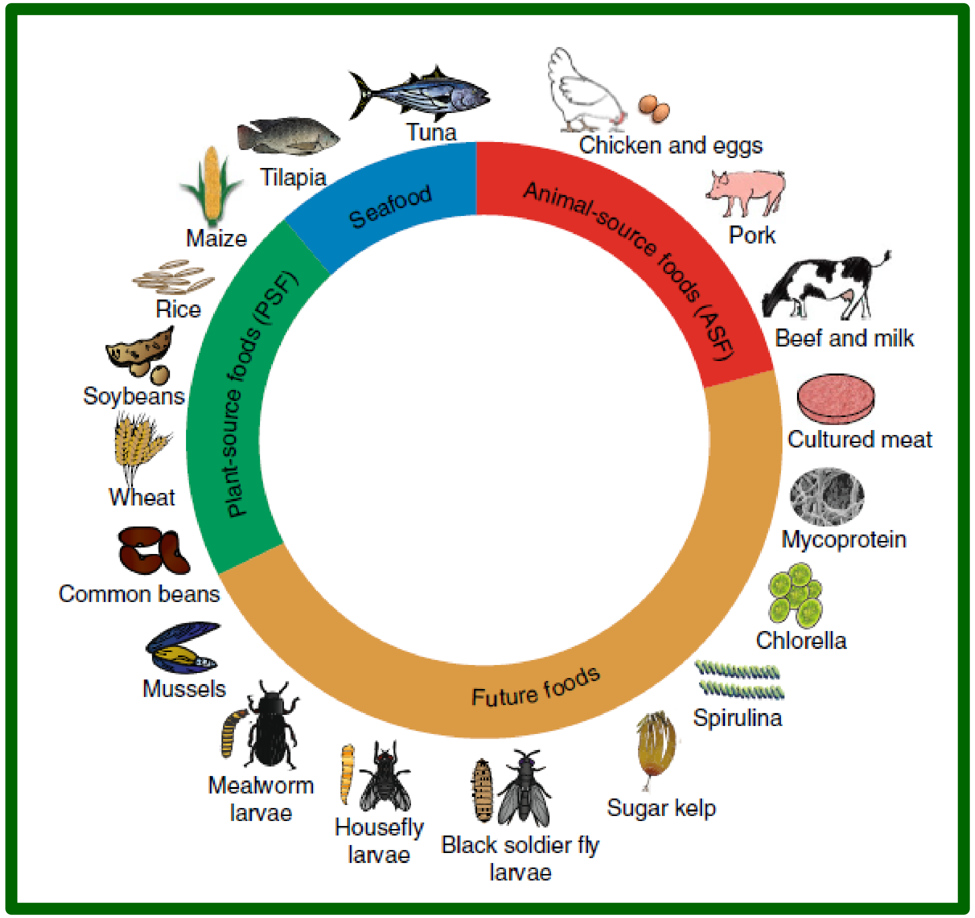
Neue Technologien

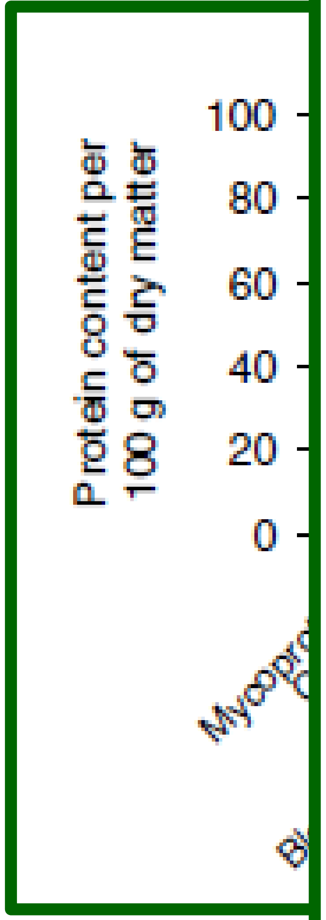


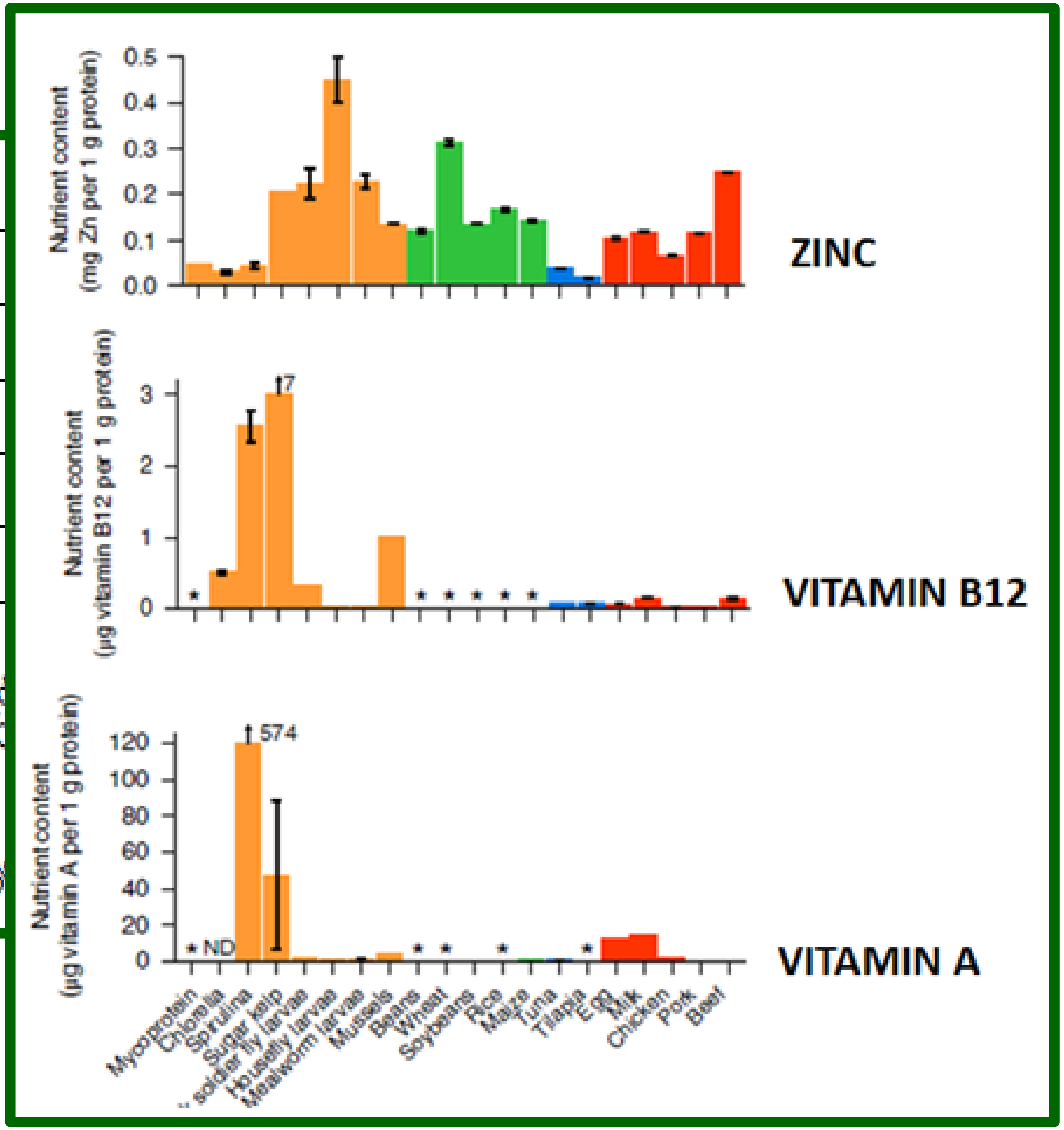
| Combination and relative contributions of mitigation measures that simultaneously reduce environmental impacts below the mean values of the planetary-boundary range.

Neue Technologien und neue Rohwaren









The potential of future foods for sustainable and healthy diets
Parodi, A, et al. *Nature Sustainability* volume 1, pages782–789(2018)

Neue Technologien: Beispiele


IMPOSSIBLE

THE IMPOSSIBLE BURGER

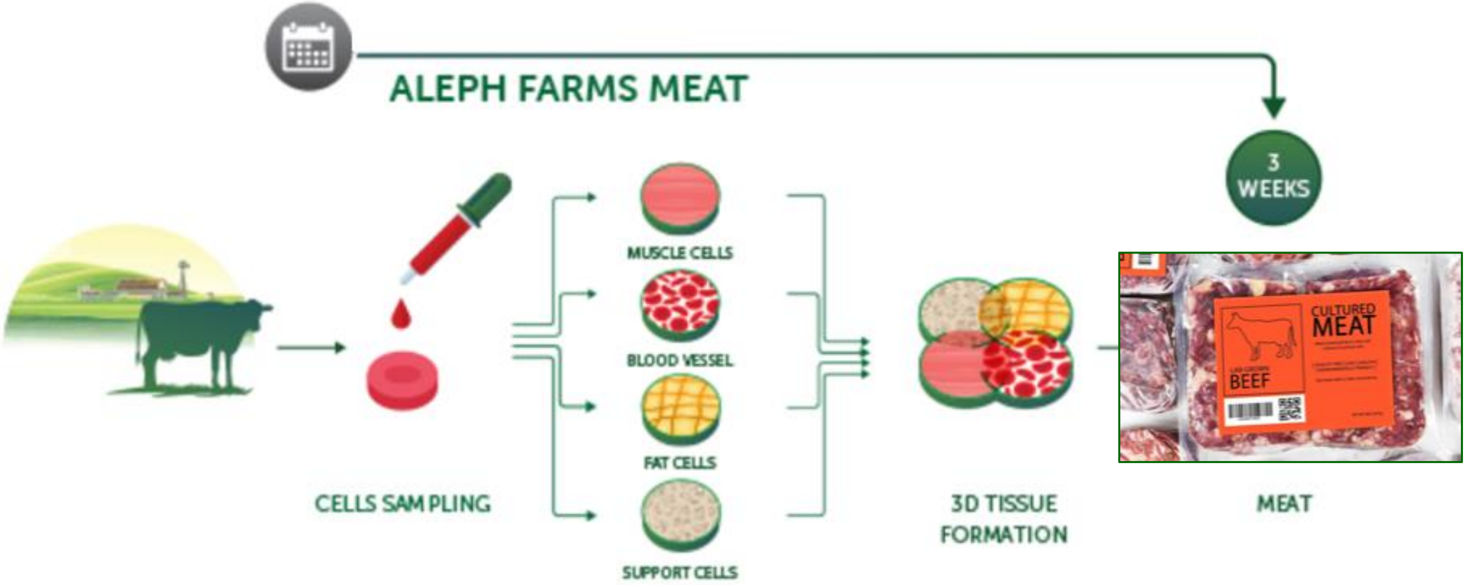
It's here. A delicious burger made entirely from plants for people who love meat. No more compromises. Ready for an introduction?

Meat-alternatives: FDA approves soy leghemoglobin as color additive following Impossible Foods petition

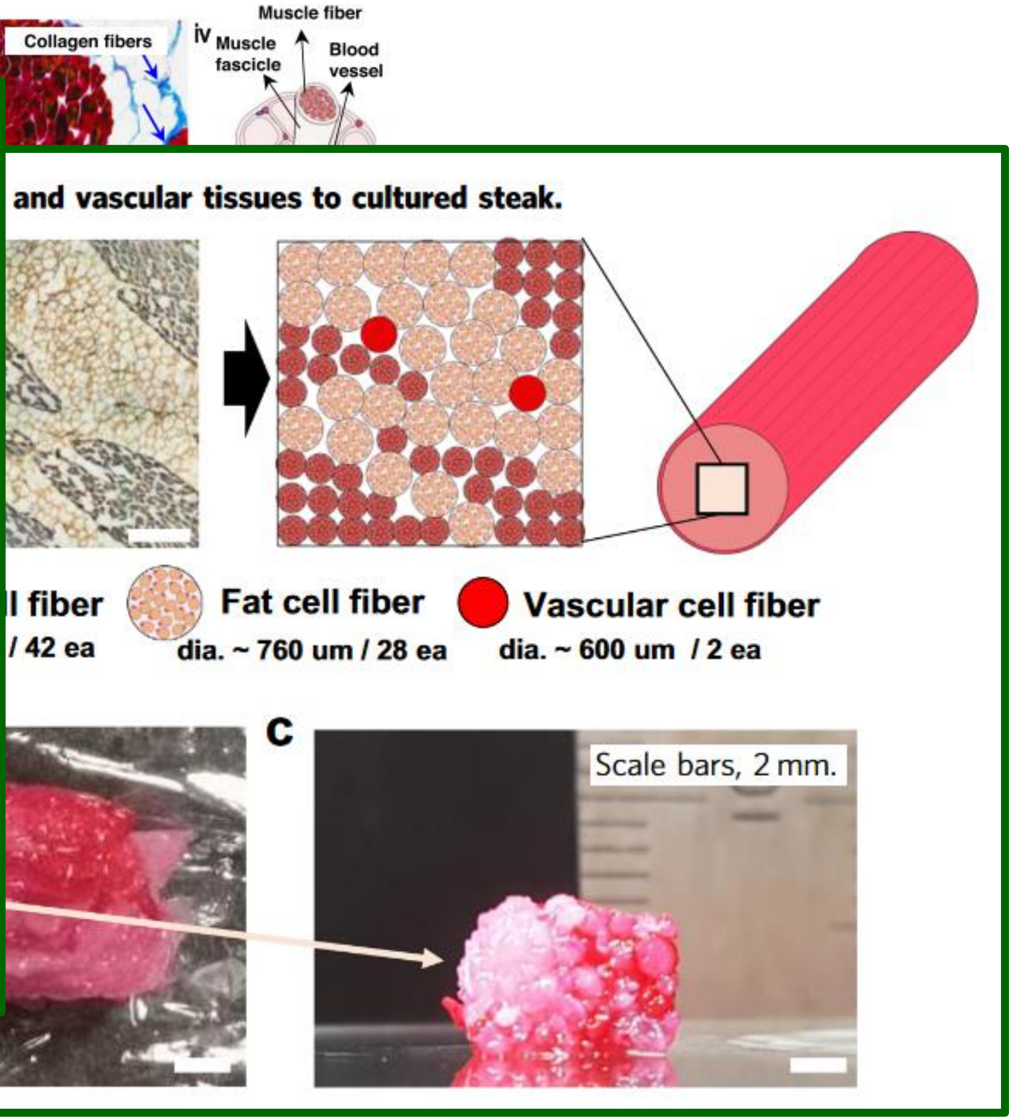
01 Aug 2019 --- The US Food and Drug Administration (FDA) has approved soy leghemoglobin as a color additive in uncooked ground beef analog products. This follows meat-alternative company Impossible Foods' 2018 petition to have the ingredient accepted as a color additive. Soy leghemoglobin imparts a reddish-brown color but has already been used by Impossible Foods as the "magic ingredient" to give an optimized beefy flavor. This ruling will allow the company to now sell raw Impossible Burgers directly to consumers, instead of cooked via restaurants.

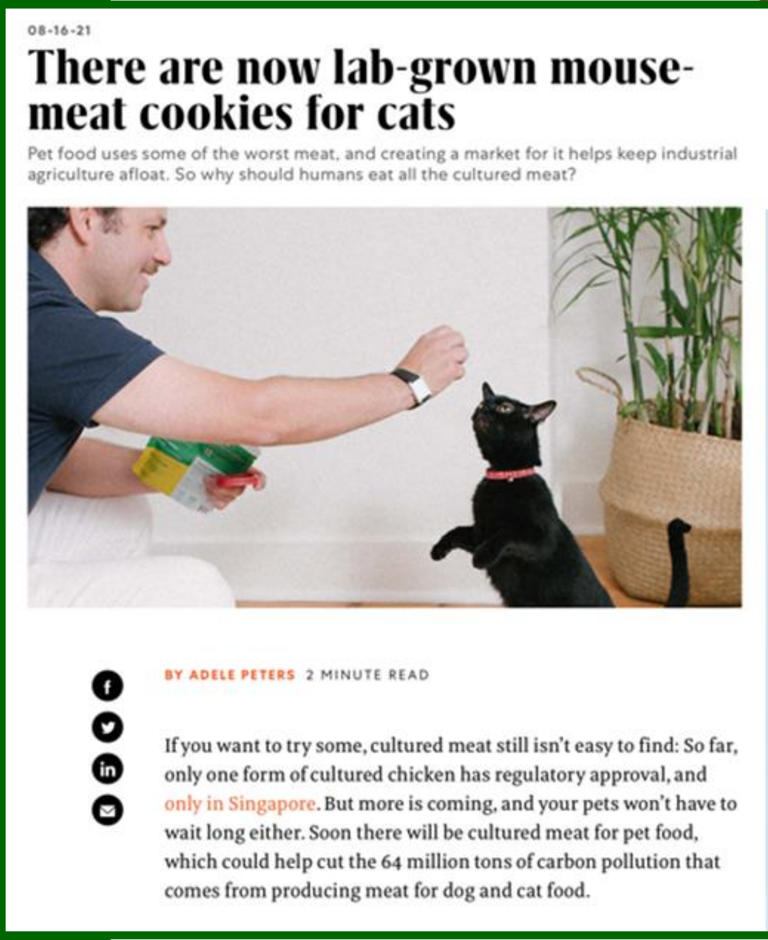
Is Lab Meat About to Hit Your Dinner Plate?

Splashy headlines suggest it might be. But experts say it's still a "moonshot" away.



Engineered whole cut meat-like tissue by the assembly of cell fibers using tendon-gel integrated bioprinting. Dong-Hee Kang et al.





08-16-21

There are now lab-grown mouse-meat cookies for cats

Pet food uses some of the worst meat, and creating a market for it helps keep industrial agriculture afloat. So why should humans eat all the cultured meat?

BY ADELE PETERS 2 MINUTE READ

If you want to try some, cultured meat still isn't easy to find: So far, only one form of cultured chicken has regulatory approval, and only in Singapore. But more is coming, and your pets won't have to wait long either. Soon there will be cultured meat for pet food, which could help cut the 64 million tons of carbon pollution that comes from producing meat for dog and cat food.

NATURE COMMUNICATIONS | (2021)12:5059 | https://doi.org/10.1038/s41467-021-25236-9 | www.nature.com/naturecommunications

Formo

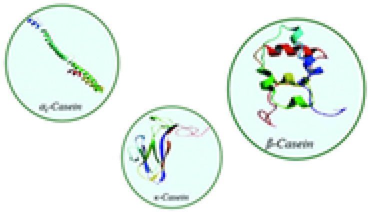
We're Formo, the future dairy from Berlin.
We're here to bring the future of food to life through science, cheese, and conversation.

Cow´s milk does not need cows

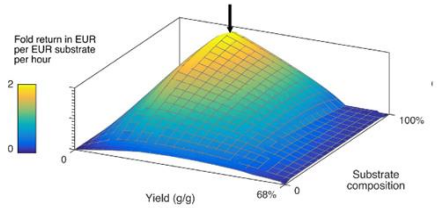
	Components	Cow milk Per 100 ml
1	Water (g)	88.1
2	Proteins (g)	3.3
3	Casein (g)	2.60
4	Whey proteins (g)	0.70
5	Fat (g)	4.1
6	Lactose (g)	4.5
7	Ash (g)	0.72
8	Calcium (mg)	120
9	Magnessium (mg)	10
10	Sodium (mg)	50.6
11	Potassium (mg)	145
12	Phosphorus (mg)	82

Protein	Content (%)
Caseins:	
α_{s1}-casein	32
α_{s2}-casein	8
β-casein	32
κ-casein	8
	80
Whey proteins:	
β-lactoglubulin	12
β-lactalbumin	4
immunoglobulins	3
serum albumin	1
	20

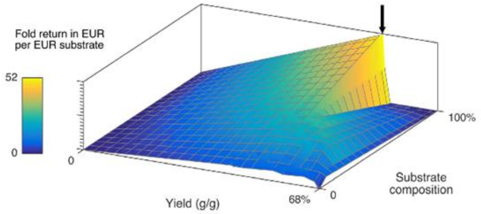
Protein	Amino Acids
Major Protein	
1) Caseins	
α_{s1}-Casein	199
β-Casein	209
κ-Casein	169
2) Whey Proteins	
α-Lactalbumin	114
β-Lactoglobulin	162
Minor Protein	
Immunoglobulins	-
Lactoferrin	689



Can microbes compete with cows for sustainable protein production ?
A feasibility study on high quality protein



Simulation of economic productivity. The plot depictures α-La fermentations at maximized productivity with yield per substrate, substrate compositions and economic return based on the substrate price per hour on the X, Y and Z axis respectively. The global maximum represents a fermentation, which converts the initial substrate into α-La worth 21.8 times the value of the starting material. The fermentation is simulated to take 11 hours and require the substrate to compose of 5% soybean and 95% sugar



Simulation of economic yield. The plot depictures α-La fermentations at maximized productivity with yield per substrate, substrate compositions and economic return based on the substrate price on the X, Y and Z axis respectively. The global maximum represents a fermentation, which converts the initial substrate into α -La worth 52 times the value of the starting material. The fermentation is simulated to take 300 hours and require the substrate to compose of 100% sugar.

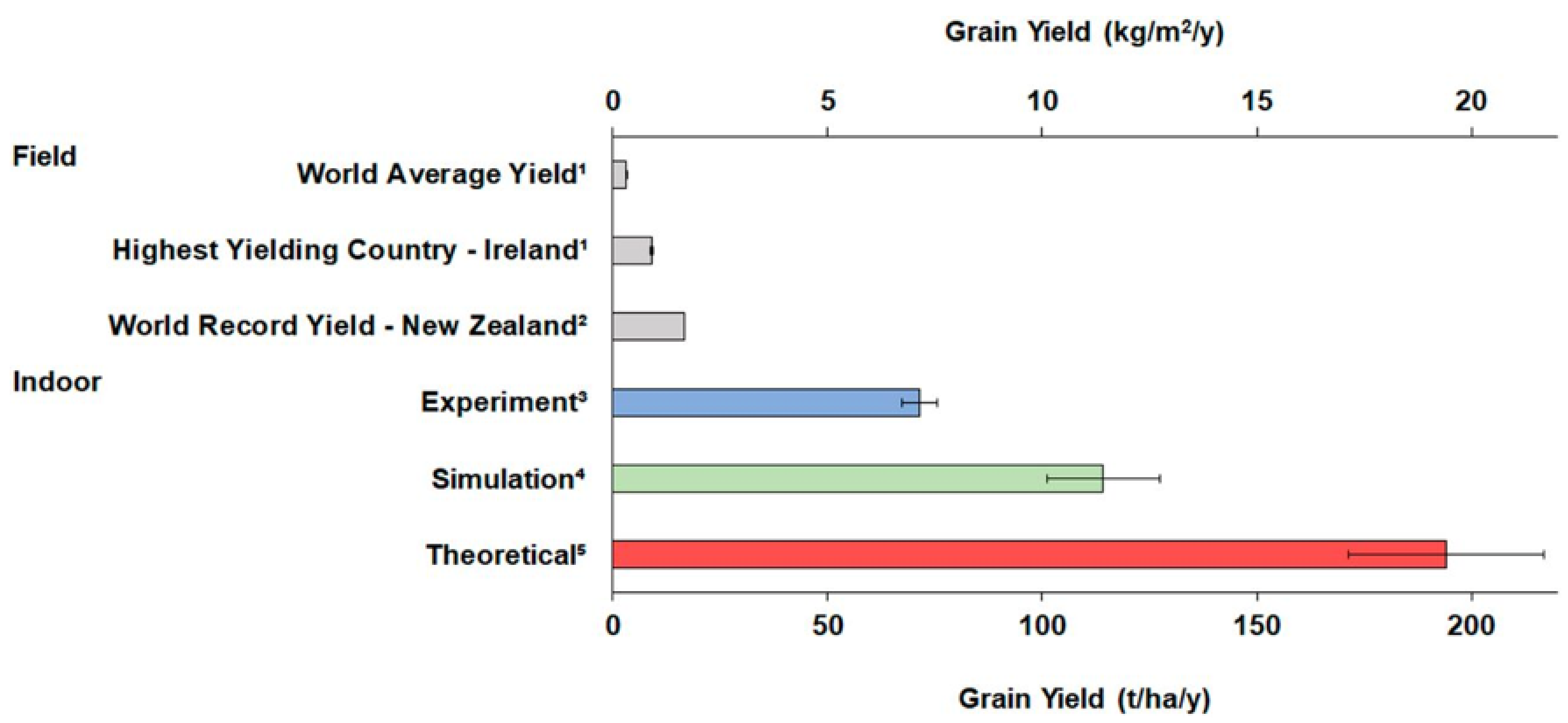
SCIENTIFIC REPORTS | 6:36421 | DOI: 10.1038/srep36421

NEUE Verfahren der Pflanzenproduktion




LED settings can be easily adapted to different needs

Annual field and indoor wheat yields.



Senthold Asseng et al. PNAS 2020;117:32:19131-19135

HOME BIOREACTOR
local food from plant cells
(Aalto University)

Pflanzliche Zellkulturen

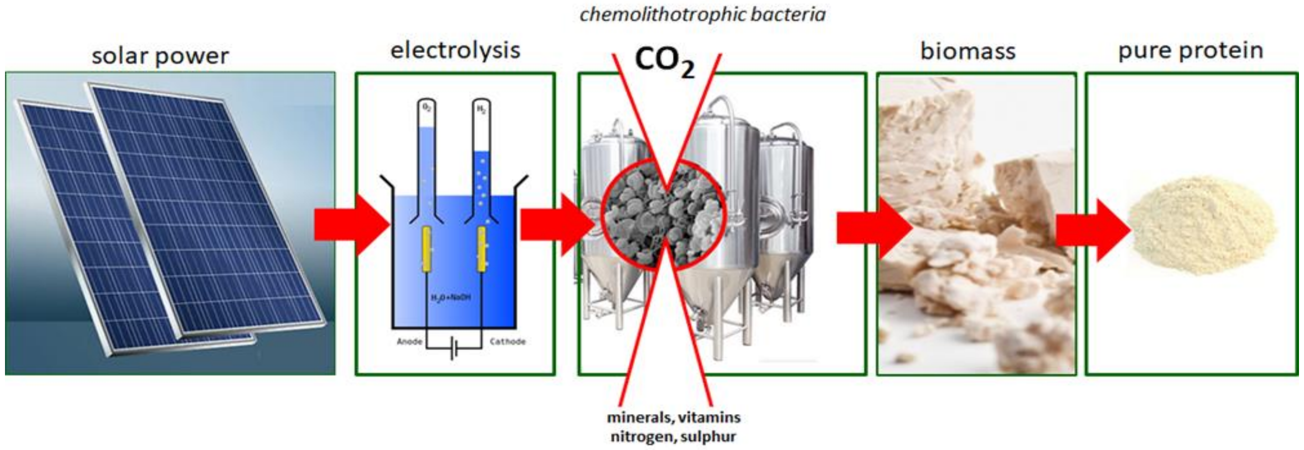
NEUE neue Rohstoffe

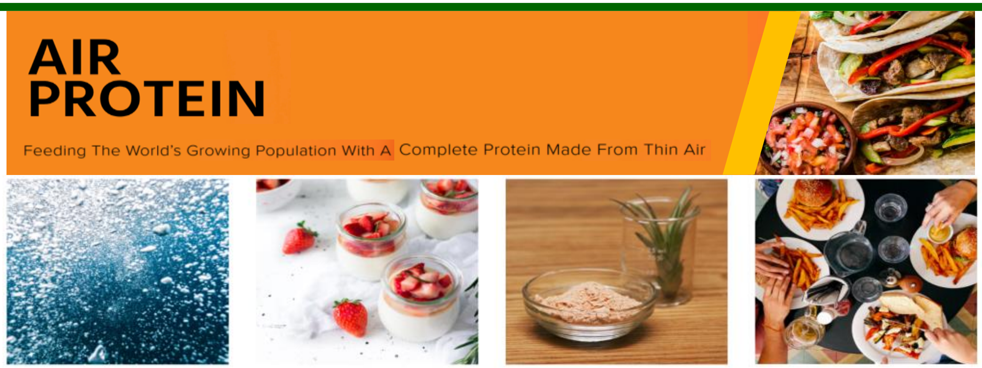
Extracting protein from grass: ‘It should be cheap to buy, offer good functionality in food, and it must be tasty’

RELATED TAGS: grass, plant-based, Protein

Denmark’s National Food Institute is contributing to a novel food application for grass protein, which researchers say need not be reserved for ruminants.

The VTT Technical Research Centre of Finland Ltd concept of carbon-neutral protein production





1 Elements from the air (like CO2, Oxygen, Nitrogen) are combined with water and minerals.

2 Using renewable energy, we begin the natural process where our probiotic production process converts the elements into nutrients. This process is similar to making yogurt.

3 The result is AIR PROTEIN, which has the same amino acid profile as animal protein.

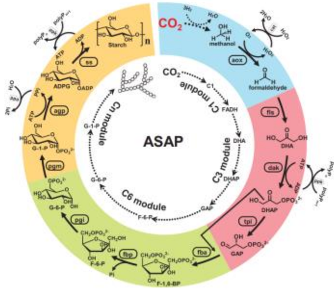
4 AIR PROTEIN can be used to make a variety of foods from burgers to pastas to cereals and more.

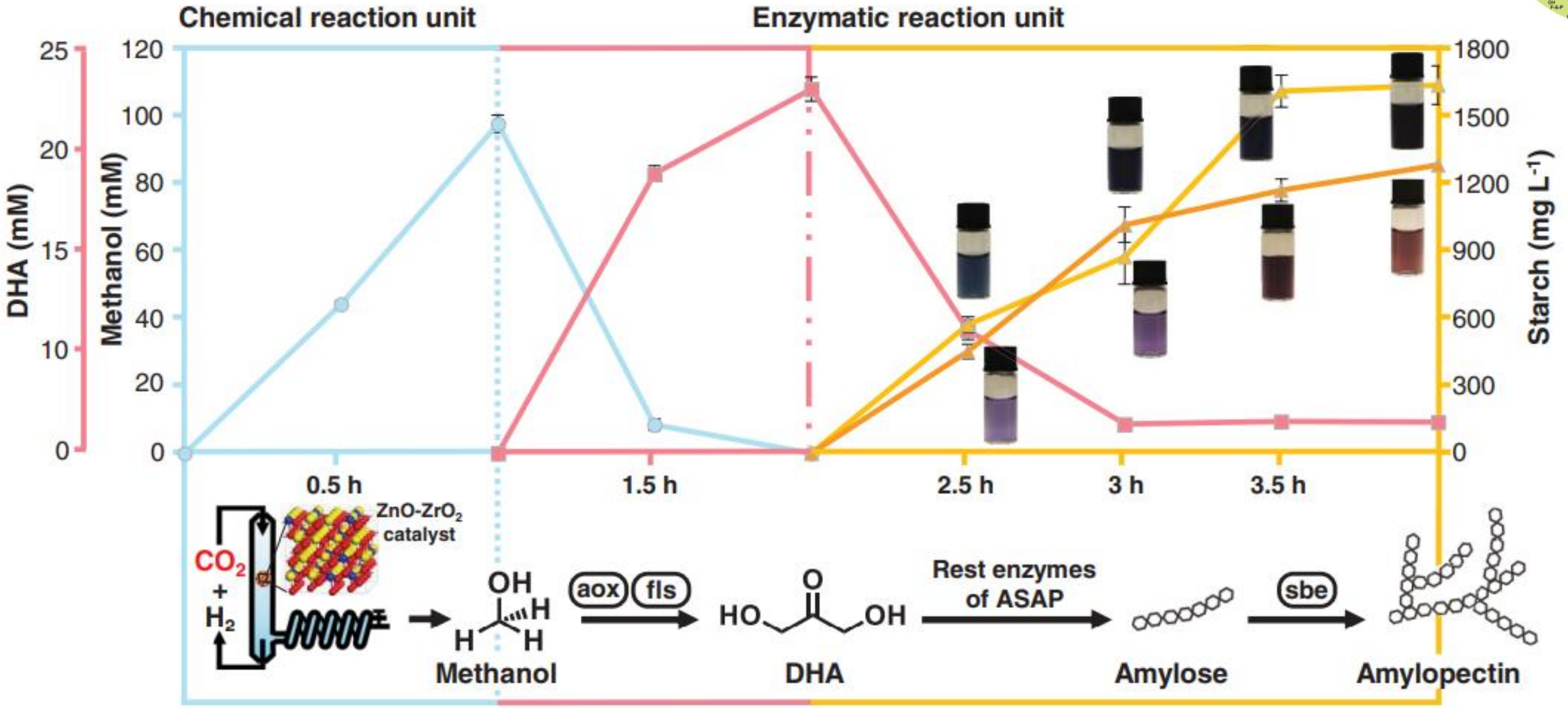
Photovoltaic-driven microbial protein production can use land and sunlight more efficiently than conventional crops

Dorian Leger, Silvio Matassa, Elad Noor, Alon Shepon, Ron Milo, and Arren Bar-Even
+ See all authors and affiliations

PNAS June 29, 2021 118 (26) e2015025118; https://doi.org/10.1073/pnas.2015025118

Cell-free chemoenzymatic starch synthesis from carbon dioxide





ASAP, driven by hydrogen, converts CO_2 to starch at a rate of 22 nanomoles of CO_2 per minute per milligram of total catalyst, an ~8.5-fold higher rate than starch synthesis in maize. This approach opens the way toward future chemo-biohybrid starch synthesis from CO_2.

Cai *et al.*, *Science* **373**, 1523–1527 (2021)   24 September 2021

Article | Published: 25 April 2022

Incorporation of novel foods in European diets can reduce global warming potential, water use and land use by over 80%

Rachel Mazac, Jelena Meinilä, Liisa Korkalo, Natasha Järviö, Mika Jalava & Hanna L. Tuomisto

Nature Food **3**, 286–293 (2022) | Cite this article

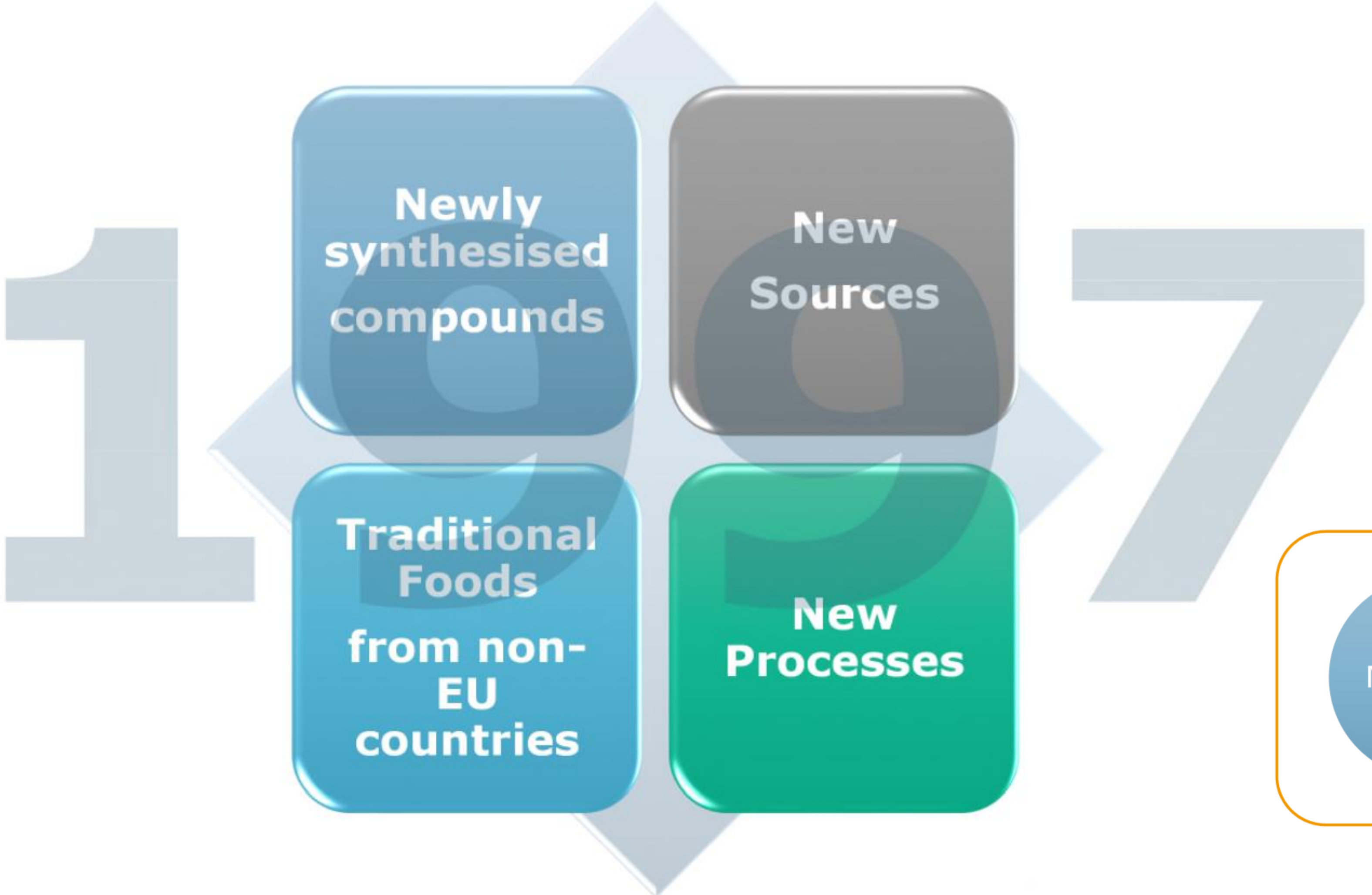
Abstract

Global food systems face the challenge of providing healthy and adequate nutrition through sustainable means, which is exacerbated by climate change and increasing protein demand by the world's growing population. Recent advances in novel food production technologies demonstrate potential solutions for improving the sustainability of food systems. Yet, diet-level comparisons are lacking and are needed to fully understand the environmental impacts of incorporating novel foods in diets. Here we estimate the possible reductions in global warming potential, water use and land use by replacing animal-source foods with novel or plant-based foods in European diets. Using a linear programming model, we optimized omnivore, vegan and novel food diets for minimum environmental impacts with nutrition and feasible consumption constraints. Replacing animal-source foods in current diets with novel foods reduced all environmental impacts by over 80% and still met nutrition and feasible consumption constraints.

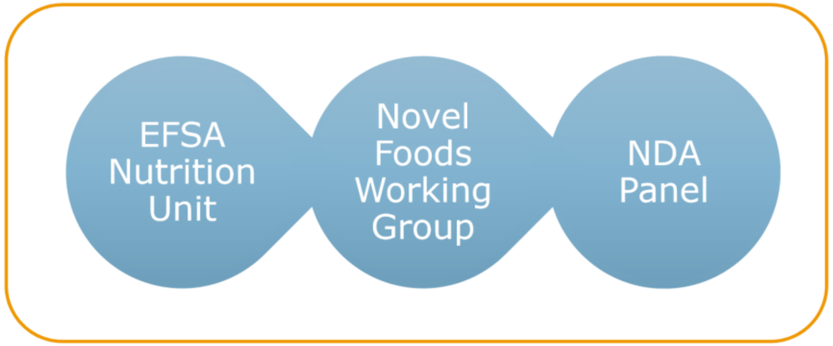
….. als die Neuartigen kamen

by courtesy of EFSA, PARMA

efsa
European Food Safety Authority



Regulation (EU) 2015/2283 on Novel Foods



Regulation (EU) 2015/2283 on Novel foods

Risk Assessment of Novel Foods

by courtesy of EFSA, PARMA

efsa European Food Safety Authority

WHAT

Novel foods (NF) are "foods or ingredients that have not been used for human consumption to a significant degree in the EU **before 15 May 1997**").

WHY

Regulation (EU) 2015/2283 introduces a **centralised assessment** and authorisation procedure for novel foods as of January 2018.

WHEN

EFSA has a **legal deadline** to adopt its scientific opinion within **9 months** from the date of receipt of a valid application from the EC.

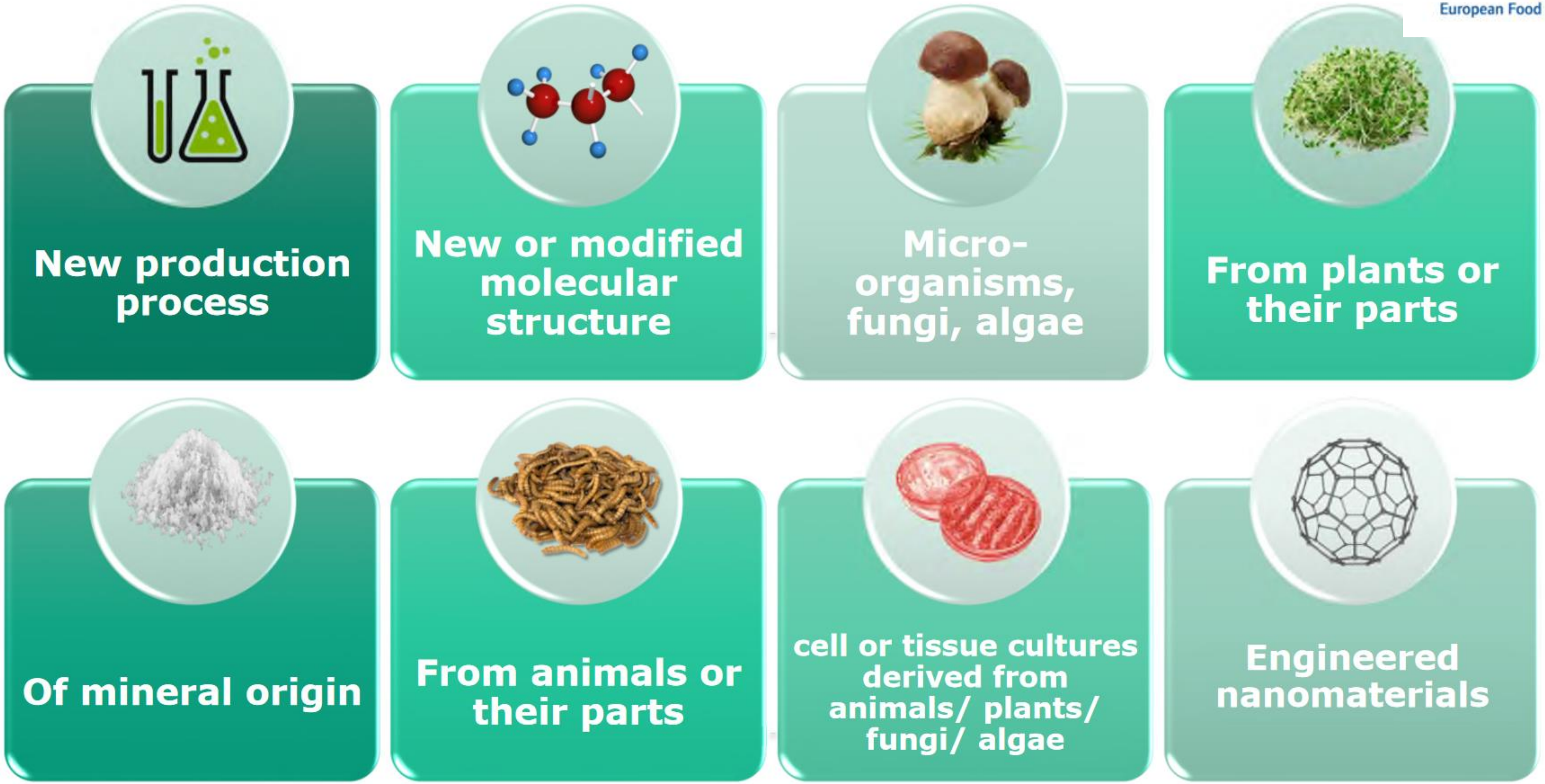
HOW

Data requirements for NF applications are outlined in "**EFSA Guidance on the preparation and presentation of an application for authorisation of a novel food in the context of Regulation (EU) 2015/2283**".

Risk Assessment of Novel Foods

by courtesy of EFSA, PARMA

European Food Safety Authority



Risk Assessment of Novel Foods

by courtesy of EFSA, PARMA

Risk Assessment of Novel Foods

by courtesy of EFSA, PARMA

efsa European Food Safety Authority

- Administrative data
- Introduction
- Identity of the novel food
- Production process
- Compositional data
- Specifications
- History of use of the novel food and of its source
- Proposed uses and use levels and anticipated intake
- Absorption, distribution, metabolism, and excretion
- Nutritional information
- Toxicological information
- Allergenicity
- Concluding remarks
- Annexes, references

EFSA shall consider the following:

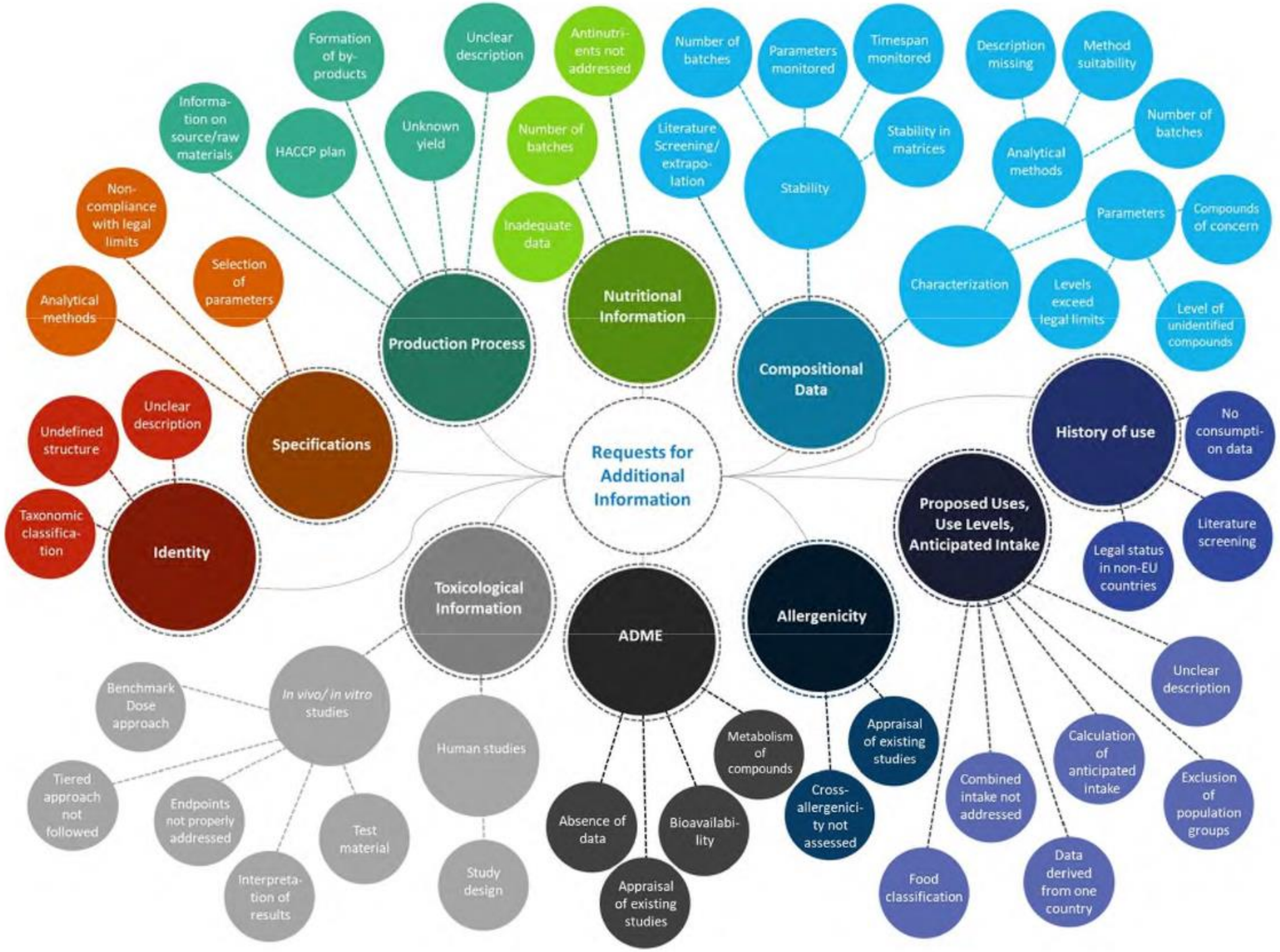
✓ whether the NF is **safe** under the proposed conditions of use

✓ whether the normal consumption of the NF would be **nutritionally disadvantageous**

Risk Assessment of Novel Foods

by courtesy of EFSA, PARMA

European Food Safety Authority



Ververis et al. Food Research International, 2020.

Safety Assessement – main considerations

by courtesy of EFSA, PARMA

European Food Safety Authority

Identity

**Foods consistin
or produced fro
tissue**

- Bi
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Characterisation

Production Process

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Nutritional Information

- Role of the NF in the diet (based on the intended uses)
- Comparative approach with conventional meat
- Quality and quantity of macro & micronutrients

Allergenicity

- Basis: comprehensive compositional data
- Potential use of «omics» tools (genomics, transcriptomics, proteomics, metabolomics)

European Commission

English Search

Food Safety

Home Food Animals Plants Horizontal topics

European Commission > Food Safety > Food > Novel Food > Authorisations > Summary of applications and notifications

Summary of applications and notifications

PAGE CONTENTS

Summary of applications

Summary of the applications submitted within the meaning of Article 10(1) of Regulation (EU) 2015/2283

In accordance with the requirements laid down in the Novel Food regulation, the European Commission will make the summary of the application publicly available based on the information concerning the name and address of the applicant, the name and description of the novel food and scientific evidence demonstrating that the novel food does not pose a safety risk to human health.

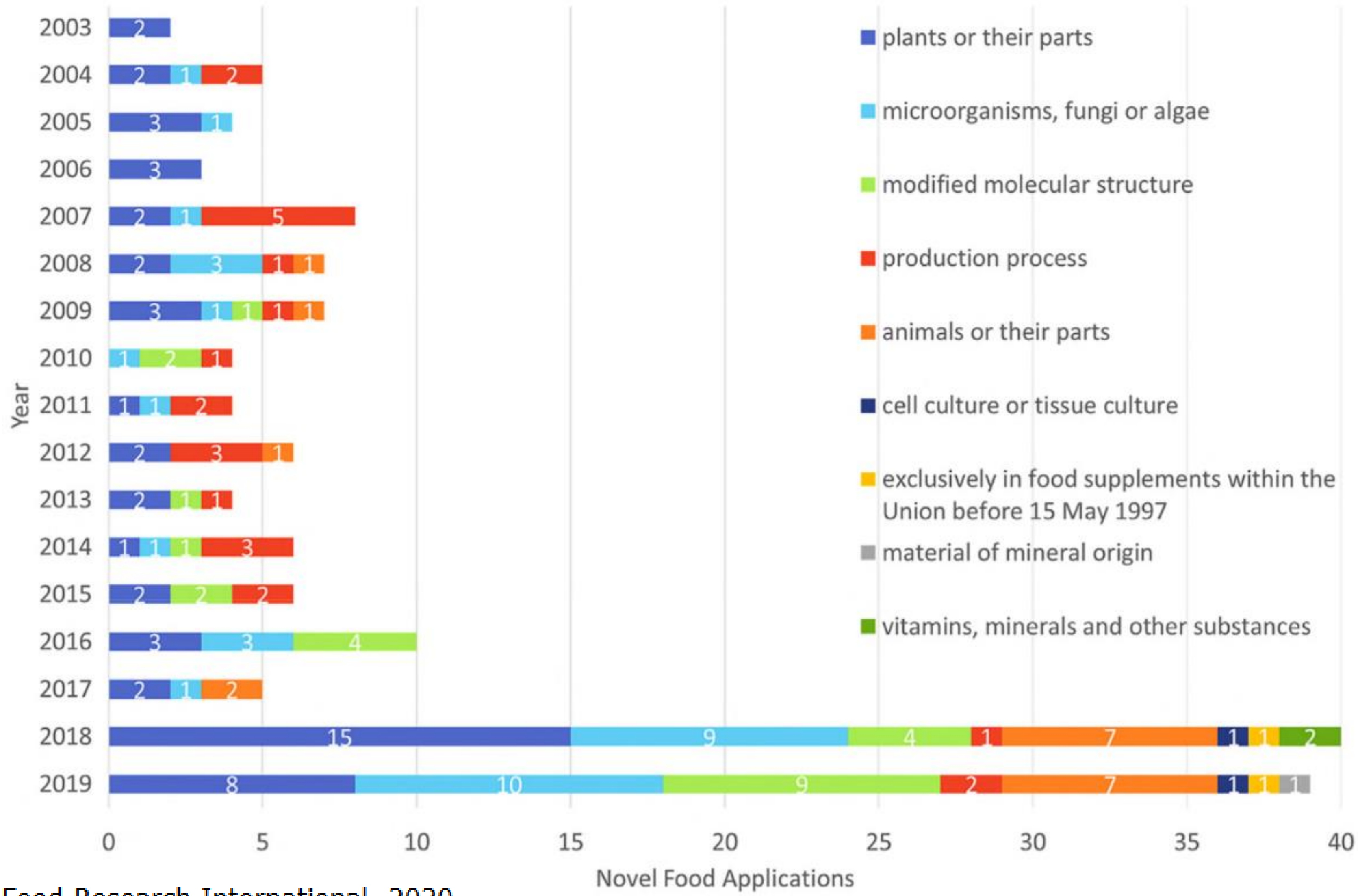
List of the summaries of the applications:

- 2'-Fucosyllactose
- 2'-Fucosyllactose*
- 2'-Fucosyllactose
- 2'-Fucosyllactose*
- 2'-Fucosyllactose*
- 2'-Fucosyllactose/Difucosyllactose*
- 3'-Siallyllactose sodium salt*
- 3'-sialyllactose sodium salt (3'-SL)*
- 3-fucosyllactose*
- 3-fucosyllactose*
- 3-Fucosyllactose*
- 3'-sialyllactose sodium salt*
- 6'-Siallyllactose sodium salt*
- 6'-sialyllactose sodium salt ("6'-SL")*
- 7-hydroxymatairesinol potassium acetate complex*
- *Acheta domesticus* (house cricket)
- *Ageratum conyzoides* L. aerial parts extract*
- Allanblackia seed oil
- Allulose
- Allulose
- Allulose*
- Allulose*
- Allulose*
- Antarctic Krill Oil from *Euphausia superba*
- *Antrodia camphorata* mycelia powder
- Apple fruit cell culture extract
- Aqueous ethanolic standardised extract of *Labisia pumila**
- Arachidonic acid-rich oil from the fungus *Mortierella alpina**
- Ashitaba sap powder*
- Bacterial cellulose*
- Barley rice protein*
- Beet Leaf protein (*Beta vulgaris L.*)*
- Beta-galactosidase from *Aspergillus oryzae**
- Beta-Hydroxybutyrate salts*
- Betaine*
- Beta-lactoglobulin (β-lactoglobulin)*
- Black yeast beta-glucan
- Blend of *Tamarindus indica* seeds and Curcuma longa rhizome extracts*
- Bovine milk basic whey protein isolate
- Bovine Milk Osteopontin*
- Brassica Napus (Whole seeds)
- Broad Spectrum Hemp Extract 85%*
- Calcidiol*
- Calcium fructoborate*
- Cannabidiol (CBD)*
- Cannabidiol (CBD)
- Cannabidiol isolated from *Cannabis sativa* L.
- Cannabidiol isolated from *Cannabis sativa* L.*
- trans-Cannabidiol (CBD) from *Cannabis sativa* L.*
- *Cannabis sativa* L. extract*
- *Cannabis sativa* L. extract*
- Isopropyl Alcohol extract from *Cannabis sativa* L.*
- CO2 extract from *Cannabis sativa* L.*
- L. Extract of *Cannabis sativa* L. extract with Tetrahydrocannabinol (THC) removed*
- Natural Pure Cannabidiol*
- Broad Spectrum Hemp Extract 85%*
- CBD Isolate Powder 99%+*
- Cellobiose*
- Cetylated fatty acids*
- Chia seeds in a number of foods
- Chia seeds in chocolate
- Chia seeds in chocolate and chocolate products
- Chia seeds in compotes
- Chia seeds in confectionery
- Chia seeds in fruit spreads
- Choline, succinate (2:1)*
- Chuta® (non-toxic edible Jatropha curcas kernels)*
- *Cistanche tubulosa* extract*
- Citicoline*
- Coffee Flour (Defatted Coffee Dietary Fibers)
- Coffee husk (Cascara) - the dried husk of the coffee fruit or coffee cherry*
- Coriander seed oil from Coriandrum sativum
- Cricket flour Acheta domesticus*
- Curcuminoid-containing turmeric extract*
- Defatted whole cricket (*Acheta domesticus*) powder*
- D-glyceric acid*
- Dried biomass of *Galdieria sulphuraria**
- Dried Gryllodes sigillatus (crickets)*
- Dried Miracle Berry (*Synsepalum dulcificum*)*
- Dried *Tenebrio molitor* (mealworms)*
- Dried *Tetraselmis chuii* microalgae
- Dried whole cell euglena*
- Dry cacaofruit cascara (*Theobroma cacao* L.)
- Egg membrane*
- EPA-rich oil from *Phaeodactylum tricornutum*
- *Eurycoma longifolia* (Tongkat ali) root extract*
- Extract derived from *Panax notoginseng* and *Astragalus membranace*
- Extract of the microalgae *Phaeodactylum tricornutum*
- Fermented soy germ powder*
- Fucoidan extract from *Cladosiphon okamuranus*
- Fungal protein-fiber rich biomass*
- Galacto-oligosaccharide (GOS)
- Glucosyl hesperidin*
- Grain from wheatgrass (*Thinopyrum intermedium*)
- Heat-killed *Mycobacterium manresensis**
- HelixComplex Snail Mucus (HSM)
- Hermetia meal
- Honey bee drone brood (*Apis mellifera*) male pupae
- Hovenia dulcis fruit extract
- Inulin-Propionate Ester
- Iron Hydroxide Adipate Tartrate (IHAT)*
- Iron Milk Proteinate (IMP)*
- Isomaltose oligosaccharide (IMO)
- Isomalto-oligosaccharide*
- Isomaltulose syrup (dried)
- Krill protein hydrolysate*
- Lactitol
- Lacto-*N*-fucopentaose I / 2'-fucosyllactose mixture (LNFP-I / 2'-FL)
- Migratory locust (*Locusta migratoria*)
- Mineral salt containing potassium and magnesium
- Mixture of 2'-Fucosyllactose and Difucosyllactose
- Monosodium salt of L-5-methyltetrahydrofolic acid*
- Mung Bean Protein
- Nicotinamide Riboside (NR)*
- Nicotinamide Riboside Chloride*
- Pasteurised *Akkermansia muciniphila**
- Pea and rice protein by Shiitake mycelia*
- Phenylcapsaicin*
- Phosphopropylsilanetriol stabilized on lactose – PPST-L
- Polyphenols derived from the lychee fruit (*Litchi chinesis*) and green tea leaves (*Camellia sinensis*)*
- Powder of chitosan*
- Protein extract from pig kidneys
- Rapeseed powder from *Brassica rapa* L. and *Brassica napus* L.*
- Refined industrial hemp extract from *Cannabis sativa* L.*
- Refined Shrimp Peptide*
- Rhamnogalacturonan-I enriched carrot fibre (cRG-I))*
- *Schizochytrium* ATCC PTA 9695_extension
- *Schizochytrium* ATCC PTA 9695_labelling
- *Schizochytrium* sp. oil
- *Schizochytrium* sp. oil
- *Schizochytrium* sp. oil (fruit and vegetable purees)
- *Schizochytrium* sp. oil (infant and follow-on formulae)
- *Schizochytrium* sp. oil*
- *Schizochytrium* sp. (CABIO-A-2)
- *Schizochytrium* sp. (TKD-1)
- Sporopollenin exine capsules
- Sugars obtained from the concentrated pulp juice from *Theobroma cacao* L
- Synthetic Cannabidiol*
- Synthetic CBD*
- Synthetic CBD*
- Synthetic CBD*
- Synthetic CBD*
- *Tenebrio molitor* (mealworm)

by courtesy of EFSA, PARMA

efsa European Food Safety Authority

Risk Assessment of Novel Foods



Ververis et al. Food Research International, 2020.

NEUE Ideen, NEUE Werte, NEUE Dissonanzen …

Wissen hilft mit Dissonanzen besser umzugehen, führt aber nicht zu einer positiven Beurteilung der modernen Land- und Ernährungswirtschaft. Vielmehr zeichnen sich Verbraucher mit einer besonders kritischen Einstellung durch einen tendenziell höheren Wissensstand aus.

Im Gegensatz dazu erweist sich Vertrauen als wichtiger Prädikator der Einstellung. Dies bedeutet dass Maßnahmen vor allem auf die Herstellung einer besseren Glaubwürdigkeit und Kompetenzzuschreibung abzielen sollten.

Chancen und Grenzen der Konsumentenverantwortung: Eine Bestandsaufnahme
Björn Anaus, Prof. Dr. Ludger Heidbrink, Imke Schmidt CRR (Center for Responsibility Research) Kulturwissenschaftliches Institut, Essen, Nr. 6/2009 ISSN 2190-5398

VIELEN DANK