WholEUGrain Summer School May 18th 2021

Whole grain and sustainability aspects

Lene M. Christensen, National Food Institute

The burning platform

Food production and consumption

~ 30% of global climate impact in Western countries

Food production is the world's largest water-consuming sector

Need to reduce the environmental impact of food production and food consumption

Photo: pexels.com

Agenda

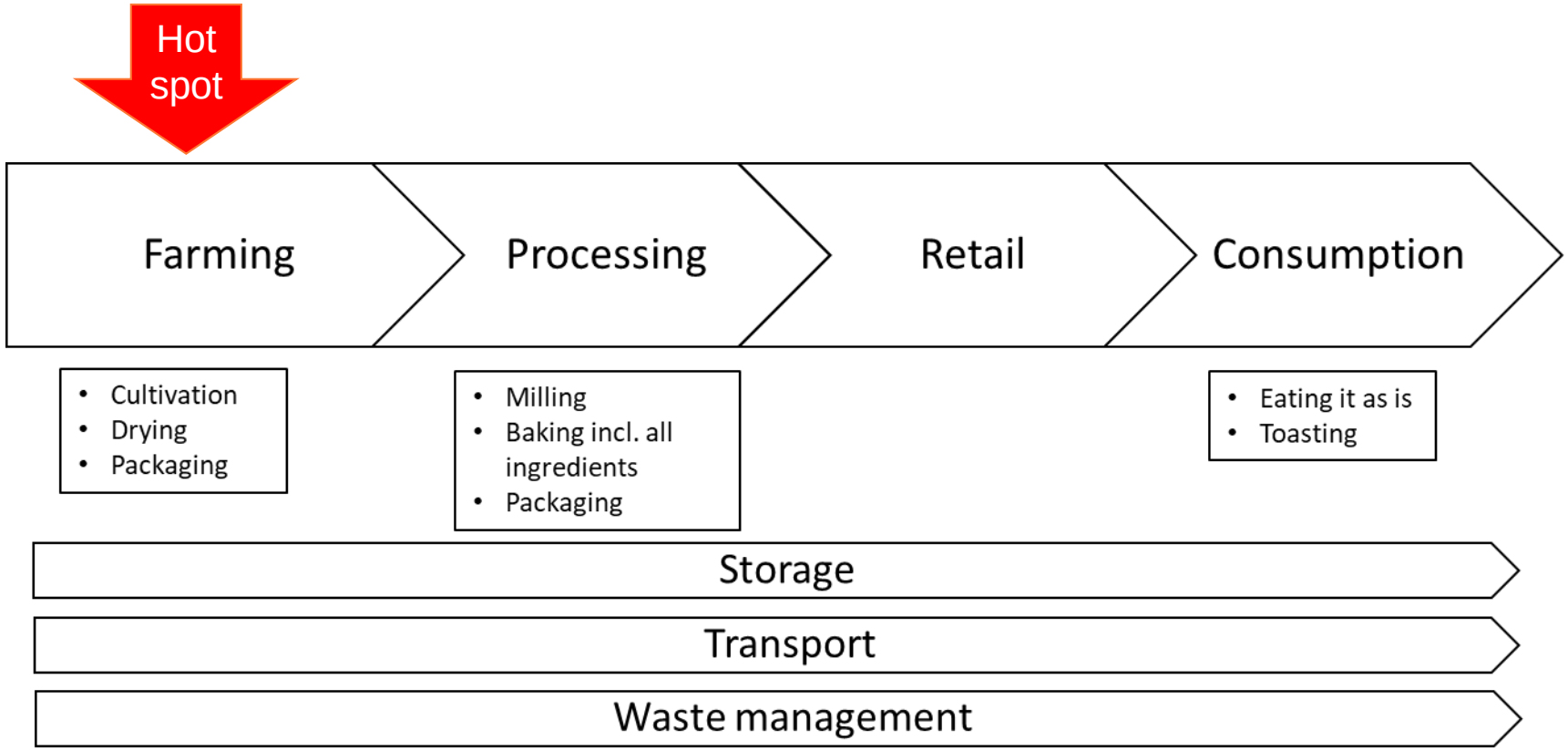
- Metrics and system boundaries
- Environmental impact of
  - grains
  - grains in the diet
- Grains in a healthy and more sustainable diet

Environmental metrics

Metric	Unit examples
Climate impact - Greenhouse gas emission (GHGE) - Carbon footprint (CF)	kg CO_2 –equivalent per unit weight of food (or per unit of protein or energy)
Land use (LU)	m^2 per unit weight of food
Land use change (LUC)	kg CO_2 –equivalent per m^2
Water use - Water footprint (blue and green)	litres per kg food
Biodiversity	number of wild species of plants and animals per m^2

Others: Eutrophication, acidification, pesticide emissions, contaminants, …

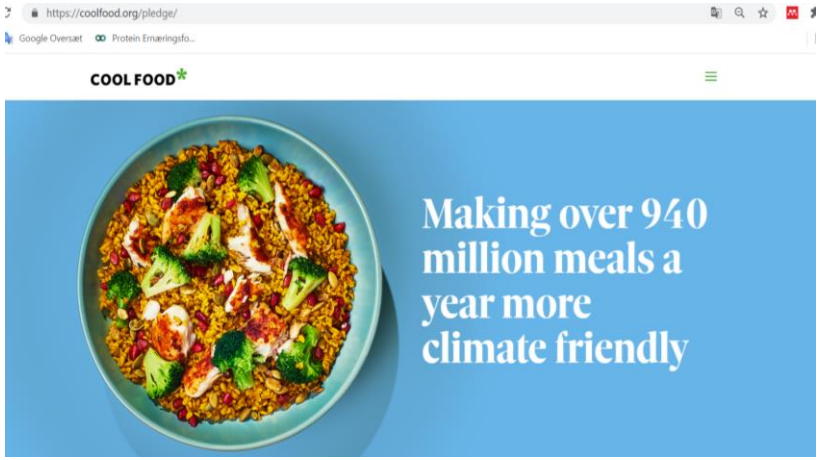
System Boundaries of the Life Cycle Assessment



Inspired by Espinoza-Orias et al. 2011

The environmental data

Collaborate with experts on Life Cycle Assessment and environmental aspects of food production



Climate impact of protein-rich foods

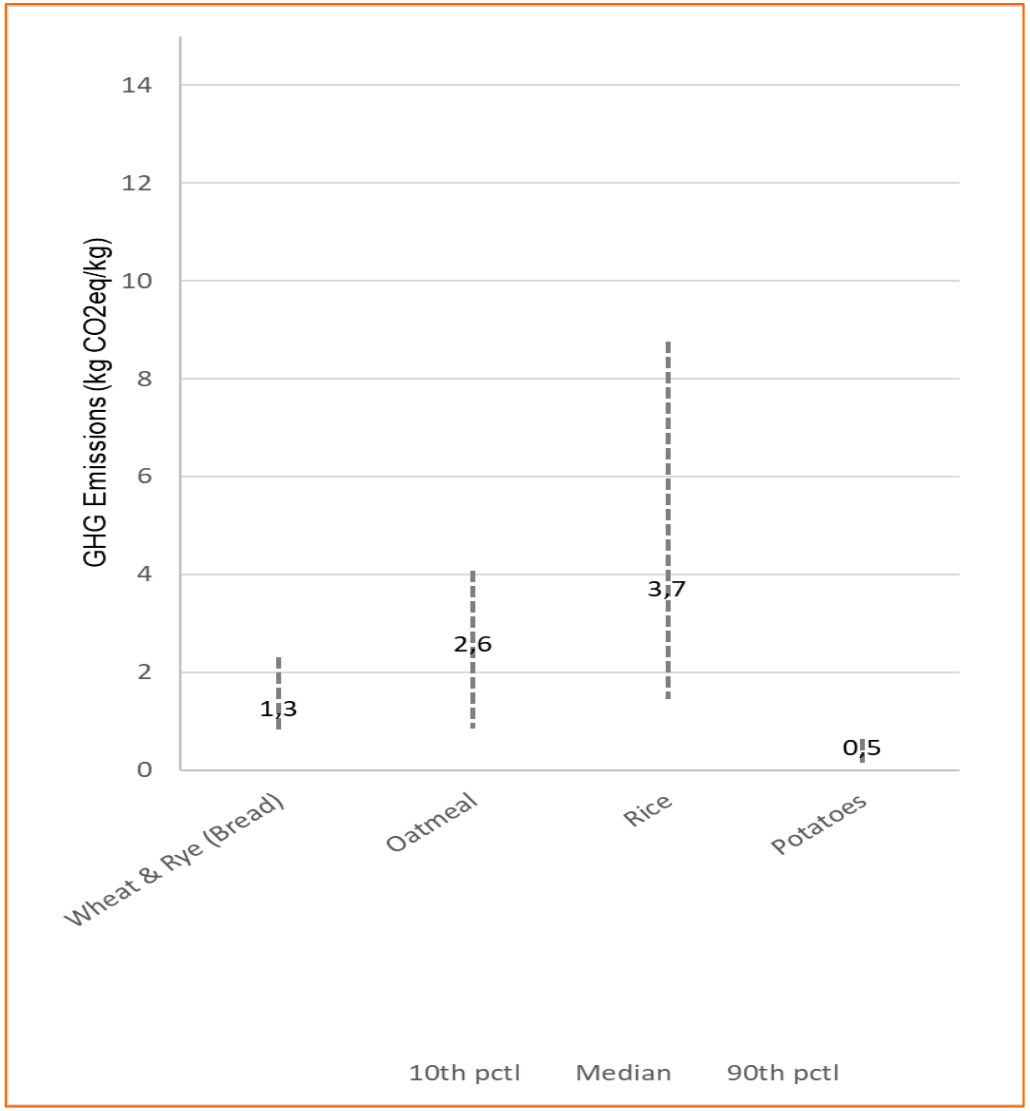
- Animal foods
- Plant foods

	Climate impact kg CO2-eq/kg food (median)	Climate impact kg CO2-eq/100 g protein (median)
Beef (beef herd)	60.4	30
Beef (dairyherd)	34.1	17
Cheese	18.6	8.4
Pork meat	10.6	6.5
Poultry meat	7.5	4.3
Groundnuts	3.3	1.3
Tofu	2.6	1.6
Pulses	1.4	0.6
Grains	1.3-3.7	0.5-1.0

Reference: Poore & Nemecek, 2018

Climate impact from starch rich products

- Large variation in data
- Use data representing the local market
- Comparability
  - Raw or cooked
  - Energy content
  - Nutrient content
  - Content in the diet



Modified by Lassen et al. (2020) from Poore & Nemecek, 2018

Whole-grain products compared to grain products made from refined grains

- Wholemeal bread 5-7% lower climate impac than white bread (Espinoza-Orias et al. 2011; Jensen & Arlbjørn, 2014)

- Wheat cultivation and milling ⟶ More efficient utilisation of the wheat grain

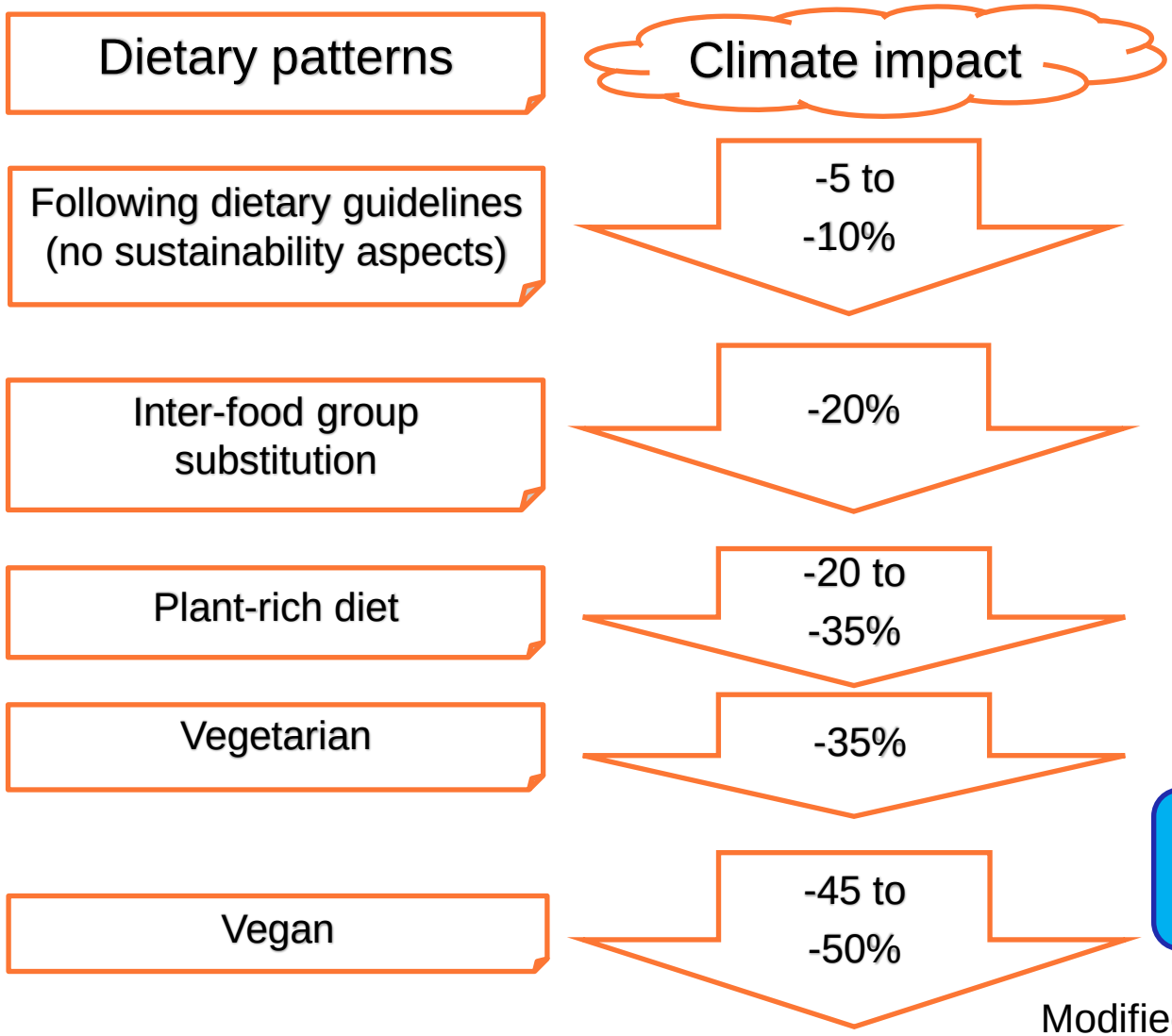
- Few studies
- Not clear if, e.g., the extra grinding to produce whole-grain flour are included

Different countries different impact – grains versus meat in the current diet

	Green house gas emission (median)	Grains and grain products		Meat and meat products	
	kg CO2eq/2000kcal	%Energy	% CHGE	%Energy	% CHGE
Denmark	4.9	27.8	6.8	10.4	34.9
Czech Republic	4.4	38.5	9.7	13.5	35.8
Italy	4.9	38.2	10.0	9.4	37.0
France	6.2	31.1	10.5	13.7	38.4

Reference: Mertens et al. 2019

Different diets – different reductions in impact

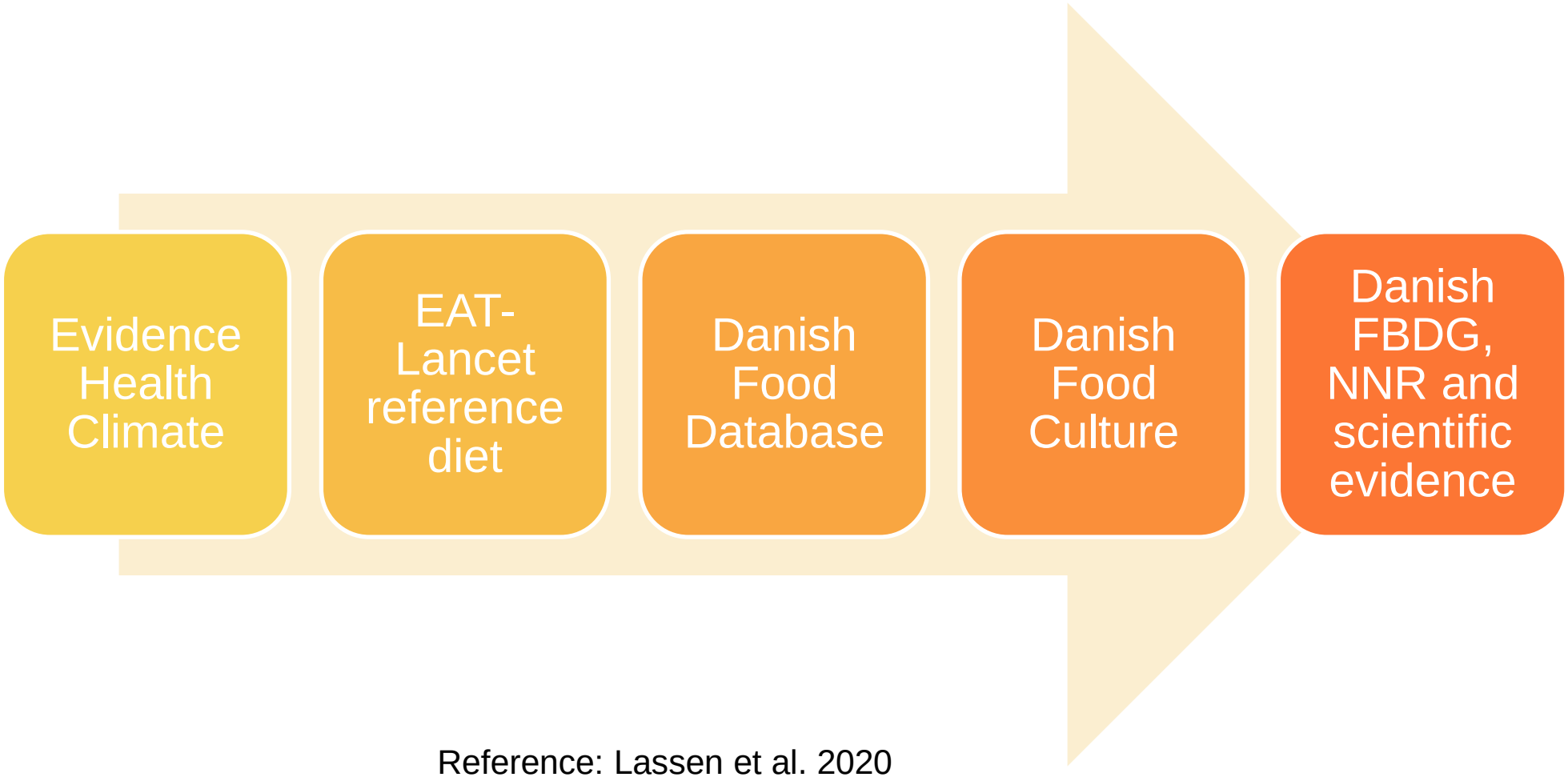


Blue water use: small changes or increase

Green water use: -26%

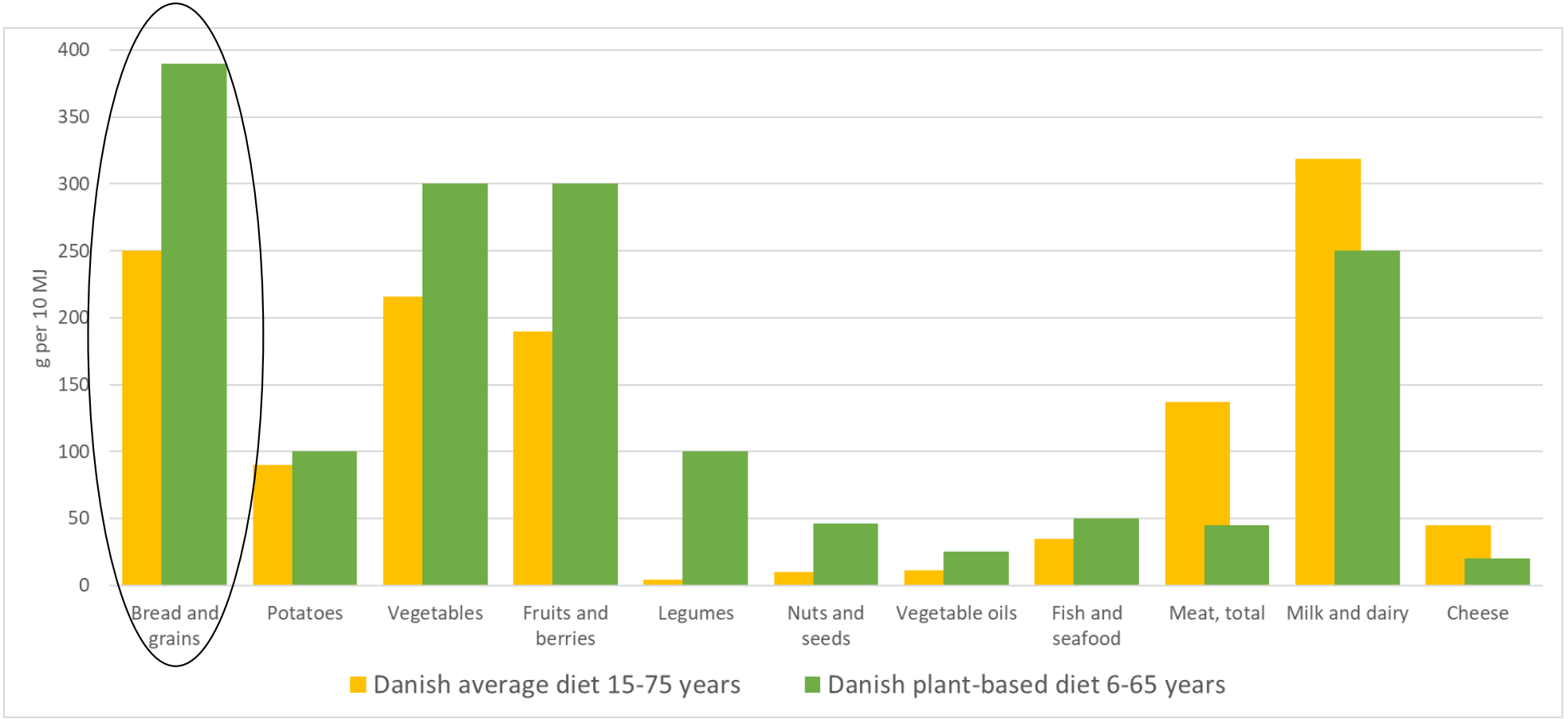
Modified from Lassen et al. (2020)

Development of a Danish plant-based diet



Reference: Lassen et al. 2020

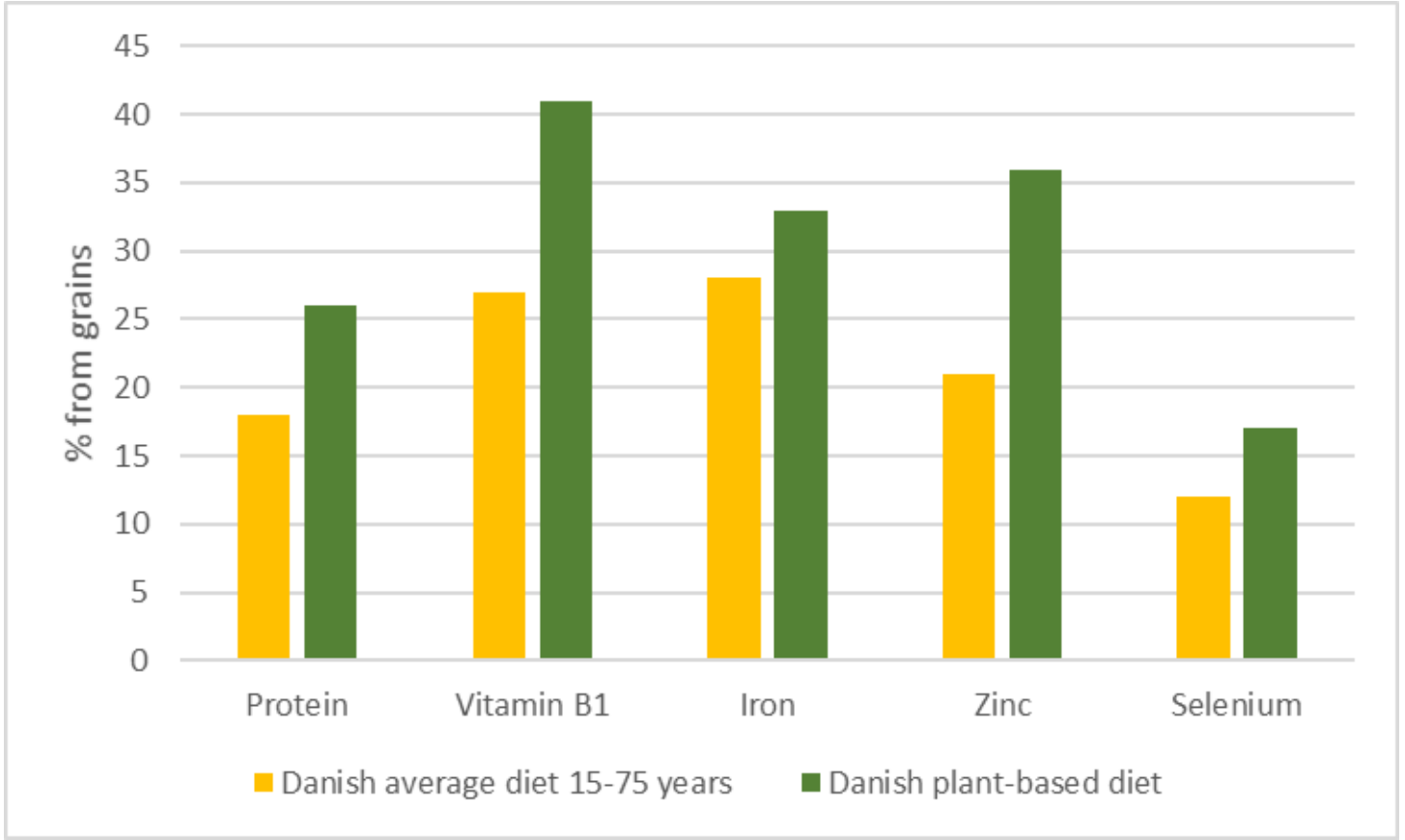
Foods in a Danish plant-based diet compared to the average diet



Reference: Lassen et al. 2020

Selected nutrients from grains in a Danish plant-based diet compared to the average diet

- Grains* 60% increase
- Whole grains x2

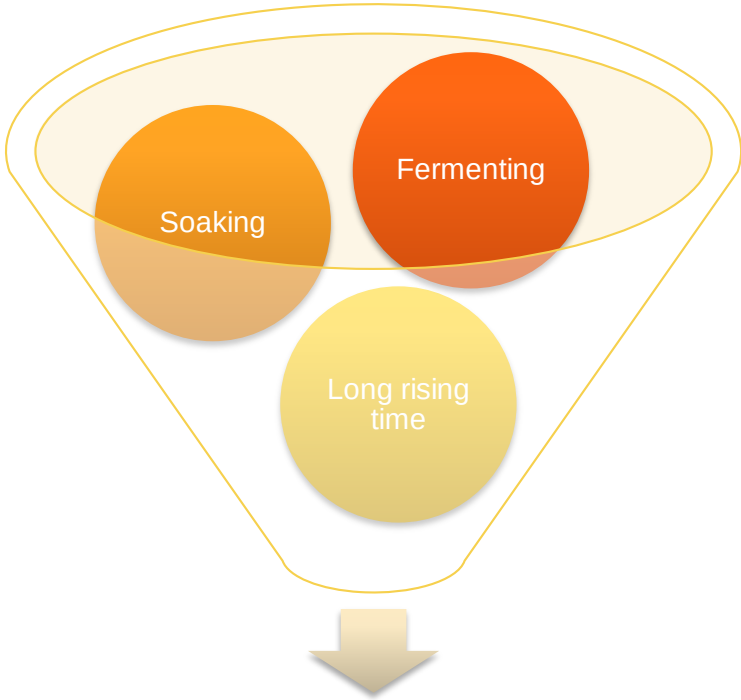


* Bread, pasta, rice, breakfast cereals, flour etc.

Reference: Unpublished data

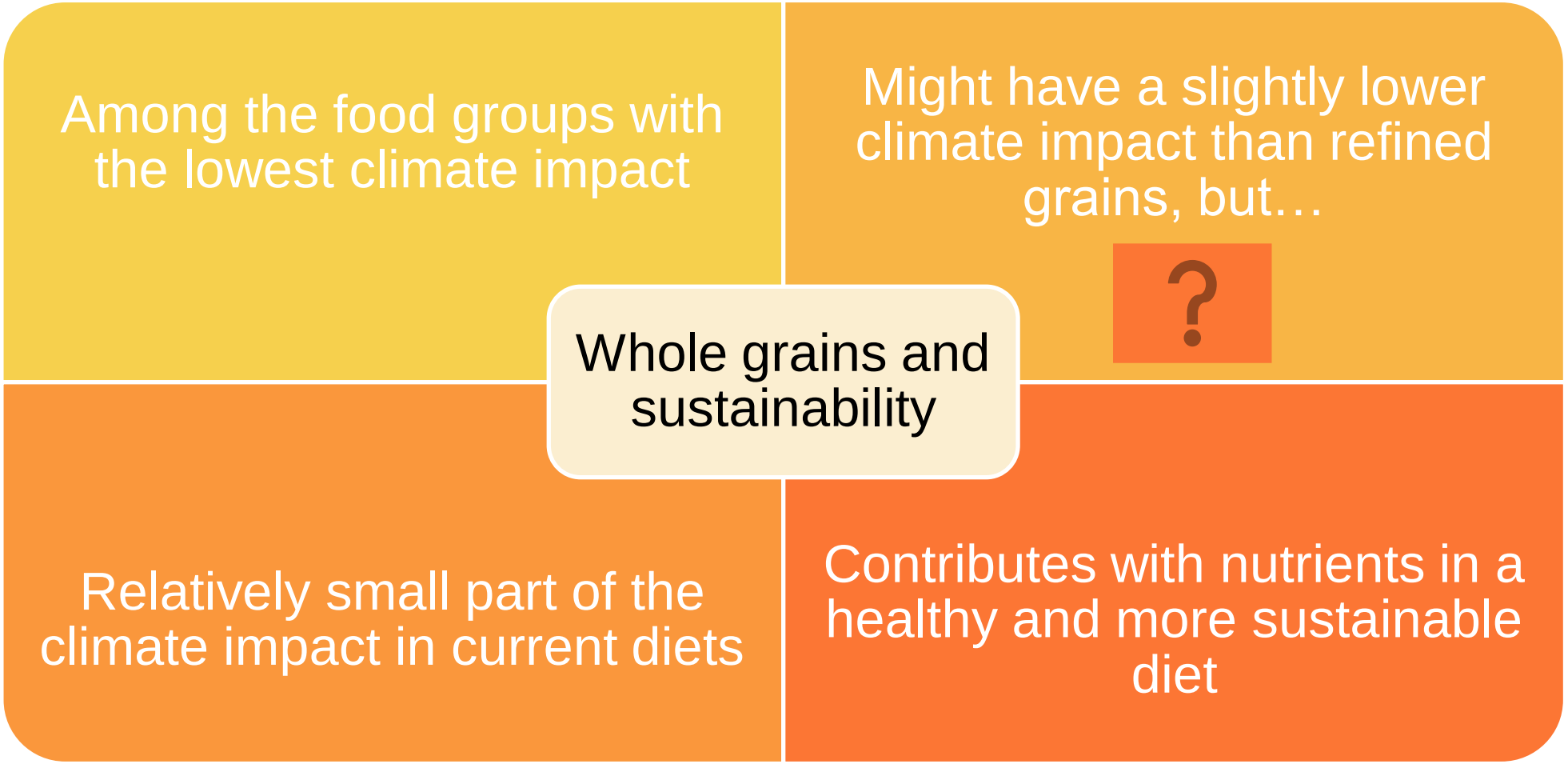
Bioavailability

Enhancer	Inhibitor
Animal tissue	Calcium Milk protein
Ascorbic acid	Tea/coffee
	Phytates



Reference: Blanco-Rojo & Vaquero, 2019 and Gibson et al. 2018.

Summary


Among the food groups with the lowest climate impact
Might have a slightly lower climate impact than refined grains, but…
?
Whole grains and sustainability
Relatively small part of the climate impact in current diets
Contributes with nutrients in a healthy and more sustainable diet

Thank you

- Co-author Ellen Trolle, DTU Food
- Anne Dahl Lassen, Heddie Mejborn and Anja Biltoft-Jensen

- The working group for updating the evidence base for whole grains in the WholEUGrain project

Photo: pexels.com

References

- Find them in Chapter 5 here:

https://www.gzs.si/wholeugrain/vsebina/Publications/Reports/Evidence-base-report

WholEUGrain

This document is part of WholEUGrain (Grant Agreement 874482), which has received funding from the European Union's 3rd Health Programme.

WholEUGrain project

A European Action on Whole Grain Partnerships

Funded under the Annual Work Plan 2018 (grant agreement 874482)

Deliverable number 4.1

Evidence base for the health benefits of whole grains including sustainability aspects

Whole grain:

definition, evidence base review, sustainability aspects and considerations for a dietary guideline.

Description: Report on the updated evidence base for health effect and sustainability aspects of whole grains

User Guide: The purpose of this deliverable is to ensure the knowledge base as one of the prerequisites for establishing a national whole grain partnership

WP 4: *Implementation tools for whole grain Partnerships*

Version: *April 27, 2021*

Editor: Sofia de Moura Lourenço

Author: WholEUGrain