

Organic food and climate

Kristian Thorup-Kristensen

Dept. Plant and Environmental Science

KØBENHAVNS UNIVERSITET



Organic food and climate effects?

- No simple answer, but some obvious questions
- What type of organic farms and food production do we consider?
 - Dairy production
 - Other animal production
 - Stockless crop production, cereals or vegetables
 - Intensive or extensive
- Is it just climate gas effects of farming?
 - Per unit food or per unit land?
- Or the greater picture of food production and use?
 - Do "organic consumers" eat a more plant base diet?

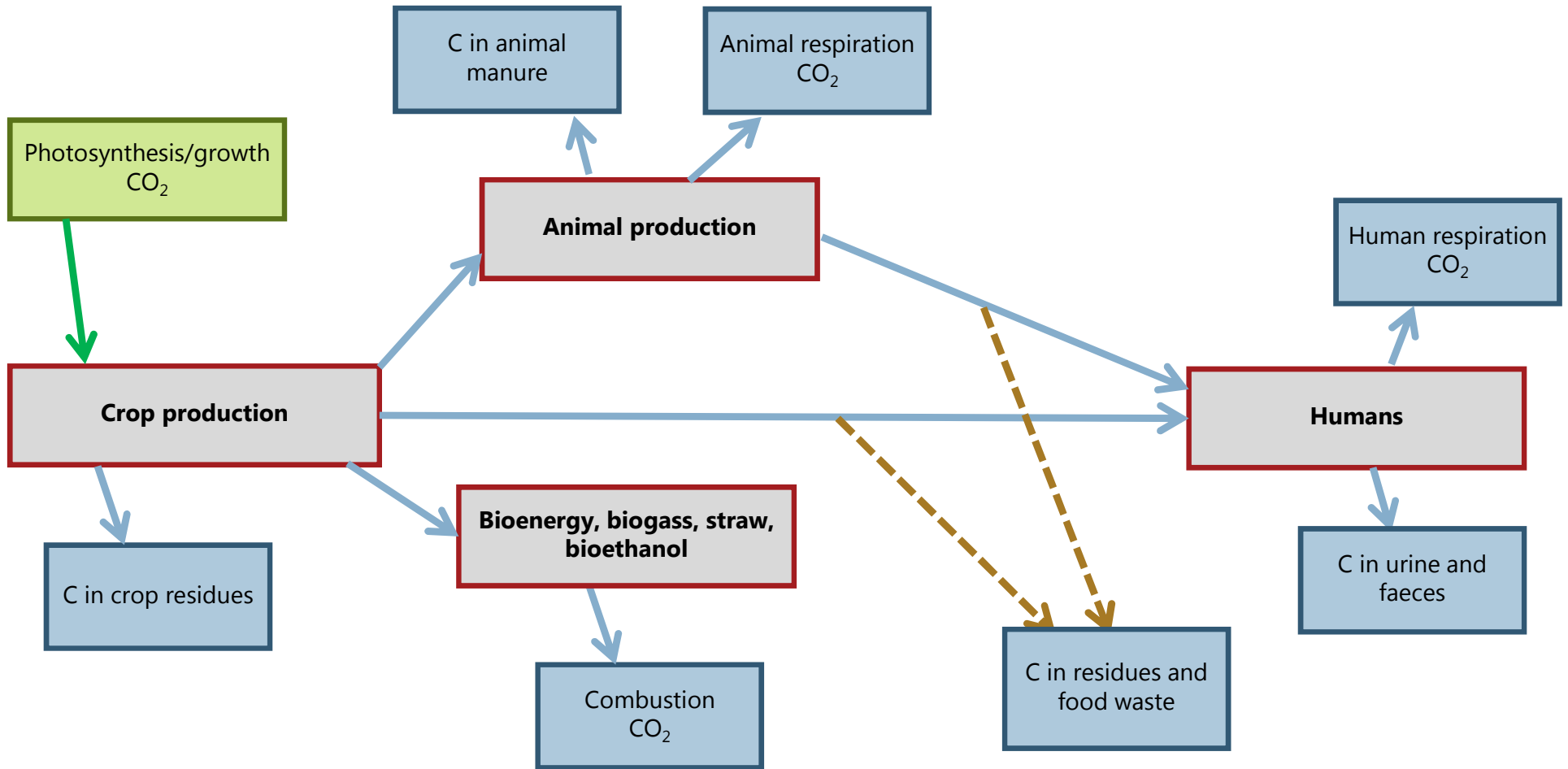


Main climate advantages of organic production

- External inputs: No synthetic N fertilizer use
 - Energy use and N₂O loss during production
- Internally: More reliance on organic manure, building soil C
 - Maybe less N₂O loss due to lower soil N levels
- But does organic farming increase soil C?
 - Lower productivity, meaning less crop residues and less animal manure produced
 - Import of organic residues from conventional farming do not create extra C input to soil, but move it to other fields



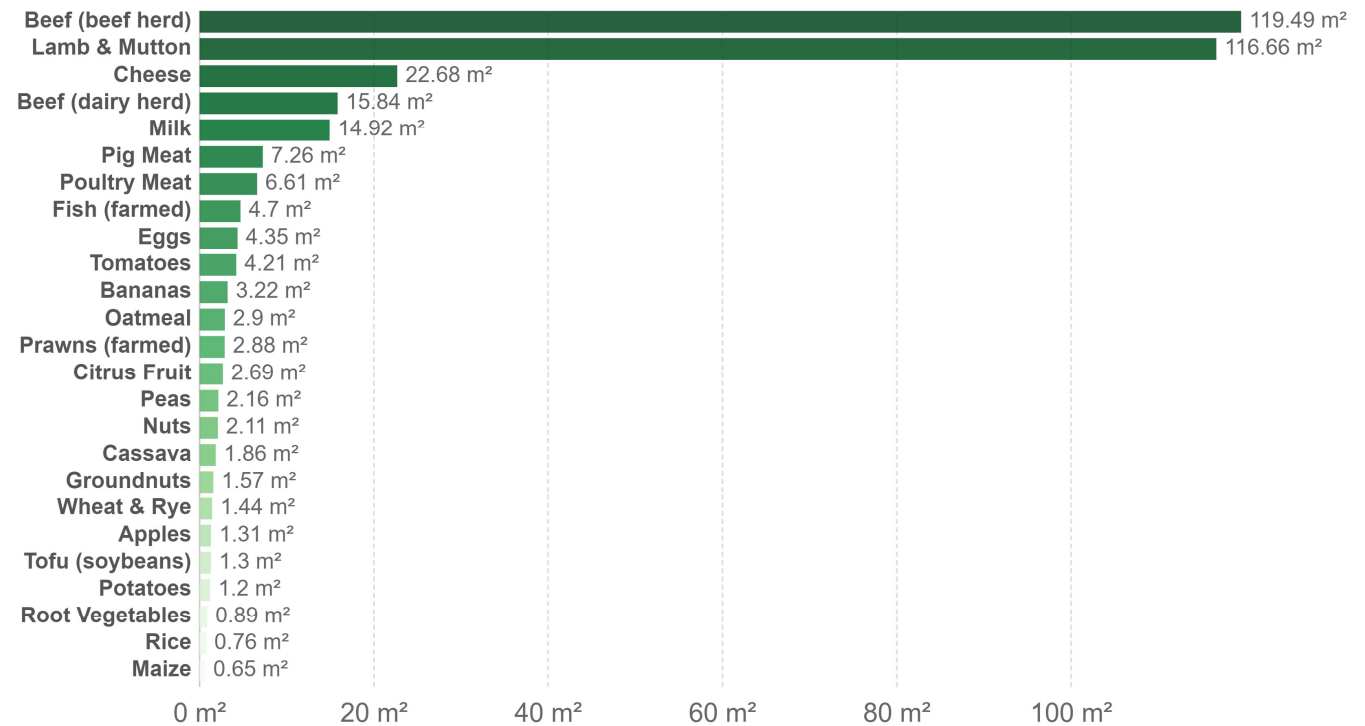
Carbon (C) fixed by photosynthesis going to..



Land use of foods per 1000 kilocalories



Land use is measured in meters squared (m²) required to produce 1000 kilocalories of a given food product.

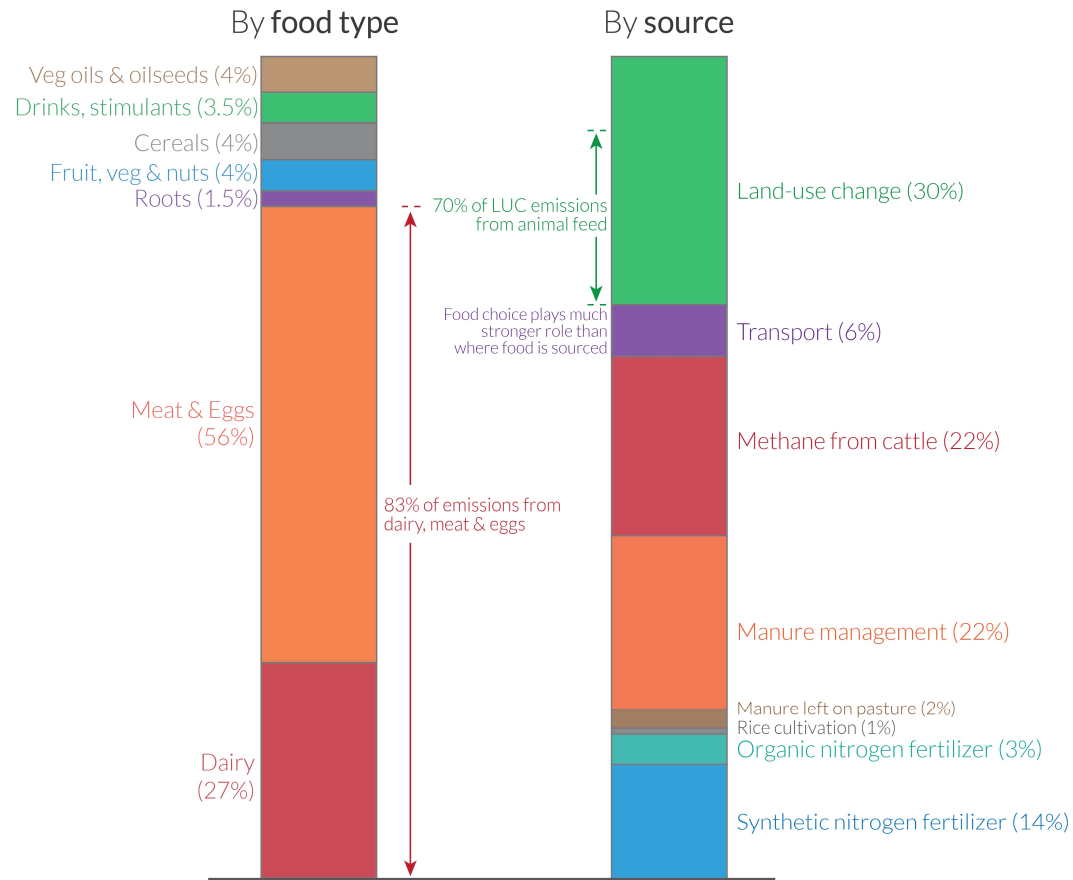


Source: Poore, J., & Nemecek, T. (2018). Additional calculations by Our World in Data.

Note: Data represents the global average land use of food products based on a large meta-analysis of food production covering 38,700 commercially viable farms in 119 countries.

OurWorldInData.org/environmental-impacts-of-food • CC BY

Carbon footprint of diets across the European Union: by food type and source



Data source: Sandström et al. (2018). The role of trade in the greenhouse gas footprints of EU diets. OurWorldinData.org – Research and data to make progress against the world's largest problems.

Licensed under CC-BY by the author Hannah Ritchie.

ARTICLE

DOI: 10.1038/s41467-017-01410-w

OPEN

Strategies for feeding the world more sustainably with organic agriculture

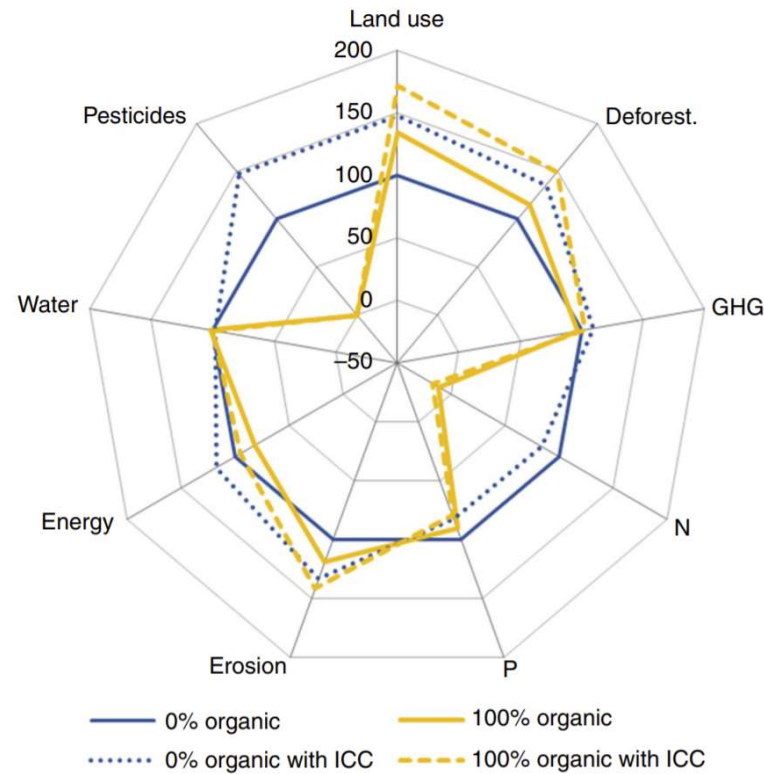
Adrian Muller^{1,2}, Christian Schader¹, Nadia El-Hage Scialabba³, Judith Brüggemann¹, Anne Isensee¹, Karl-Heinz Erb⁴, Pete Smith⁵, Peter Klocke^{1,6}, Florian Leiber¹, Matthias Stolze¹ & Urs Niggli¹

could play in sustainable food systems. Here we show that a 100% conversion to organic agriculture **needs more land than conventional agriculture** but reduces N-surplus and pesticide use. **However, in combination with reductions of food wastage** and food-competing feed from arable land, **with correspondingly reduced production and consumption of animal products**, land use under organic agriculture remains below the reference scenario. Other

DOI: 10.1038/s41467-017-01410-w

OPEN

Strategies for feeding the world more sustainably with organic agriculture



Main question: Significance of lower productivity?

- Organic crop yields from 40% to 100% of conventional?
 - Dependent on crop, farm type and many other aspects
 - Generally highest yields at dairy farms, lowest at stock-less crop production farms
 - Soil C effects best on dairy farms, - clover grass crops and animal manure
- Lower productivity = land use change elsewhere?
 - Do "organic consumers" eat a more plant based diet?
 - Due to their opinions, or due to expensive animal products
 - But organic rotations rely on animals and animal manure
 - Dairy farms with clover grass ley crops optimal
- Dilemma: Animals/dairy for the organic farms, but plant based for overall food production?