

MANY SHADES OF GREY

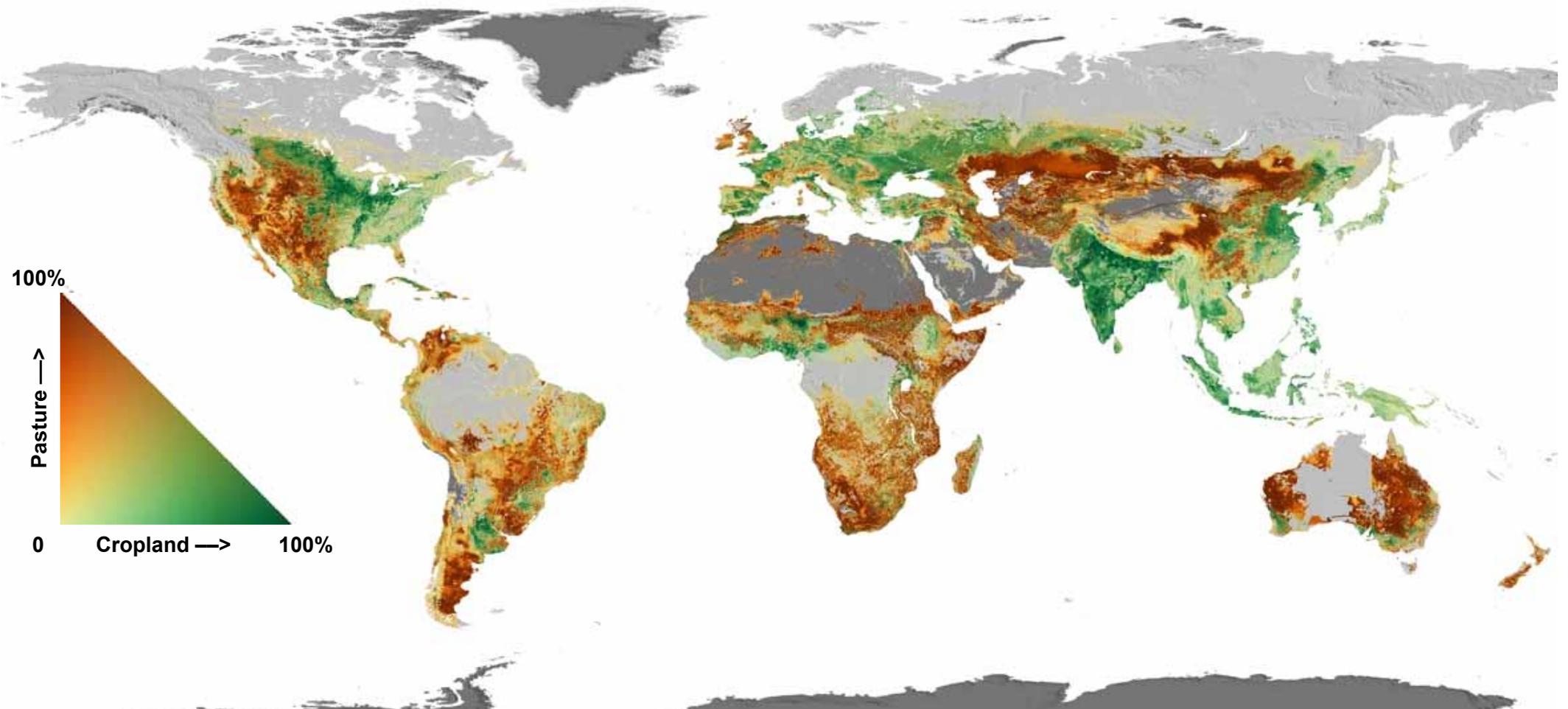
- The context-dependent performance of organic agriculture

Verena Seufert

Land Use Change Group, Institute of Meteorology and Climate Research (IMK-IFU), Karlsruhe
Institute of Technology (KIT)
Archived at <http://orgprints.org/32404>

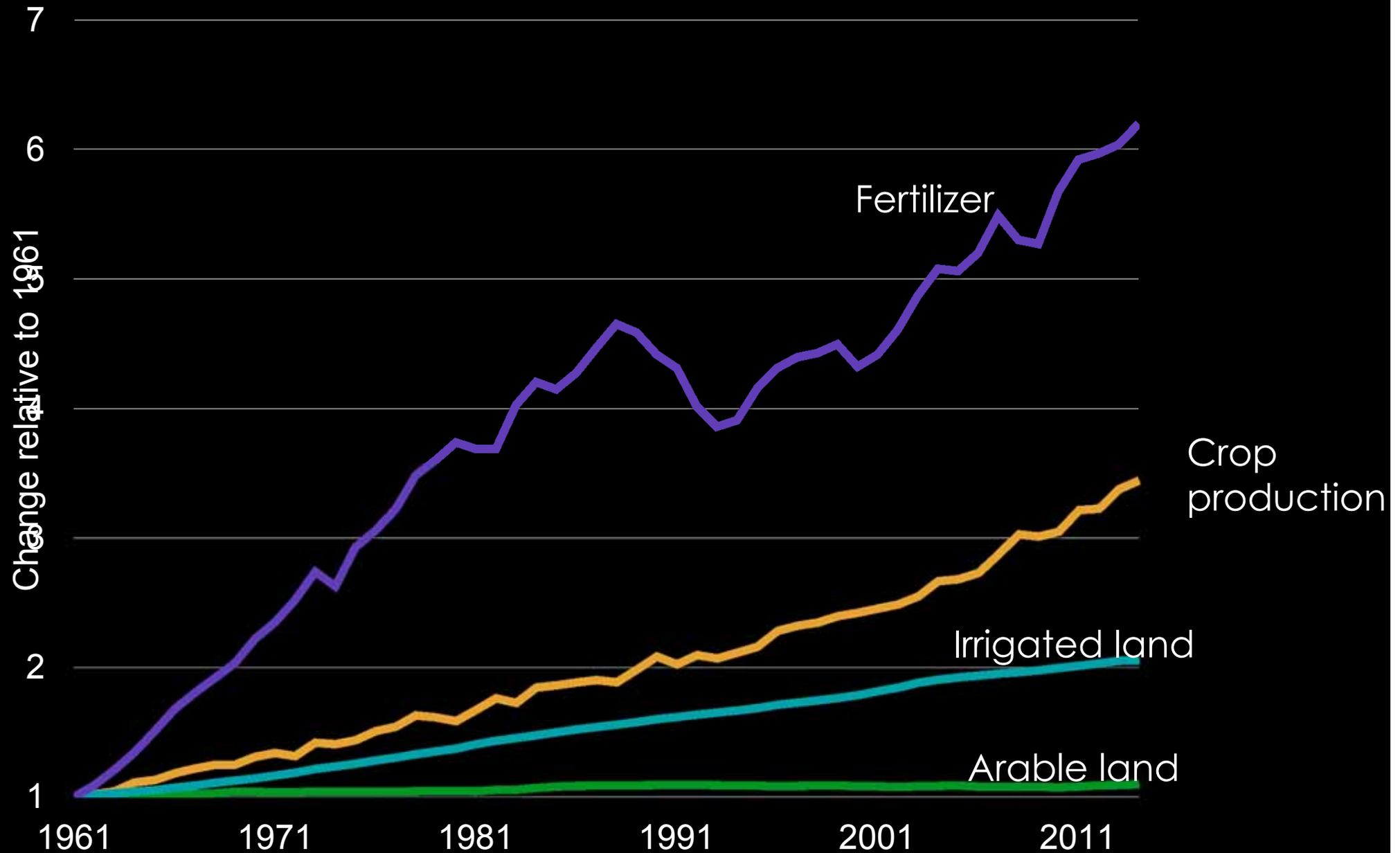




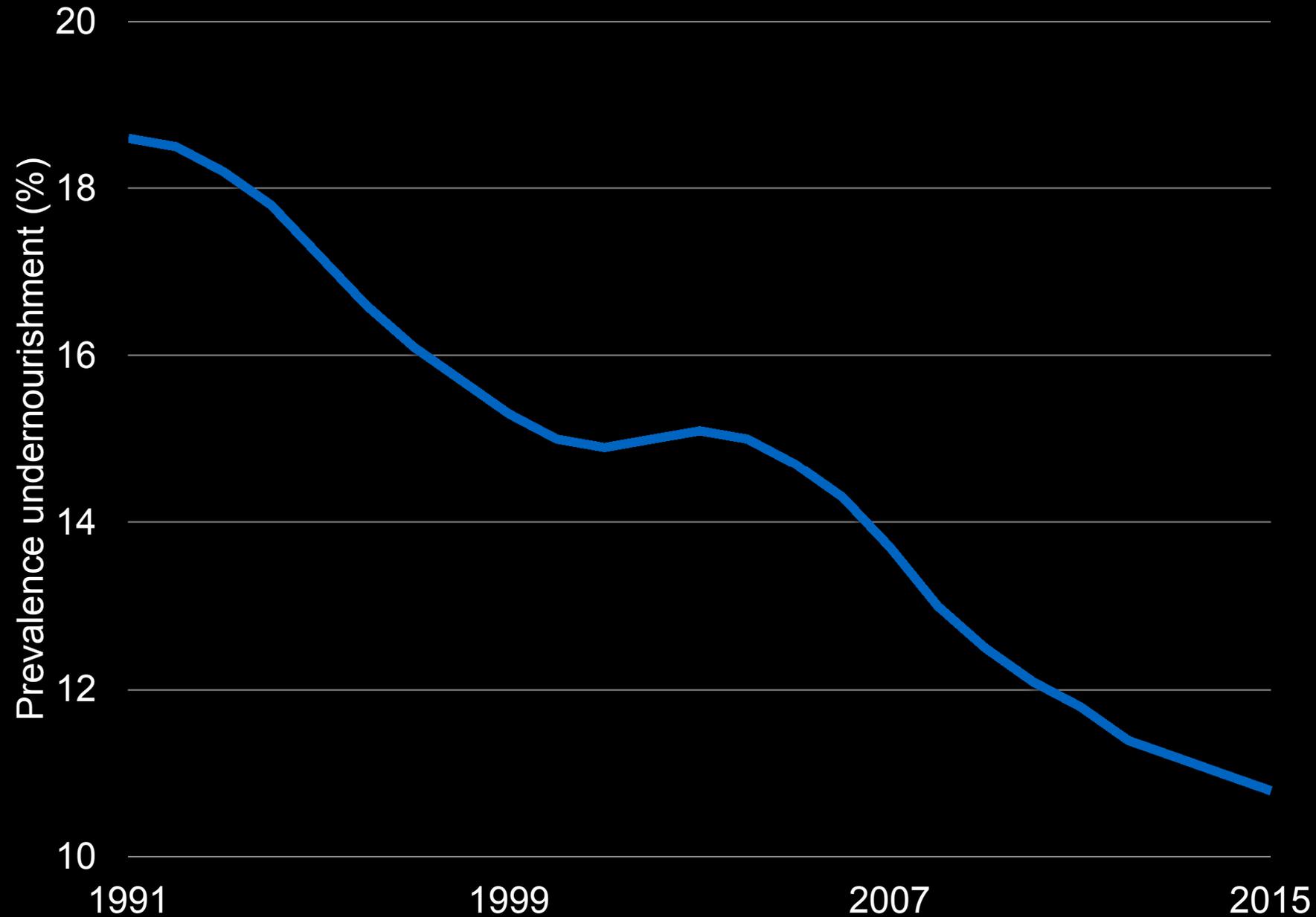


1/3 of land in agriculture

Agriculture



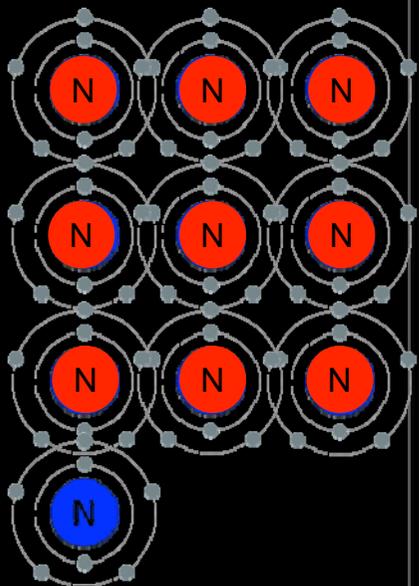
Hunger



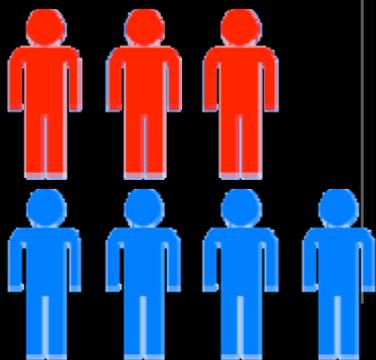
Our success has come
at a cost



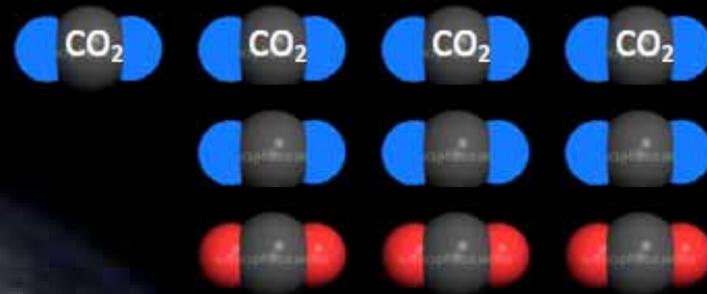
Agriculture:
70% H₂O
withdrawals



Agriculture:
90% N pollution

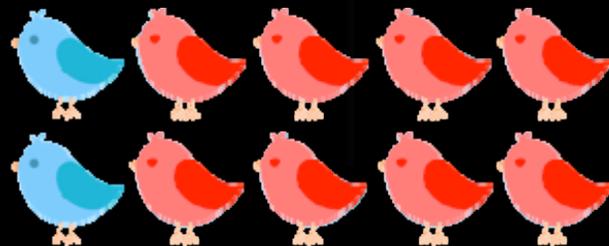


Almost 3 billion people
under- or overnourished

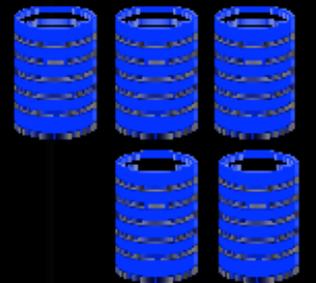
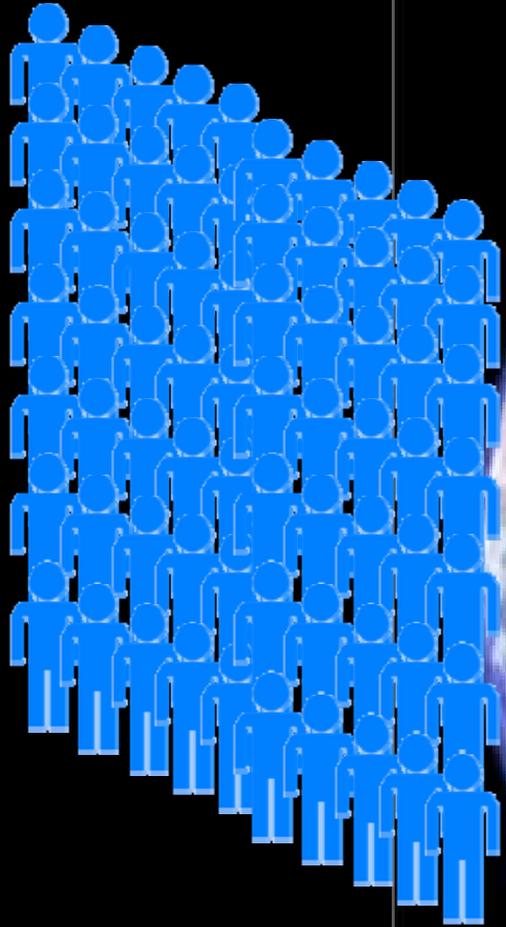


Agriculture:
30% GHG
emissions

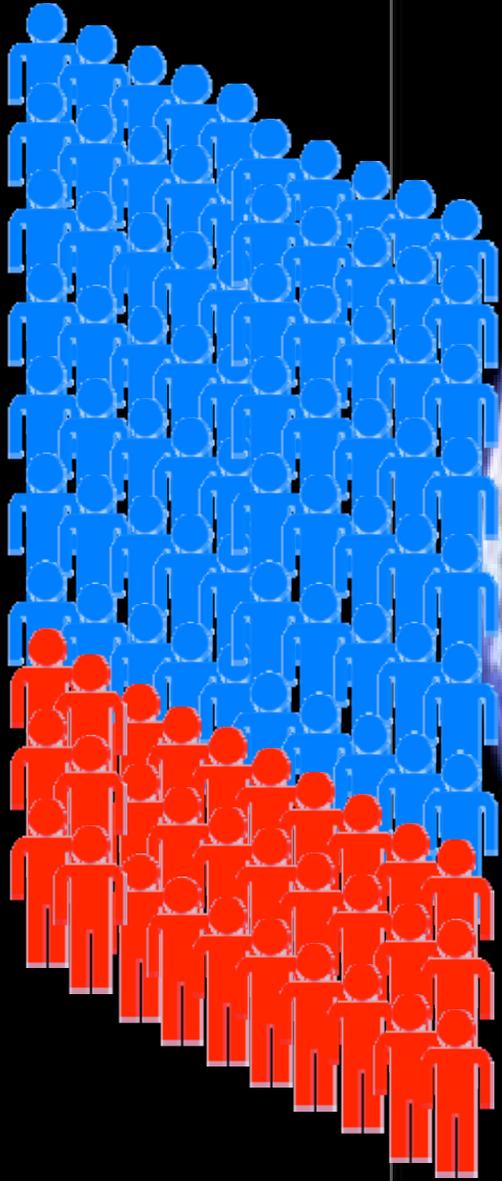
Agriculture:
80% of biodiv-
ersity loss



Today



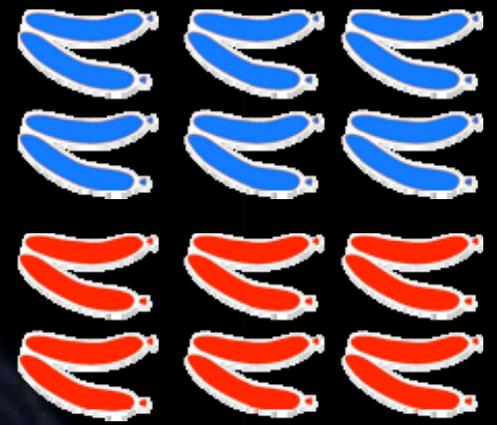
Tomorrow



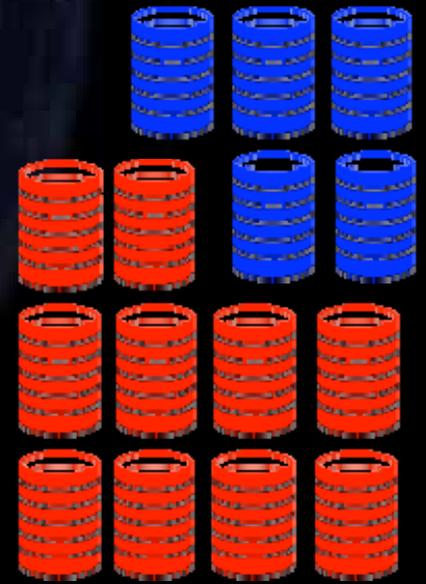
2050: 9 billion people



2050: 2 x meat consumption



2020: 3 x biofuel production



Global Sustainable Food Security

More food



Affordable prices



Quadruple challenge

Reduced environmental impact



Livelihoods to farmers





ORGANIC



Conventional

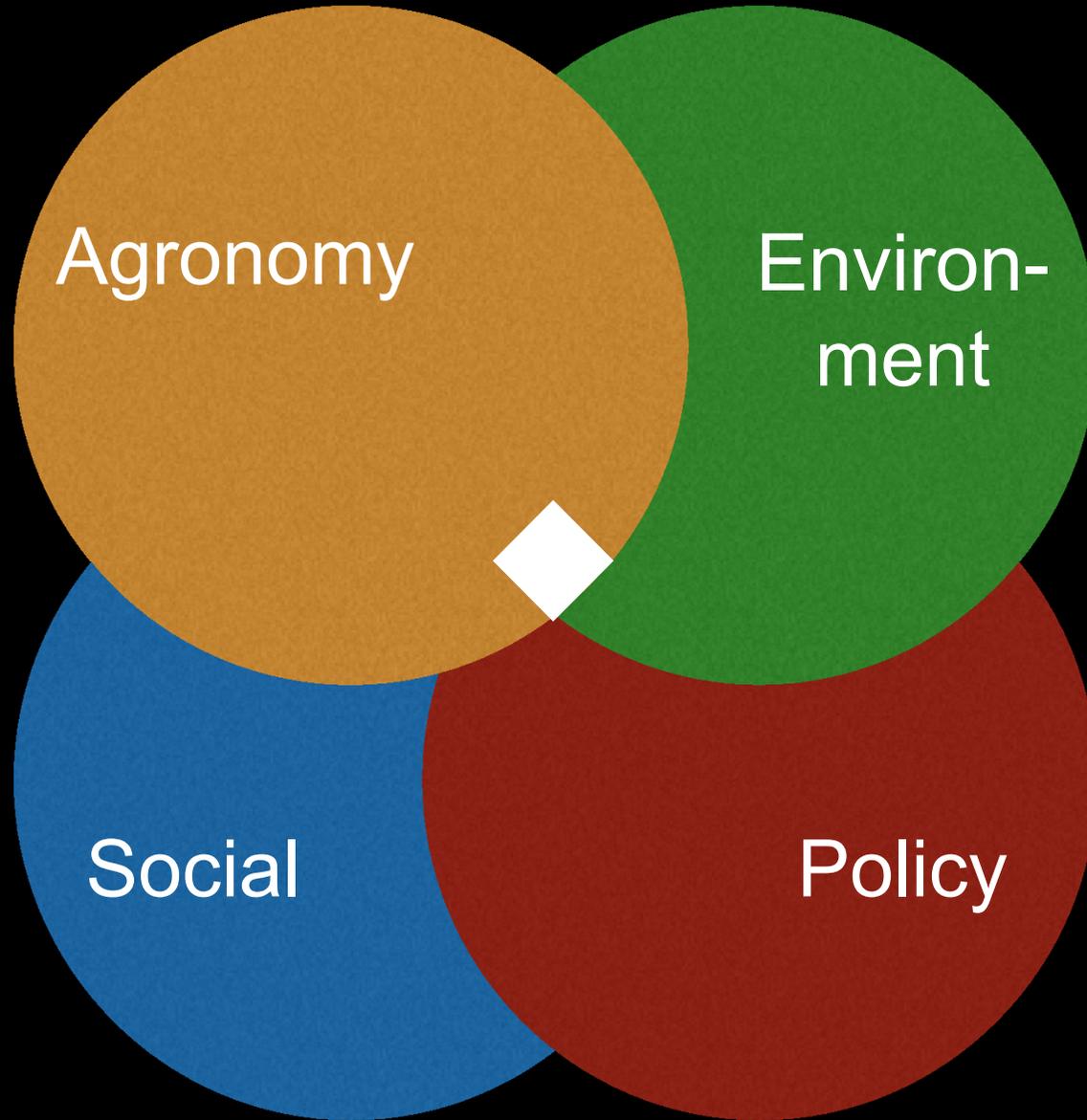
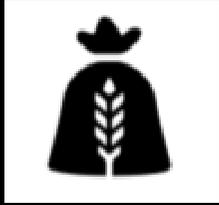
Organic



There is nothing black and white about organic agriculture



M. C. Escher, Day and Night



A grid of various soda cans including brands like Sprite, Dr Pepper, Coca-Cola, Hanjery, and Crush.

Meta-analysis



Depicts 106,000 aluminium cans
- the # used in the US every 30s



LETTER

doi:10.1038/nature11069

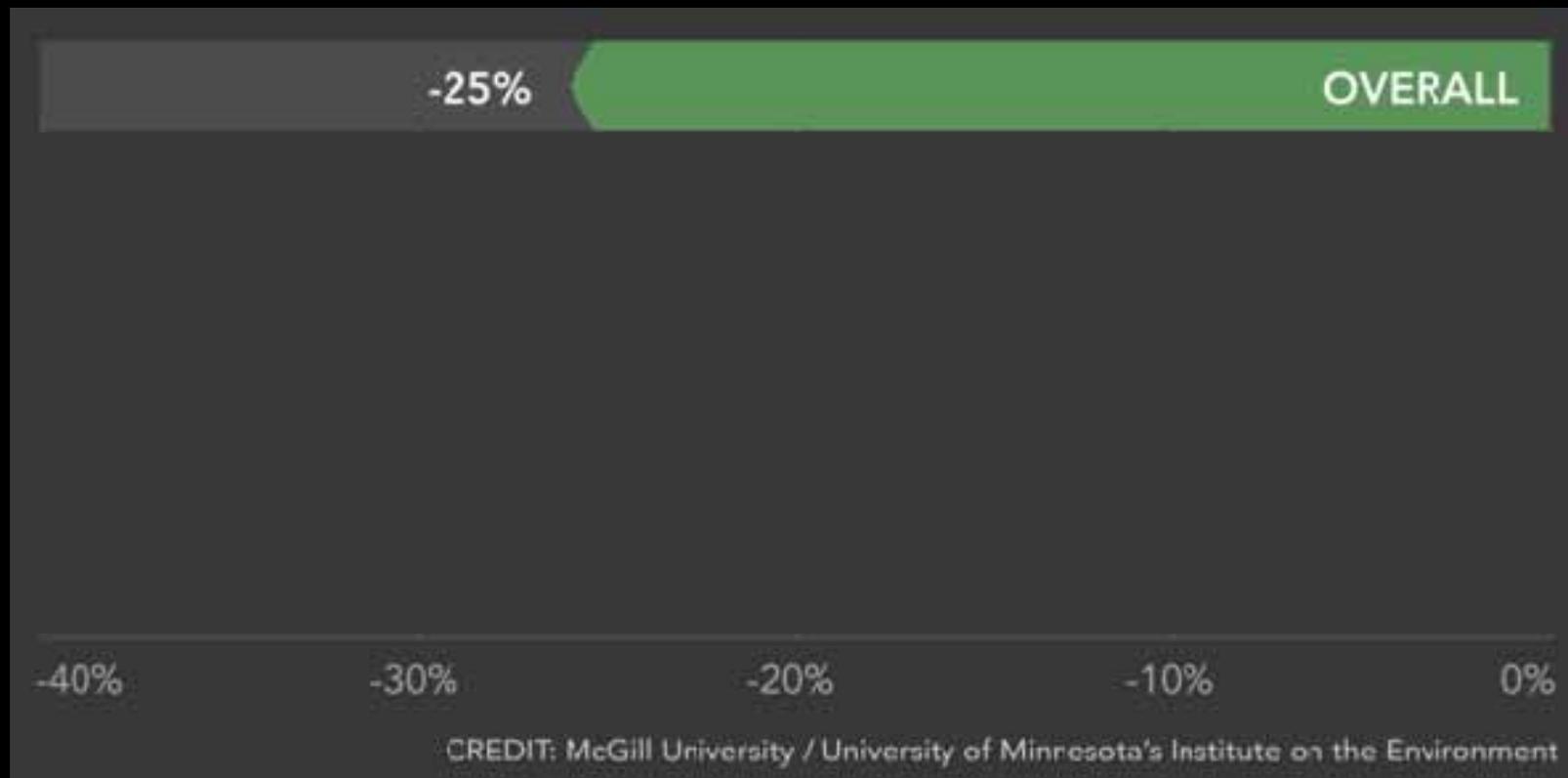
Comparing the yields of organic and conventional agriculture

Verena Seufert¹, Navin Ramankutty¹ & Jonathan A. Foley²

Meta-analysis of 66 studies (316 observations) comparing organic & conventional yields



RELATIVE ORGANIC YIELD PERFORMANCE



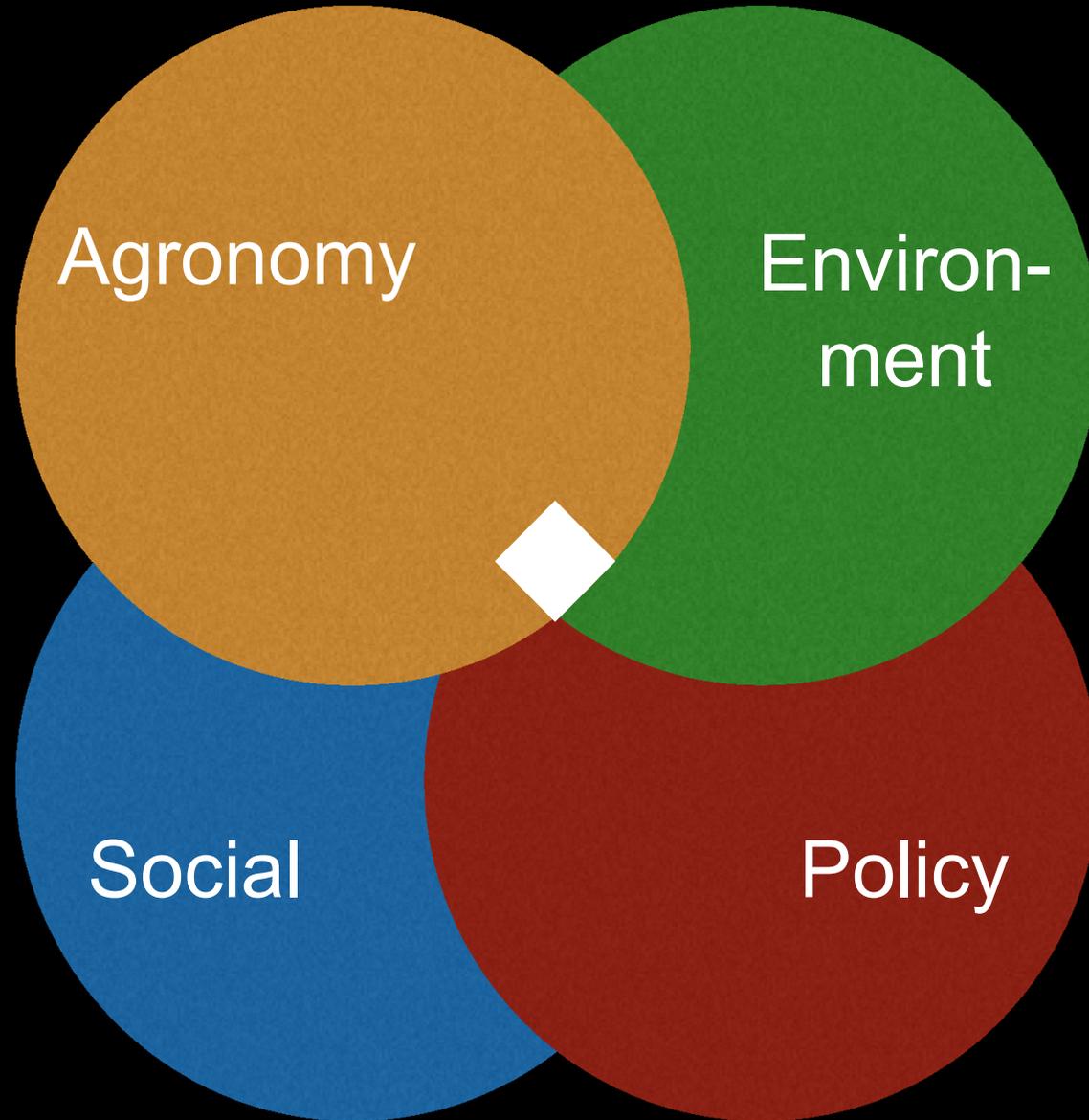
Seufert *et al.* (2012), *Nature*

ORGANIC



YIELD PERFORMANCE

Optimal	Poor
Legumes	Vegetables
Perennials	Annuals
Best management	Poor management
Long-term	Short-term
High N inputs	Low N inputs





> 9 x increase in reactive N

ORGANIC





-25%

Organic



Conventional

Seufert & Ramankutty (2017),
Science Advances



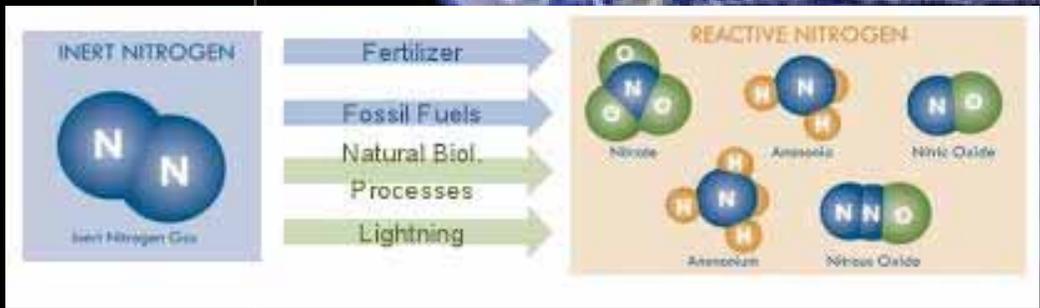
↑ +3%



Organic

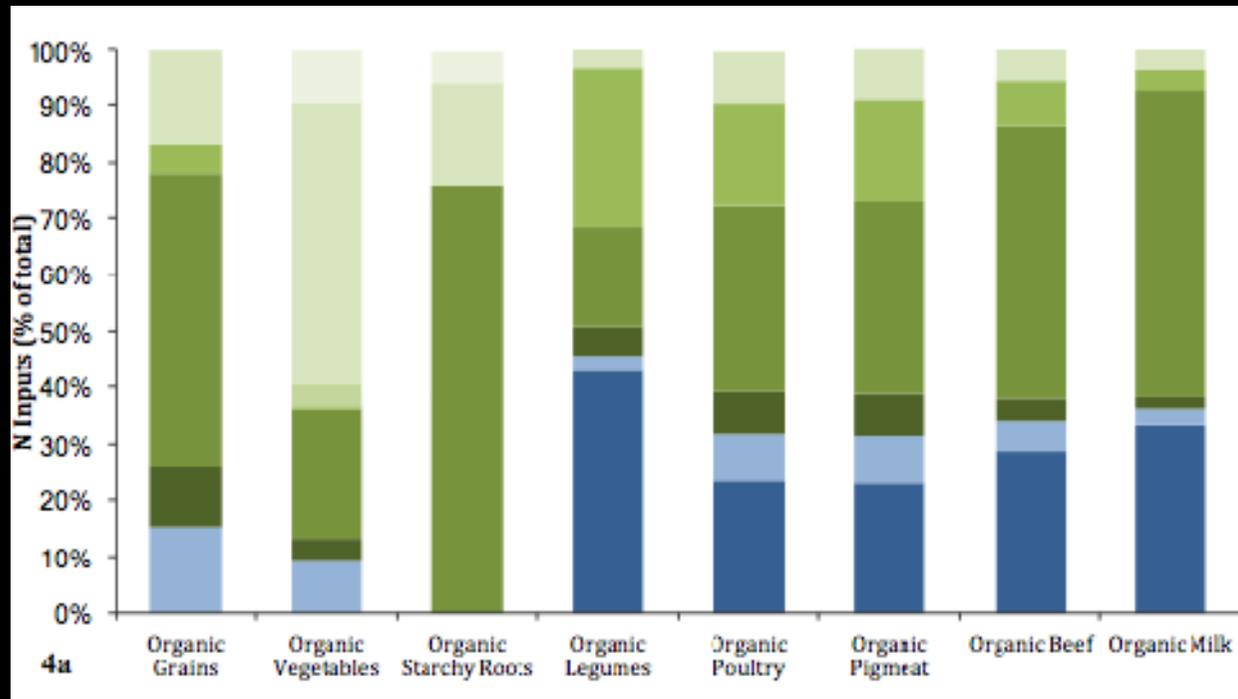
Conventional

Seufert & Ramankutty (2017),
Science Advances

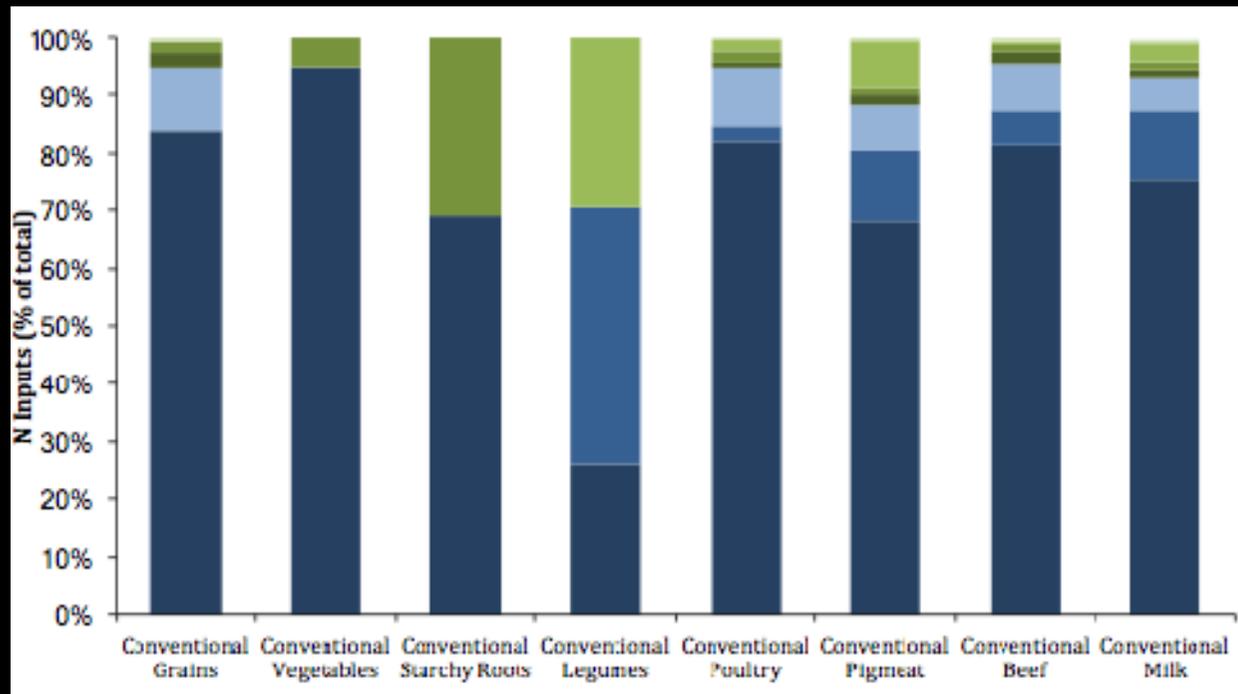


N sources

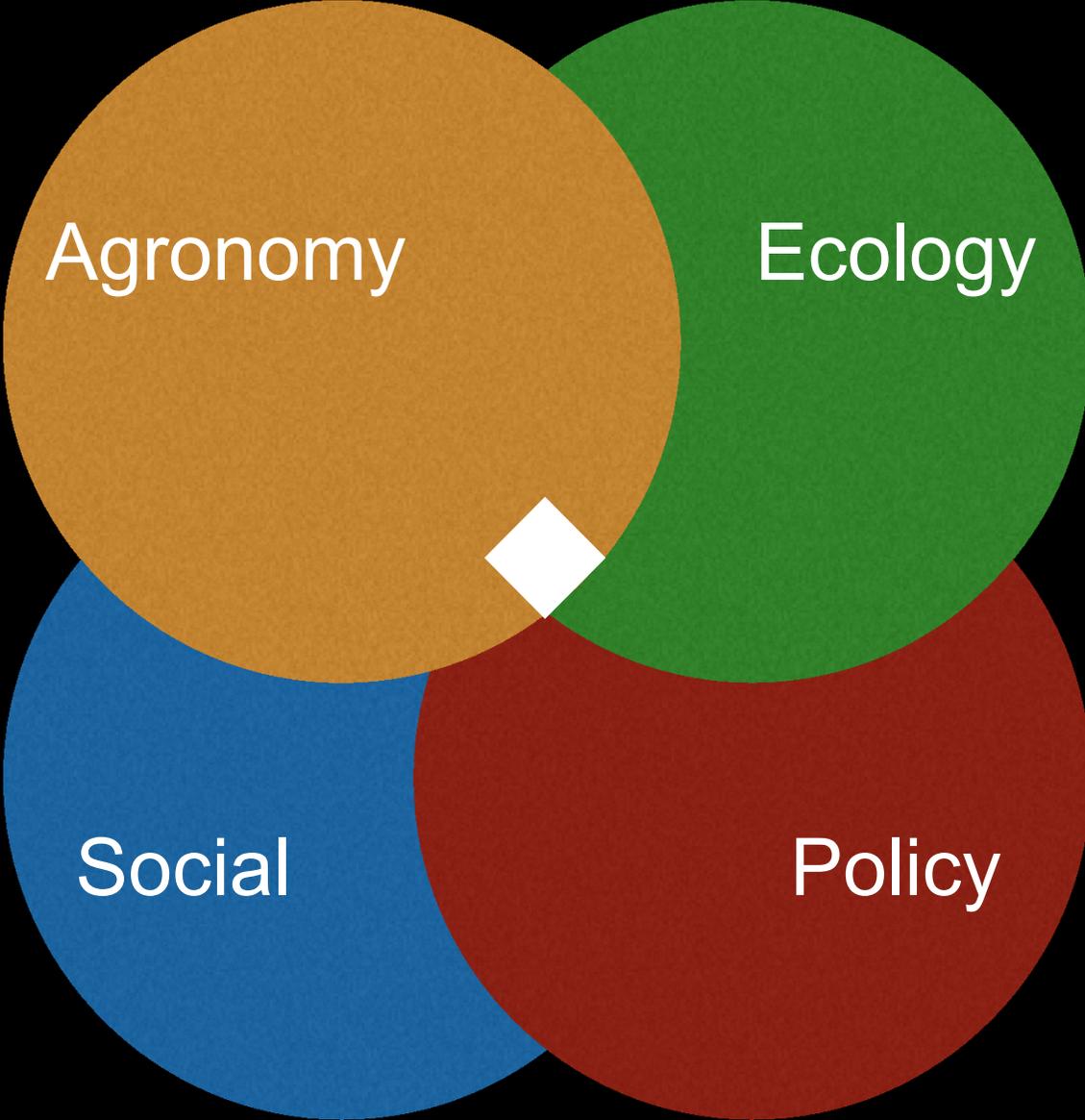
Organic



Conventional



Cattell-Noll *et al.* (in prep)





Impact of organic?

Yields		
Costs		
Prices		
Resilience		
Autonomy		
Other benefits		

Seufert (2012), *ISID Policy Brief*



Impact of organic?

	Direction	Impact
Yields	↓/↑	+/-
Costs	↓/↑	+/-
Prices	↑	+
Resilience	↑	+
Autonomy	↓/↑	+/-
Other benefits	↑	+

Seufert (2012), *ISID Policy Brief*

Case study in Kerala



Hobby farmers



Committed farmers



Export farmers

Livelihood outcomes



	Hobby	Committed	Export
Yields	↓	↓	↓
Costs	↑	↓	↑
Prices	→	↑	↑
Resilience	→	↑	↓
Autonomy	→	→	↓
Other benefits	→	→	↑

ORGANIC



LIVELIHOOD PERFORMANCE

Optimal	Poor
Poor or rich farmers	Middle class farmers
Domestic market	Export market
Ideology	Profit



Organic compared to
conventional...

per unit area



Seufert & Ramankutty (2017),
Science Advances

Organic compared to conventional...

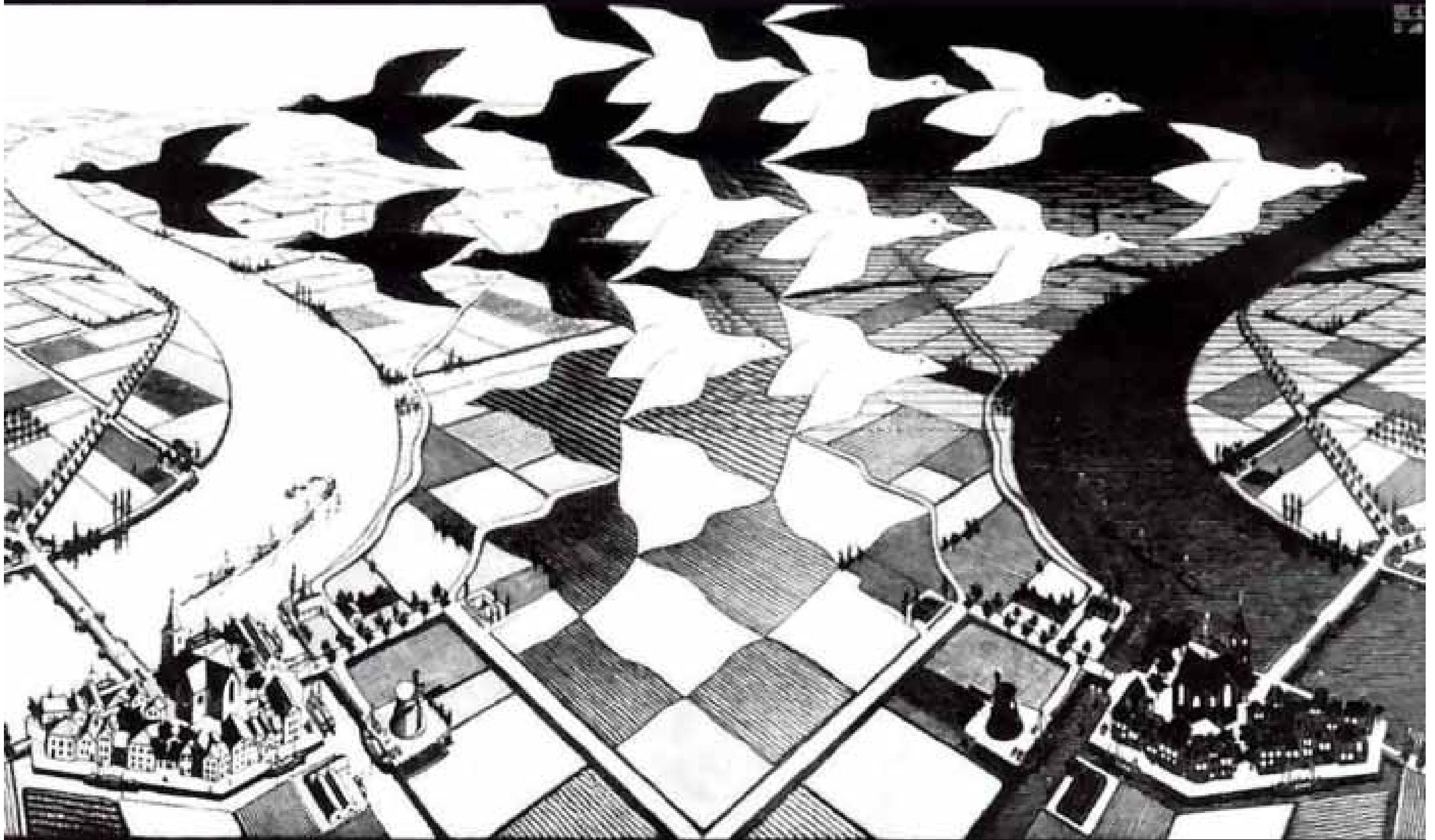
per unit output

Access



Seufert & Ramankutty (2017),
Science Advances

There is nothing black and white about organic agriculture



M. C. Escher, Day and Night



Organic food may be good for you or the planet, shock study finds

ORGANIC food may not be best for the planet, study finds

PUBLISHED: 19:31, Fri, Mar 10, 2017

THE HILL TIMES

SEARCH

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Tuesday, March 28, 2017

Organic is good for the planet but needs more support, say authors of UBC study

Organic growers and researchers have been sustainably innovating on a shoestring budget for decades. Imagine what could be achieved with more.



University of Manitoba researcher Michelle Carkner examines a new organic wheat variety that is nutritious, tastes great, and is competitive on performance when compared with conventional varieties.



Conclusions on Organic



Lower, but depends on...



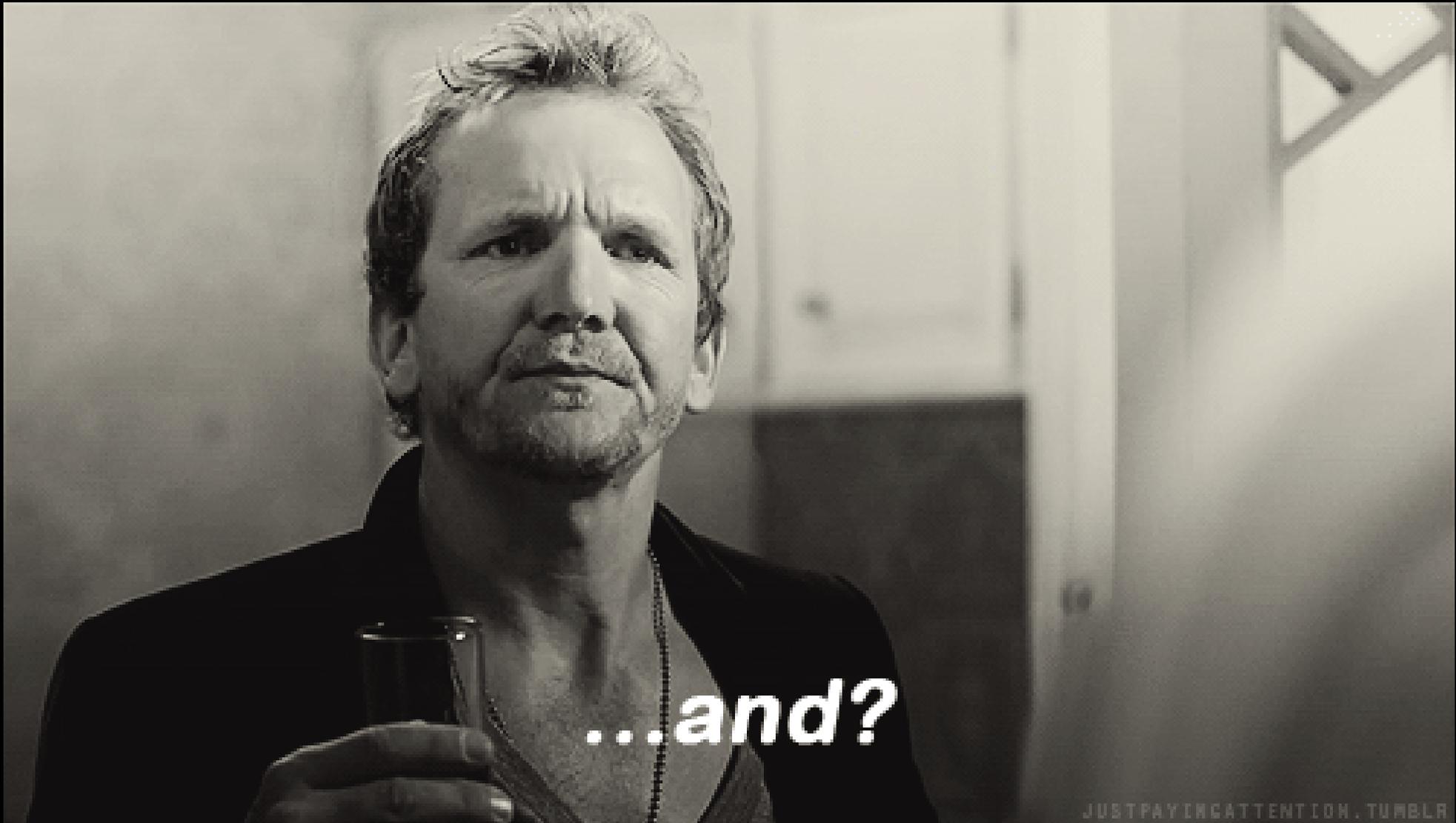
Higher per unit area,
uncertain per unit output,
depends on...



Depends on...



Organic \neq environment
= no chemical inputs



...and?

Recommendations

We need to make organic better!



Increase organic yields

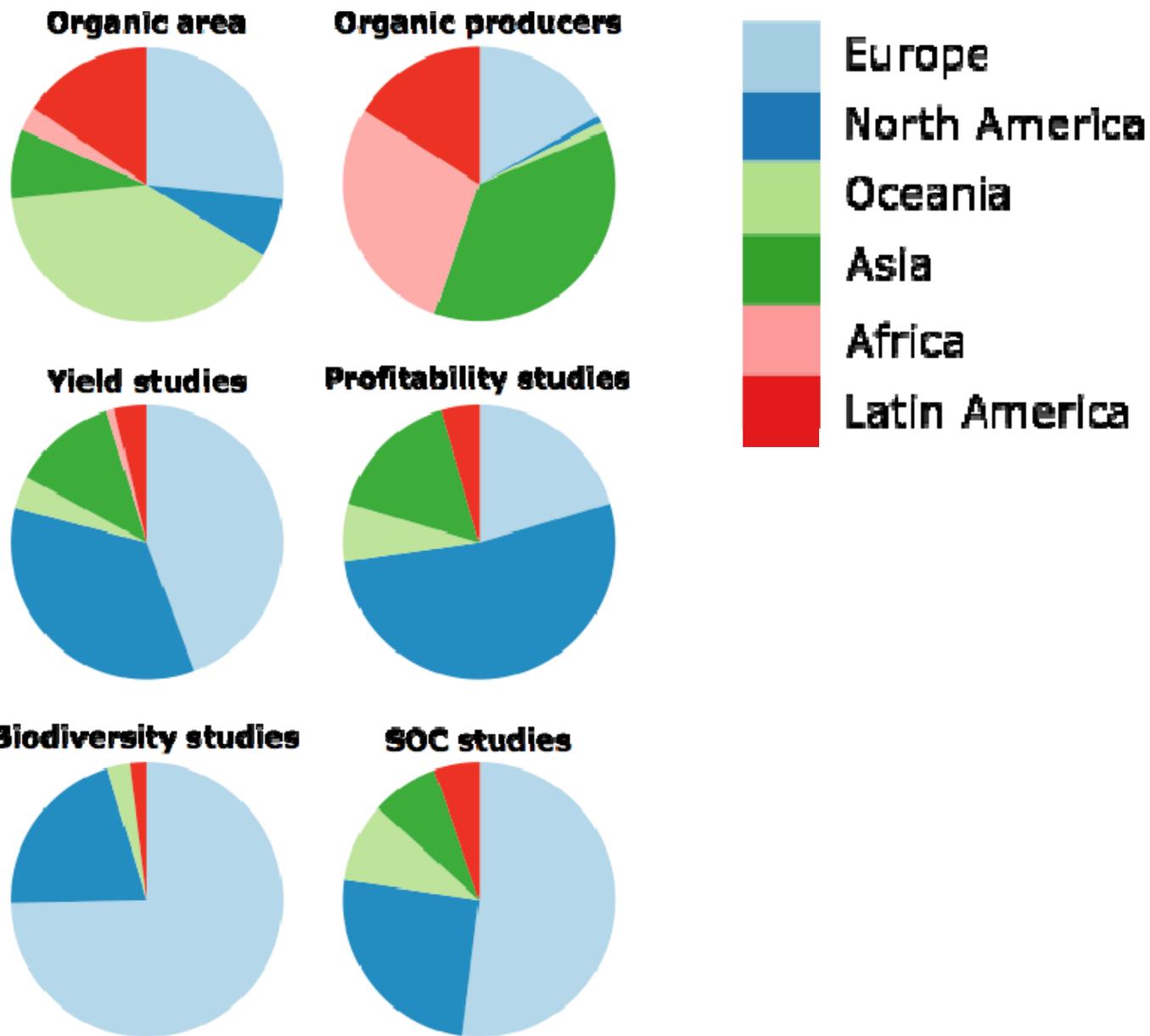


Include environmental best practices
in organic regulations



We need to make conventional more organic!

What we don't know



Seufert & Ramankutty (2017)



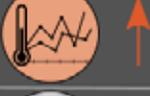
Thank you!

Email: verena.seufert@kit.edu

 @vereseufert

verenaseufert.weebly.com

RELATIVE ORGANIC PERFORMANCE

	Performance per:	Farm area	Food output
Environment	Yields		
	Organism abundance		
	Soil quality		
	Water quality		
	GHG emissions		
	Water use		
Producer	Farm profitability		
	Pesticide exposure		
	Farm wages		
Consumer	Food prices		
	Vitamin content		



Source
 Verena Seufert & Navin Ramankutty (2017), Many shades of grey - the context-dependent performance of organic agriculture. *Science Advances*.

Organic Agriculture

