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Resilience and organic agriculture

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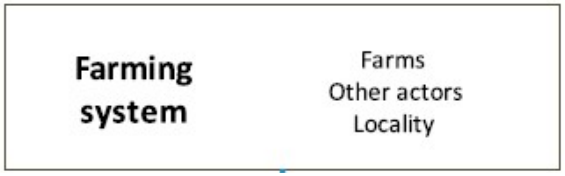
R&D Days for Organic Agriculture, 26.10.2022, online presentation

Resilience

1. Resilience *of what*?

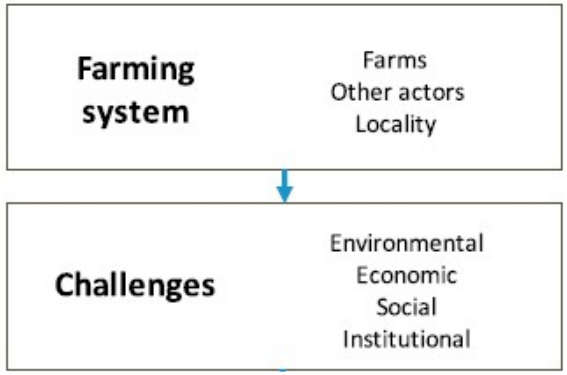


Meuwissen et al. 2019

Resilience

1. Resilience *of what*?

2. Resilience *to what*?



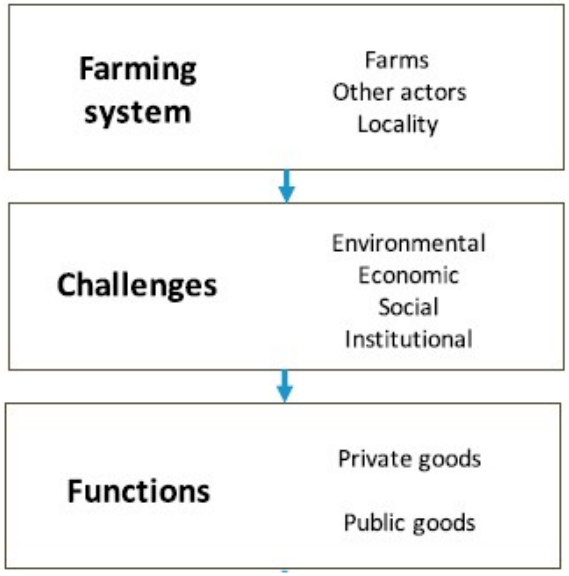
Meuwissen et al. 2019

Resilience

1. Resilience *of what*?

2. Resilience *to what*?

3. Resilience *for what purpose*?



Meuwissen et al. 2019

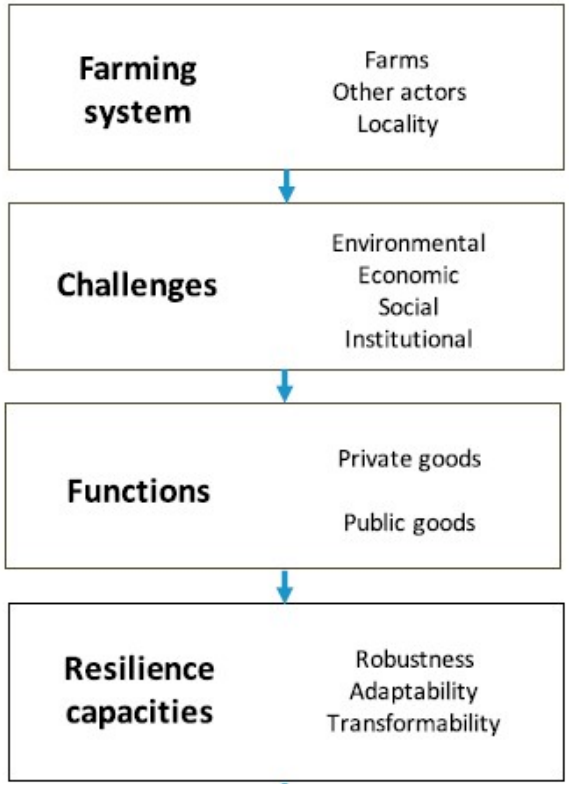
Resilience

1. Resilience *of what*?

2. Resilience *to what*?

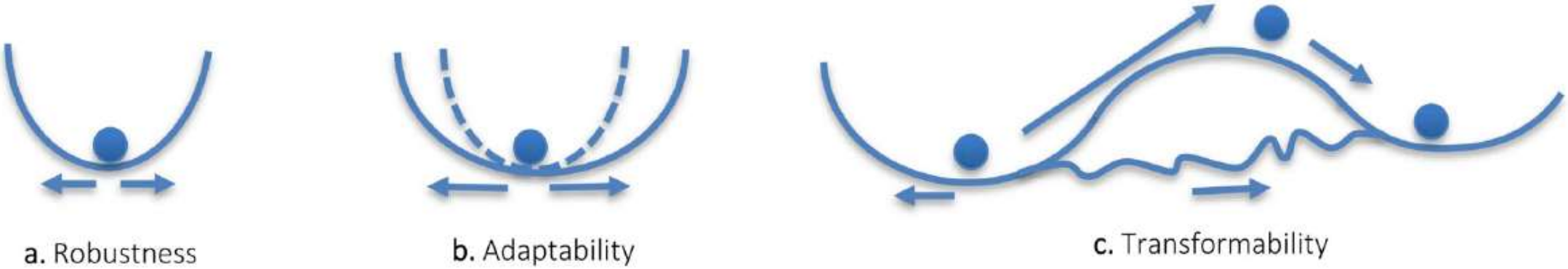
3. Resilience *for what purpose*?

4. What *resilience capacities?*



Meuwissen et al. 2019

Resilience capacities



Meuwissen et al. 2019

Resilience

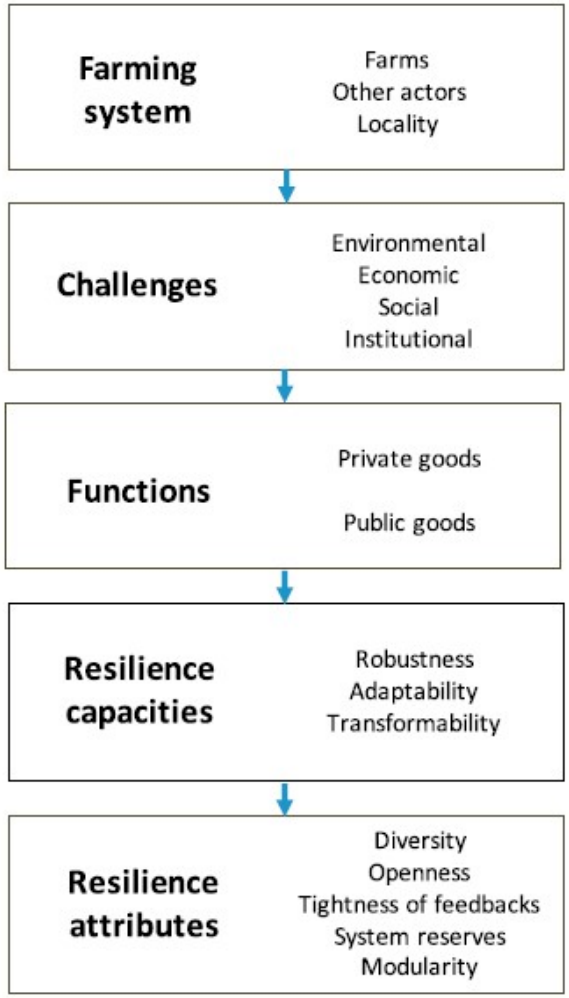
1. Resilience *of what*?

2. Resilience *to what*?

3. Resilience *for what purpose*?

4. What *resilience capacities?*

5. *What enhances* resilience?

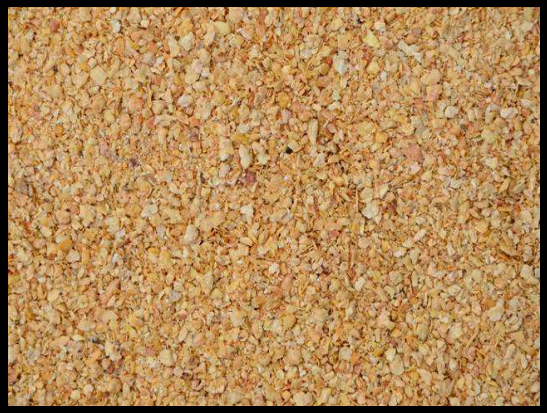


Meuwissen et al. 2019

Diversity

Figures GmbH; Leopoldina

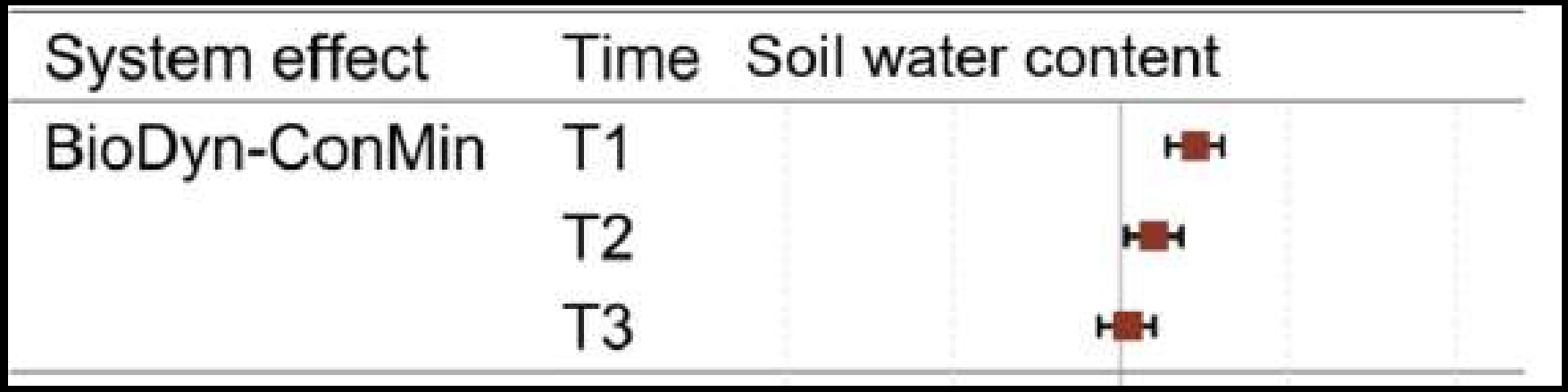
System reserves, redundancy



- 3000 kcal/cap/d
- 30% food waste and loss
- High shares of concentrate feed-based animal source food

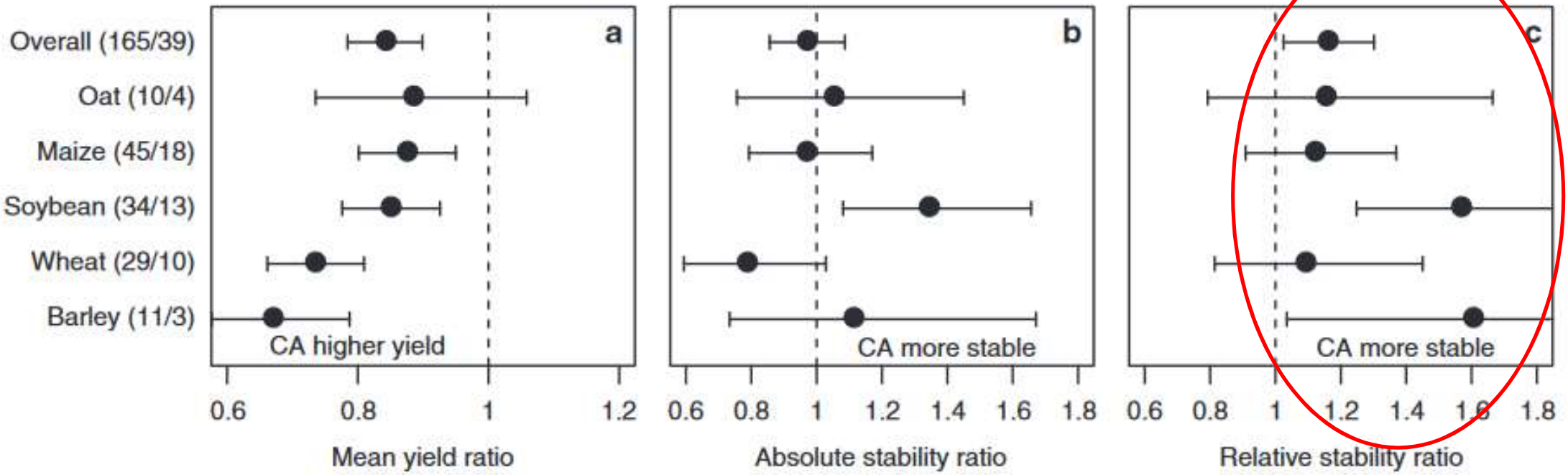
How resilient is organic agriculture? – Some claims

Extreme events / soil water contents



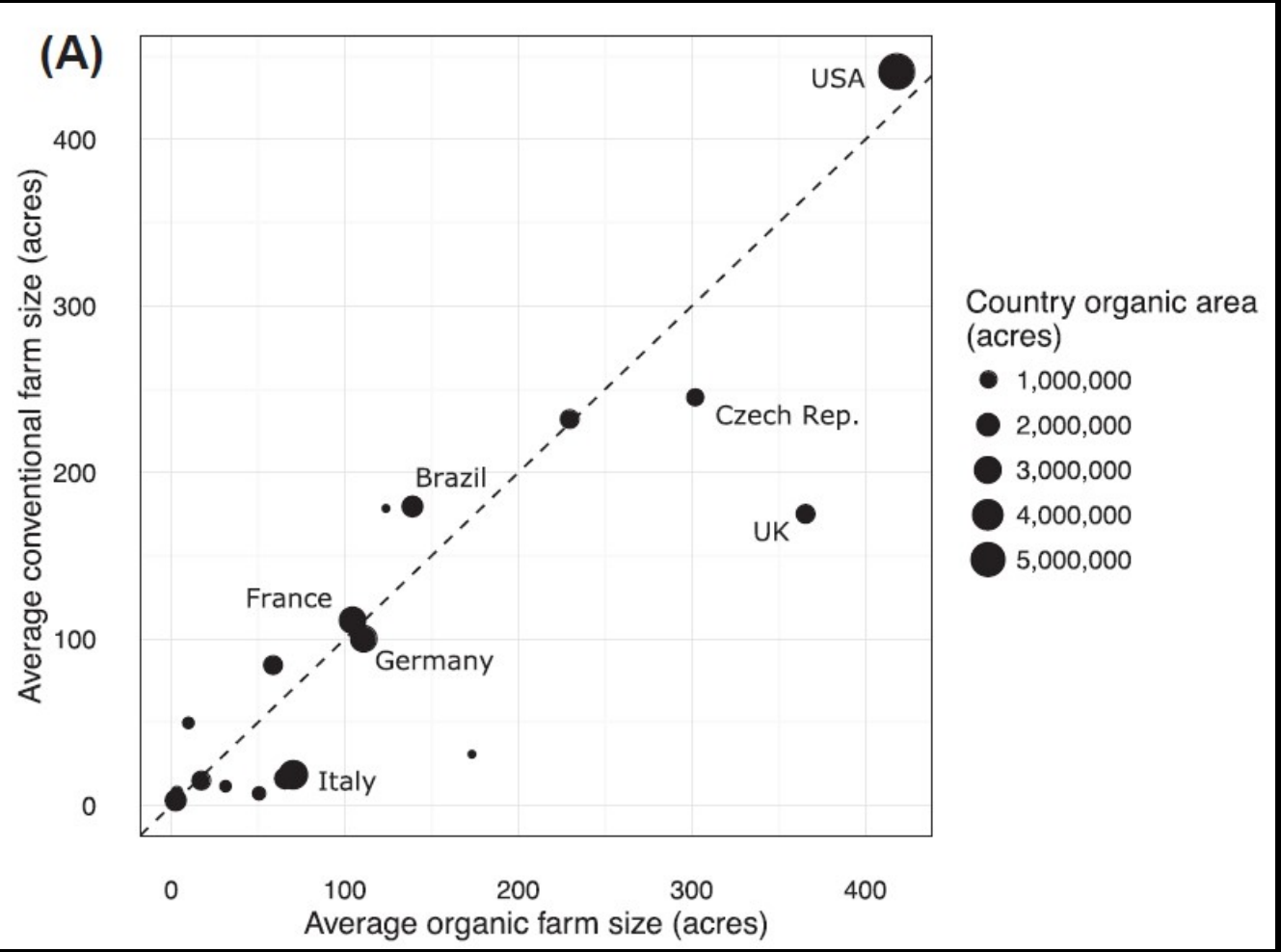
Kundel et al.2020

Yield stability



Knapp and van der Heijden 2018

Farm size

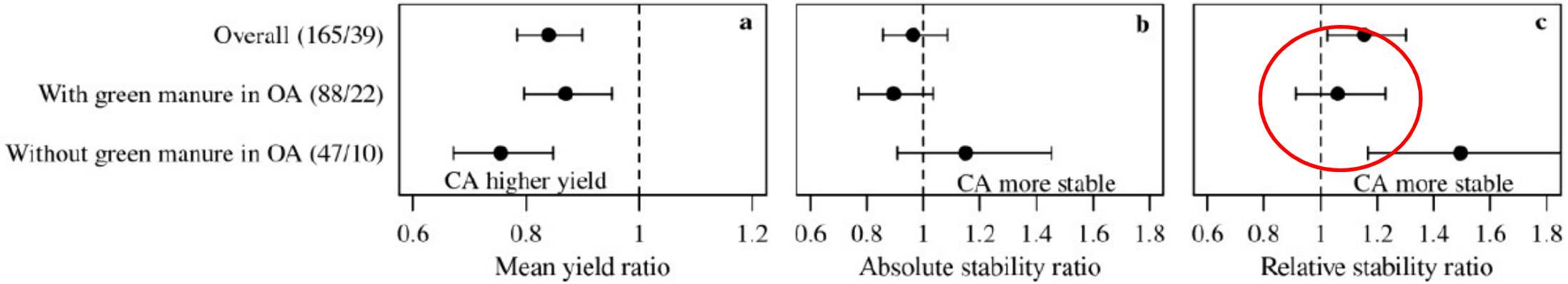


Seufert et al. 2019

How resilient is organic agriculture? – Some facts

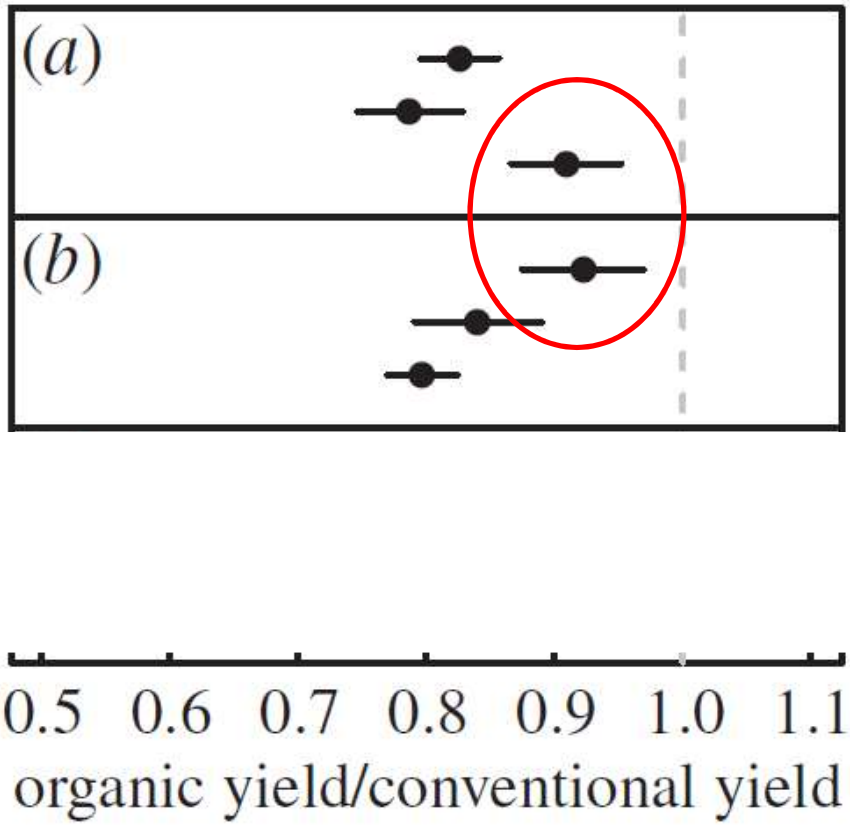
Extreme events / soil water contents

Yield stability



Knapp and van der Heijden 2018

Yield

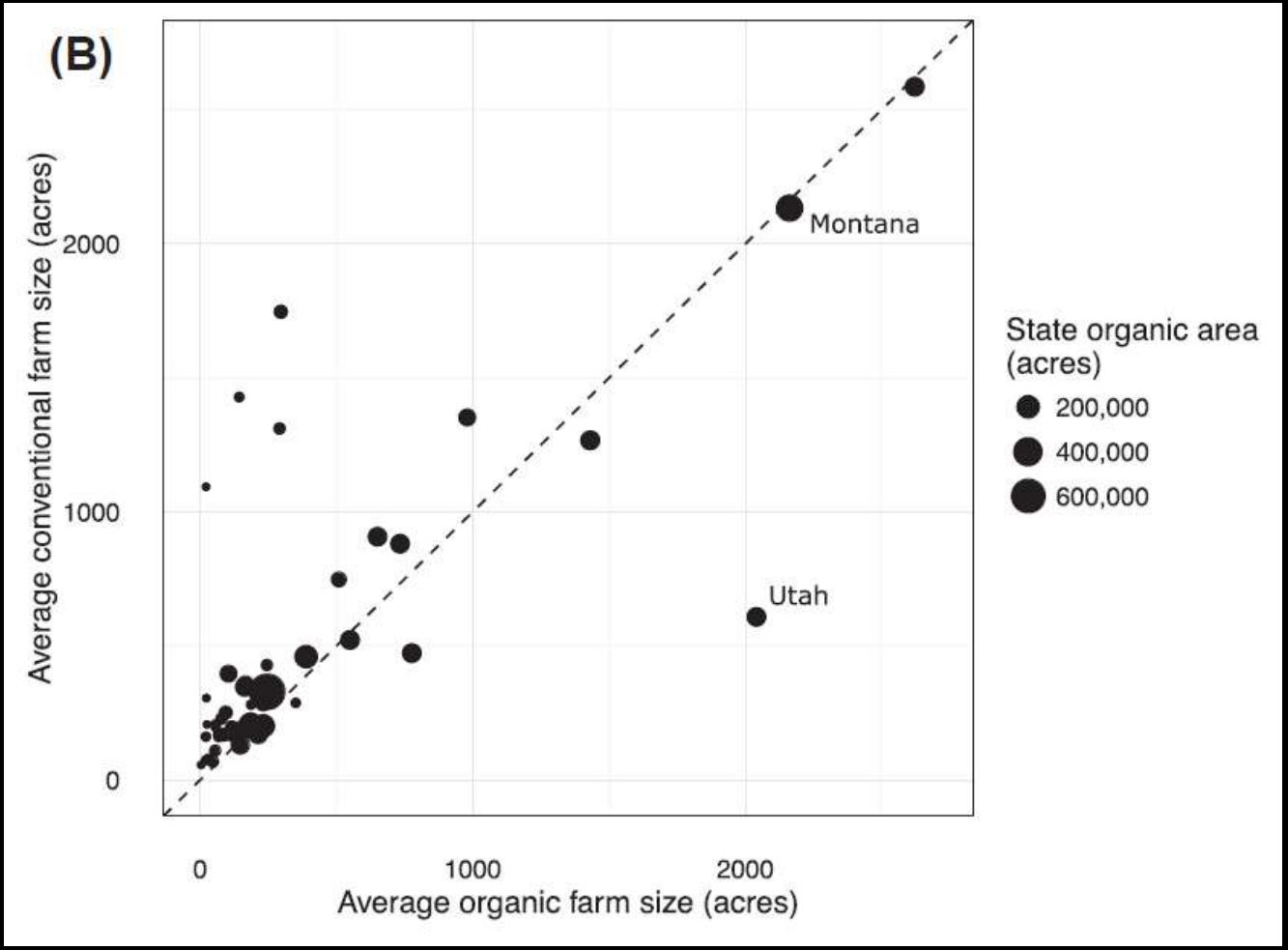


monoculture (77, 449)
polyculture (18, 367)
organic polyculture only (17, 173)

more rotations in organic (14, 113)
no rotations (36, 178)
similar rotations (54, 670)

Ponisio et al. 2015

Farm size



Seufert et al. 2019

Climate change adaptation and agroecology

Table key	Performance with respect to the baseline:
✓	significanlty b
×	significantly w
0	no effect
red	Practices reported in meta-analyses that may not be deemed agroecological in all cases
blue	Indicators referring to temporal stability/variability

		✓	better, but not significant																										
		×	worse, but not significant																										
		Soil organic carbon						Soil microbiome		soil biodiversity																			
		Indicators for climate change adaptation																											
		Soil health										Biodiversity		Plant protection						Productivity									Employment	Health
		Soil organic carbon contents	Soil organic carbon sequestration	Total soil N	Soil loss	Soil fertility	Soil microbial activity	Soil microbial biomass	Soil biodiversity (microbial diversity/ richness)	Nematode abundance	Species richness/abundance/diversity	Stability of species richness/ abundance	Natural plant protection	Level of biological control	Animal pest abundance	Weed abundance	Pathogen abundance	Total biomass production	Stability in total production	Yield	Yield stability	Pollination services	Resource use efficiency	Ecosystem services stability	Profitability	Stability of costs and profits	Rural employment	Exposure to pesticides
Agroecological practices	Organic agriculture	✓	✓		✓		✓	✓	✓		✓	✓		✓	✓	×	✓			×	×		0			0	✓	✓
	Low input systems									✓	✓									×								
	Agroforestry (incl. silvopast.)				✓	✓	✓				✓							✓										
	No tillage	✓				✓														×	×							
	Reduced tillage	✓		✓		✓	✓	✓										×		✓								
	Cover crops	✓		✓				✓																				
	Biochar	✓																										
	Organic fertilizers (incl. slurries)	✓		✓		✓				✓	✓							×		✓								
	Crop rot./ diversity/ intercropping	✓	✓	✓				✓	✓		✓		✓						✓	✓	✓				✓	✓	✓		
	Grassland diversity																			✓									
	Practices enhancing biodiversity & complex landscapes												✓							✓		✓	✓	✓					

Muller et al. 2020

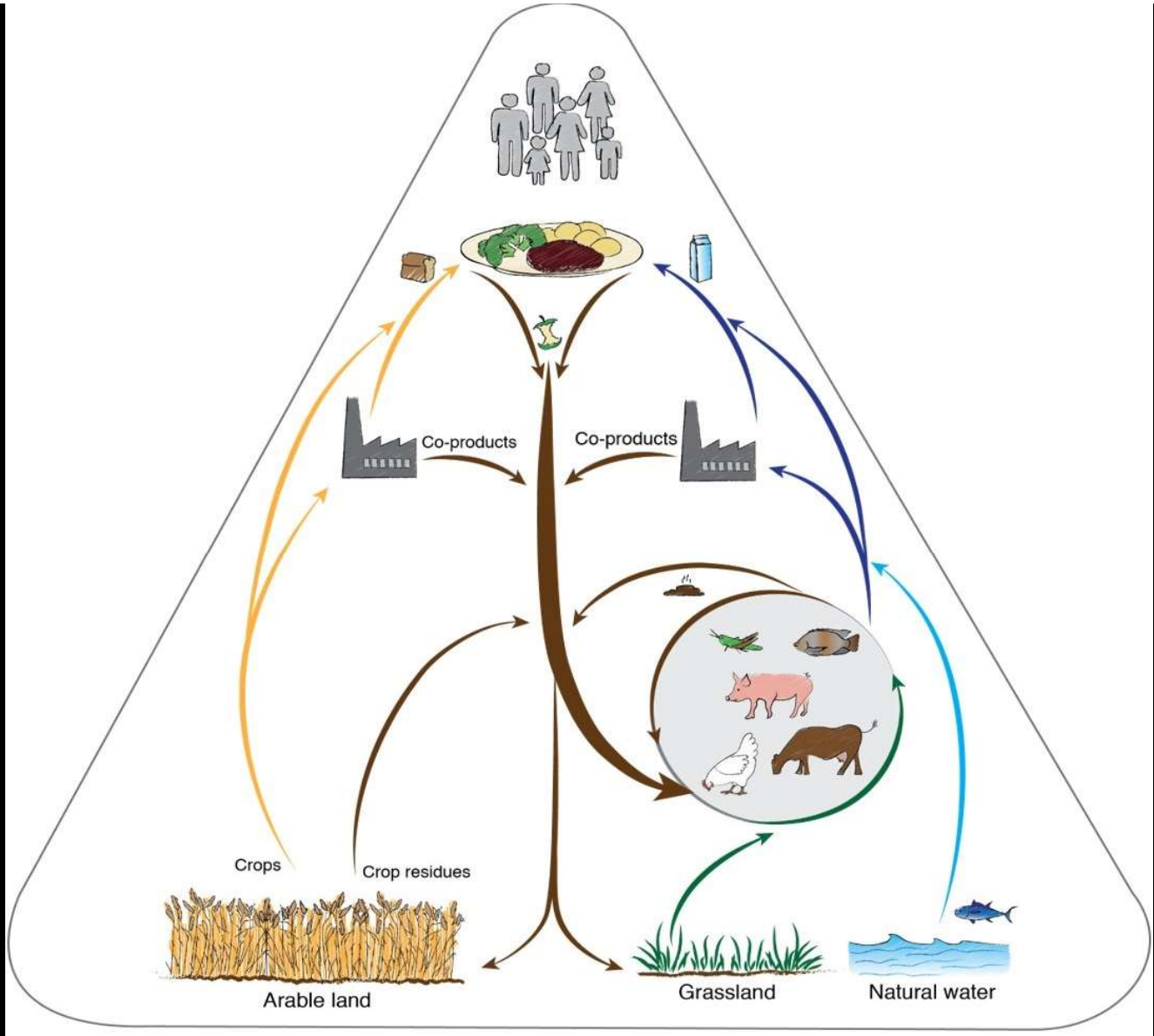
How resilient is organic agriculture? – Some challenges

- circular food systems

- grass-fed animals

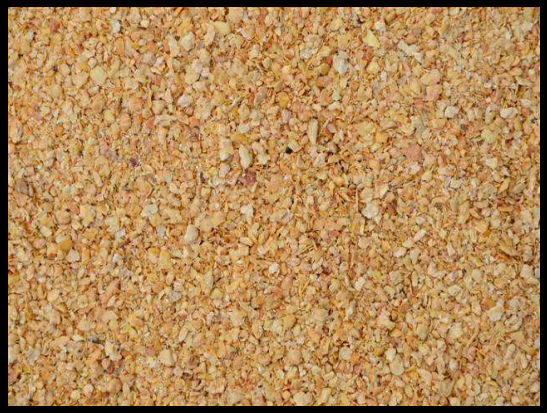
- organic: nutrient supply

Biohoif Wigger Obernau



Van Zanten et al., 2019

Trade-offs



- Robustness vs. transformability
- Overproduction: hedges against failures
- Extensification: reduces pressure on the systems

Concluding messages

- Organic agriculture has good potential to be resilient
  - but it needs to really utilize it (e.g. diversity)
  - and not just mimic conventional systems (in standardization)
    - processing, trade and retail need to support heterogeneous production systems
  - and it needs to hedge against key challenges (e.g. dependence on local feed, local nutrient supply)

- Be very clear about resilience of what (plant, plot, farm, landscape, society…) and resilience to what (drought, heavy rains,…)?

- Be aware of the challenge of slow changes over long time-periods (less or more water in 20 years? – And by how much?)
  - and ask which resilience is best: robustness or transformation?

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In a nutshell

- Make organic systems truly diverse on all levels
  - Whole value chain approach
- Resilience to which threats?
- Plot – farm – landscape level?
  - How does your farm/ income source look like in 30 years

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