What is a sustainable food system – Considerations on efficiency, consistency and sufficiency

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GHG (g CO₂-Cₚeq. per g protein)

- Maize
- Wheat
- Rice
- Other cereals
- Sugar
- Oils
- Oil crops
- Tropical fruits
- Vegetables
- Roots
- Legumes
- Butter
- Eggs
- Dairy
- Non-trawling fishery
- Trawling fishery
- Recirculating aquaculture
- Non-recirculating aquaculture
- Poultry
- Pork
- Ruminant meat

Tilman and Clark 2014
Land use

Hallström et al. 2015
What is a sustainable food system?

Vegan and organic?
**Climate change impact on yields**

<table>
<thead>
<tr>
<th>% Wasteage reduction</th>
<th>% Reduction in food-competing feed</th>
<th>% Organic</th>
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</thead>
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<td>Zero</td>
<td>Medium</td>
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<td>-19 -17 -13 -10 -7 -3</td>
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*Muller et al. 2017*

**Relative change in land use**
(a) overall (115, 1071)
(b) annual (95, 995)
(c) perennial (21, 58)
(d) legume (19, 83)
(e) non-legume (113, 970)
(f) cereals (56, 559)
(g) fruits and nuts (35, 158)
(h) oilseed crops (24, 126)
(i) roots and tubers (10, 28)
(j) vegetables (19, 166)

organic yield/conventional yield
We have to reduce the size of the food system to gain room for more extensive production systems.
We need systems that perform reasonably well along all indicators but need not be maximally performing on any single one.
What is a sustainable food system?

Less concentrate feed
Less animal products in diets
Less food loss and wastage
More organic production
### Climate change impact on yields

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<tr>
<th>% Wastage reduction</th>
<th>% Reduction in food-combining load</th>
<th>Zero</th>
<th>Medium</th>
<th>High</th>
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Muller et al. 2017

N surplus (kg N/ha)
A main challenge for organic production: adequate nutrient supply

- Crop rotations – fodder legumes
- Fodder legumes – land use
- Off-season legume lays – water use
- Grass-based production – manure quantities

Closed nutrient cycles
iii) Continuous improvement of mainstream systems

ii) Increasing the demand for more sustainable products

i) Supporting organic systems while improving their performance

iv) Raising legal requirements and industry norms

Global agriculture and food systems

Number of producers

Sustainability (various dimensions)
Conclusions

1. "Efficiency" is important, but "sufficiency" is central as well and "consistency" also contributes to viable solutions.

Therefore, the yield gap is not that important.

We need systems that perform reasonably well along all indicators but need not be maximally performing on any single one.
Conclusions

2. We need to adopt the food systems view; to look at sustainability in production only is not enough, the consumption side is central as well.

Otherwise, central options for taking action are neglected and the danger of «leakage» is big.

Therefore, a central focus has to be on the consumption side.

We have to reduce the size of the food system to gain room for more extensive production systems.
Conclusions

3. The Central question is not whether organic may feed the world or not, but which role organic may play in the transition towards sustainable food systems.

We have to overcome the polarized and ideological debates – conventional systems can learn from organic ones and vice-versa.
The big question, the big gap

How to take action on the consumption side?