The role of animal source food in sustainable diets

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We agree on the challenge

9-10 billion in 2050
Large environmental impact

- World arable land: 40%
- World grain production: 30%
ASF provide macro- and micronutrients
What role, if any, can animals play?

Different narratives
Today.....

Circular narrative
“efficient land use”

Production narrative
“Produce more with less”

Consumption narrative
“Eat less, no ASF”
Produce more with less
- production narrative -

Unarticulated assumptions: we **have** to meet global demand

**Global demand for ASF (M ton)**

2013 & 2050

Scientific approach: reduce environmental impact per unit of ASF
Produce more with less
- production narrative -

Reduce environmental impact per unit of ASF

METRIC
resource use or emissions in chain
unit of ASF
Sustainable intensification of crop and animal production

- Higher crop yields per unit of land/energy/P - Nature 2011
- Improving feed efficiency - PNAS 2008
- Improving life-time productivity (rBST) - PNAS 2008
- Use fast-growing broilers – Poultry Science 2012
- From grass-based to mixed ruminant systems - PNAS 2014
- Improve animal health – Journal of Cleaner production 2017
Consume less, better or no ASF
- consumption narrative -

- Land footprint: $m^2$ per kg edible protein -

De Vries and De Boer (2010)
Consume less, no or better ASF
- consumption narrative -

METRIC

Annual consumption per person × Footprint per product

kg milk  m² per kg milk
kg pork   m² kg pork
kg cod    m² kg cod
kg potatoes m² kg potatoes
kg beans  m² kg beans
....

Underlying metric is the same as for production narrative
Consume less, no or better ASF
- consumption narrative -
Solutions
- consumption narrative -

• Become vegetarian or vegan

• Replace “red meat” by “white meat” or “fish”

Lower footprint per kg protein & kcal
Footprint studies ignore ....

• “product-packages”
  no milk without meat, no sugar without beet-pulp

• “feed-food” competition
Direct competition
Indirect competition

Agricultural land: yes
Marginal land: no
Land use ratio

Van Zanten et al. (2016; IJLCA)

Land feed

\[ \sum \text{HDP plant prod} \]

1 kg human digestible protein (HDP) from animal

HDP kg from animal
Results

<1 animal production more efficient

Conclusion: livestock production can be more efficient than crop production

……… but systems should change
How much??

- Co-products
  - 14 g protein per day
- Food-waste
  - 3 to 7 g protein per day
- Marginal land
  - 21 g protein per day

60 g protein needed
Livestock important role in global food supply
Animals are essential for food production - circular narrative -

Unarticulated value: animals value “leftover” streams

Not increasing efficiency of the animal but increasing efficiency of food system
Solutions
- circular narrative -

• Biomass at highest utility ≠ highest animal productivity

• Improve utilization of leftovers
  - breeding: animals efficiently convert leftovers
  - fungi, insects on manure, food waste
  - role of fish, algae?

• Moderate consumption of ASF
Thank you

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