

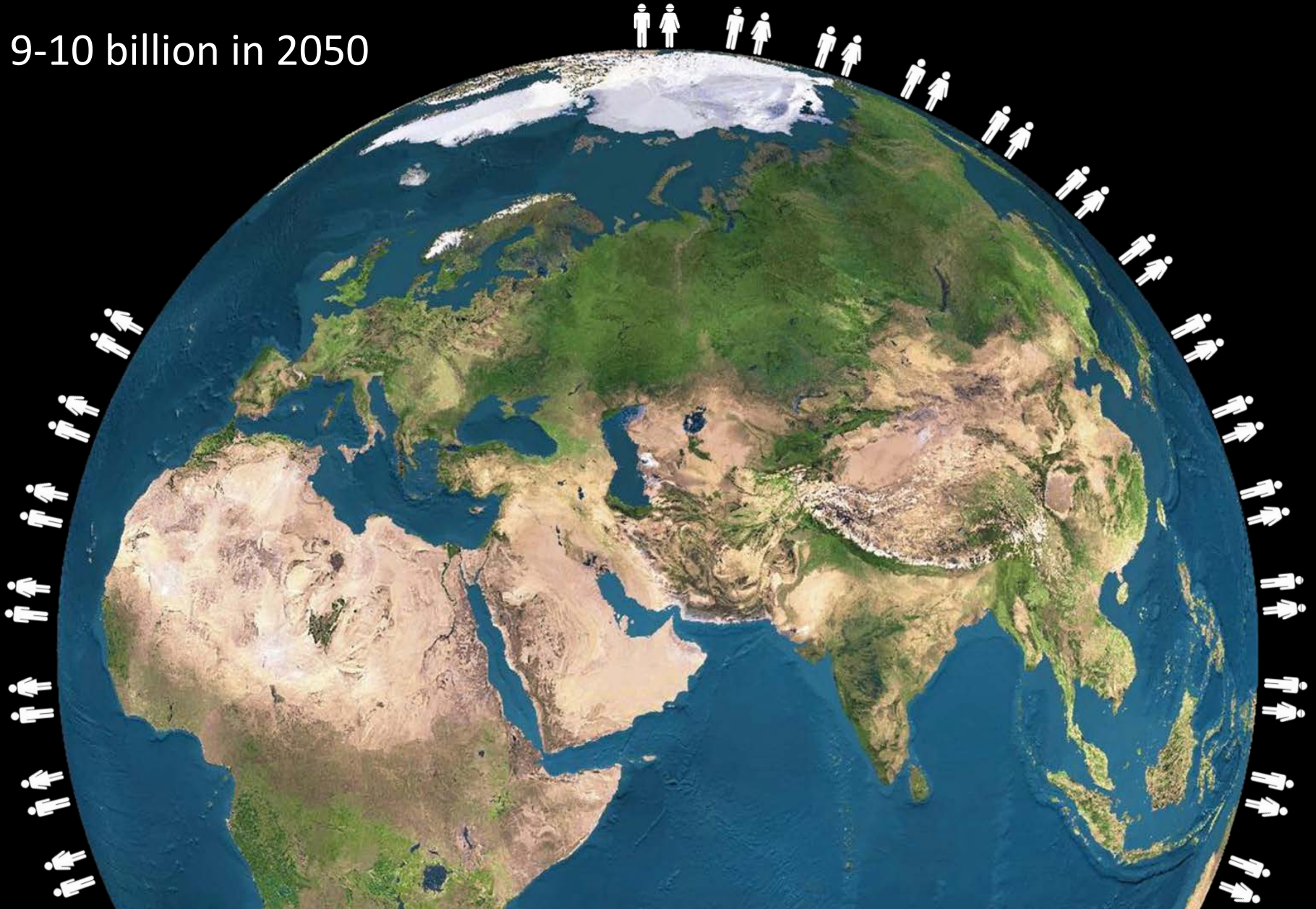
Innovation pathways for livestock

Hannah van Zanten

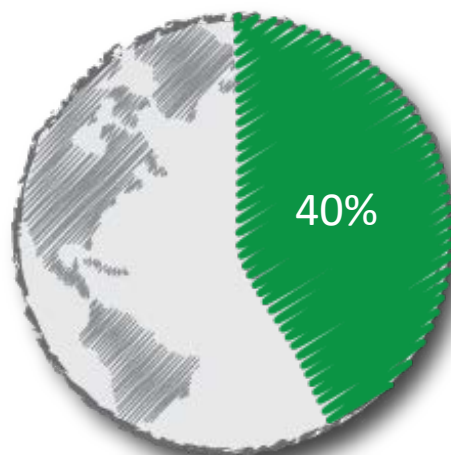


We agree on the challenge

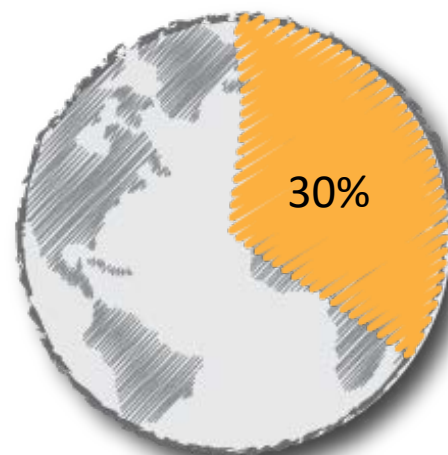
9-10 billion in 2050



Large environmental impact



World arable land

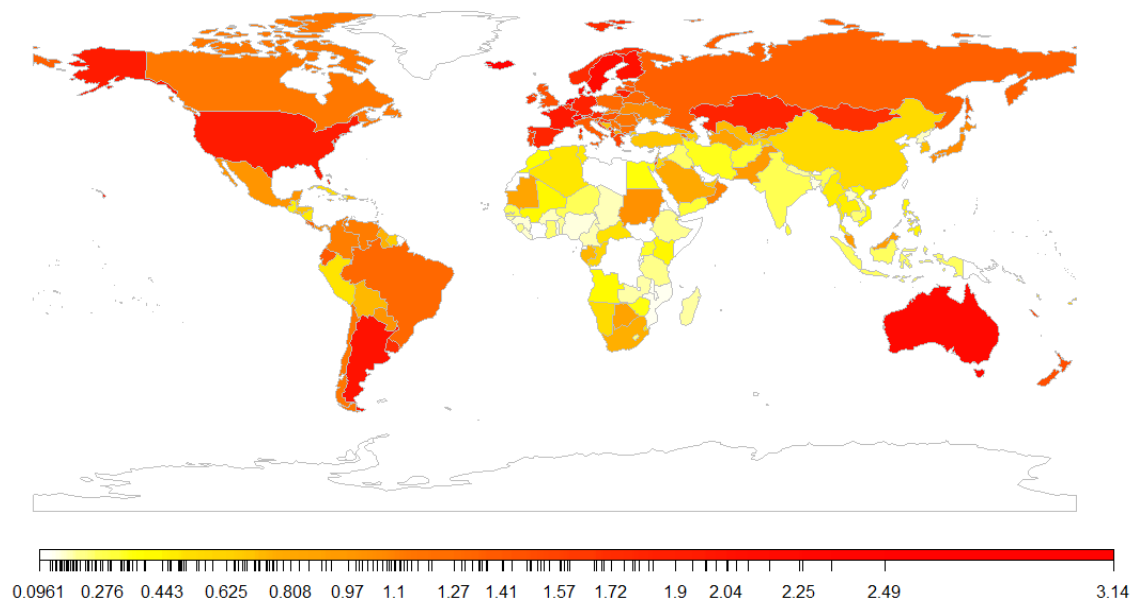


World grain production

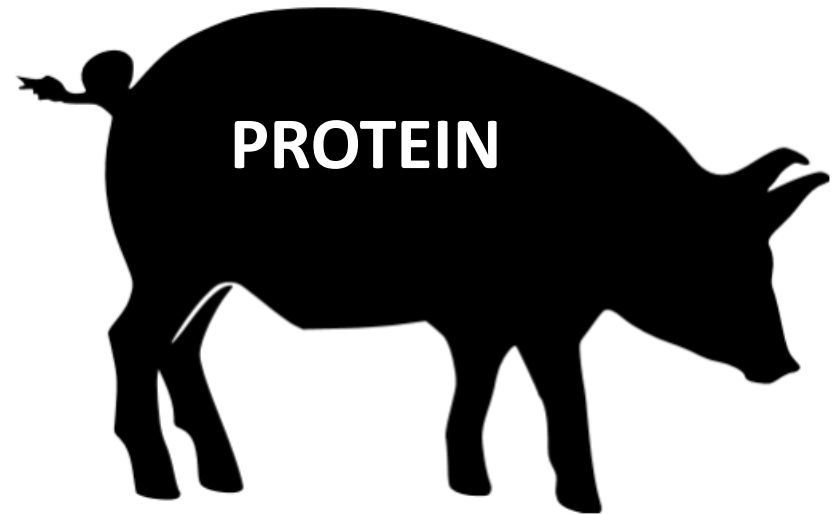
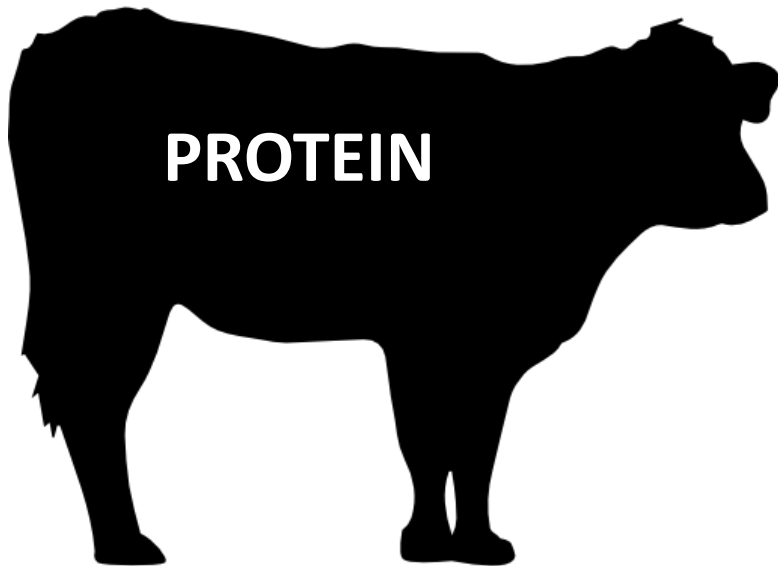
But

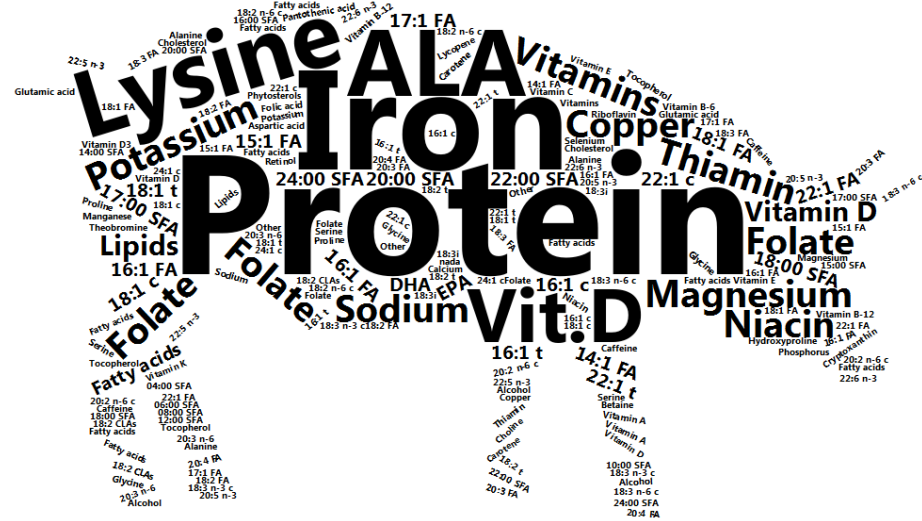
30% of the global protein intake is coming from animal source foods (ASF)

Index Animal protein / vegetal protein



Animals: an important source of protein





What role, if any, can animals play?



Different narratives

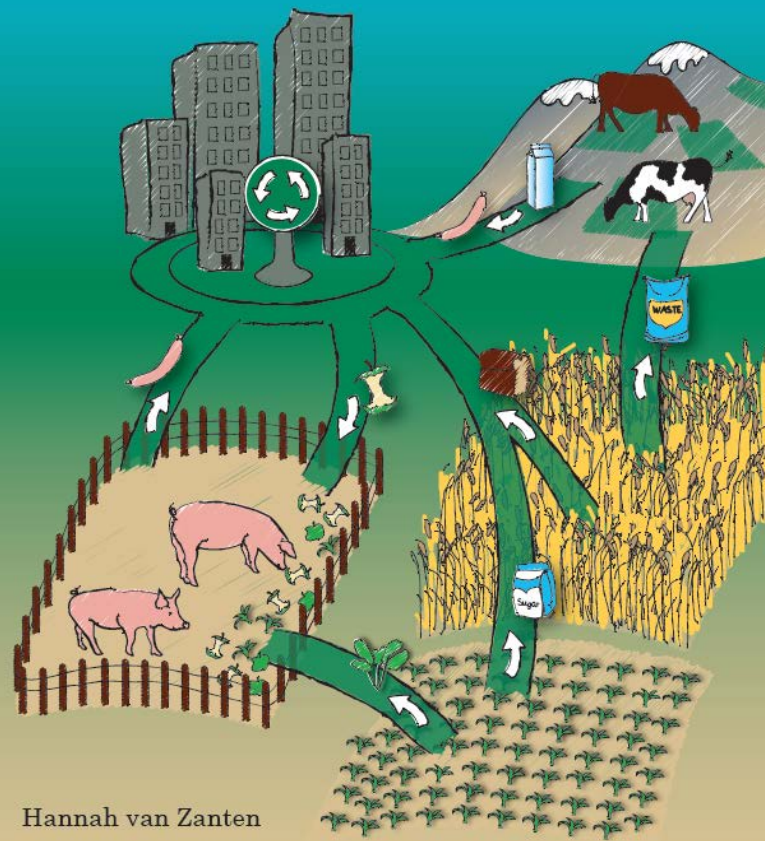
What role, if any, can animals play?

Production narrative
"Produce more with less"

Consumption narrative
"Eat less, no or better"

Circular narrative
"animals are essential for
resource-efficient food
production"

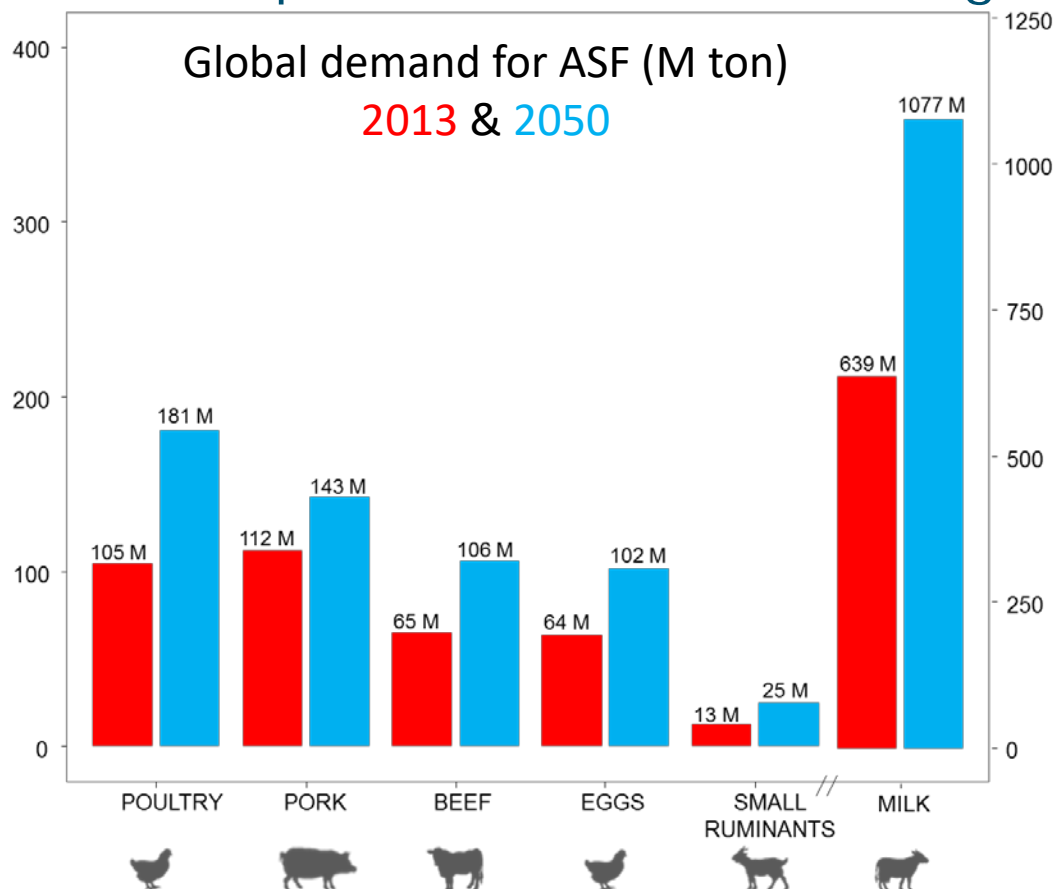
Feed sources for livestock:
Recycling towards a green planet



Produce more with less - production narrative -



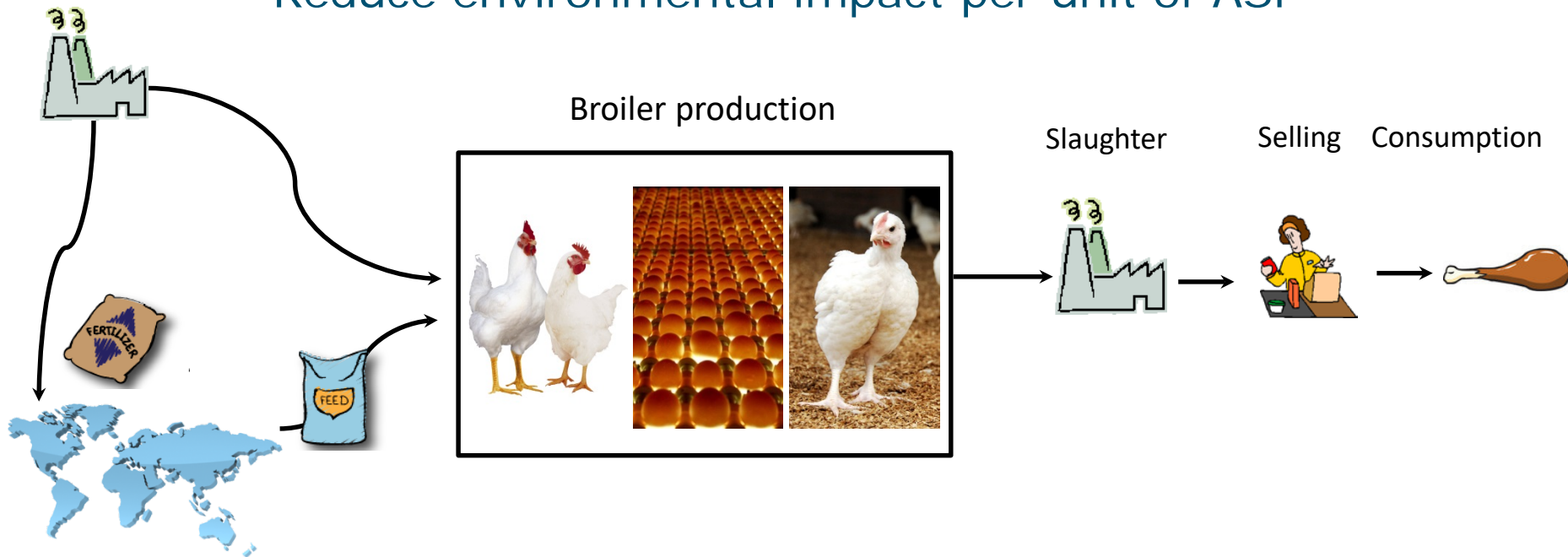
Unarticulated assumptions: we **have** to meet global demand



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



Solutions

- production narrative -

- 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**
- Feeding novel feed sources - **Journal of Cleaner production 2016**

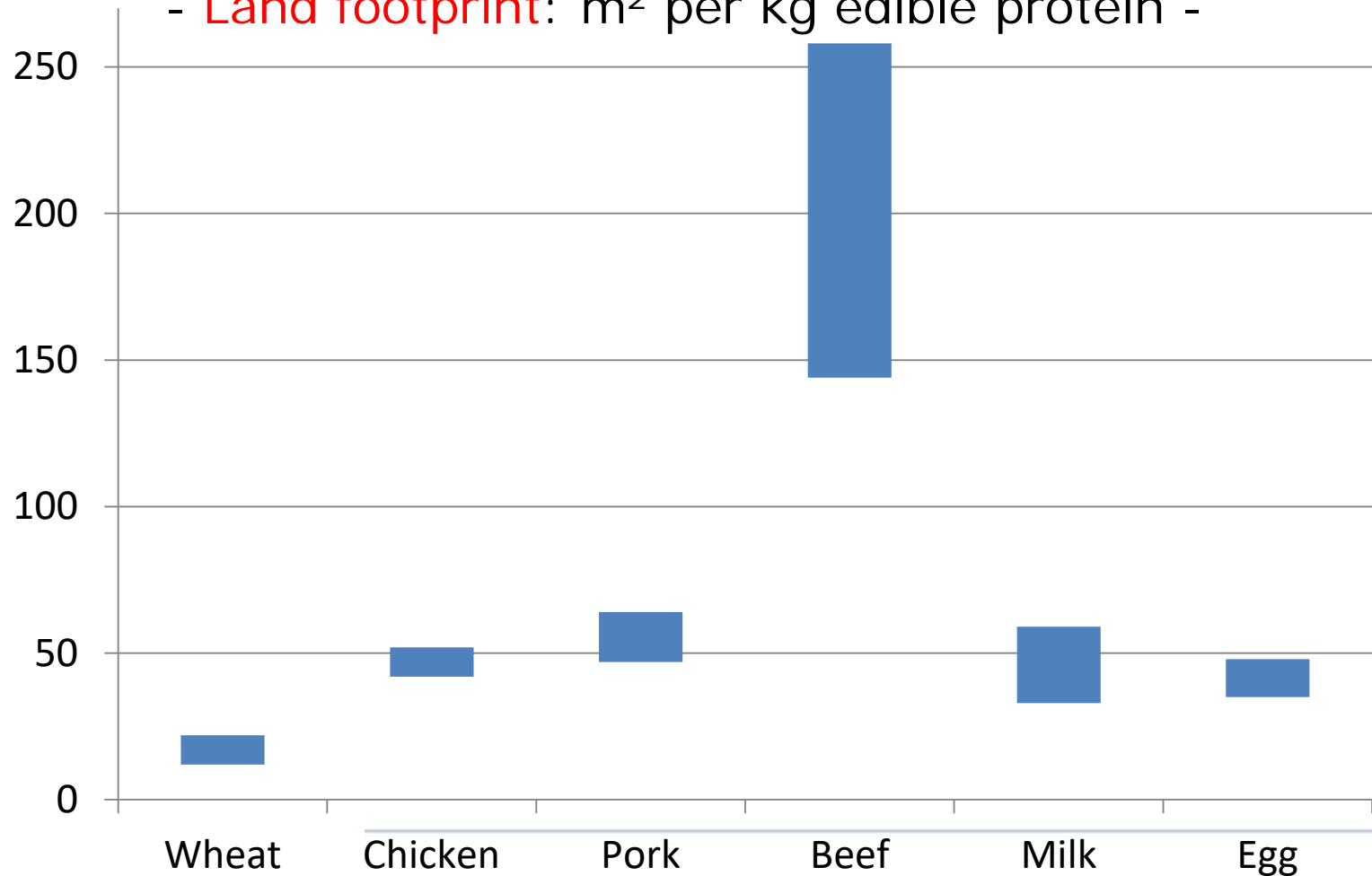
**Sustainable intensification of crop and animal
production**



Consume less, better or no

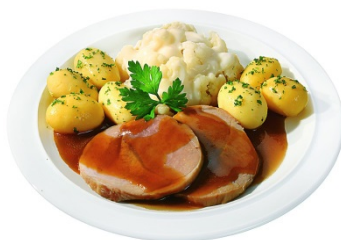
ASF - consumption narrative -

- **Land footprint:** m² per kg edible protein -



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

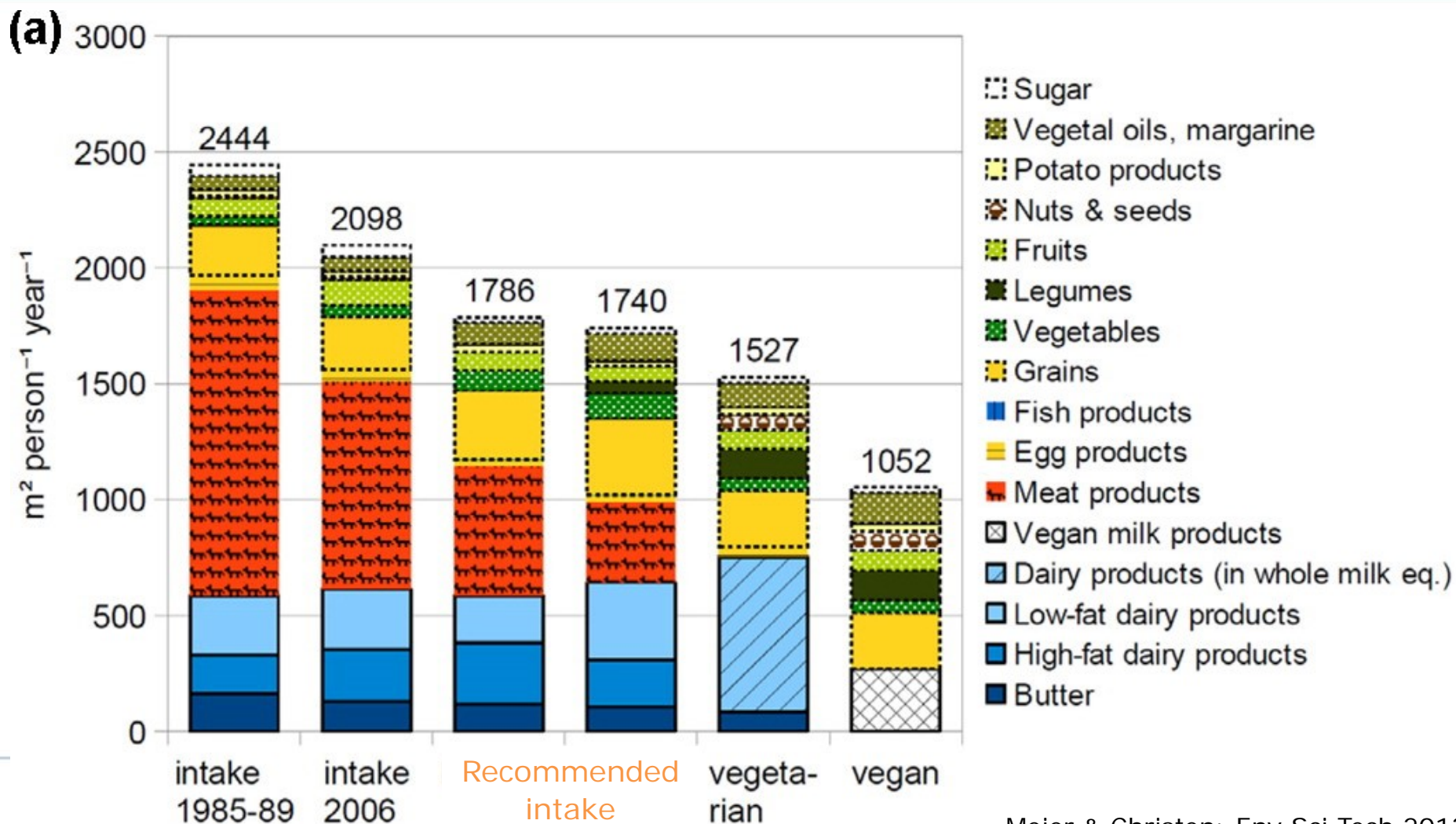
m² kg beans

....

....

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"
- Replace ASF with alternative protein sources

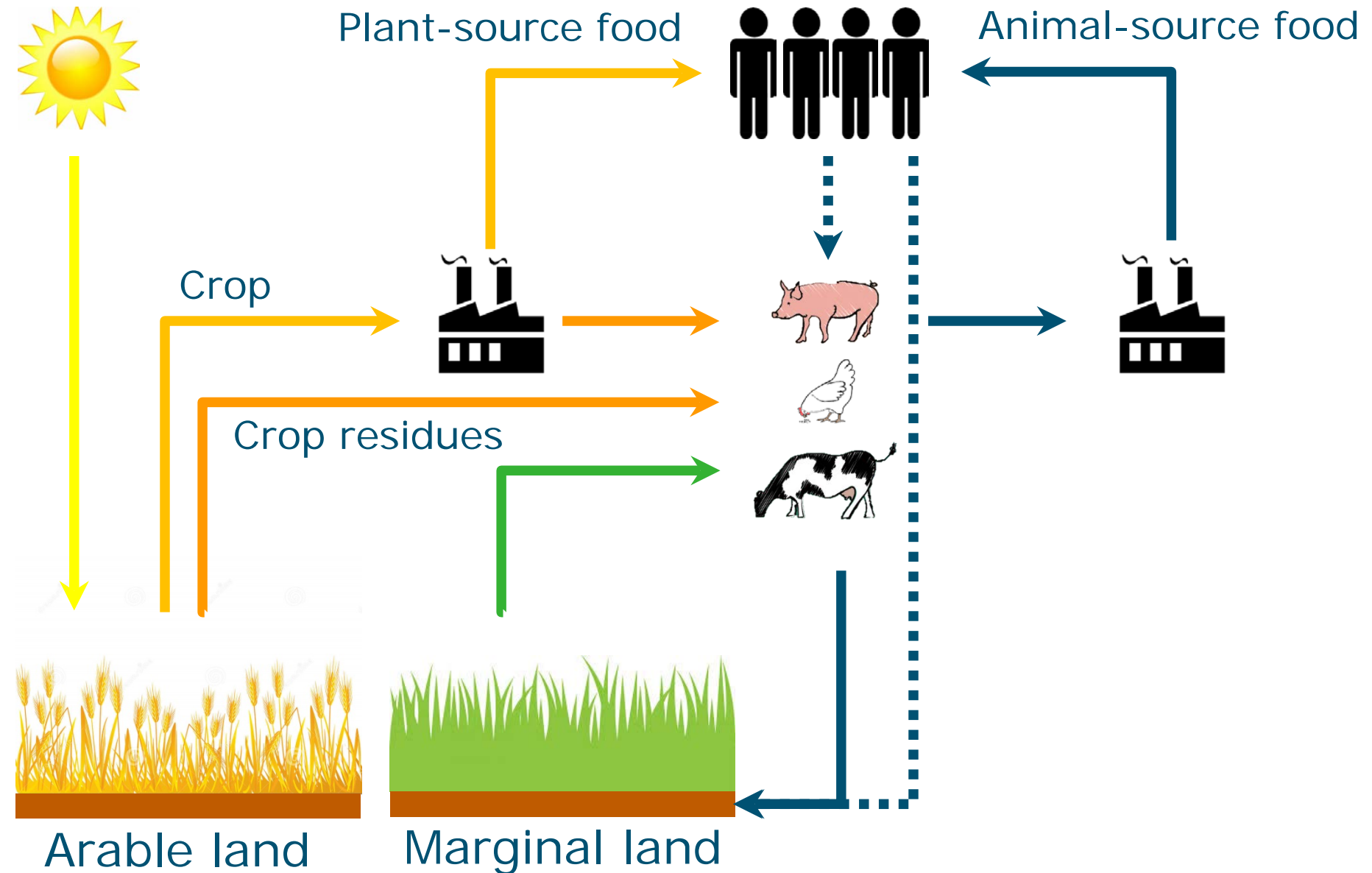
Lower footprint per kg protein & kcal



Footprint studies ignore

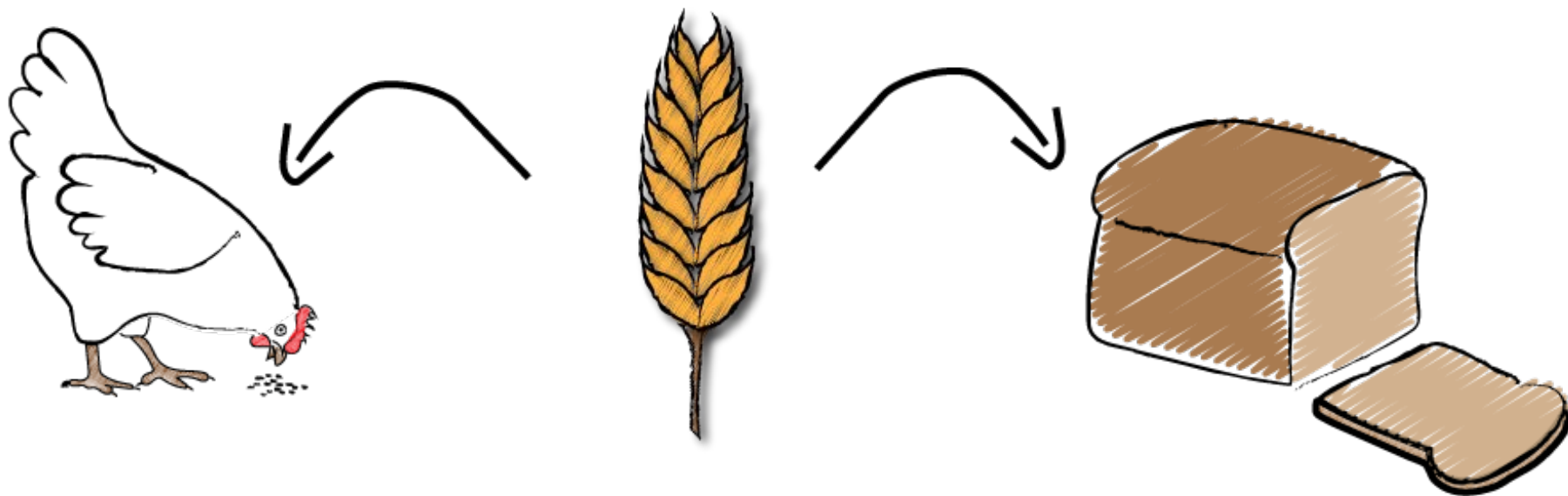
- “product-packages”
no milk without meat, no sugar without beet-pulp
- “feed-food” competition

Concept of circular narrative



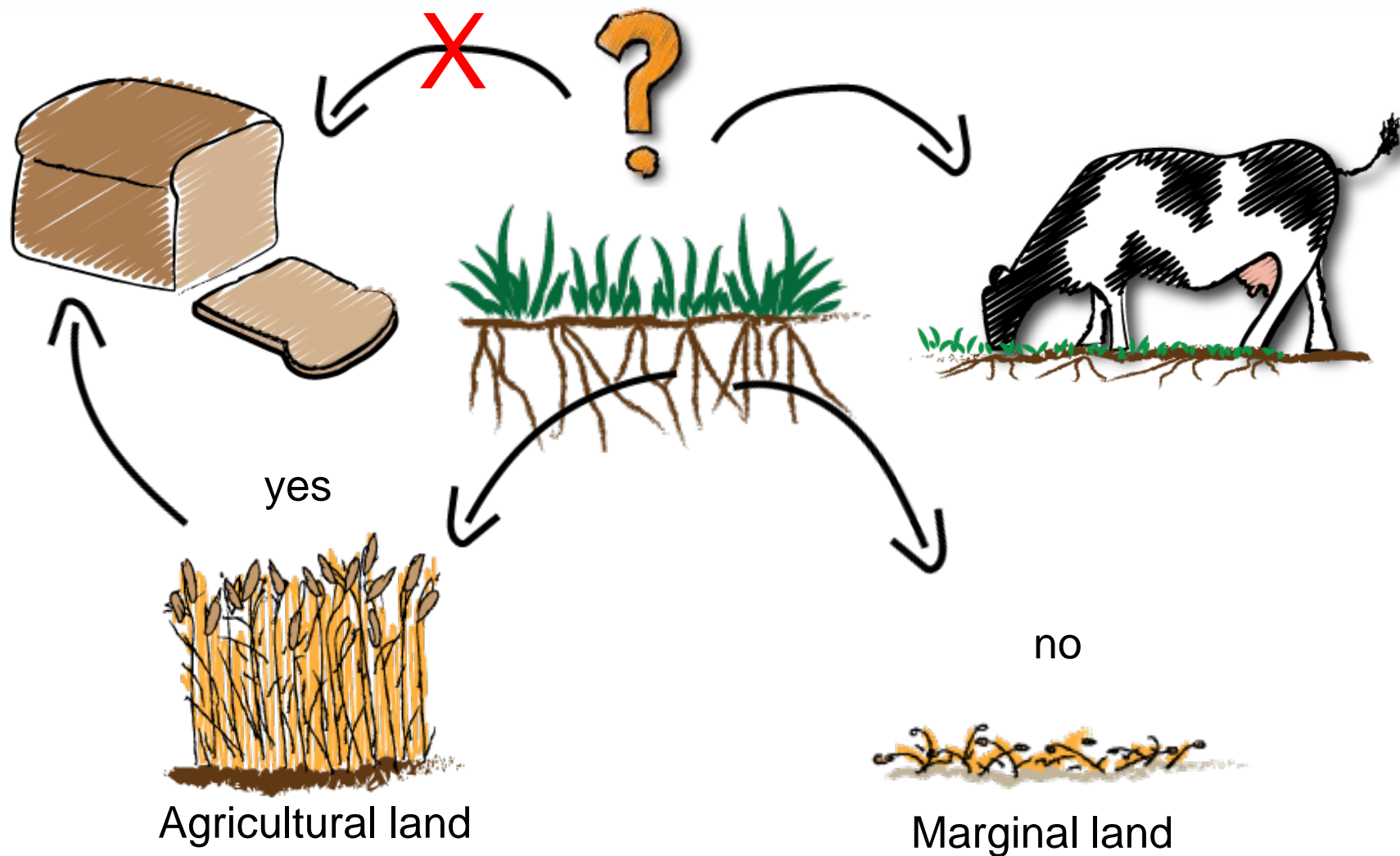
Circular pathway

Direct competition



Circular pathway

Indirect competition



Circular pathway Leftovers

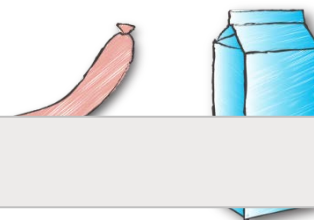
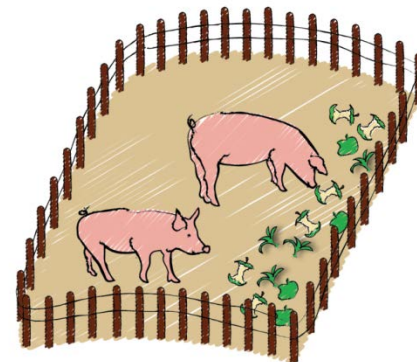
■ Co-products



■ Waste products



■ Marginal land



Avoiding feed-food competition

Circular pathway

How much?

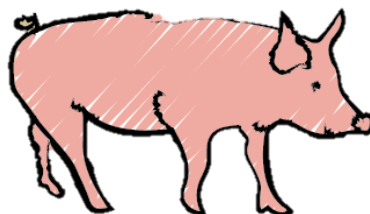
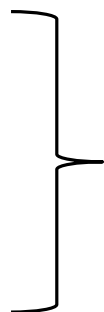
- Co-products



- Food-waste



- Marginal land



14 g protein per day



3 to 7 g protein per day

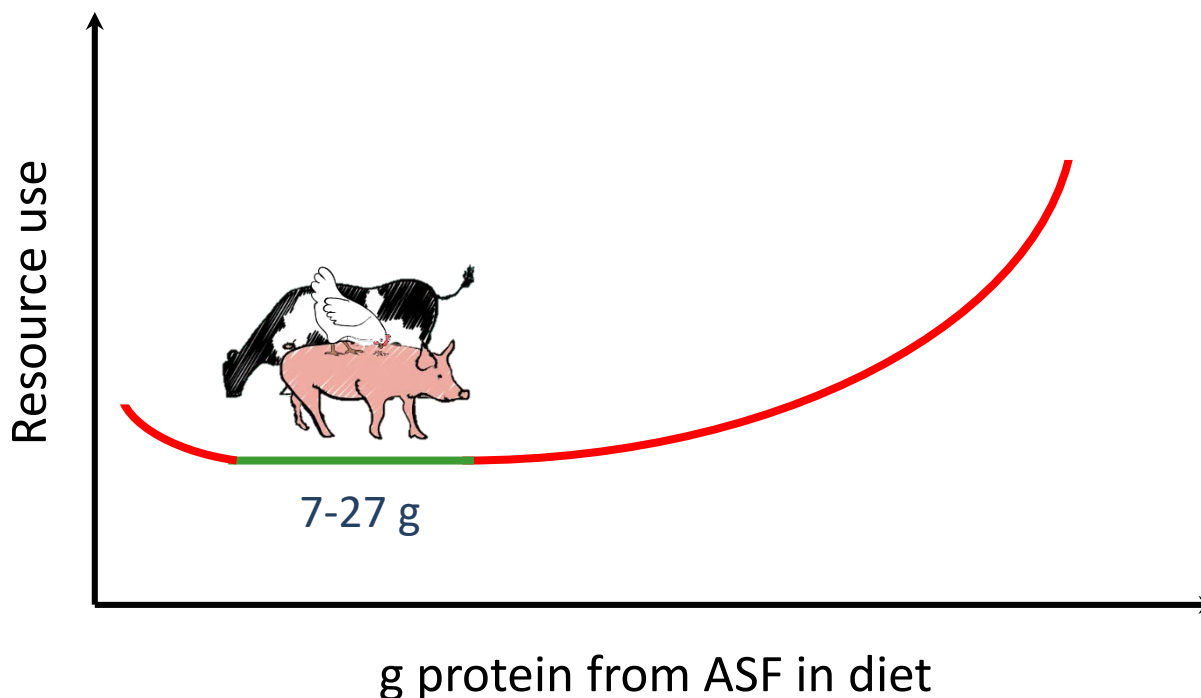
21 g protein per day

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



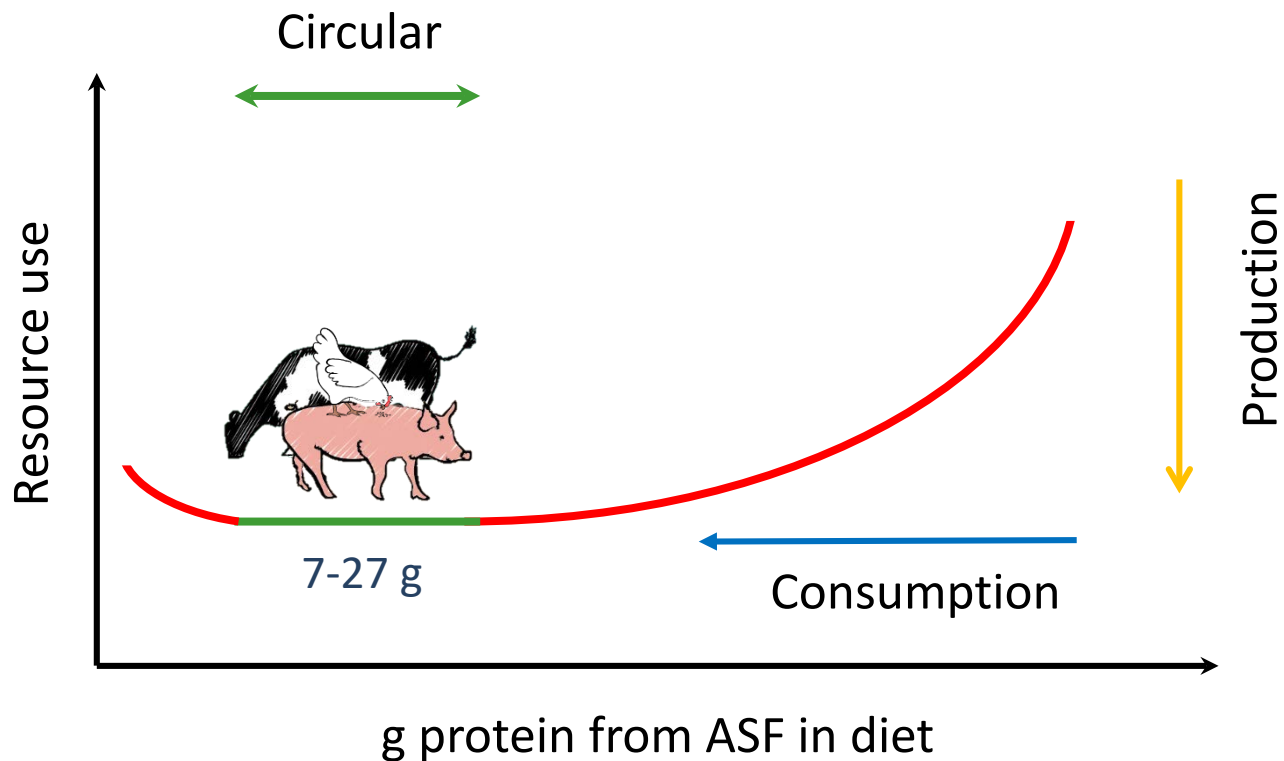
Feeding maximum amount of people
resource use or emissions

Solutions

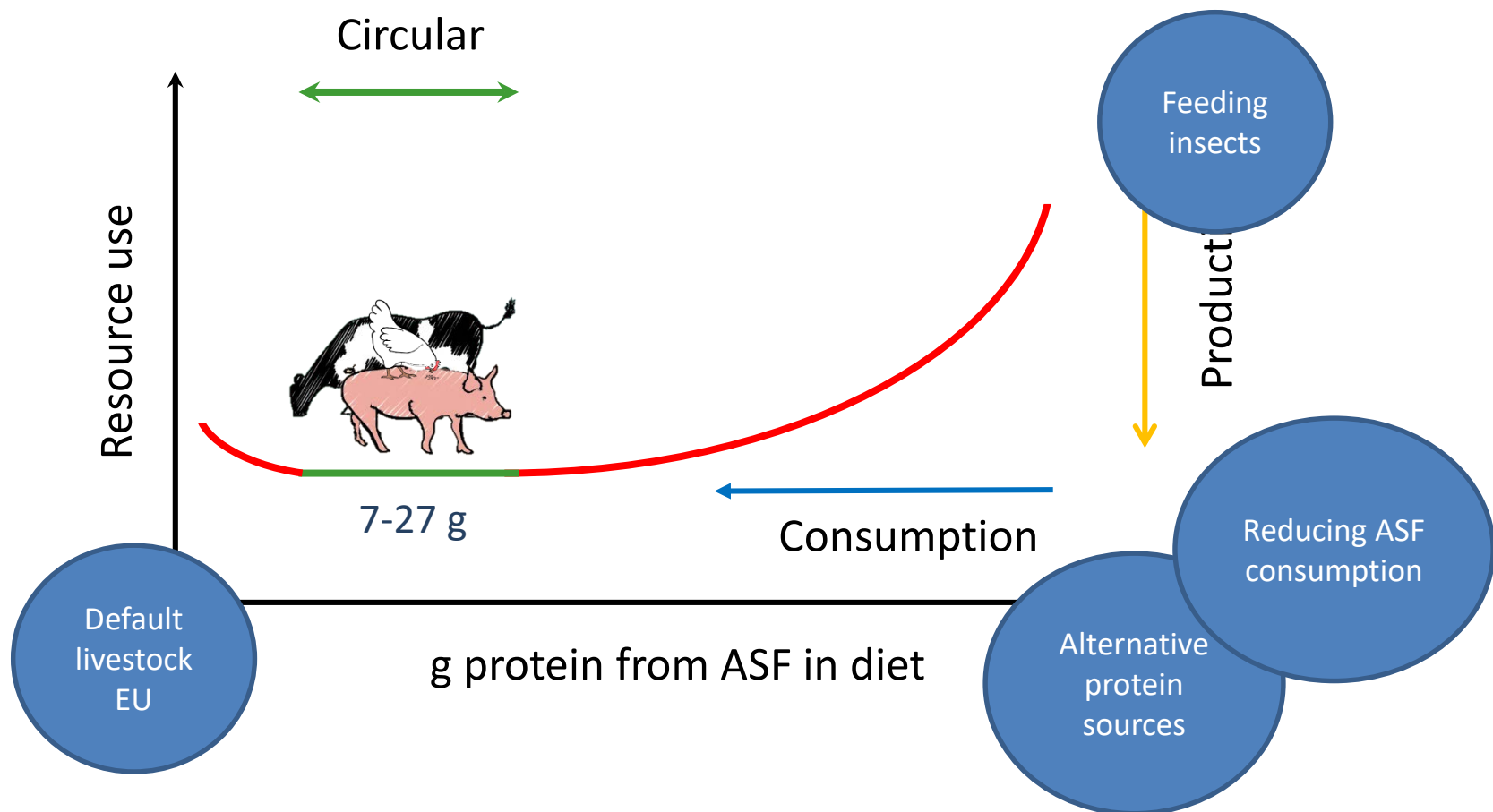
- circular narrative -

- Biomass at highest utility \neq highest animal productivity
- Improve utilization of leftovers
 - breeding: animals efficiently convert leftovers
 - fungi, insects on manure, food waste, animal meal
 - role of fish, algae?
- Value animal and human excreta as fertilizer
- Moderate consumption of ASF

Relation narratives



Research focus



Thank you

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