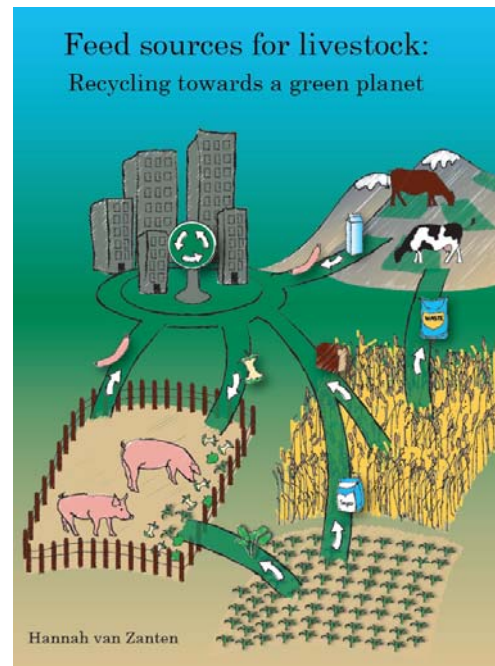


Feed sources for livestock: recycling towards a green planet

Hannah van Zanten

Animal Production Systems
group

11-5-2017



Demand for Animal Source Food

Current

2050



258 million ton —————> 455 million ton (76%)



664 million ton —————> 1077 million ton (62%)

Large environmental impact!



Feeding 'leftover' the solution?

- Co-products



- Waste products



- Marginal land



Environmental opportunity of using leftover streams as livestock feed



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Method: life cycle assessment

Input



System



Output



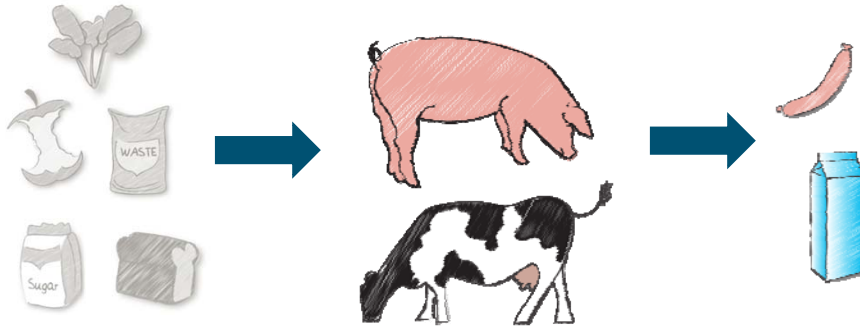
GWP
Energy use
Land use

Two methodological challenges

Input

Systeem

Output



Consequences

'feed-food'
competition

Environmental consequences of feed optimization: alternative protein sources in pig diets



Considering consequences

- Amount of leftovers is limited
- Food waste already used —→ bio-energy



- What are the consequences?
- Develop framework: Consequential LCA



Van Zanten et al. 2014
Assessing environmental consequences of using co-products in animal feed
Inter. J. of Life Cycle Assessment

Two cases: leftovers replace soybean meal

- Co-products

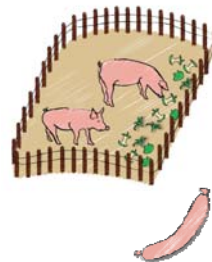


Rapeseed
meal →

- Waste products



Waste-fed
insects →



Aim




Assess environmental consequences of
feed optimization,
when RSM or waste-fed insects are included in
growing pig diets

Three feed scenario's

Nutrient content g/kg	SBM	RSM	Insects
Nett energy, MJ	9.5	9.5	9.5
Crude protein	162	160	166
Lysine (SID)	7.59	7.59	7.59
Final body weight	116.4	116.4	116.4

Ingredients	SBM	RSM	Insect
Rapeseed meal, CP <380	-	23.00	-
Soybean meal, CP<480	15.00	-	-
Larvae meal	-	-	15.00
Peas	9.36	10.00	-
Maize	30.00	30.00	30.00
Wheat	29.74	30.24	24.29
Wheat middlings	0.90	-	26.57
Barley	10.10	-	-
Sugarcane molasses	2.00	2.00	2.00
Vit. and min. premix	0.40	0.40	0.40
Phytase premix	0.65	0.65	0.65
Animal fat	-	2.09	-
Limestone	1.24	0.96	1.10
Salt	0.37	0.29	0.26
Monocalcium phosphate	0.11	0.01	-
Sodium bicarbonaat	-	0.09	0.15
L-Lysine HCL	0.10	0.22	0.03
L-Tryptophan	-	0.01	-
L-Threonine	-	0.02	-
DL-Methionine	0.03	0.01	-

Assess environmental impact

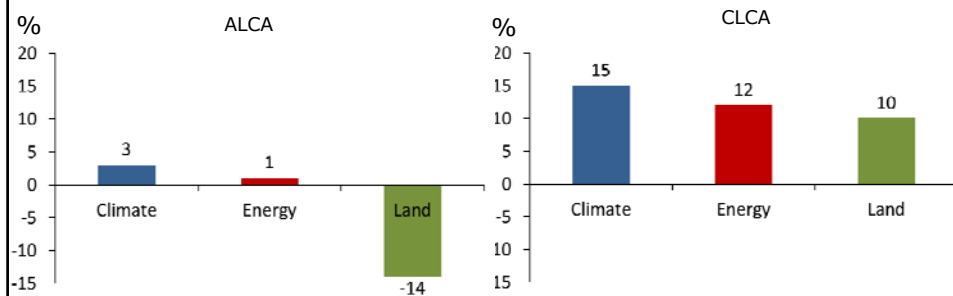
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ALCA: sums up impact

CLCA: 1) identify co-products
2) identify consequences

Results

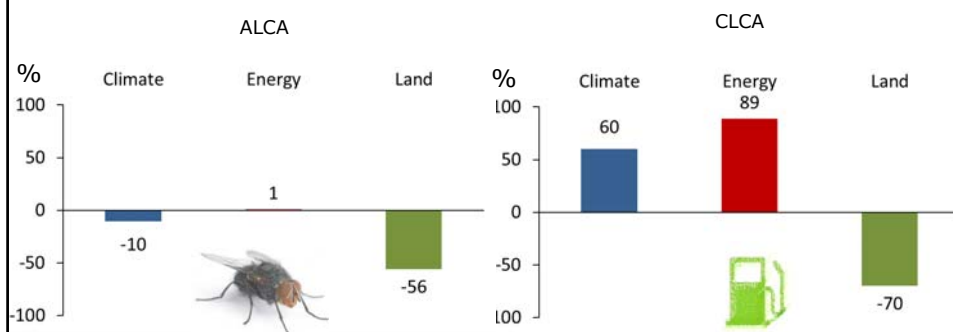
Environmental impact of replacing SBM with RSM in pig diets



Conclusion: - large methodological differences
- no environmental improvement

Results

Environmental impact of replacing SBM with waste-fed insects

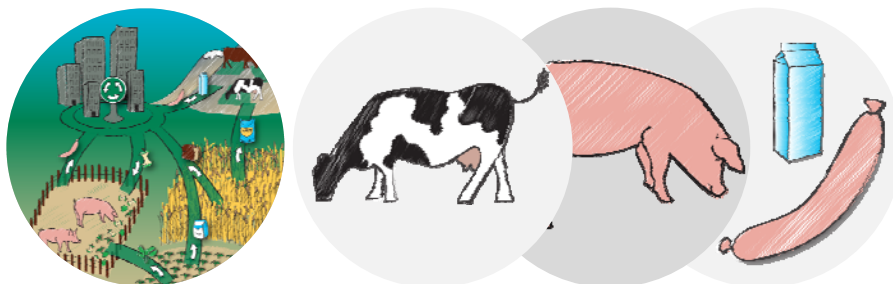


Conclusion: - large methodological differences
- environmental improvement?

Recommendation

- Status quo of feed —————> use ALCA method
- Implementing innovation —————> use CLCA method

How much animal-source food can we produce while
avoiding feed-food competition?



Feeding 'leftover' the solution?

- Co-products



- Waste products



- Marginal land



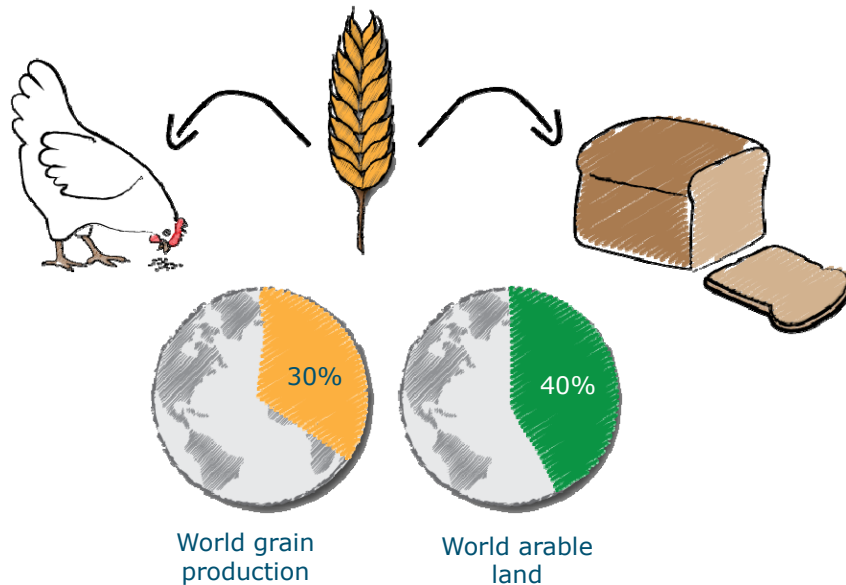
Avoiding feed-food competition



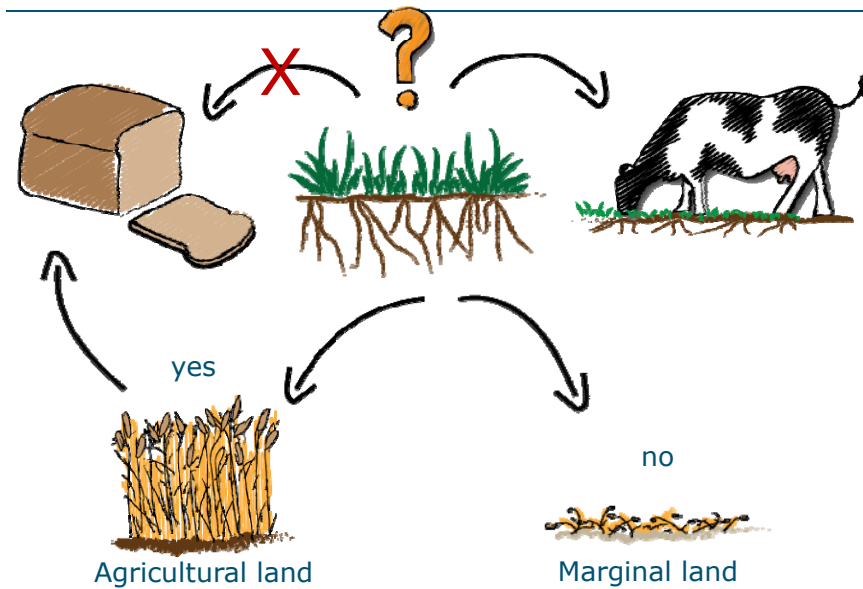
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Direct competition



Indirect competition



Feed-food competition

Research question 1:

Are there livestock systems without feed-food competition?

- no method

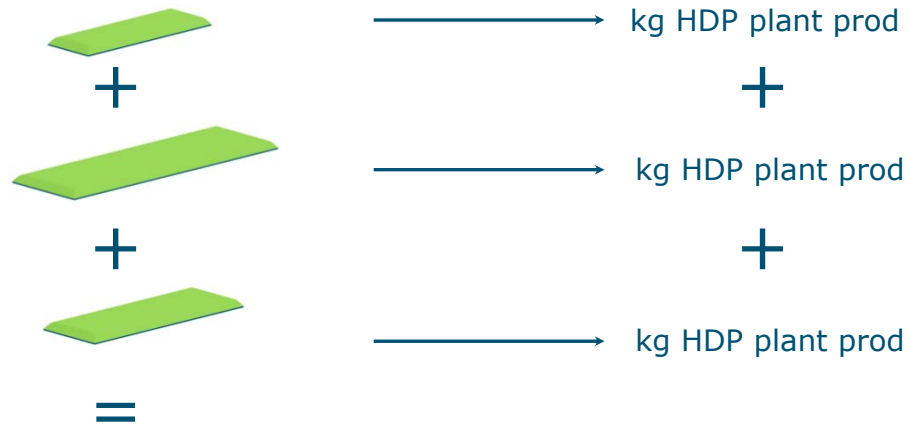
Research question 2:

How much animal source food can we eat while avoiding feed-food competition?

Land use ratio

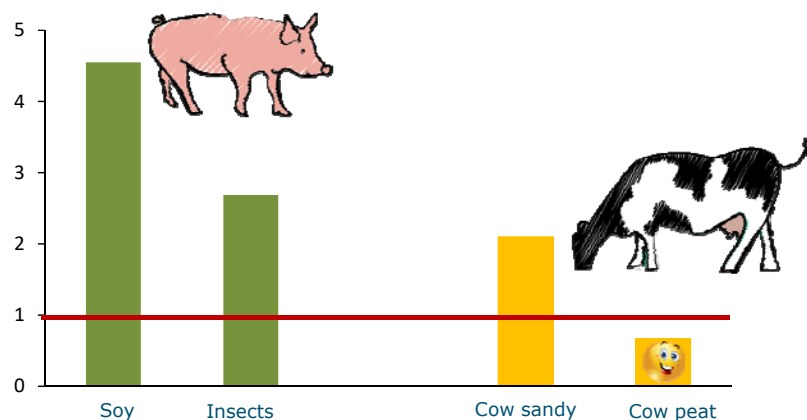
Van Zanten et al. (2016; IJLCA)

Land feed



Results

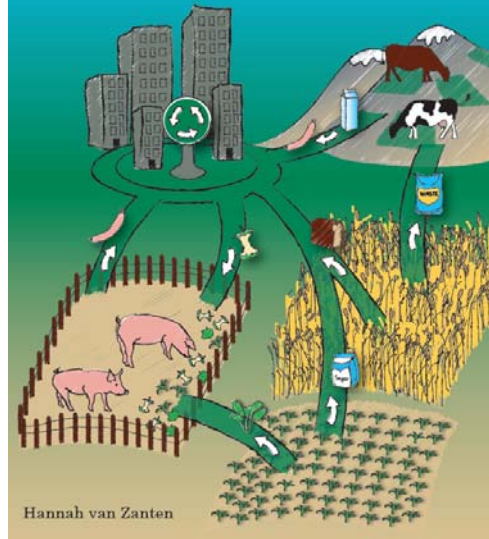
<1 animal production more efficient



Conclusion: livestock production can be more efficient than crop production
..... but systems should change

How
Much?

Feed sources for livestock:
Recycling towards a green planet



How
much?

How much??

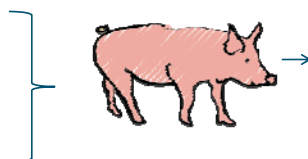
■ Co-products



■ Food-waste



■ Marginal land



14 g protein per day

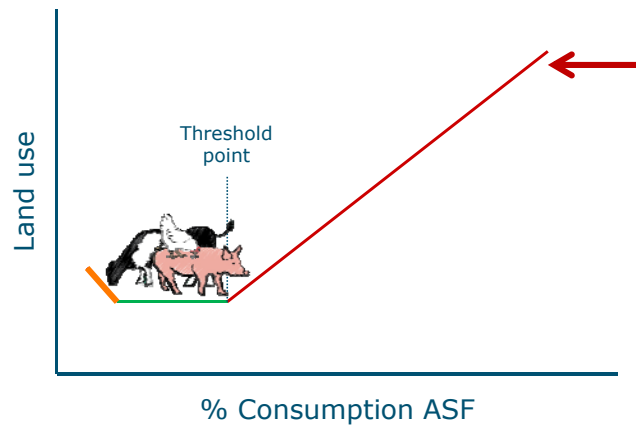


3 to 7 g protein per day

21 g protein per day

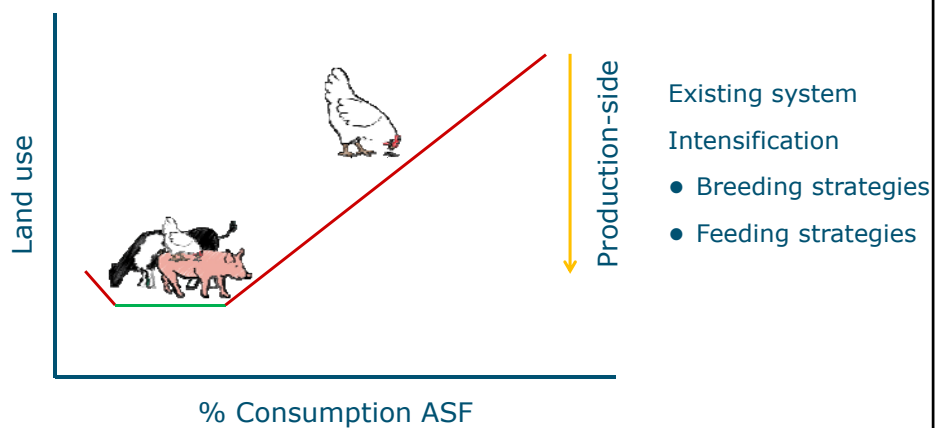
60 g protein needed
Livestock important role in global food supply

Hockeystick figure

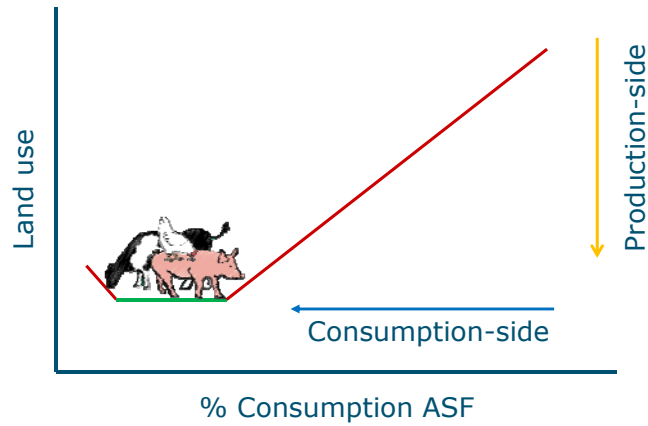


Consuming small amount of animal source food
most optimal from a land use perspective

Hockeystick figure

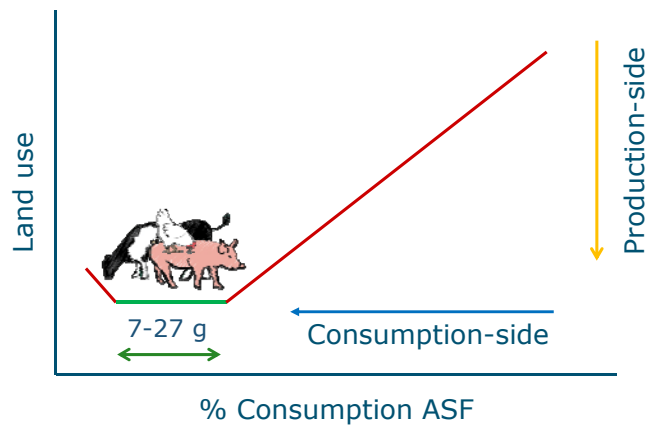


Hockeystick figure

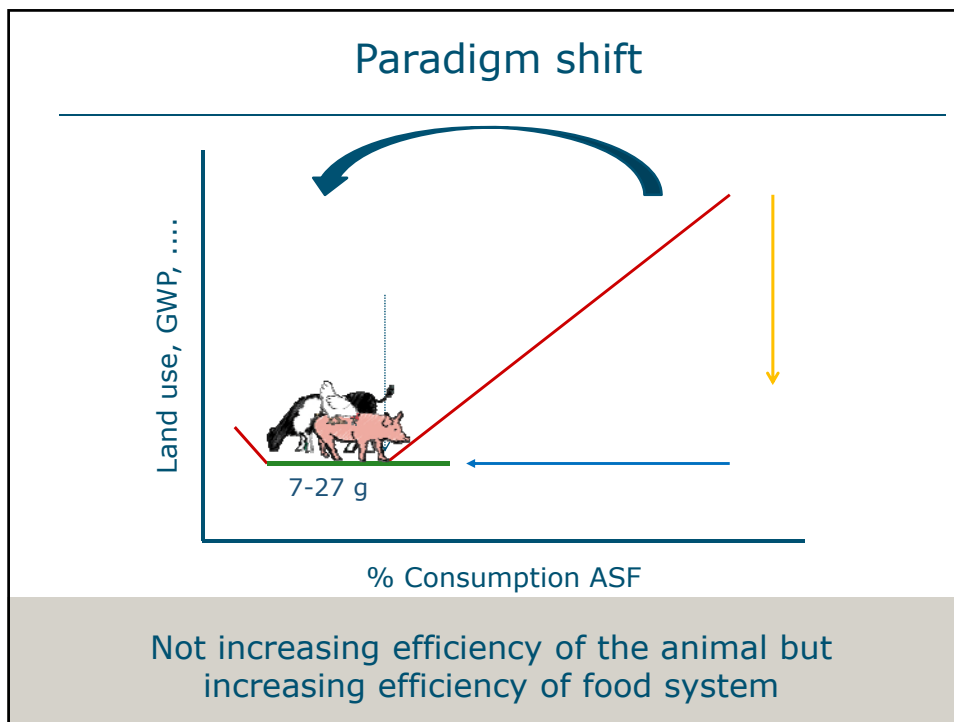


- Replace ruminant meat with monogastric meat
- Alternative protein sources
- Reduce consumption of animal source food

Hockeystick figure




- Crop-residues
- Biomass marginal land
- Co-products
- Food waste



Future research

The role of animal source food in sustainable human diets

- Extending nutrients – not only protein
- Finding the optimal use of leftover streams
 - animal species and productivity levels
 - the role marginal lands can play in food security
- Role of alternative protein sources or new technologies

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Thank you

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