The sustainability dilemma in organic livestock: a discussion input

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Introduction

• Main sustainability-issues of global livestock husbandry:
  • Greenhouse-gas emissions (enteric methane)
  • N-fixation -> translocation -> N-eutrophication
  • Land-use for feed production, deforestation,
  • Overgrazing -> erosion -> desertification / abandonment of grasslands

• Animal «welfare»: do we give livestock a decent role and awareness?

• BUT: can we realise nutritional sustainability and animal welfare in the same systems? Or are we in a dilemma here?
Methane emissions from ruminant livestock

**CH$_4$-Emissions in the EU (2007)** 414’806 Gg CO$_2$-equivalents (8.3% of total GG)

- From agriculture: 201’409 Gg CO$_2$-equivalents (50%)
  - 71.9% from livestock digestion
  - > 80% from cattle
  - 2.7% of European GG Emissions are CH$_4$ from Cattle
  - Cattle: 33% of European CH$_4$ Emissions

- 26.9% slurry
- 0.2% burning
- 1.2% rice

(soil as CH$_4$-sink -0.3%)

(UNFCCC 2009; www.eea.europa.eu)
Introduction: recalling the problem

Fig. 1. Potential global environmental costs of livestock 2000-2050. Estimated greenhouse gas emissions (Gt CO$_2$-e) (Left), biomass appropriation (Gt C) (Center), and reactive nitrogen mobilization (Mt N$_2$) (Right) associated with the global livestock sector in 2000 versus 2050 under FAO production estimates (FAO projections scenario) as well as three alternative scenarios (substitution, livestock, and soy protein) relative to proposed sustainability boundary conditions for human activities in aggregate.

Nathan Pelletier$^1$ and Peter Tyedmers
PNAS | October 26, 2010 | vol. 107 | no. 43 | 18371–18374

Eutrophication
Acidification
Biological simplification
Biodiversity loss
Atmospheric changes
Introduction: recalling the problem
Introduction: recalling the problem
Soybean requirements

Development of soybean and meat production, 1961-2020

Source: KPMG, 2013

Source: FAOSTAT / FAPRI
Self-sufficiency of organic concentrates in Europe

Früh et al., 2015: ICOPP / FiBL
World-wide agricultural land use
(in billion ha and percentage)

- Permanent grassland: 3.4 billion ha (66%)
- Arable land for feedstuff (livestock): 1.27 billion ha (24%)
- Arable land for direct human consumption: 0.39 billion ha (8%)
- Permanent crops for direct human consumption: 0.13 billion ha (2%)

FAOSTAT, 2011
Global animal feed consumption and protein production

Livestock: On our plates or eating at our table? A new analysis of the feed/food debate

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Global animal feed consumption

6.0 BILLION TONES DRY MATTER

Grass & leaves 46%
Grains 13%
Crop residues 19%
Oil seed cakes 5%
By-products 5%
Other non-edible 3%
Fodder crops 8%
Other edible 1%

Fodder crops: grain and legume silage, fodder beets
Crop residues: straws and stover, sugar cane tops, banana stems
By-products: brans, corn gluten meal and feed, molasses, beetroot pulp and spent breweries, distilleries, biofuel grains
Other non-edible: second grade cereals, swill, fish meal, synthetic amino acids, lime
Other edible: cassava pellets, beans and soy beans, rapeseed and soy oil

Fig. 2. Global livestock feed ration composition (source: GLEAM 2.0).
Global animal feed consumption and protein production

<table>
<thead>
<tr>
<th>Feed sources</th>
<th>Grassland</th>
<th>Arable crops, potentially edible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs (mio ha)</td>
<td>1945</td>
<td>170</td>
</tr>
<tr>
<td>Outputs (mio t protein)</td>
<td>36</td>
<td>320</td>
</tr>
</tbody>
</table>
Tibetan Plateau
Inner Mongolia

© Florian Leiber
Kyrgyzstan (Tian-shan mountains)
North-west Russia
North-west Russia
And now we add animal welfare...
And now we add animal welfare...
... we want land for our chicks
And now we add animal welfare…
… we want a life for their brothers
And now we add animal welfare…
… we want happy pigs and rare breeds
And now we add animal welfare…
… and we sell them all

We sell a healthy, well-being AND sustainable animal. That is what people expect buying organic eggs.

Do we cheat them?

We have to ask the Lenin question:

What shall we do?
What shall we do?

Steps to sustainable livestock

With improved breeding and cultivation, ruminant animals can yield food that is better for people and the planet, say Mark C. Eisler, Michael R. F. Lee and colleagues.
What shall we do?

8 strategies of Eisler et al

- Feed animals less human food
- Raise regionally appropriate animals
- Keep animals healthy
- Adopt smart supplements
- Eat quality, not quantity (eat less meat!)
- Tailor practices to local culture
- Track costs and benefits
- Study best practice

Does this paper ignore the stated dilemma?

No.

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What shall we say?

EAT LESS MEAT!

Would we dare to say this to our customers? «We are grateful to sell you a chicken. But only once a month. The other week you may have a small and fine steak.»
• Feed animals less human food
• Raise regionally appropriate animals
• Keep animals healthy
• Adopt smart supplements
• Eat quality, not quantity (eat less meat!)
• Tailor practices to local culture
• Track costs and benefits
• Study best practice

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• Eisler et al. are completely right:
• we need to restrict animal nutrition to non-edible resources
• we need robust breeds
• we proved that we have systems in which these animals can stay healthy
• we can afford all this in respect to local cultures
• IF WE REDUCE THE DEMANDS
Nutritional inefficiency is a fact of animal being. But not a disaster, if we are fine with the fine pieces.
The true disaster is, when we treat animals as efficient machines. The true disaster is if the organic movement keeps running in that wheel, just because it is also confessed to the old productionist paradigm «the more the better». 
SCHADER ET AL., 2015, J Royal Soc Interface

Impacts of feeding less food-competing feedstuffs to livestock on global food system sustainability
The FiBL “Feed no Food”-Project

– 52 organic dairy farms included in an assessment and extension programme.
– Target: reducing the concentrate inputs.
– Timeframe: 6 years.
– Twice yearly extension meetings on the individual farms and data collection (feeding, performance and health indicators)
concentrates per cow and year

Daily milk yield

Calving Interval

Veterinary treatments total
Comparison of low- versus zero concentrate feeding of dairy cows on an organic dairy farm (Leiber et al., 2015, J Dairy Res)

Organic dairy farm near Berne Switzerland

Swiss Fleckvieh (average performance 7000kg milk / a)
Animals and experimental schedule

Organic dairy farm near Berne Switzerland
Swiss Fleckvieh (average performance 7000kg milk / a)
Stanchion barn with separated feeding troughs

2 groups of 15 cows each
- «Prot+»: 2.4 kg individually fed concentrates / cow / day
- «Prot-»: 0 kg individually fed concentrates
- Excluded animals: 3 in Prot+, 4 in Prot-

2 experimental periods (21 days each)
- Period 1: TMR1 ad libitum for all cows
- Period 2: TMR2 ad libitum for all cows; 6.00 a.m.- 8.00 a.m. hay ad libitum for all cows
Results: protein efficiency

Protein efficiency in dairy cows fed different levels of protein concentrates

![Bar chart showing protein efficiency in dairy cows fed different levels of protein concentrates. The chart compares milk protein to ingested CP and milk protein to apparent digested CP. The bars are labeled Prot+ and Prot-.]
Ongoing project: improving utilization of protein excess from grasslands

-> increasing utilization of excess protein by offering tannin-rich forage supplements.
Ongoing project: improving utilization of protein excess from grasslands

2 groups of dairy goats (n=24)
Treatments:
1: sainfoin (tannin rich)
2: Alfalfa
Ongoing project: intake modification by feed diversification
Ongoing project: intake modification by feed diversification

Figure 4 | Durées d’alimentation [minutes/h] dans le groupe Prot+ pendant les jours 2–4 des semaines de collecte 1 et 2. Semaine 1: alimentation à base de RTM, semaine 2: alimentation à base de RTM modifiée et distribution séparée de regain le matin. *
*: p < 0,05; **: p < 0,01; ***: p < 0,001.
Global animal feed consumption and protein production

Feed sources

Grassland

Arable crops, potentially edible

Inputs (mio ha)

1945

320

170

Edible stuff

240

250

Outputs (mio t protein)

36

38

Ruminants

Poultry / Porc

How to act?

Increase efficiency

Decrease use

Control input sources

Develop forage systems

Implement grazing management

Change genotype policy

Restrict

Replace

Increase self-sufficiency
Conclusions

- as long as we measure sustainability in terms of direct nutrient efficiency, organic livestock systems will be under pressure
- this is the more true, if we reduce efficiency in order to achieve high welfare standards
- the apparent dilemma can be overcome by reducing the productivity demands from organic livestock systems
- why don’t we value and respect meat like wine?
- it is our responsibility not to sell cheap shit!

Thank you for your time and patience!