A comparison of human edible feed conversion efficiency between organically and conventionally managed livestock

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Introduction

• Livestock production: feed demand → land resources
• Reduce net food supply
• Some methodological approaches to identify feed & food efficiency
  • Land use efficiency
  • Human edible feed efficiency
  • …
• Organic livestock products: improved efficiency?
Method: Human edible feed conversion efficiency (Ertl et al. 2015)

\[
\text{heFC (protein/energy)} = \frac{\text{human edible protein / energy in product}}{\text{human edible protein / energy in feed}}
\]


The net contribution of dairy production to human food supply: The case of Austrian dairy farms

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„Absolute feed“ vs. „Human edible feed“

- **Absolute feed:**
  - Roughage: fresh grass, silage, hay
  - Cereal grains of low quality
  - By-products from bioenergy- or plant oil production
  - By-products from mills, breweries, dairies or sugar-industry
  - Kitchen leftovers
  - ...

- **Human edible feed:**
  - Cereal grains, legume grains (of high quality)
  - Plant oils
  - ...
Material: Comparison of...

...22 organic dairy farms
...27 organic beef farms
...11 organic (fattening) pig farms

→ with Austrian averages (dominated by conventional farms; Ertl et al. 2016)

**Hypotheses:**

1. Organic farms: higher heFCE values than national average
2. Organic beef farms: positive net contribution to human food supply
Results: Human edible feed conversion efficiencies (heFCEs)

heFCE-protein

heFCE-energy

Milk
Beef
Pork

Austrian average
Organic farms
Relevance of feeds for the net food supply – example of organic pigs?

- Wheat/Triticale
- Faba bean
- Corn
- Barley
- Oats
- Soy cake
- Soybean
- Peas
- Rye
Discussion: Extended system boundaries → include milk from suckler cows as potential human food

If suckler cows’ milk from the rearing phase is included as a potentially human edible product...

However, suckler cows’ milk is no marketable product (no milking or milk transport infrastructure,...)
Results & Discussion

✓ Both hypothesis confirmed
   1. Increased efficiency heFCEs for organic products
      • $heFCE_{protein}$ organic milk = factor 3.7 * $heFCE_{protein}$ conventional milk
      • $heFCE_{energy}$ organic pork = factor 1.3 * $heFCE_{energy}$ conventional pork
      • Organic beef: factors of 7.2 – 11.4 for comparison with conventional bull fattening
   2. Organic beef shows a positive net contribution to human food if only fattening period is considered (i.e. without consideration of suckler cows’ milk)

• Reason: low use of concentrates $\rightarrow$ high use of absolute feeds

• Results for organic farms: not significantly different from Austrian average $\rightarrow$ high variability (esp. for milk and beef)
Conclusions, limitations and outlook

- Large differences between farms: relevance of indicators for net food supply in sustainability assessments!
- Advantage of low input – moderate output farms, e.g. organic PS
- heFCE-method not (easily) applicable for a life cycle approach with extended system boundaries
- heFCE-method does not include efficiency of feed cultivation / land use

→ Advantages for organic livestock products regarding land use efficiency?? → further research needed!
Thank you for your attention!

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