Analysis of the net food production of different livestock categories in Austria

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Background

- **Worldwide trends:**
  - Population growth
  - Consumption of animal source foods ↑
  - => Crop demands nearly double (2005–2050)

- Conversion efficiency of livestock systems ~10:1

- Need to increase net food production
Measuring net food production

Animal production system

Quantity changes?

One parameter

Quality changes?
Materials and Methods (I)

- **Quantity changes:**
  
  Human-edible feed conversion efficiency (heFCE)
  
  \[
  \text{heFCE} = \frac{\text{human–edible output (animal products)}}{\text{human–edible input (feeds)}}
  \]  
  (for GE and CP)

- **Quality changes (for protein):**
  
  Protein quality ratio (PQR)
  
  \[
  \text{PQR} = \frac{\text{Protein quality score of human–edible output}}{\text{Protein quality score of human–edible input}}
  \]
Materials and Methods (II)

- **Data Source:**
  - National data from 2011–2013
  - Human-edible **output:**
    - Livestock *production data* (Statistics Austria)

- Human-edible **input:**
  - National *feed balance* (Statistics Austria)
  - Estimated human-edible fractions of feeds
Materials and Methods (III)

- Protein quality:
  - Digestibility
  - (Indispensable) amino acid composition

=> Digestible Indispensable Amino Acid Score (DIAAS)
## Results - Energy

<table>
<thead>
<tr>
<th></th>
<th>Human-edible fraction (% of feed)</th>
<th>FCR</th>
<th>heFCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy cows</td>
<td>10.3</td>
<td></td>
<td>1.44</td>
</tr>
<tr>
<td>Growing-fattening bulls</td>
<td>17.4</td>
<td>11.5</td>
<td>0.26</td>
</tr>
<tr>
<td>Swine</td>
<td>51.3</td>
<td>3.7</td>
<td>0.35</td>
</tr>
<tr>
<td>Laying hens</td>
<td>51.0</td>
<td></td>
<td>0.31</td>
</tr>
<tr>
<td>Broiler</td>
<td>48.5</td>
<td>2.2</td>
<td>0.30</td>
</tr>
<tr>
<td>Sheep</td>
<td>10.3</td>
<td></td>
<td>0.31</td>
</tr>
</tbody>
</table>

\[
\text{FCR} = \frac{\text{kg feed dry matter}}{\text{kg bone-in carcass}}
\]

\[
\text{heFCE} = \frac{\text{human-edible energy in the animal product}}{\text{human-edible energy in feeds}}
\]
# Results - Protein

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>heFCE</th>
<th>PQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy cows</td>
<td>1.98</td>
<td>1.9</td>
</tr>
<tr>
<td>Growing-fattening bulls</td>
<td>0.45</td>
<td>1.7</td>
</tr>
<tr>
<td>Swine</td>
<td>0.36</td>
<td>1.7</td>
</tr>
<tr>
<td>Laying hens</td>
<td>0.63</td>
<td>1.6</td>
</tr>
<tr>
<td>Broiler</td>
<td>0.52</td>
<td>1.4</td>
</tr>
<tr>
<td>Sheep</td>
<td>0.54</td>
<td>1.9</td>
</tr>
</tbody>
</table>

\[
\text{heFCE} = \frac{\text{human–edible protein in the animal product}}{\text{human–edible protein in feeds}}
\]

\[
PQR = \frac{\text{Protein quality score output}}{\text{Protein quality score input}}
\]
Take home messages

- Only about 10–20% of diets of ruminants is potentially human-edible.
- Cattle in total contribute to human energy as well as protein supply.
- When protein quality changes are included, not only cattle but also laying hens and sheep are net contributors to human food supply.
A comprehensive version of this study can be found in the research paper „Net food production of different livestock: A national analysis for Austria including relative occupation of different land categories” published in Die Bodenkultur – Journal of Land Management, Food and Environment 2016/2.

Further information will be presented at the poster „Land occupation for livestock feed production in Austria”

Thank you for your attention