The Ecology of Scale: Data Assessment of Beef, Pork and Wine

Objectives:

• Researching energy data for entire process chains of food;
• Allocating these data to adequate functional units;
• Comparing regional to global food, in terms of energy;
• Comparing small to large scale business, in terms of energy.

Why?

• Lack of empiric data and
• Many prejudices regarding global and regional food.
Method: Qualitative, performing case studies!

1. Researching all the energy efforts such as gas, fuels, power:
   • of producing food including farming, breed and crop;
   • of transporting and distributing from the place of origin via any processing unit up to the point of sale.

2. Allocation of these primary data to the functional units;

3. Specific turnover of energy versus business size.
Who?

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Food examples and places of origin

1. Fruit juices (Brazil, Europe, Germany) [Schlich:InLCA 2003]
2. Lamb meat (Germany, Hungary, New Zealand) [Schlich:InLCA 2003]
3. Beef (Argentina, Germany, Hungary)
4. Pork (Germany, Hungary)
5. Wine (Germany, Hungary, South Africa)
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Typical global shipping of food

Prof. Dr. Elmar H. Schlich et al.
Case study beef: Market data in Germany

Beef per capita: 8.8 kg/a

Beef in total: 730,000 t/a

- German production: 75%
- Import: 25%
Imported beef in total: 182,000 t/a

Argentina
18%

Others
82%

Beef in Germany: Import data
# Beef: Results

<table>
<thead>
<tr>
<th>Case</th>
<th>Beef [kg/a]</th>
<th>Specific energy [kWh/kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ger A (1)</td>
<td>7,000</td>
<td>3.5</td>
</tr>
<tr>
<td>Ger B (1)</td>
<td>2,500</td>
<td>6</td>
</tr>
<tr>
<td>Arg A (2)</td>
<td>80,000,000</td>
<td>1.4</td>
</tr>
<tr>
<td>Hu A (3)</td>
<td>800,000</td>
<td>1.8</td>
</tr>
</tbody>
</table>

(1): Data of local German farmers: farming, slaughter including local transport.
(2): Main import company from Argentina: data include farming, slaughter, sea container vessel to Hamburg and German truck.
(3): Hungarian farming and slaughter; truck transport to Germany must still be added (under calculation)
Beef: Data assessment

Fig. 1: Specific energy turnover of beef versus business size
Case study pork: Market data in Germany

Pork per capita: 39.5 kg/a

Pork in total: 4,600,000 t/a

German production 82%

Import 18%
Pork in Germany: Import data

Imported pork in total: 830,000 t/a

- Others: 68.51%
- DK: 31.25% (1) Danish pork under research
- HU: 0.24%
## Pork: Results

<table>
<thead>
<tr>
<th>Case</th>
<th>Pork per a [kg]</th>
<th>Specific energy [kWh/kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ger A</td>
<td>58,800</td>
<td>4.9</td>
</tr>
<tr>
<td>Ger B</td>
<td>2,500</td>
<td>9.1</td>
</tr>
<tr>
<td>Ger C</td>
<td>8,600</td>
<td>6.5</td>
</tr>
<tr>
<td>Ger D</td>
<td>138,000</td>
<td>3.4</td>
</tr>
<tr>
<td>Ger E</td>
<td>18,500</td>
<td>4.1</td>
</tr>
<tr>
<td>Hu A</td>
<td>625,000</td>
<td>3.9</td>
</tr>
<tr>
<td>Hu B</td>
<td>420,000</td>
<td>3.7</td>
</tr>
<tr>
<td>Hu C</td>
<td>370,000</td>
<td>3.8</td>
</tr>
</tbody>
</table>
Pork: Data assessment

Fig. 2: Specific energy turnover of pork versus business size
Case study wine: Market data in Germany

Wine per capita: 24 l/a
(incl. sparkling wine)

Wine in total: 20,000,000 hl/a
Wine in Germany: Import data

Imported wine in total: 13,300,000 hl/a

SA

1%
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Wine: Results of typical cases

<table>
<thead>
<tr>
<th>Winery</th>
<th>Area</th>
<th>Production</th>
<th>Diesel</th>
<th>Electricity</th>
<th>Natural gas</th>
<th>Heating oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>W2002/1</td>
<td>12.5</td>
<td>1,000</td>
<td>6,045</td>
<td>23,390</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>M2001/1</td>
<td>4.4</td>
<td>247.50</td>
<td>5,743</td>
<td>7,595</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>M2001/2</td>
<td>4.1</td>
<td>357.89</td>
<td>3,828</td>
<td>4,216</td>
<td>0</td>
<td>400</td>
</tr>
<tr>
<td>M2001/5</td>
<td>2.1</td>
<td>153.40</td>
<td>5,290</td>
<td>1,496</td>
<td>0</td>
<td>300</td>
</tr>
<tr>
<td>HU2002/3</td>
<td>200</td>
<td>16,000</td>
<td>13,100</td>
<td>54,972</td>
<td>19,900</td>
<td>0</td>
</tr>
<tr>
<td>B2001/3</td>
<td>22.5</td>
<td>2,100</td>
<td>2,955</td>
<td>6,490</td>
<td>0</td>
<td>15,000</td>
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<tr>
<td>B2001/6</td>
<td>98.5</td>
<td>8,500</td>
<td>9,970</td>
<td>125,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HB2001</td>
<td>254.3</td>
<td>13,640</td>
<td>25,695</td>
<td>330,872</td>
<td>0</td>
<td>71,616</td>
</tr>
</tbody>
</table>
Wine: Data assessment (region 1, Germany)

Fig. 3: Specific energy turnover of wine versus business size – German region 1
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Wine: Data assessment (regions 1+2, Germany)

Fig. 4: Specific energy turnover of wine versus business size – German regions 1 and 2
Wine: Data assessment (regions 1+2+3, Germany)

Fig. 5: Specific energy turnover of wine versus business size – German regions 1, 2 and 3
Wine: Data assessment (German regions + Hungary)

Fig. 6: Specific energy turnover of wine versus business size – Germany, Hungary
Wine: Data assessment (German regions + Hungary + South Africa)

Fig. 7: Specific energy turnover of wine versus business size – Germany, Hungary, South Africa
Conclusions, Recommendation and Outlook (1)

- Results show in all cases degressive dependencies of specific energy turnover and business size!
- No relation between specific energy intake and marketing distance!
- Small units are facing severe disadvantages because of missing logistics and bad operational efficiency!
- The ecological quality depends mainly on the operational efficiency and not on the marketing distance!
Conclusions, Recommendation and Outlook (2)

- Small scale units can obtain energy efficient production and distribution by good cooperation!
- South African wineries prove: Big scale units may waste energy as well! Reasons are to identify!
- Hence: Each case has to be investigated and prejudices are definitely misleading!
The conclusions are valid for the researched examples, but:

The claims for „food regionality“ in Germany are not generally valid!
Many thanks:

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