Data collection

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How to get representative LCI data?

Two approaches

- Structural, general production and economic data are regularly recorded in most countries (statistics, FADN, FAO, EUROSTAT)
- Data on agricultural management are largely missing (fertiliser use, pesticides, use of machinery, timing of interventions, etc.)

Two possible solutions:

1. Make a large survey: pilot farm networks
   - one single data source
   - enables to assess the variability
   - preferable, but very expensive!
2. Modelling LCI: based on statistics, FADN, recommendations, expert knowledge, etc.
   - combination of several different data sources
   - difficult to assess the variability
   - most frequently used alternative, much cheaper
How to get representative LCI data?

1. Example of Swiss farm LCA network

Project Life Cycle Assessment – Farm Accountancy Data Network (LCA-FADN)

- Integrate environmental LCA into FADN
- Project supported by the Swiss Federal Office for Agriculture
- Establish an operating system with 110 farms (during 3 years with 60 in the first year)
- Establish an information technology infrastructure
- Training life cycle management principles in practice
- Develop concepts for evaluation and communication and practice them with farmers and extension services
- Sectoral monitoring and environmental management of farms
## How to get representative LCI data?

### 2. Example of modelling LCI

<table>
<thead>
<tr>
<th>Data category</th>
<th>Data source(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yields for main products</td>
<td>FADN ART (weighted means for 1996-2003)</td>
</tr>
<tr>
<td>Straw yields and crop residues</td>
<td>Fertilising recommendations (Walther et al. 2001)</td>
</tr>
<tr>
<td>Moisture content</td>
<td>Gross-margin catalogue from the extension service (LBL et al. 2000)</td>
</tr>
<tr>
<td>Quantity of seed</td>
<td>Work budget (planning tool, Näf 1996)</td>
</tr>
<tr>
<td>Use of machinery (number of passes)</td>
<td>Work budget (planning tool, Näf 1996)</td>
</tr>
<tr>
<td>Sowing and harvest dates</td>
<td>Work budget (planning tool, Näf 1996)</td>
</tr>
<tr>
<td>Quantity of fertilisers</td>
<td>Fertilising recommendations (Walther et al. 2001)</td>
</tr>
</tbody>
</table>
| Types of fertilisers in integrated systems | Import statistics (years 1996-98 from Rossier 2000) for mineral fertilisers  
                                          Pilot farm network (years 1994-96 from BLW et al. 1998) for farmyard manure              |
| Types of fertilisers in organic systems | Pilot farm network (years 1994-96 from BLW et al. 1998) for farmyard manure                                                                    |
| Pesticide applications                 | Pilot farm network (years 1994-96 from BLW et al. 1998)                                                                                         |
| Chemical seed dressing                 | Information provided by seed suppliers and experts (survey)                                                                                     |
LCI data collection in agriculture
Data categories (1)

- Yields
- Machinery and fuel
- Fertilisers:
  - Organic and mineral fertilisers
  - Taking into account crop rotation
  - Taking into account crop residues (nutrients received from previous crop, nutrients delivered to the following crop)
  - Fertiliser recommendations
  - Overfertilisation: what if the farmer does not follow the recommendation?
  - In case of lack of data: use nutrients withdrawal for P and K, total N uptake (including by-products and crop residues)
## Accounting for nutrient transfer in crop residues (except N)

<table>
<thead>
<tr>
<th></th>
<th>Crop1</th>
<th>Crop2</th>
<th>Crop3</th>
<th>Crop4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrient requirement</strong></td>
<td>NR1</td>
<td>NR2</td>
<td>NR3</td>
<td>NR4</td>
</tr>
<tr>
<td><strong>Nutrients in crop residues</strong></td>
<td>CR1</td>
<td>CR2</td>
<td>CR3</td>
<td>CR4</td>
</tr>
<tr>
<td><strong>Fertiliser rate applied by the farmer</strong></td>
<td>FR1=NR1-CR4</td>
<td>FR2=NR2-CR1</td>
<td>FR3=NR3-CR2</td>
<td>FR4=NR4-CR3</td>
</tr>
<tr>
<td><strong>Fertiliser rate used in the inventory</strong></td>
<td>FR1=NR1-CR1</td>
<td>FR2=NR2-CR2</td>
<td>FR3=NR3-CR3</td>
<td>FR4=NR4-CR4</td>
</tr>
</tbody>
</table>
LCI data collection in agriculture
Data categories (2)

- Pesticides: the active ingredients need to be known. The total amount of pesticides is insufficient → most statistics do not provide enough detail.

- Irrigation: distinction of irrigated and rainfed crops might be necessary. Otherwise, the dataset should reflect a weighted average.

- Seed: for many crops of lower importance (multiplication rate gives an indication of the importance).

- Drying: can be sometimes quite important.
LCI data collection in agriculture

- Be careful with experimental data. They might be too optimistic compared to current practice.
- Data should be representative for the actual situation and not for an optimal case.
- Deviations from the optimal case should also be included:
  - Crop failure
  - Necessity of resowing the crop
  - Deviations from good practice
Period for data collection

- Ideally, the practice of the last 3-5 years should be reflected.
- Yields:
  - Not less than 3 years, in order to smooth the annual variations
  - Not longer than 5 years, in order to exclude outdated statistics (technical progress)
  - The reference period of the yields is also set as the time period for the whole dataset
- Depending on the availability of reliable statistics
- Other data: ideally also for the same period, but not always possible
- For parameters that are less variable, data from one year are acceptable
Regionalised data collection

- Top-down approach:
  - Start with simple average inventory
  - Refine as needed
- Consider if other subdivision than regional would not be more appropriate (intensive/extensive, irrigated/rainfed, mechanised/manual)
- Caution with non-linearities and non-proportionalities → can cause bias