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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**
- Time-frame: 2004 - 2010 with **data acquisition from 2006 - 2008**
- 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**

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How to get representative LCI data? 2. Example of modelling LCI

Data category	Data source(s)
Yields for main products	FADN ART (weighted means for 1996-2003)
Straw yields and crop residues	Fertilising recommendations (Walther *et al.* 2001)
Moisture content Quantity of seed Use of machinery (number of passes)	Gross-margin catalogue from the extension service (LBL *et al.* 2000)
Sowing and harvest dates	Work budget (planning tool, Näf 1996)
Quantity of fertilisers	Fertilising recommendations (Walther *et al.* 2001)
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)

Source: Nemecek, Erzinger (2004). Modelling representative life cycle inventories for Swiss arable crops. Int J LCA.

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)

	Crop1	**Crop2**	**Crop3**	**Crop4**
Nutrient requirement	NR1	NR2	NR3	NR4
Nutrients in crop residues	CR1	CR2	CR3	CR4
Fertiliser rate applied by the farmer	FR1=NR1-CR4	FR2=NR2-CR1	FR3=NR3-CR2	FR4=NR4-CR3
Fertiliser rate used in the inventory	FR1=NR1-CR1	FR2=NR2-CR2	FR3=NR3-CR3	FR4=NR4-CR4

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 to 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