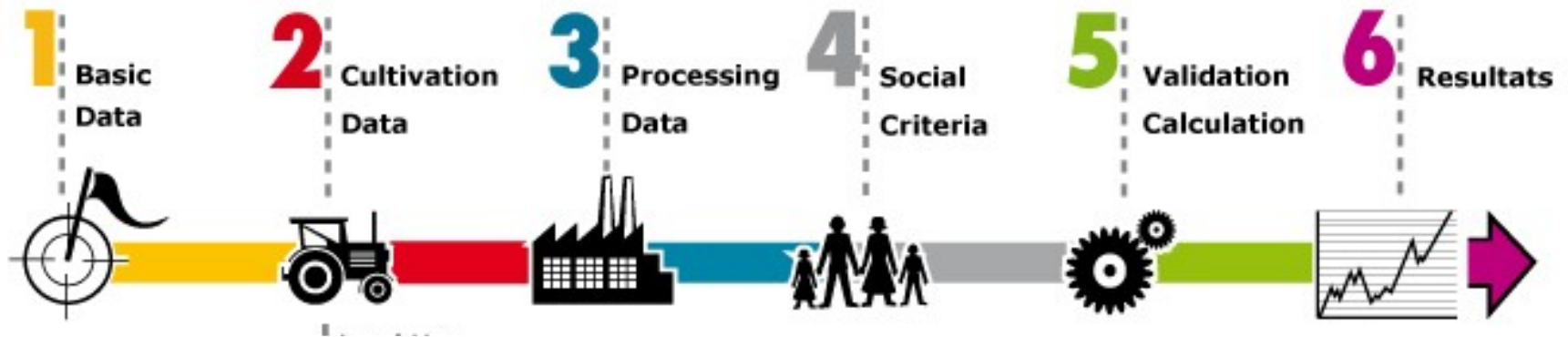




Sustainability Quick Check for Biofuels (SQCB)



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EMPA, Switzerland

Content

- Context/Motivation
- Conception
 - Questionnaire
 - Life Cycle Inventory calculation
 - Life Cycle Impacts Assessment
 - Benchmarking
- Limitations
- Outlook

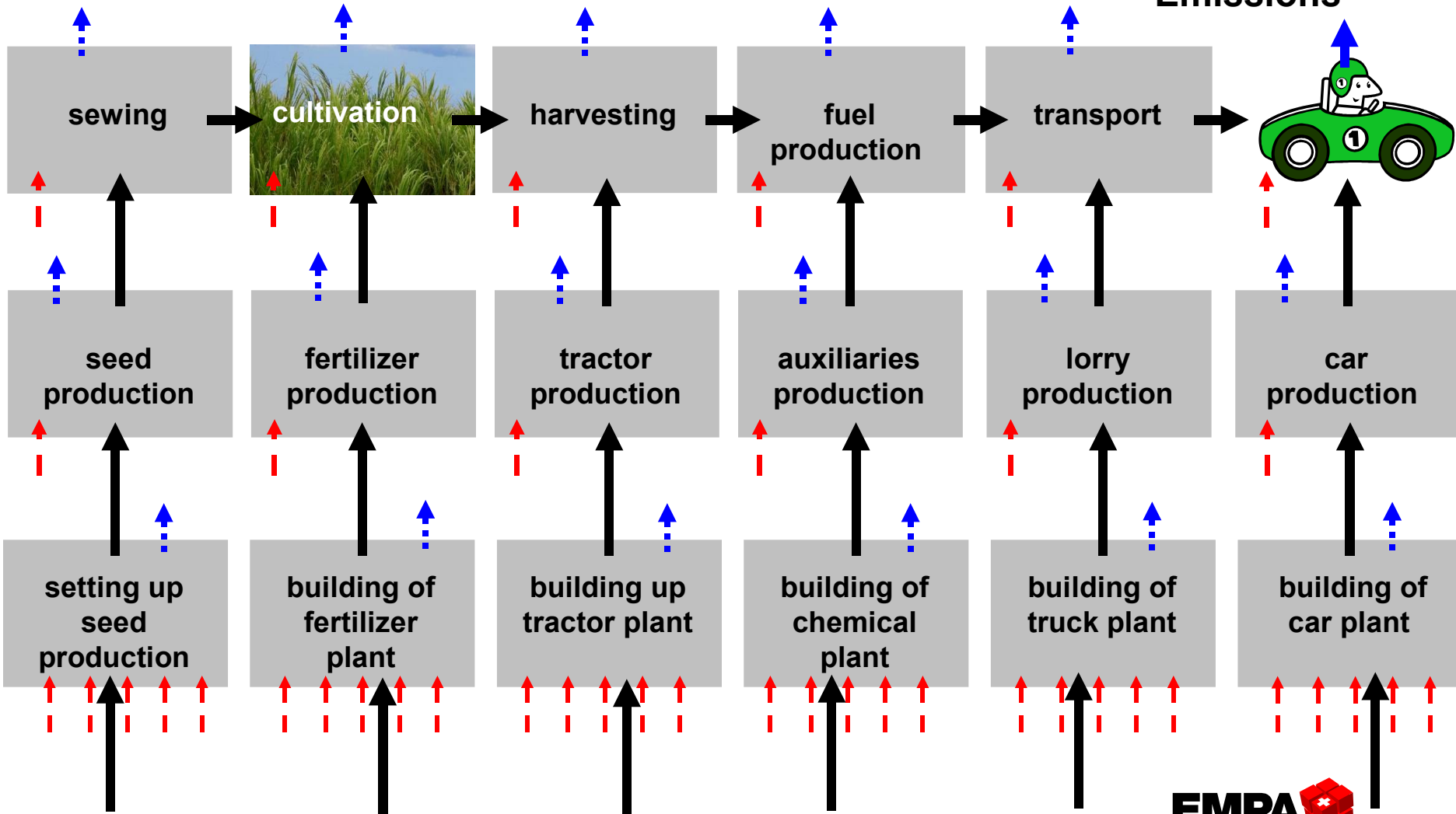
Swiss law on mineral oil tax from 23.3.2007

- Article 12b stipulates tax exemption for biofuels
- Paragraph 3:
 - Biofuels must comply to minimum requirements regarding evidence of
 - positive environmental balance and
 - acceptable labour conditions
 - Basis for the definition of the minimum environmental requirements:
 - Empa study 2007 (Zah et al. 2007; www.empa.ch/biofuels)

 **Was first ordinance world-wide which bases on LCA calculation!**

LCA calculation

- Materialflow
- ▶ Energyflow
- ⋯▶ Emissions



Motivation

- Full LCA = resource demanding and complex
 - interpreted differently by each institute
 - often not to afford by small scale producers
- But, various production chains of biofuels have already been evaluated
 - critical factors are know

 **Develop a web-based tool for rapidly assessing individual pathways of agro-biofuels on a LCA basis**

- increase the knowledge about critical issues within agro-biofuel production
- facilitate the entry of small producers from developing countries

Co-operation


■ Partners

- Empa: M. Faist Emmenegger (project leader), R. Zah, J. Reinhard
- HTW Berlin: T. Ziep, R. Weichbrodt , Prof. V. Wohlgemuth
- Agroscope: A. Roches, R. Freiermuth, G. Gaillard

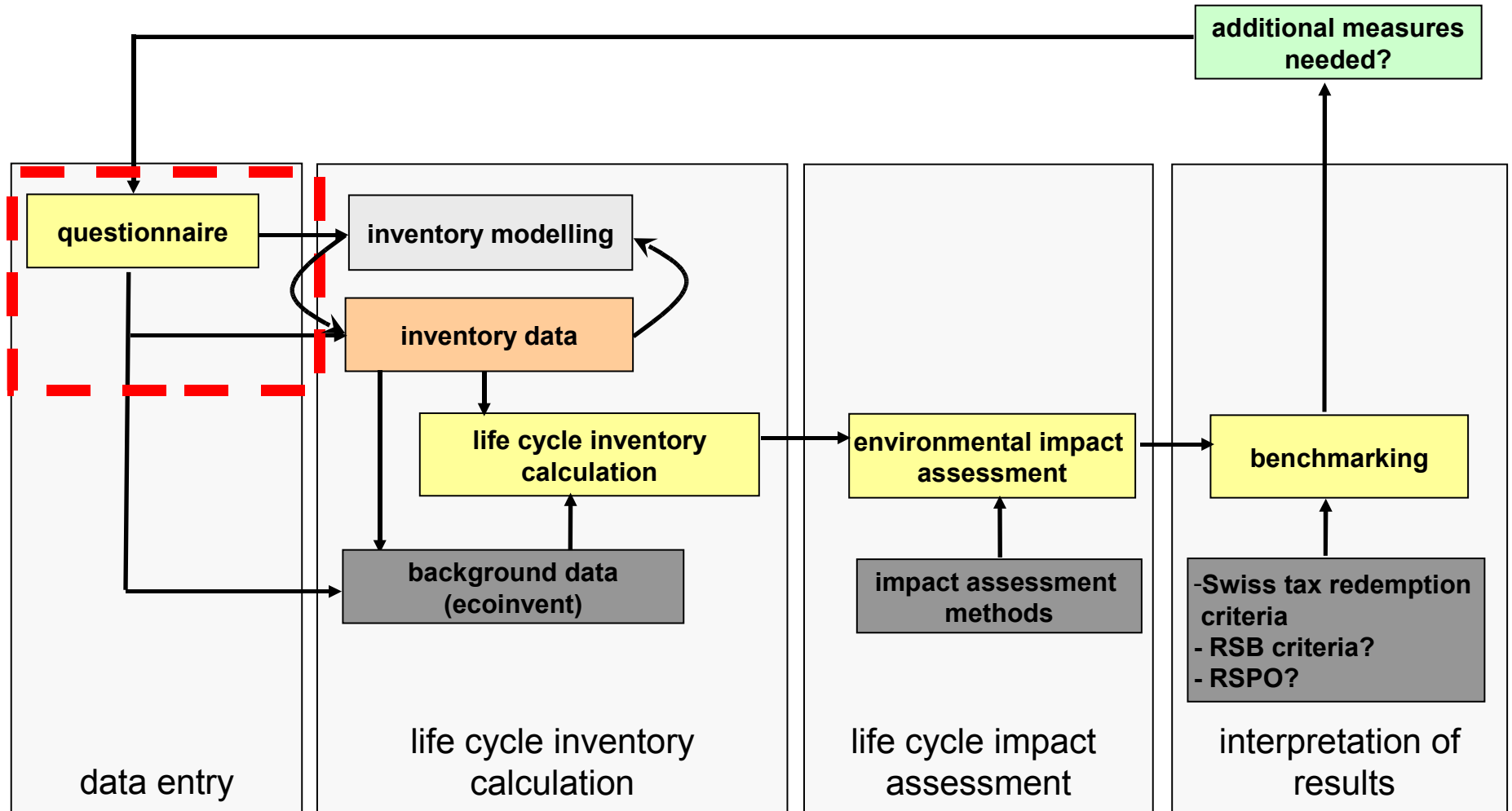
■ Founding:

- State Secretariat for Economic Affairs SECO, Switzerland

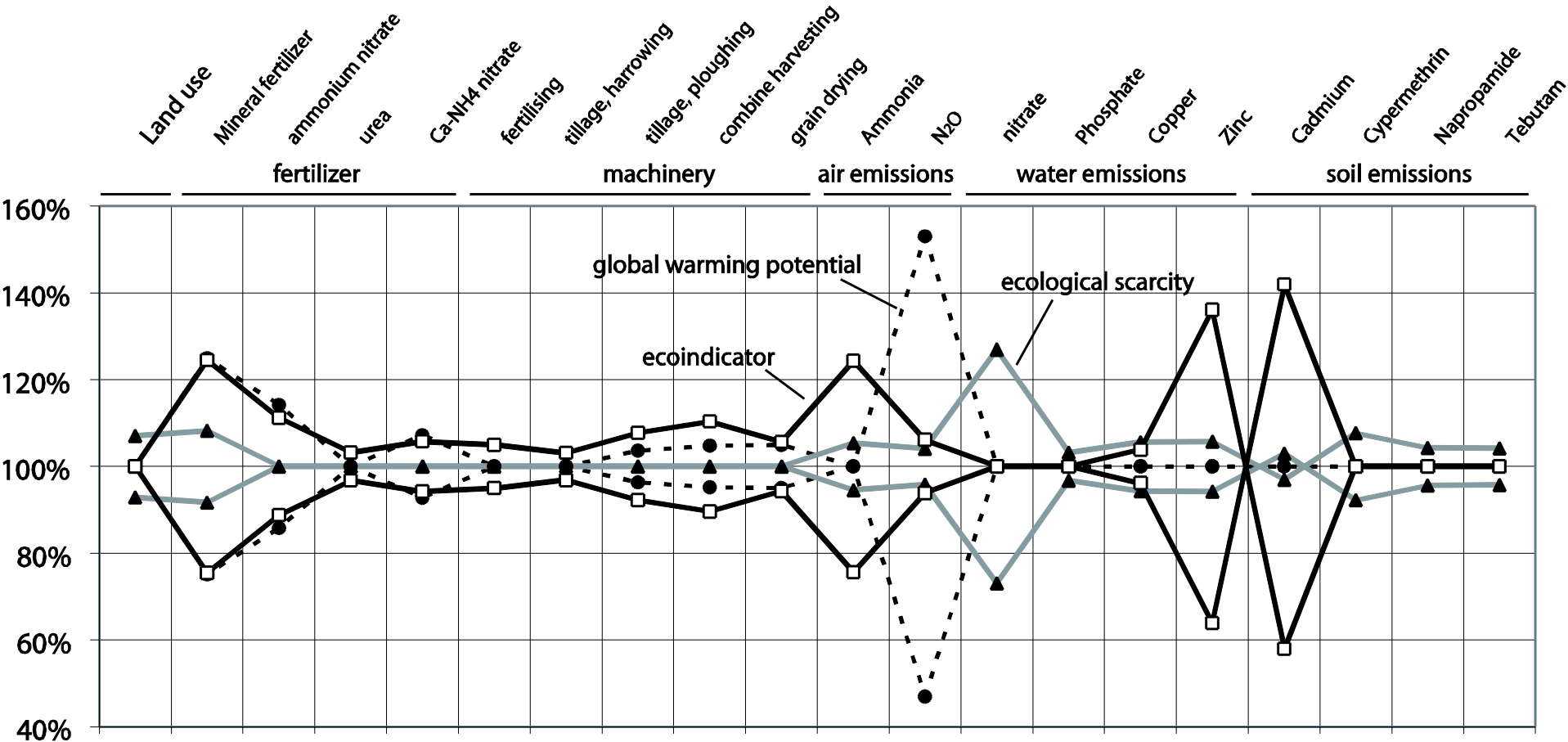
Content

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Conception: Workflow SQCB



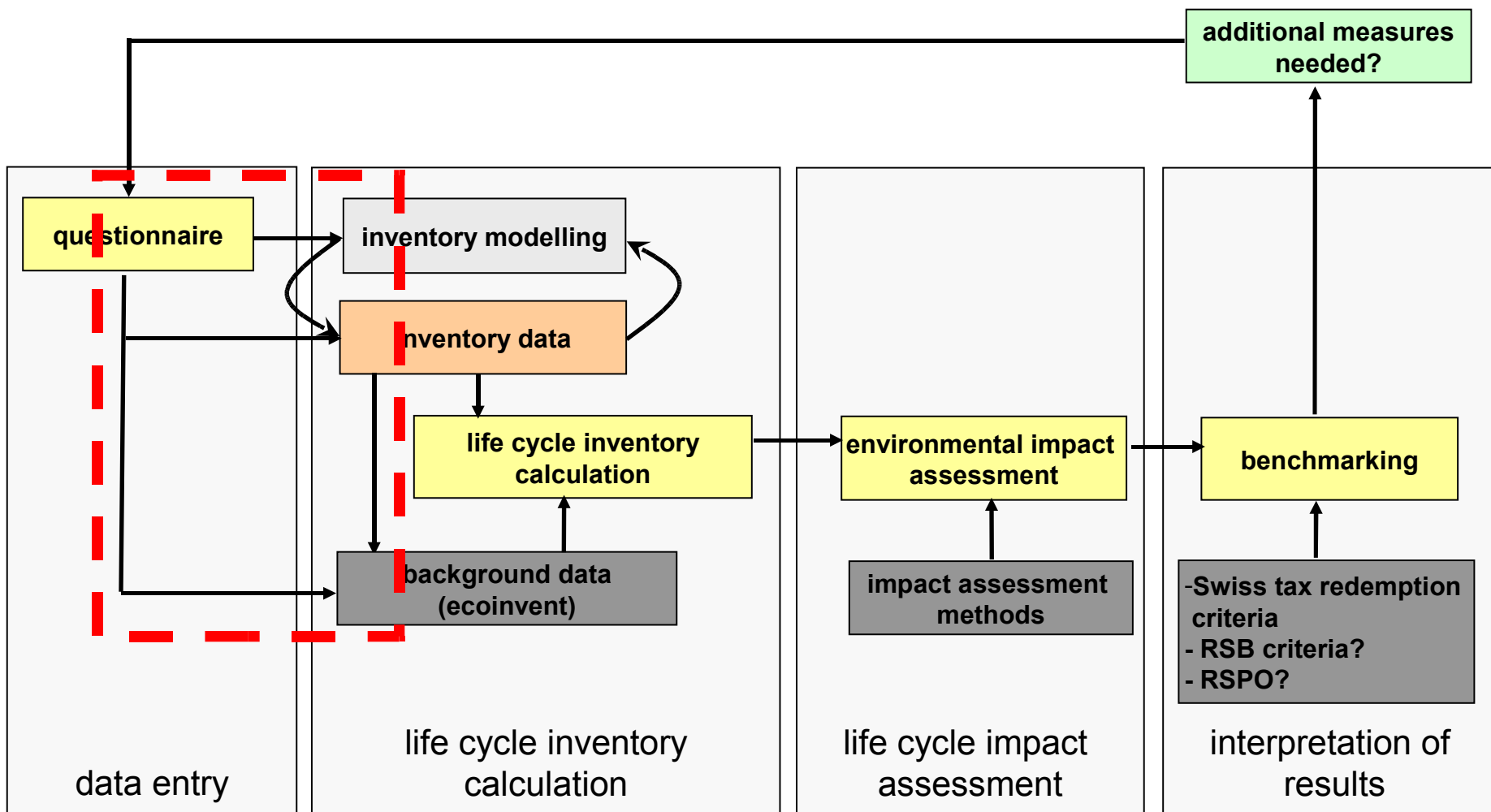
Questionnaire: What is important?



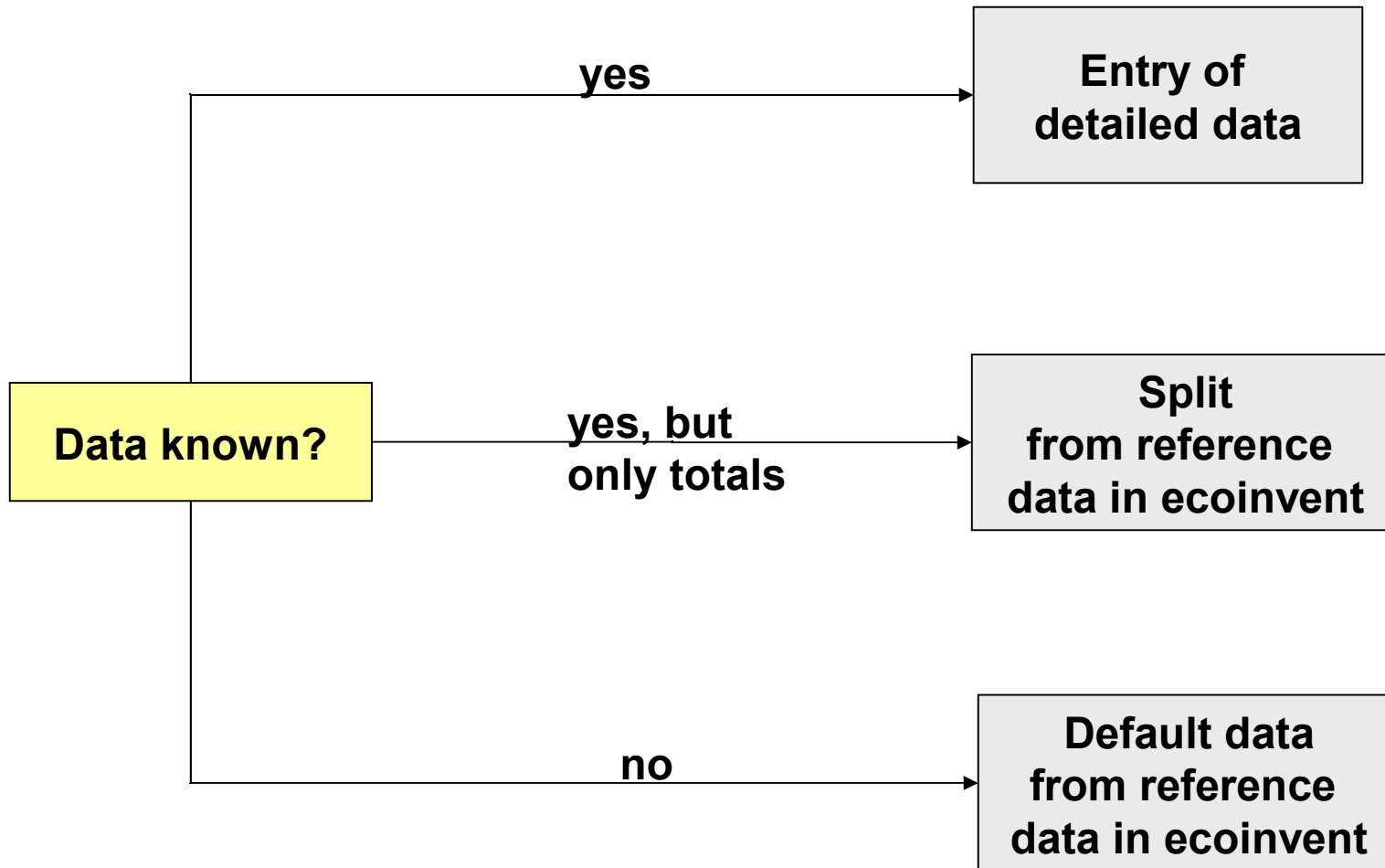
Which data can the user enter?

- Agriculture (per furnisher)
 - Crop type, Yield
 - Geographic information (climatic zone, type of soil, rain etc.)
 - Mineral fertilizer
 - Organic fertilizer
 - Pesticide
 - Land use at specific date
- Fuel production/refining
 - Energy and chemicals use
 - Allocation factor
- Questionnaire has got a similar structure as the form of the Swiss government

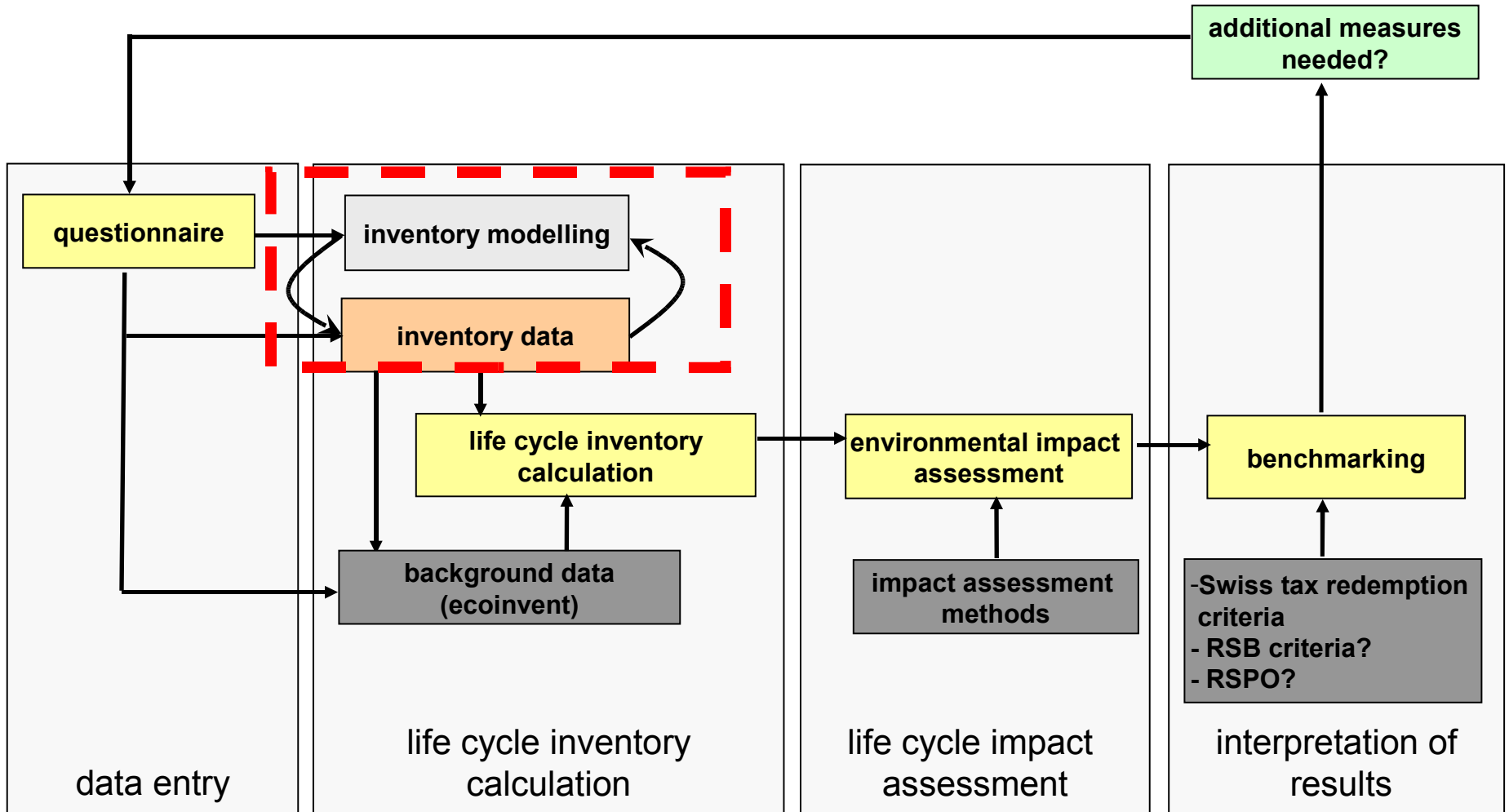
Data entry



Alternatives for data entry



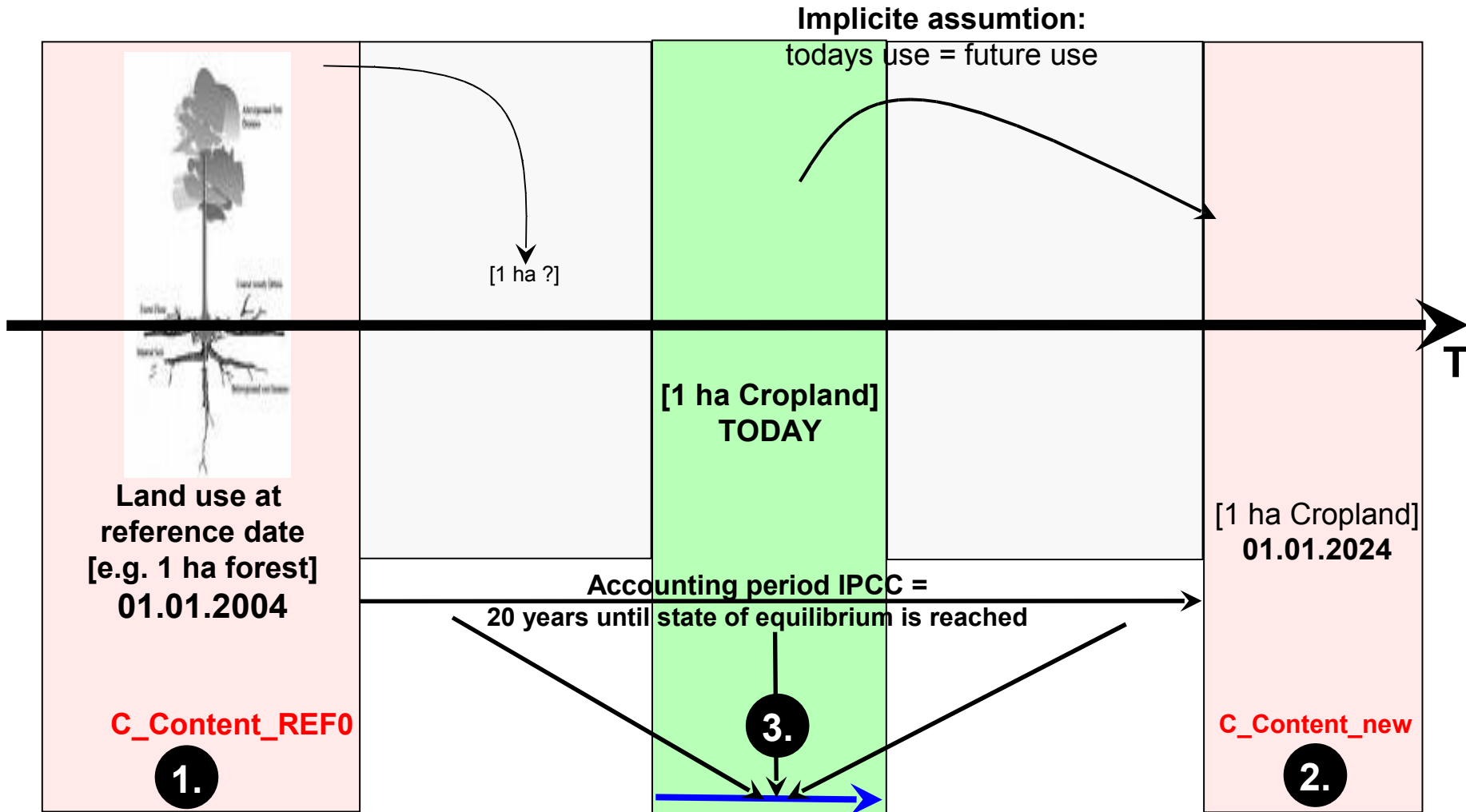
Inventory modelling



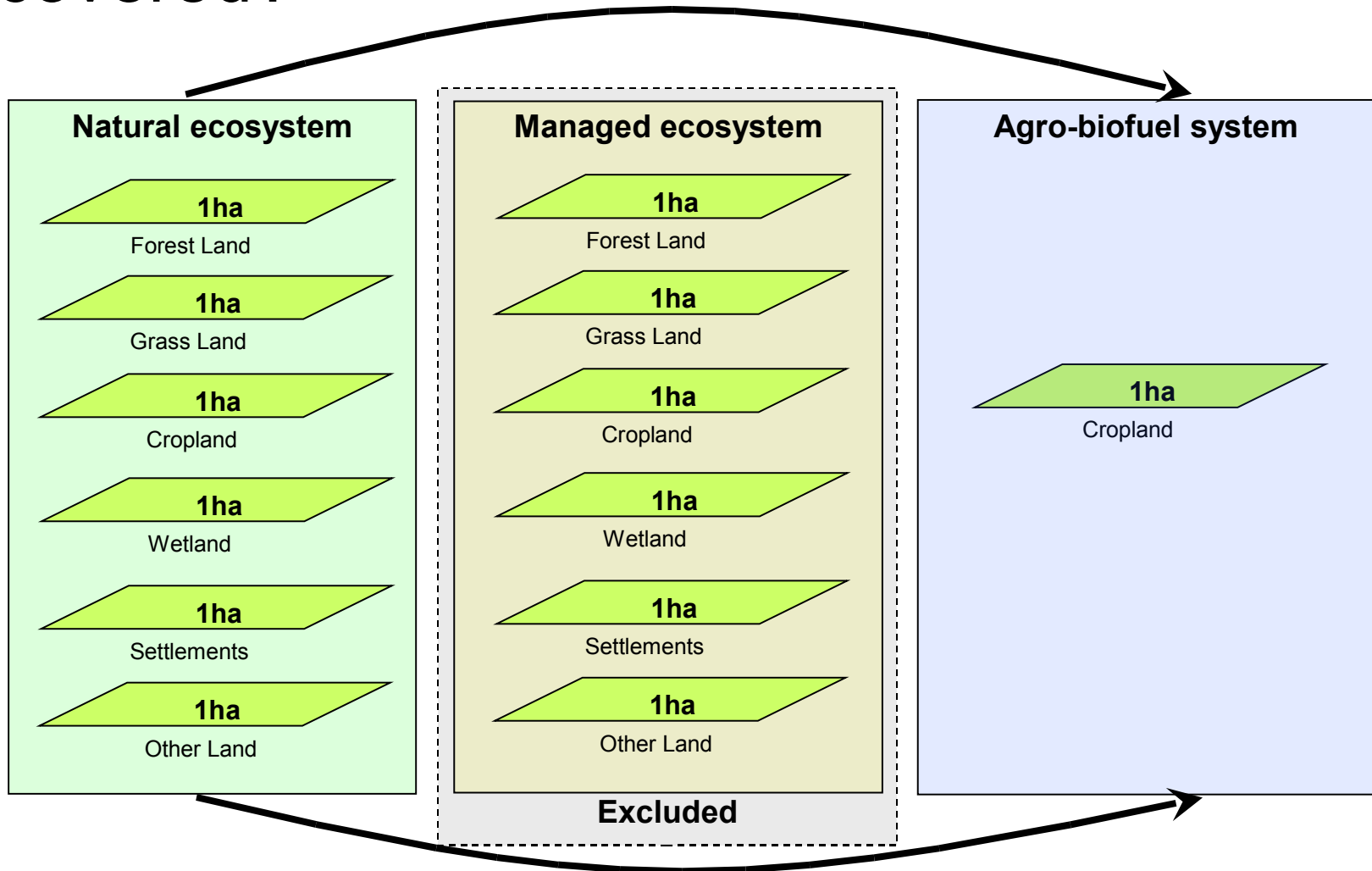
Inventory modelling

- Emissions in agriculture are calculated according to ecoinvent Nr. 15, agriculture (e.g. N_2O , NH_3) and Nr. 17, bioenergy (e.g. heavy metals)
- For nitrate and phosphorus, new simplified models were developed
 - → collaboration with Agroscope
- CO_2 emissions from direct LUC
 - by stock difference method
 - standard values of tier 1, IPCC 2006

Inventory modelling: CO₂ LUC



Inventory modelling: CO2 LUC – What is covered?



Inventory modelling: CO₂ LUC

- Basic simplifications:
 - LUC from managed ecosystems not considered
 - default values for AGB, DOM and SOC
 - time scale the emissions are attributed to
 - today's application = future application
 - emission from forest burning are not addressed
 - N₂O-Emissions and CH₄ not included
 - iLUC = not included

 **More accurate modelling will be implemented until May**



- Basic Data
- Cultivation Data**
- Provider1
- Land Use
- Mineral Fertilizer
- Organic Fertilizer
- Pesticides

- Processing Data
- Social Criteria

- Validation/Calculation

- Results

- Reset entered data
- show help boxes?

Yield:

 ? yield in t/ha

Ecozone:

 ? Ecozone

annual rainfall:

 ? annual rainfall in mm

winter-type precipitation distribution? should be clear :)?

Soil Information

USDA Soil Order:

 ? Please look up here

mean slope:

 ? mean slope

Cultivation Practice

tillage method:

 ? tillage method

annual irrigation:

 ? annual irrigation in m3

anti erosion practice:

 ? anti erosion practice

conventional drainage?
 ? yes/no

Land Use Information

Land Use:

 ? Type of land use on the 1st of January 2006

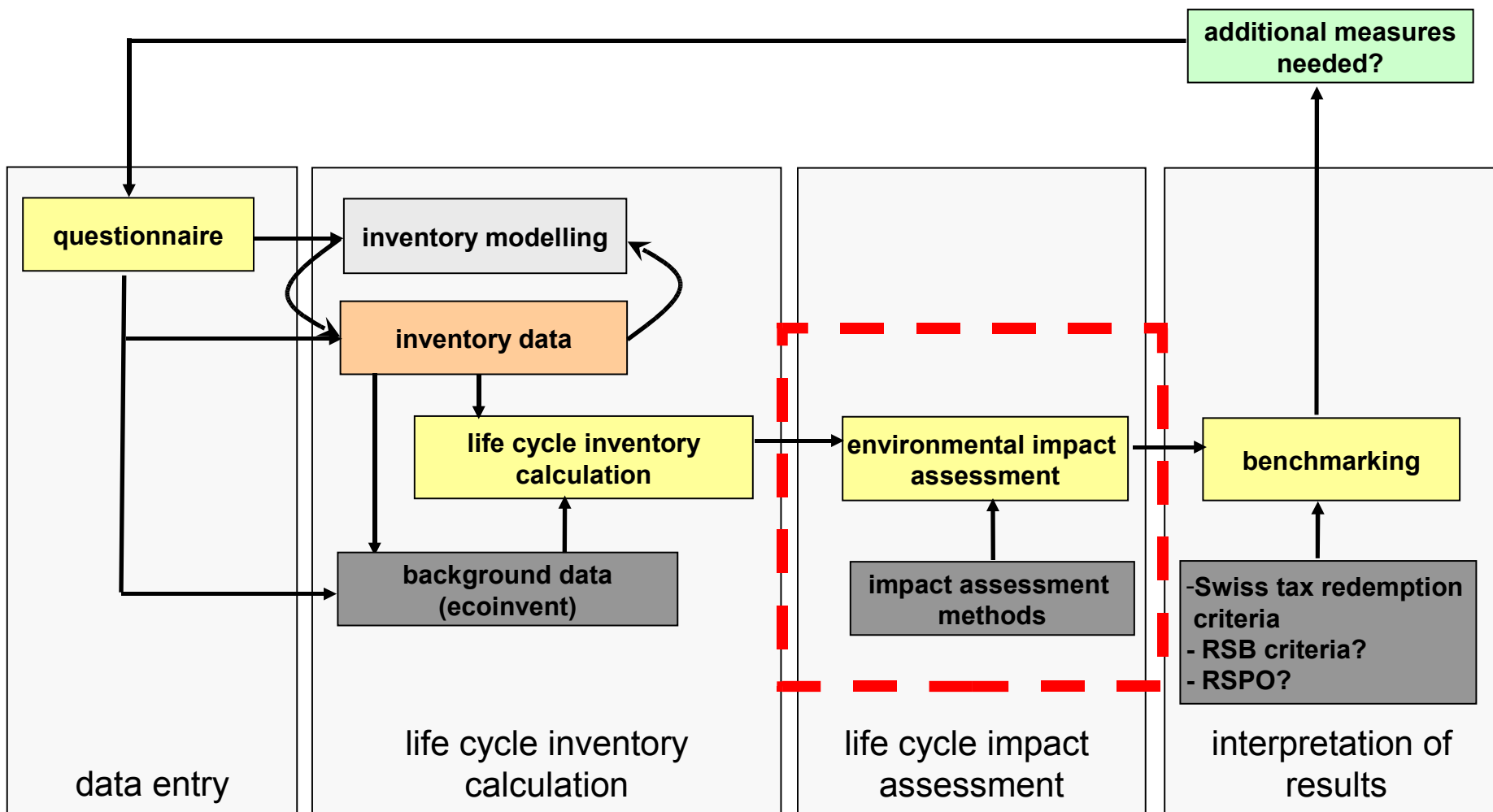
Acreage:

 acreage %

peat land?
 Check box if land is peat land

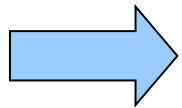


Impact evaluation



Impacts evaluation

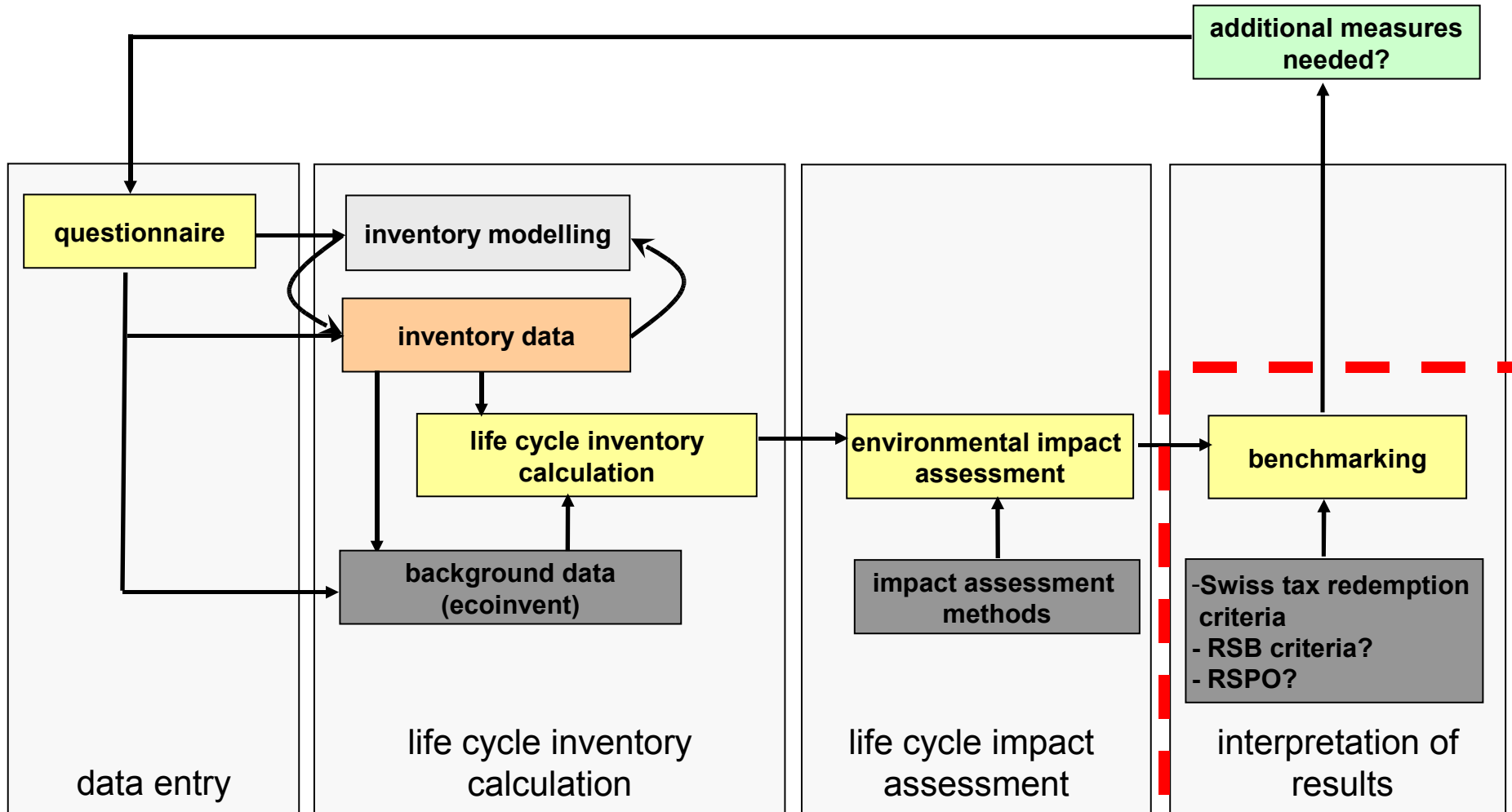
- Midpoint level: Global warming potential
 - GWP100
- Endpoint level: Swiss method of ecological scarcity
 - UBP 06



Other impact assessment methods can be added

- Social factors: information on requirements of Swiss regulation

Benchmarking





Basic Data

Cultivation

Processing

Social Criteria

Validation Calculation



Results

Overview

UBP06

GWP

MAKE PDF

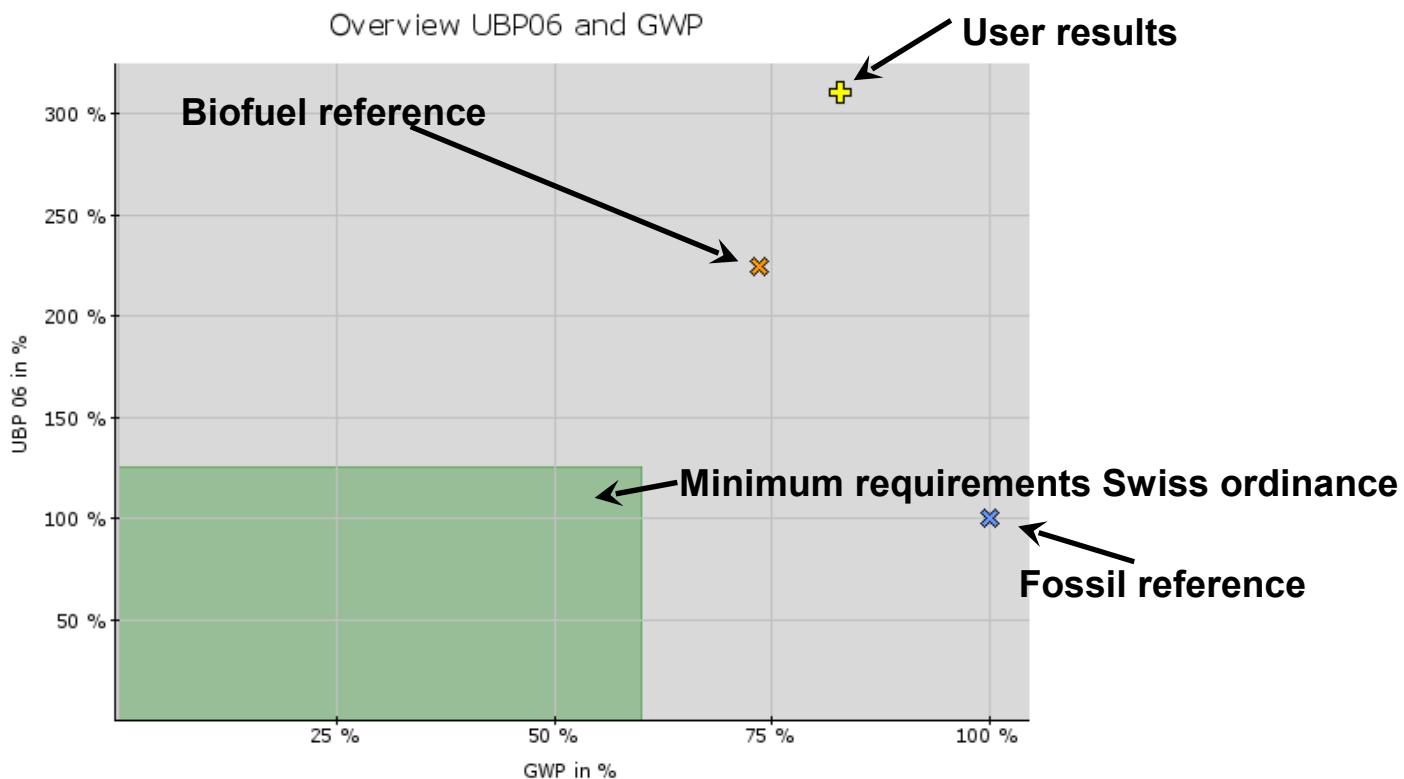
The calculated results for your biofuel don't meet the requirements of the Swiss ordinance on mineral oil tax.

- Basic Data
- Cultivation Data Provider1
- Processing Data
- Social Criteria
- Validation/Calculation

Results

Reset entered data

show help boxes?



rape seed, your values rape seed, reference fossile reference



Basic Data



Cultivation Data

Provider1

Land Use



Mineral Fertilizer



Organic Fertilizer



Pesticides



Processing Data



Social Criteria



Validation/Calculation

Results

Reset entered data



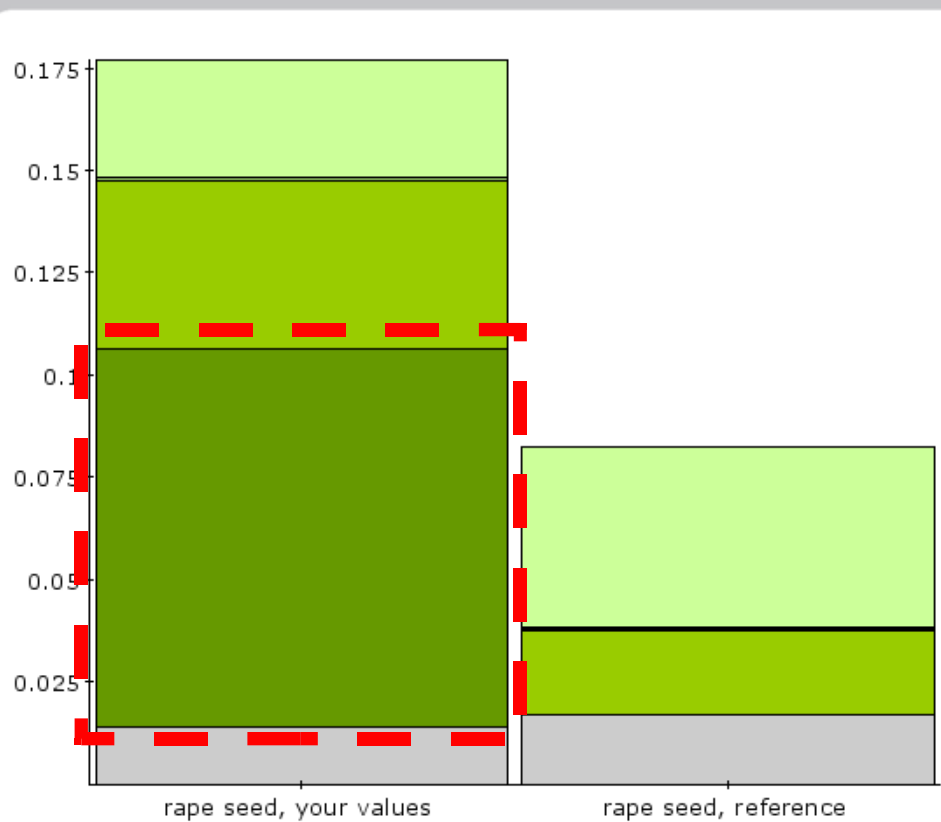
show help boxes?



Overview UBP06 GWP MAKE PDF

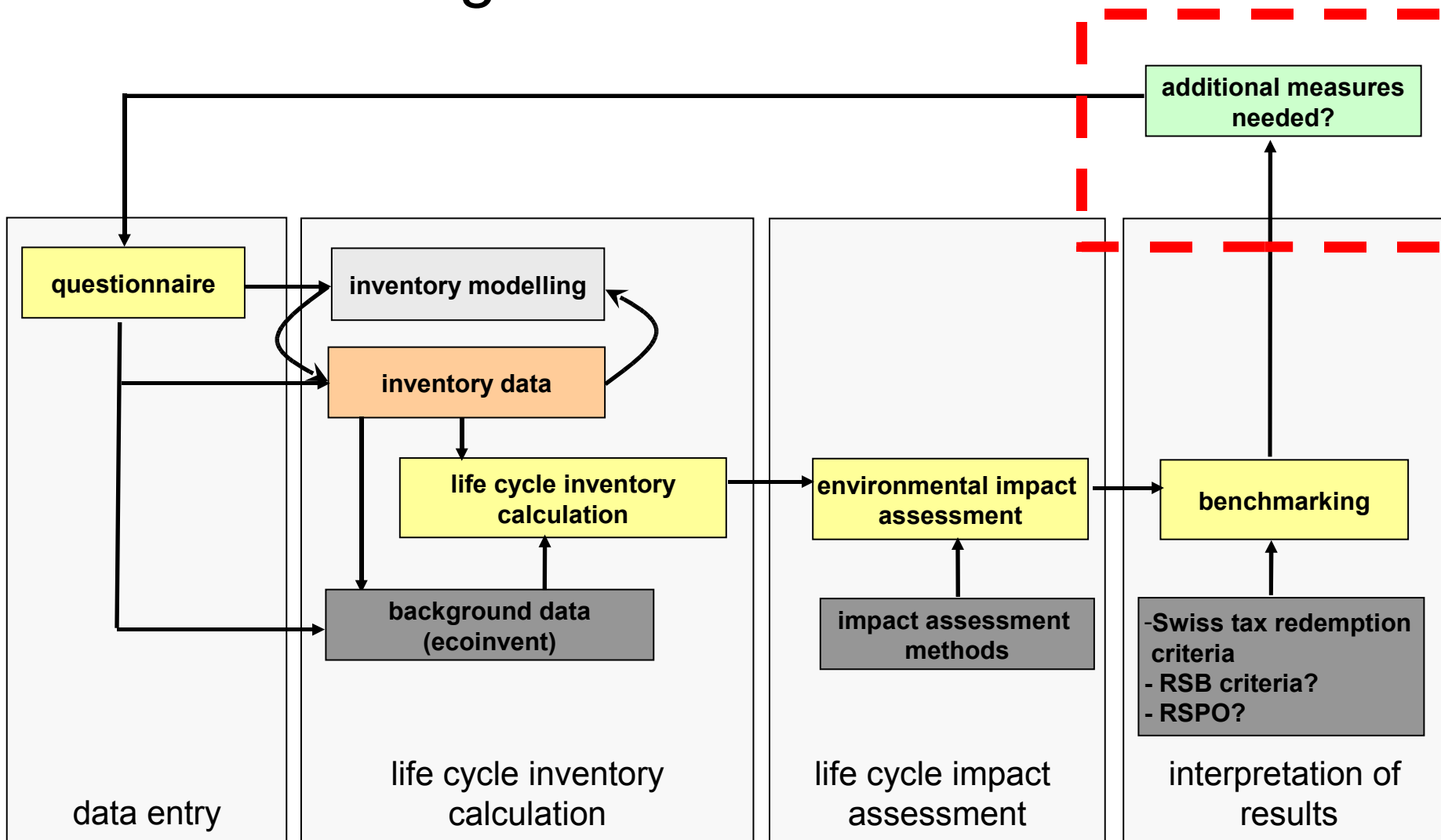
Cultivation Compare Providers Processing

Cultivation results for your calculation for X-Methylester production from rape seed.



Default values
 CO2
 Land Use
 Mineral Fertilizer
 Organic Fertilizer
 Pesticide
 Emissions

Benchmarking





Basic Data



Cultivation Data
Provider1

Land Use



Mineral Fertilizer



Organic Fertilizer



Pesticides



Processing Data



Social Criteria



Validation/
Calculation

Results

Reset entered data



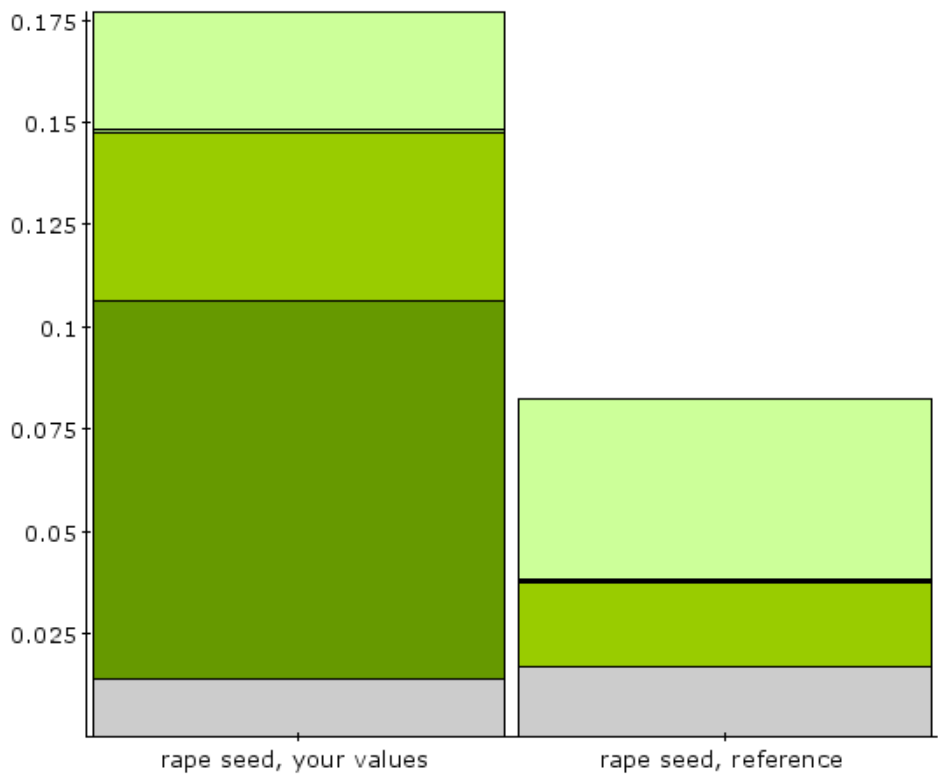
show help boxes?



Overview | **UBP06** | GWP | MAKE PDF

Cultivation | Compare Providers | Processing

Cultivation results for your calculation for X-Methylester production from rape seed.



Default values
 CO2 Land Use
 Mineral Fertilizer
 Organic Fertilizer
 Pesticide
 Emissions

Content

- Context/Motivation ✓
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 - Life Cycle Impacts Assessment ✓
 - Benchmarking ✓
- **Limitations**
- Outlook

Limitations of the tool

- Simplified models based on few parameters in the agriculture
- Reference data has only limited validity
- Streamlined assessment, doesn't replace a full LCA
- Garbage in = garbage out
- Results don't have any legal value

Outlook: work on progress!

- Prototype finished with XME from rape seed
 - currently: uncertainty assessment
 - first results appear very accurate (compared to ecoinvent)
- Phase 2 → End of May 2009
 - tests and ameliorations
 - new value chains (e.g. ethanol from sugar cane, sugar beet, etc.)
 - extension of evaluation
 - evaluation of the adaptation to other standards
 - dissemination
- tool will be available under www.sqcb.org as of May 2009



Thank you for your attention!

Jürgen Reinhard

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www.sqcb.org (as of May 2009)