Assessing existing and potential cereal food and non-food uses by combining E-LCA and S-LCA
Cereals food and non-food uses: « 4F »

- **FOOD**
  - Human food uses
- **FEED**
  - Animal feed uses
- **FUEL**
  - Energy uses
- **FIBRE**
  - Material uses
ALT-4-CER: which « F’s » of the « 4F » for Wallonia?

Key steps:

1. To draw the portrait of the Walloon cereals, and their current and future/potential uses
2. To define several scenarios 2030 acc. to current trends (B-a-U) and contrasting breaks
3. To develop environmental and socio-economic LCA methodologies fed with local data
4. To integrate environmental and socio-economic aspects through multi-criteria analysis with stakeholders
   ➢ To provide clues for most sustainable and pertinent uses of the cereal resources in Wallonia
Walloon context: main crops

(% cultivated lands)

- Winter wheat: 36%
- Winter barley: 12%
- Spelt: 16%
- Grain maize: 10%
- Forage maize: 7%
- Sugar beet: 3%
- Chicory: 2%
- Linseed: 2%
- Rapeseed: 1%
- Potato: 1%
- Temporary meadows: 2%

Cereals: 66%

Source: DGSIE (INS)- Recensement agricole 2010
Scenarios 2030: Grains + straw + forage maize

1. **Business-as-Usual**: current trends extrapolated from past 15 years
2. **Strategic**: environmental, economic and social optimization of current system
3. **Localisation**: development of new cereal conversion units in Wallonia + increased autonomy
4. **Globalisation**: massive export + focus on high added-value products (biorefinery, bio-based chemistry)
Scenarios analysis with E-LCA & S-LCA

→ Cover the 3 pillars of sustainable development

→ Common objective: evaluate environmental and socio-economic consequences of potential changes in the uses of Walloon cereals by 2030, in comparison with current situation (2010)

→ Consequential LCA

→ E-LCA & S-LCA specific objectives: assess influence of cereal use chains on environmental & socio-economic performances within a given scenario → Attributional LCA

→ Common « 4F » functional unit = 1 ha
System boundaries in E-LCA & S-LCA

Local communities
- Workers
- Companies
- Farmers

Agricultural inputs manufacturers
- Agricultural machinery manufacturers
- Cereal producers
- Agricultural contractors

Grain wholesalers
- Processing
- Animal breeder/rearer

Distributers → Consumers
- Processing

Physical flow between actors (transport)
- Influence between actors

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Environmental LCA $\rightarrow$ identify **regional** differences regarding the **cultivation** step:

$\rightarrow$ (New) cropping practices;

$\rightarrow$ Machinery characteristics & fuel consumption;

$\rightarrow$ Direct field emissions assessment;

$\rightarrow$ Inputs management;

$\rightarrow$ Animal feeding & husbandry;

$\rightarrow$ etc...

+ **Conversion** processes based on existing facilities
Scenarios analysis with S-LCA

- **Stakeholders categories**
  - Workers
  - Companies
  - Farmers
  - (Local communities)

- **Impact subcategories**
  - Workings hours
  - Health and safety at work
  - Local employment
  - Added value creation

- **Impact categories**
  - Working conditions
  - Socio-economic repercussions

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• Working conditions: interviews:
  – Using methodology *Bilan Travail* (labor balance for production step):
    • Developed by INRA & Institut de l’Elevage in order to assess *work types* and *share* for animal rearing systems
    • To be adapted for cropping systems
• Use *farms’ accounting data* collected at the Walloon Region level (FADN-like) (production step)
• Transformation step: data collection from existing *facilities*
Life Cycle Costing

• Detailed costs balance of cereal chains is not the objective of our project ➔ not a traditional LLC but a valuation of distribution of added value

• **Objective:** compare best value chain by studying distribution of costs according to chain link rather than an accurate estimation of their evolution in absolute value

• Are included: stocks, sales, raw materials, labour force costs, etc.

• Could be distributed according to working hours for example
Multi-criteria Analysis

- **Integrate** environmental and socio-economic impacts (E-LCA & S-LCA results)
- **Involve stakeholders** (producers, policy makers, consumers):
  - **Identify** most relevant impact categories, group/prioritize
  - **(Weight into a global performance indicator?)**
LCI data

Midpoint
- Human & eco-toxicity
- Ozone layer depletion
- Climate change
- Acidification
- Eutrophication
- Abiotic resources use
- Working hours
- Health & Safety at work
- Local employment
- Added value creation

Endpoint
- Human health
- Ecosystem quality
- Resources
- Working conditions
- Socio-economic repercussions

Integration

Subcategories

Impact categories

E-LCA
S-LCA

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ALT-4-CER: Expected results

Key features of the project:

• To involve local stakeholders in all steps (scenario building, data collection, impact weighting)
• To use local data → for local issues

Answer key questions raised today in human Societies:

“What type of agriculture do we want for tomorrow? Is it ethically, environmentally and economically sustainable to dedicate cereals resources to other uses than human food?”

End of project: February 2014
Thank you for your attention!

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