LCA of Starch Potato From Field To Starch Production Plant Gate

Caroline Godard, Joachim Boissy, Camille Suret, Benoît Gabrielle

c.godard@agro-transfert-rt.org

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Introduction

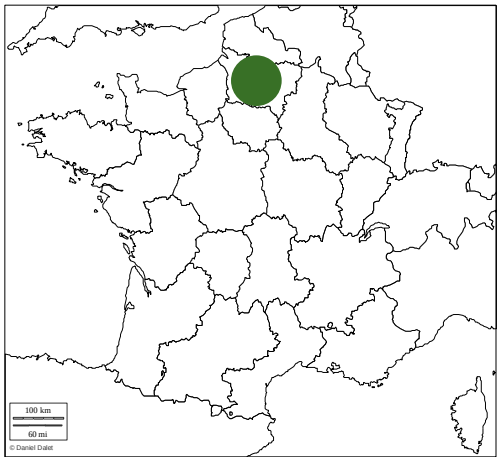
- Many industrial applications for potato starch
- Main existing LCA potato studies on food potato to date
- Our study focused on the LCA of starch potato by developing and using accurate inventory data:
  - Focus on the upstream processes
  - Focus on in-field emissions
- From a specific starch plant and crop production area: specific **logistics & production data** on starch potato
- Combined to **model based inventory methods**

Objectives of the study

- To test an inventory method based on modelling
- To focus on the contribution of soil carbon dynamic in the global warming impact of starch potato
- To provide local stakeholders with accurate environmental assessment of starch potato production

Studied area characteristics

- Supply area of a starch plant in Picardy



- 3 Major soil types

	Clay content (%)	$CaCO_3$ content (%)
1/ Deep clayey loam	20	9.2
2/ Deep loam	16	7.9
3/ Clayey loam over chalk	10	56

- Weather conditions:
  - mean annual rain: 600 mm
  - temperature range: 2.8°C (December mean T°C)
    17.8 °C (July mean T°C)

Starch potato production data

- Crop rotation: sugar beet / winter wheat / **potato** / winter wheat

  ↑

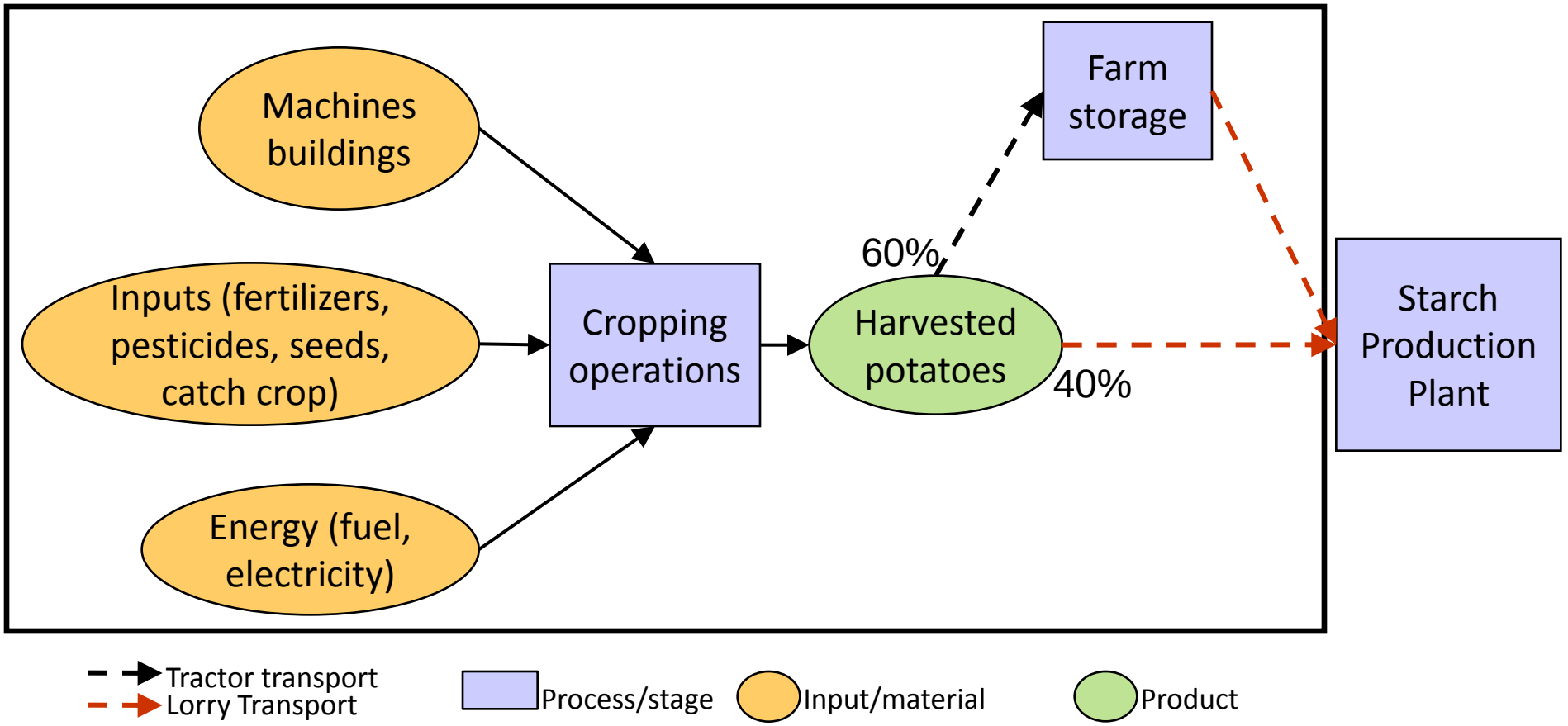
  White mustard

- Potato yield (fresh matter): 52 t/ha (22% DM)
- Rainfed potato
- Main fertilizer and pesticide inputs

N fertilizer rate	180 kg N/ha
P fertilizer rate	80 kg P_2O_5/ha
Pesticide application rate	30.06 kg active ingredient /ha
Pesticide runs	19 (including 17 fungicide sprayings)

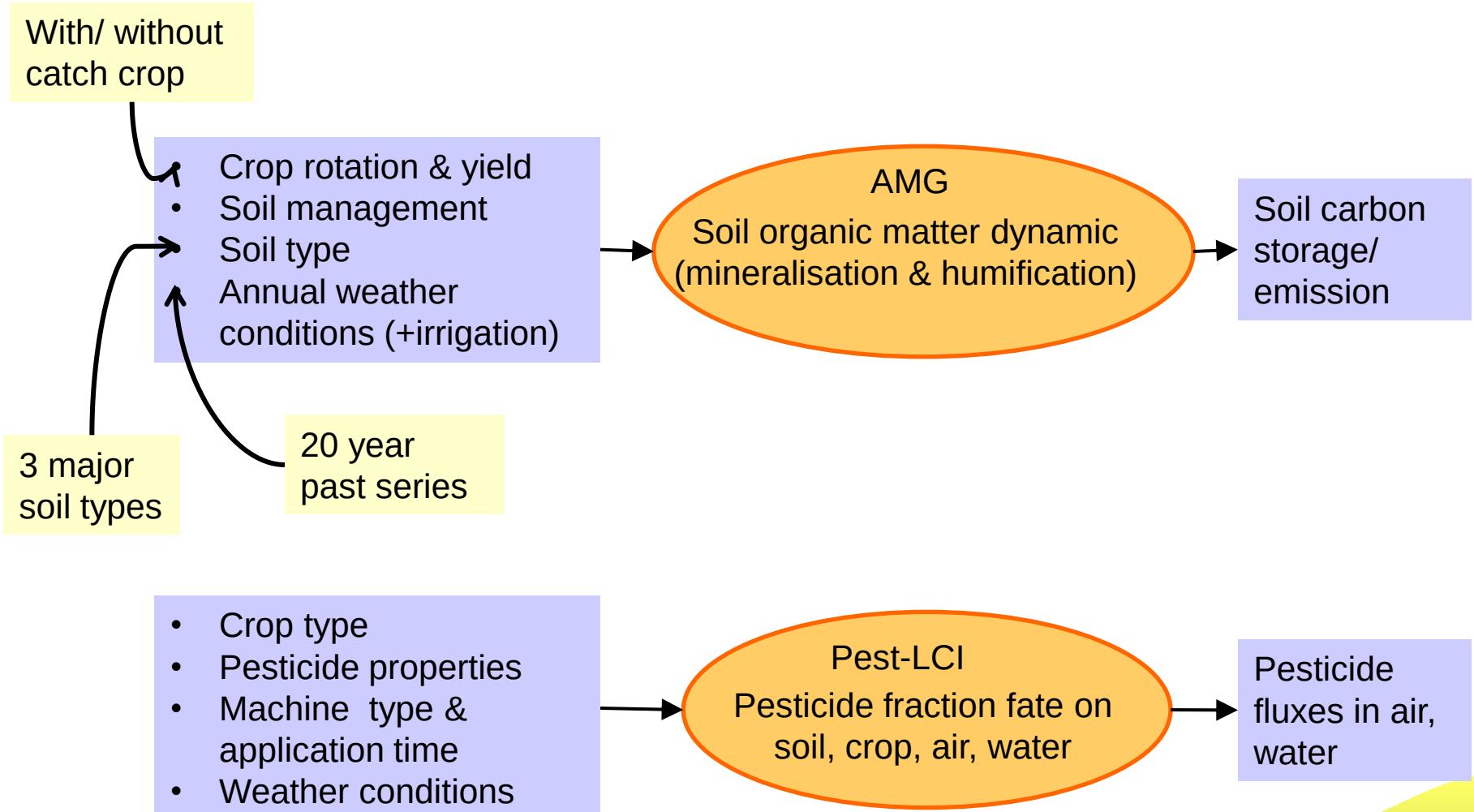
Studied system and functional unit

System boundaries

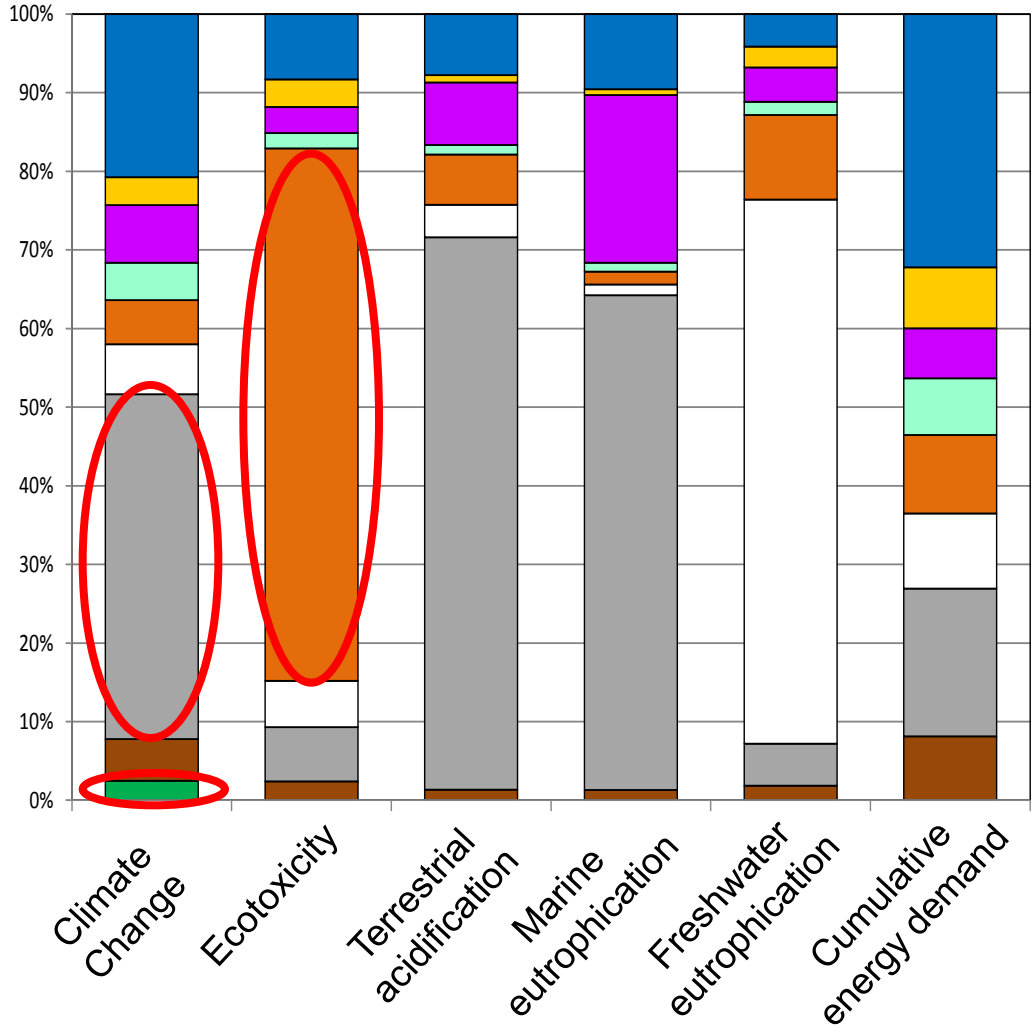


Functional Unit = 1 t starch potato (22% DM)

Inventory models
for soil organic carbon and pesticide fluxes



Contribution analysis



- Transport to the plant
- Transport to the farm + storage
- Seeding
- Harvesting
- Pesticides
- PK fertilization
- Nitrogen fertilization
- Tillage
- Soil carbon release

Soil organic carbon contribution to climate change impact

Soil type	Climate change impact (kg CO2-eq)	Soil organic carbon contribution to climate change impact	
		Without catch crop effect (%)	Including catch crop effect (%)
1. Deep clayey loam	106.7	**-15.6**	**-2.4**
2. Deep loam	109.5	**-19.5**	**-5**
3. Clayey loam over chalk	99.8	**-9.8**	**5.7**

Very few differences across 3 main soil types

Always a carbon **release**

Slight **release** to **sequestration**

Conclusion

- Approach to account for soil C dynamics in CC impact: integration of soil type, crop rotation and weather conditions
- Question of the integration of catch crop and crop rotation in the assessment of soil C dynamics
- The proposed approach is able
  - To apply in different contexts and for various crops (Godard et al., 2012)
  - To integrate spatial variation in LCA
  - To help in decision making adapted to local production conditions higlighted by our accurate environmental assessment

Thank you !

c.godard@agro-transfert-rt.org