Impact simulation of feed levers on ruminant farms sustainability with CAP'2ER®

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Introduction

- Our objectives for the dairy/beef sectors in France :
  - Reducing the milk and meat carbon footprint (20% for the milk and 15% for the meat from 2015 to 2025)
  - Improve dairy and meat sustainability
  - Implementing knowledge on environmental burdens and dairy/beef farming
  - Training advisers and farmers
  - Disseminating low carbon practices
  - Developing a national strategy and a multi stakeholders partnership

A sustainability analysis in livestock

	CAP'2ER®
Animal categories	
Environmental burdens	**Greenhouse gases emissions**: kg CH_4, kg N_2O, kg CO_2 → kg CO_2 eq **Air quality (acidification)**: kg NH_3 emitted → kg SO_2 eq **Water quality (eutrophication)**: kg N and kg P leaching → kg PO_4 eq **Energy comsumption**: Direct and indirect energy → MJ
Positives contributions	**Carbon sequestration**: kg carbon /year **Conservation of biodiversity**: ha eq of biodiversity **Food performance**: Number of fed people/year Perfalim*
Durability indicators	**Economical performances**: Production costs **Work conditions**: Quantity of work, paintulness...

CAP'2ER is following IPCC methodology

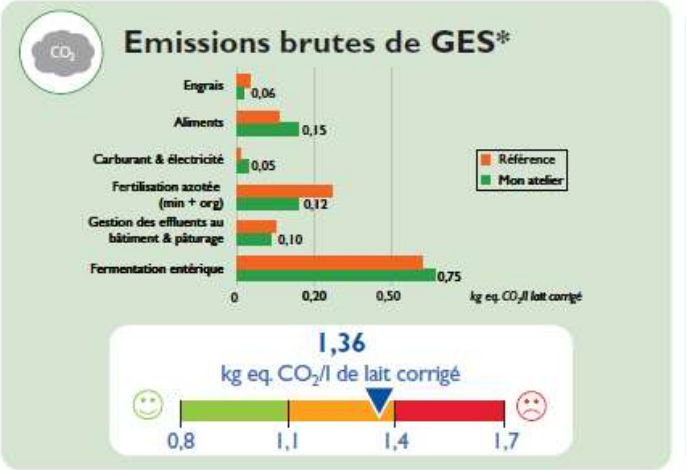
	Sources	Methodology
Methane	Enteric fermentation	IPCC 2006 – Tiers 3 Sauvant et al, 2014
	Manure	IPCC 2006 – Tiers 2
Nitrous oxyde	Manure management, mineral fertilizers	IPCC 2006 – Tiers 1 and 2
Carbon dioxyde	Energy consumption	French data base
	Inputs	EcoInvent, Ecoalim, 2016

- **CAP'2ER in accordance with**
  - LEAP (FAO) guidelines
  - IDF guidelines
- **CAP'2ER certified by**

Two levels of assessment in CAP'2ER

CAP'2ER Level 1

- A simplified analysis at dairy unit level
- 29 activity data / 1 hour to collect data and to present results to farmers
- To develop an observatory
- To highlight the link between practices and environment



CAP'2ER Level 2

- A Complete analysis at farm level
- 150 activity data / half day to collect data and to present results to farmers
- To simulate mitigation practices
- To build individual carbon action plans

→ **National data base**

Activity data collected

Herd
(animal categories and number, yield,..)

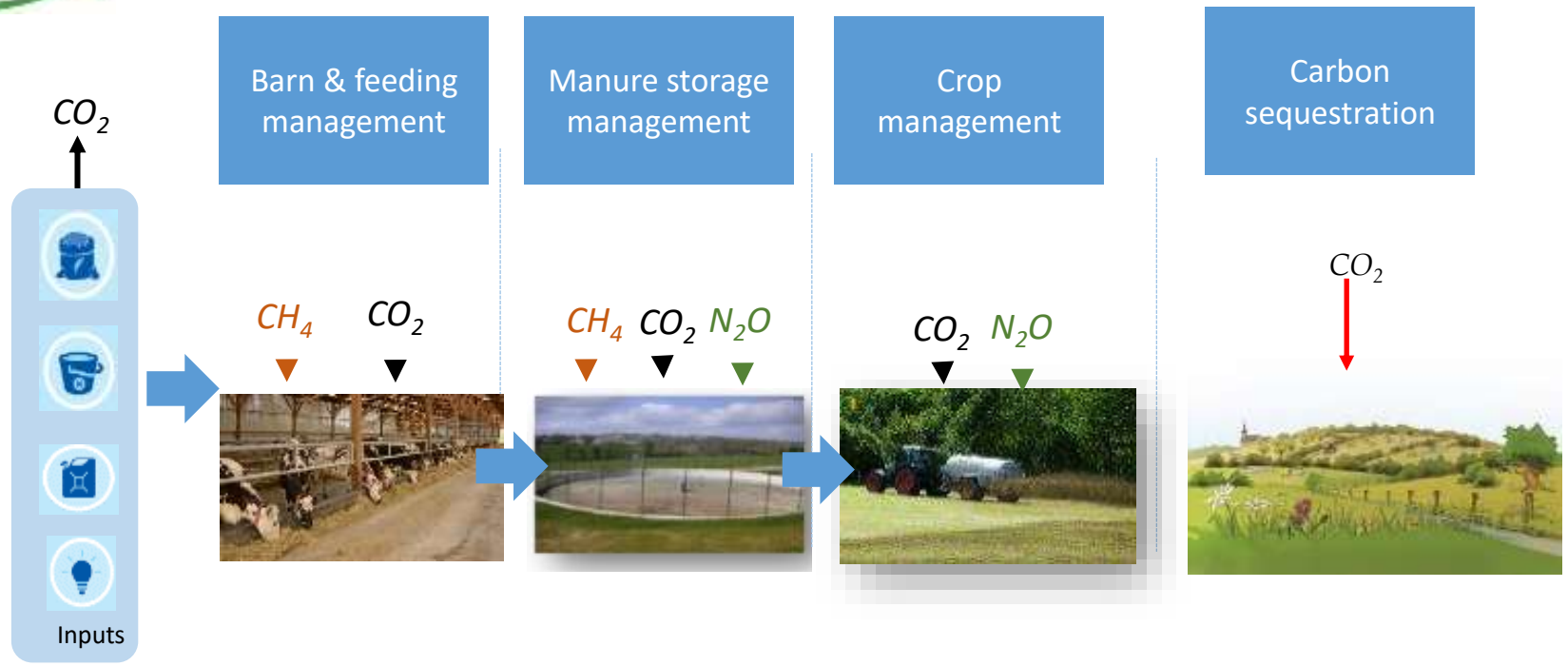
Manure management
(shed, storage,…)

Areas
(practices, rotation, fertilizers,..

Feed (forage, concentrate, quality/quantity)

Energy consumption

A LCA whole farm assessment



More than 40 mitigations practices

GHG emissions

Inputs
Pasture management,
Concentrates and fertilizers,
Legumes, Crops rotation

Fuel and electricity
No-till cultivation,
Power and equipment,
Working organization

Crops management & fertilization
Legume fodder crops,
Optimization of fertilizers uses

Herd management
Increasing productivity
Reducing number of unproductive animals

Feed
Feed efficiency,
Forage quality and yield

Manure management
Time spent in shed vs pasture,
Biogas production

Carbon sequestration

Cover crops

Avoid bare soil

Agroforestry

Grassland management

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Focus on feed levers

- Several actions may be implemented to reduce GHG emissions :
  - Reducing feed wastage in fodder and concentrates
  - Ration balance: reduce overconsumption of concentrates,
  - Increasing milk yield in accordance with genetic potential
  - Reducing the use of imported soybean meal
  - Improving protein autonomy through fodder: fodder quality, protein crop mix
  - Making better use of grass: increasing the proportion of grass in the ration by grazing and harvesting, increasing grass yield

GHG emissions reduction potential : from 2% to 8%

Substitution of soybean by rapeseed

Typical dairy farm in Western France

Optimised ration of 28 litre milk / day

1.42 kg DM of soybean meal

EF : 1.579 kg CO_2 / kg (including deforestation)

CAP'2ER®

2.13 kg DM of rapeseed meal

EF : 0.46 kg CO_2 / kg

At ration level : 0.29 kg CO_2 / kg DM
At farm level : 0.87 kg CO_2 / litre of milk

At ration level : 0.22 kg CO_2 / kg DM
At farm level : 0.81 kg CO_2 / litre of milk

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Conclusion

- CAP'2ER: multi-criteria modelling tool for environmental assessment and technical support in ruminant farm
- Simulation of action levers impact on GHG emissions, in particular levers on cattle feeding
- Feed levers : potential of GHG reduction from 2% to 8%
- Substitution of soybean meal by rapeseed very efficient because it reduces deforestation

Thanks for your attention

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