



Testing feeding levers to decrease the carbon footprint of dairy farms.

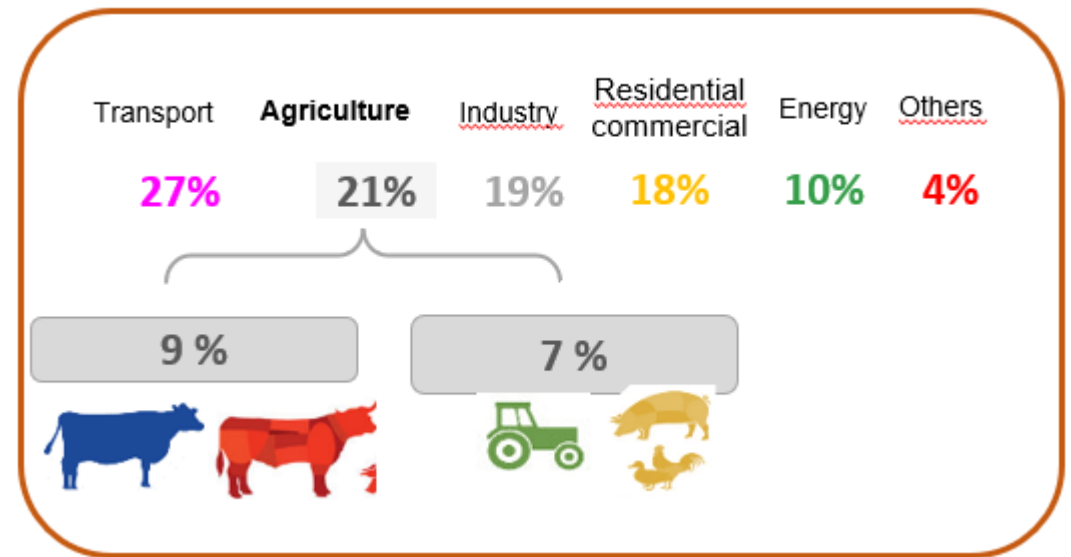
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Livestock farming at the heart of major environmental issues

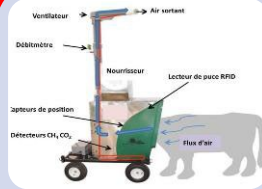
- In France, Cattle farms contribute to **9%** of GHG emissions
- National target: -20% reduction in the carbon footprint of milk by 2025
- In research farms: implementation of **low C footprint systems**
- Further: Test of extra **levers** to decrease the C footprint



Source: CITEPA, 2021

In experimental farms: test, measure, apply, innovate!

Brocard et al.,
EAAP 2022



Tests on rations or feed supplements on enteric CH₄ emissions

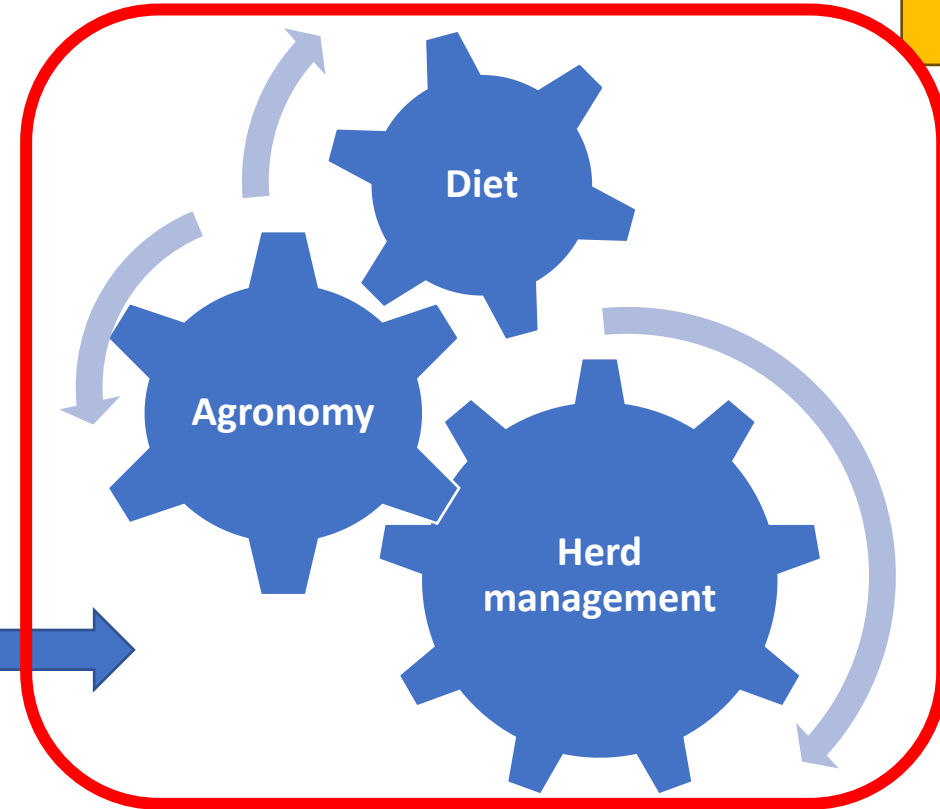


Soil observatory and effects of rotations on fertility, organic matter



Rearing young stock on grass and monitoring growth performance

Analytic test of levers



Global
technical/economic/environmental
analysis of farming systems

Reduction of production costs with no negative impact on other environmental factors and no production loss

Implementing a global Low Carbon Footprint in an experimental farm



TREVAREZ BAS CARBONE

CAP'2ER®



125 dairy cows



40-45 replacement
heifers/year



130ha

- 80ha grass
- 42ha maize
- 8ha cereals

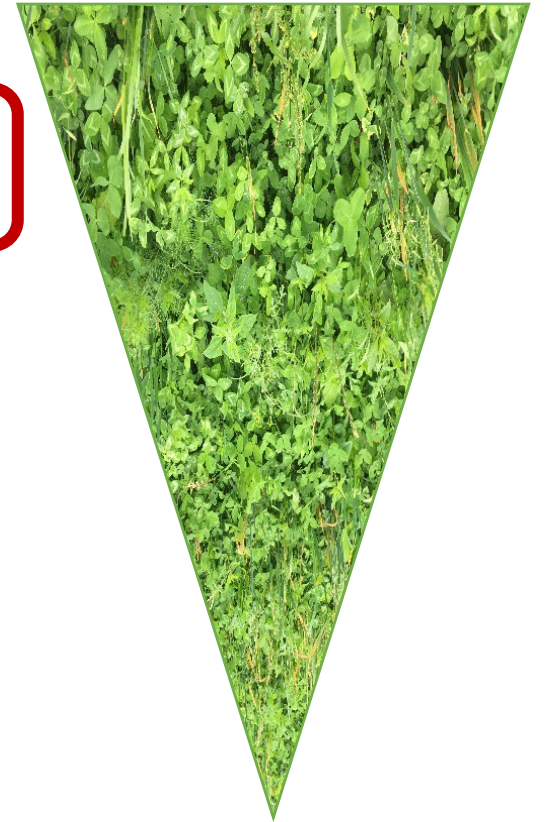


- Aim = 8,000 kg produced per cow per yr
- 0.25 ha grazed grass per cow (regional average)

Potential levers to decrease C footprint and their relative impacts



- Herd management: 10-15%
 - Replacement, heifers, herd health
- Feeding: 2-4%
 - Forage quality, concentrates, protein self sufficiency, grazing
- Crops management: 3-4%
 - Yield, fertilisation
- Energy consumption: 1-2%
 - Fuel, electricity
- Carbon storage: 2-8%
 - Type of grasslands, lifespan of the temporary grasslands, renewing/reseeding grasslands, new hedges, agroforestry



ESTIMATED IMPACTS OF SOME TECHNICAL LEVERS ON THE CARBON FOOTPRINT

Production concentrate

- Without

-4%

Protein concentrate

- Rapeseed

-6%

Stage of harvest for grass silage

- Early harvest

-1%

Age at 1st calving

- 24 months

-2%

Calving period

- 65% Autumn –
35% Spring

0%



Economy, environment, workload?

Going further with feeding levers?

4 experiments

Feeding additive



95 g
PDI/UFL
(16%CP)

Winter Control
Diet

Grazing legume-rich leys in
summer



Ear-corn silage



Fodder beets



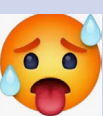
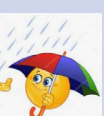
N conc

4-5 kg DM
grass silage

Ad lib
maize
silage

Grazing legume-rich leys in summer

- 3 contrasted summers:
- Analytic experiment: 3 months

2021	2022	2023
 	  	 

↓
2*20 cows

CONTROL

EXPERIMENTAL

100% indoor

Indoor + 4h grazing

cow ⁻¹ d ⁻¹	Control	Experimental
Maize silage (kg DM)	16	11
Grass silage (kg DM)	4	4
Grazing (kg DM)	0	Target: 5
Rapeseed cakes 35%CP (kg)	4.2	2.9

**Replacing
concentrate by
legume grazing**



Grazing legume-rich leys in summer

to reduce N concentrate

2021-23

**40 to 66%
legumes
17 to 22% CP**

**Average
density
189 to 300
kg
DM/cm/ha**

**Average
growth
50 kg
DM/ha/d**

**Carbon
Footprint:
0 to -0.03 g
CO₂/l milk eq**

**-2 to 0 kg
milk
difference**

**Margin over
feeding cost
+0,42 €/cow/d
(max)**

**No effect
on milk
solids**



A self sufficient diet based on grass silage and ear corn silage:

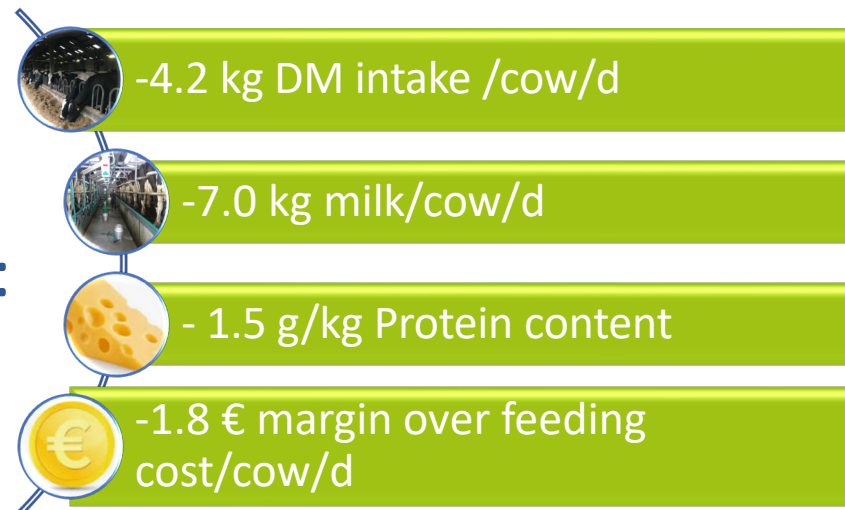
- ear corn silage tested during 2 winters



Diets	Control	ABCD
Maize silage	Ad lib	/
Grass silage (13% CP)	4 kg DM	Ad lib
Ear corn silage	/	5 kg DM
Rapeseed cakes	260 g / kg DM maize	1 kg (Greenfeed)

- With a diet based on ad libitum grass silage and 5 kg DM ear corn silage :

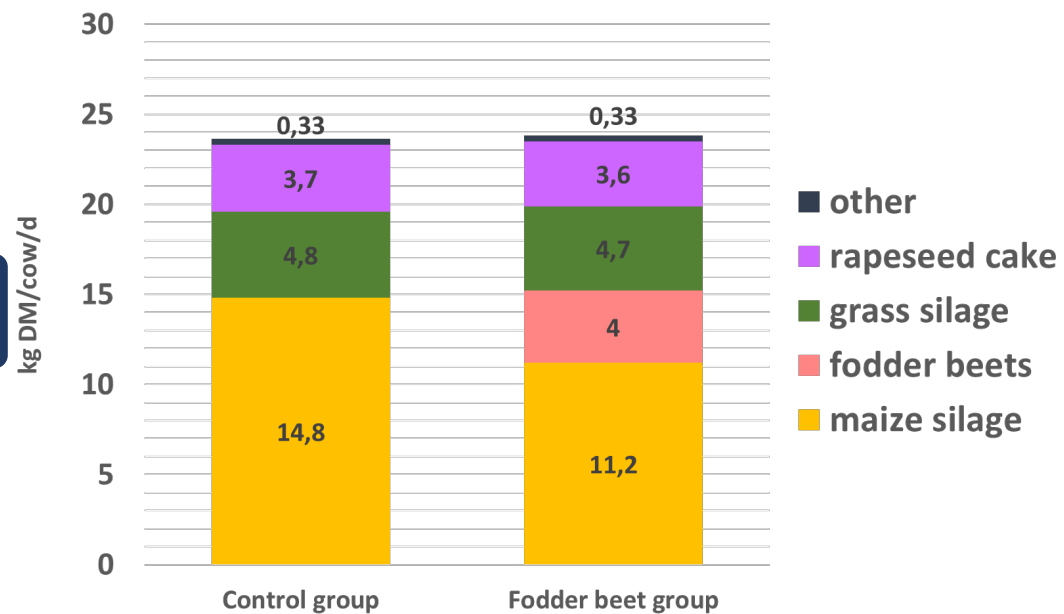
More self
sufficiency



No
decrease
in C
footprint

Fodder beets added to maize silage diets: no miracle

- Addition of 4 kg DM fodder beets on a maize silage diet: tested during 2 winters



-  Same yield as maize, or better
-  Complete substitution fodder beets/maize silage
-  -1.0 kg milk/cow/d
-  No effect on milk solids
-  Positive effects: agronomy, CAP, climate

No
decrease
in C
footprint

Feeding additives to reduce the enteric methane?



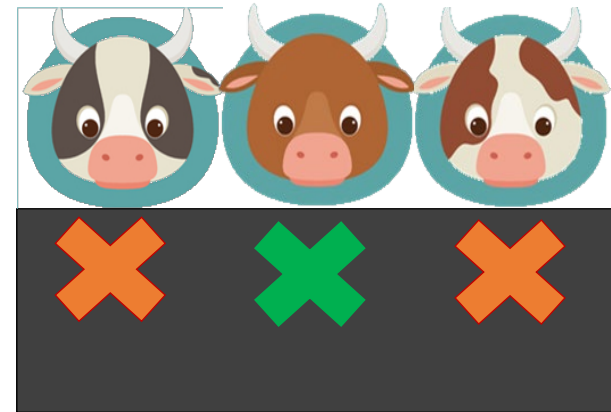
2 x 20 cows



12 weeks



22 g per day



g/d

-0.8 g/kg
milk

g/kg
DMI

**A slight decrease in CH₄ emissions per kg corrected milk
-2% at year level**

Benchmarking feeding levers tested:

Feeding additive



But cost and acceptability?

Grazing legume-rich leys in summer



Ear-corn silage



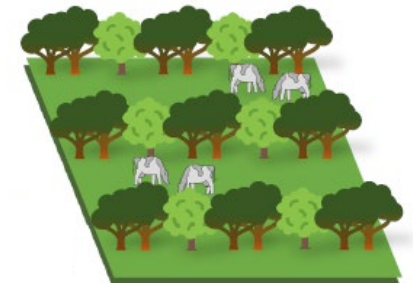
If compensation
of milk decrease by + cows

Fodder beets



Conclusions

- Possible to decrease C footprint on most of dairy farms with simple levers
 - In parallel, reduce dependency on N inputs
 - In Trevarez: 0.86 NCF in 2018, 0.71 in 2022 (g CO₂ per l milk eq.)
- Extra levers: Impact remains limited
 - combine families of levers with consistency
- Usually positive neutral or positive effect on farm profit
 - Workload ?
 - Cost of additives? Acceptability by farmers and consumers?



Conclusions

- A ruminant is ruminating, in particular in low input systems based on forage production (= profitability)
 - Biologic emissions represent 85% of our emissions (CH_4 rumination, N_2O manure management)
 - Compensate C input emissions only? We currently store 100% of the C inputs (fertilisers, rapeseed) under grasslands + root of hedges
 - Change calculation methods (GWP*)?



Grazie mille !!!

Questions?



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