LIFE 14CCM/BE/001187 LIFE DAIRYCLIM

Feeding strategies to decrease methane emissions and carbon footprint of dairy cows in Belgium, Luxembourg and Denmark

LIFE DAIRYCLIM

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C. Actions

- C.1: Survey on grasslands loss and proportion of grazed areas
- C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions
- C.3: Development of precision grazing methods at the experimental farm
- C.4: Follow-up and application of best feeding strategies and precision grazing in the experimental and pilot farms
- D.1: LCA
- D.2: Monitoring
- E: Dissemination
- F: Management

C.1: Survey on grasslands loss and proportion of grazed areas

Responsible beneficiary: Convis (Lu)

- Foreseen start date: 1/12/2015
- Actual end date: 1/04/2019

Actual start date: 1/12/2015

Foreseen end date: 1/04/2019

Objectives

- grasslands loss : proportion to be estimated by collection of official figures
- grazing proportion and grazing practices: info's collected via a survey
- Report => policymakers and stakeholders
- Increasing awareness about this topic
- A second survey will be organised at the end of project => objectivizing changes – progresses
- Target: 20% answer rate

C.1: Survey on grasslands loss and proportion of grazed areas

Problems encountered

Collection of data

- Delay to receive updated official figures (2015)

- Low answer rate in LU => questionnaires were allotted to the CONVIS advisors => answer rate of 14.4%

- Some forms were deleted due to obvious mistakes and/or answers to a very limited part of the questions.

C.1: Survey on grasslands loss and proportion of grazed areas

Country	Sent forms		Filled forms		Used forms		Answer rate
Wallonia	3152		1016		1004		32,2 %
Denmark	2550		386		375		15,1 %
Luxembourg	430		62		60		14,4 %
Total	6132		1464		1439		23,9 %

Question 8: Answers difficult to provide: productivity - fertilizer

C.1: Survey on grasslands loss and proportion of grazed areas

Problems encountered

Report

- In the proposal, each country => treatment –Stat on its own dataset
- Report based on the compilation of 3 national reports
- Report delivered with the progress report

After suggestions from EU:

- Another approach: compilation of the datasets from each country
- Statistical analysis as a whole
- New report provided with the Mid term Report

C.1: Survey on grasslands loss and proportion of grazed areas

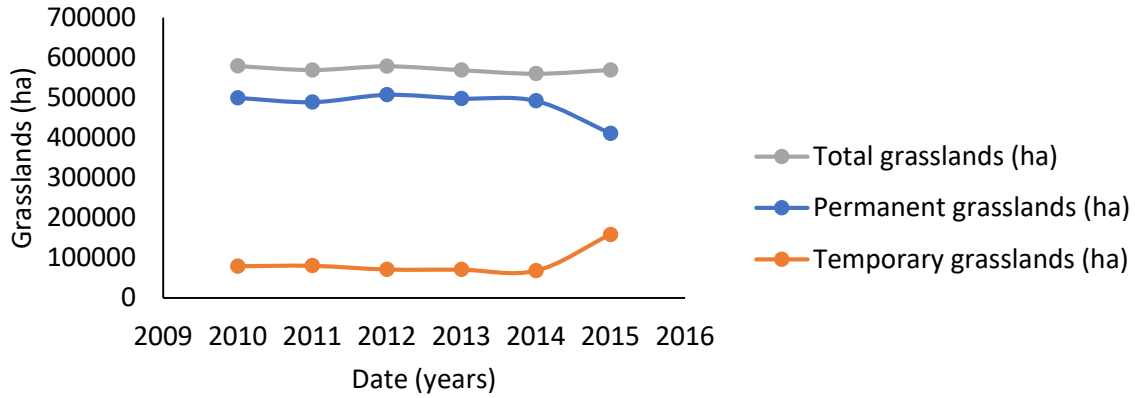


Figure 1. Evolution of surfaces devoted to grassland in Belgium

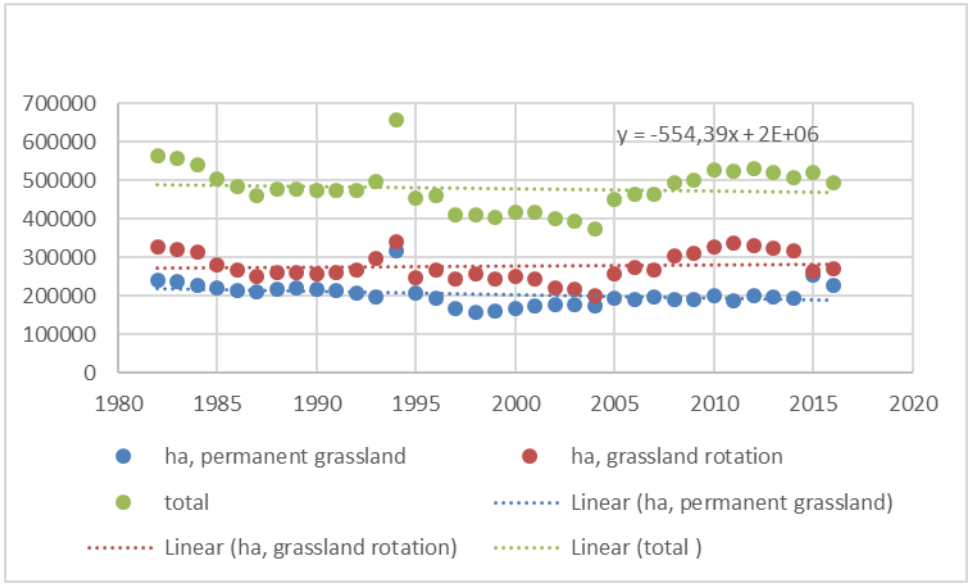


Figure 2. Evolution of surfaces devoted to grassland in Denmark.

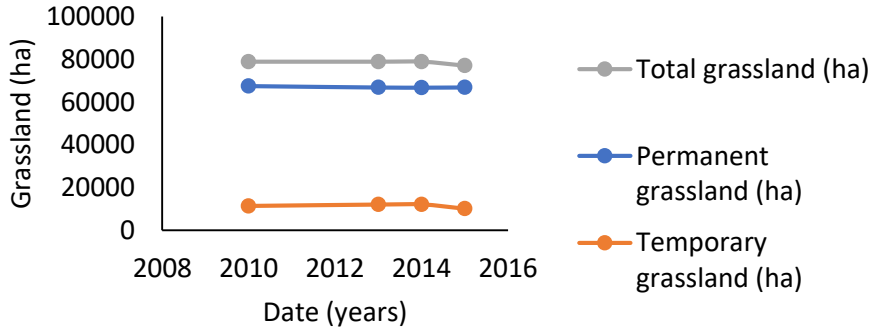


Figure 3. Evolution of surfaces devoted to grassland in Luxembourg

C.1: Survey on grasslands loss and proportion of grazed areas

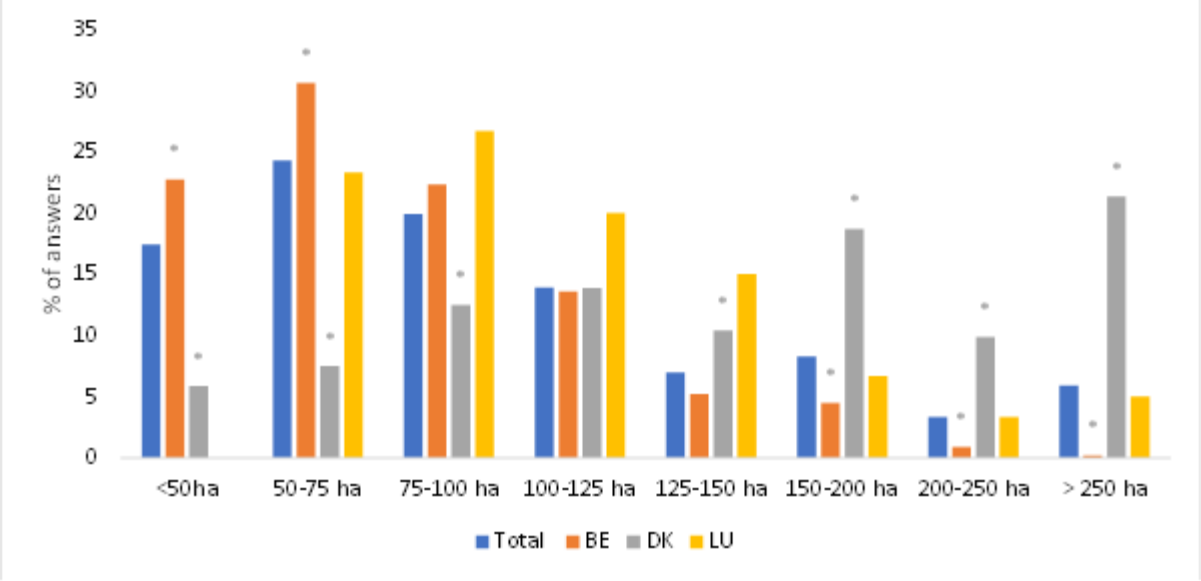


Figure 6. Surfaces of the dairy farms from each country and comparison with the compiled dataset. Statistical differences (p<0,05) are highlighted by "". BE is Belgium. DK is Denmark. LU is Luxembourg.*

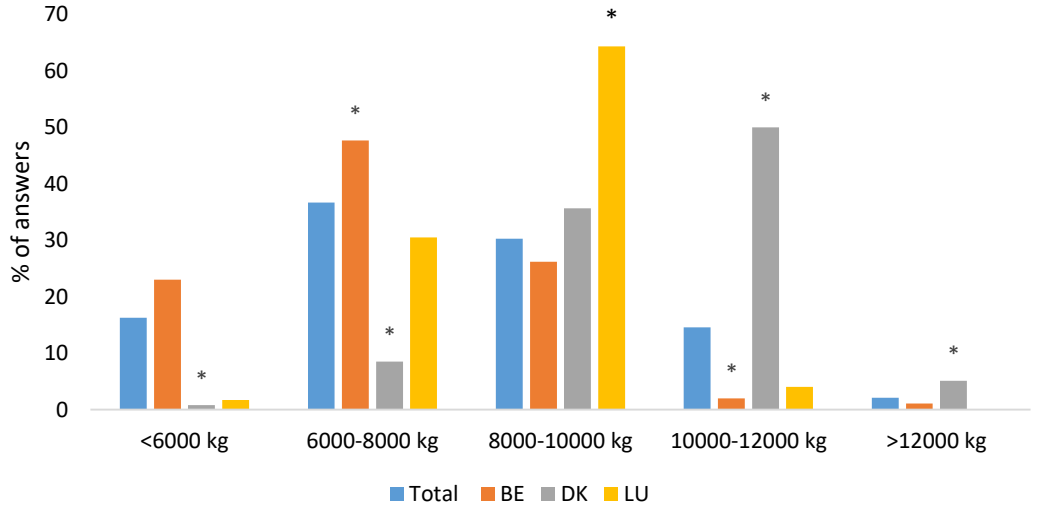
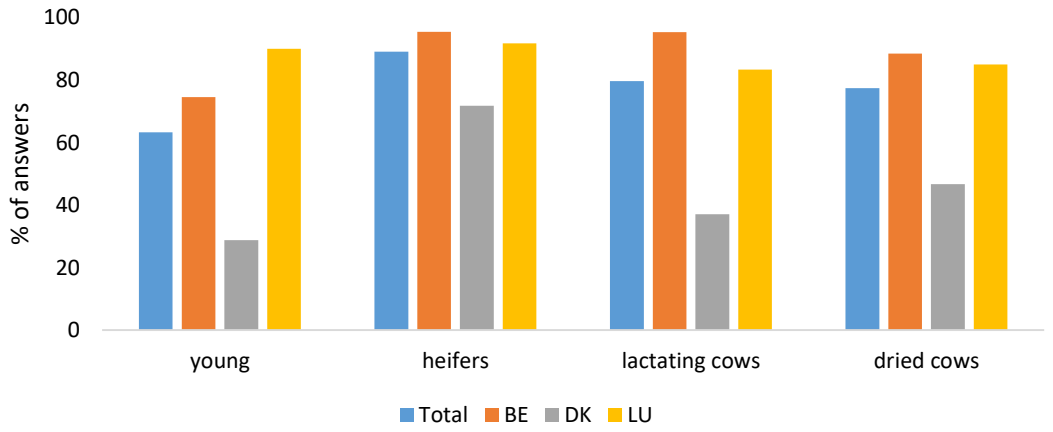


Figure 8. Average annual milk yield per cow and per farm in each country and comparison with the compiled dataset. Statistical differences (p<0,05) are highlighted with an "". BE is Belgium. DK is Denmark. LU is Luxembourg.*

Figure 9. Dairy cattle having access to pastures: percentage of each category in the compiled dataset and in each country. BE is Belgium. DK is Denmark. LU is Luxembourg.



C.1: Survey on grasslands loss and proportion of grazed areas

Future of grazing

- Farmers were asked about their perspectives regarding grazing:
- 86 % => expect keeping or increasing grazing practices.
- 10% => would decrease grazing and 4% thought they would stop it.
- 13% => no opinion

C.1: Survey on grasslands loss and proportion of grazed areas

2d Survey

Questionnaire

- Ask contact number?
- Help to fill in?
- Direct contact to fill in? e.g discuss about the survey at agricultural events

C.1: Survey on grasslands loss and proportion of grazed areas

- Deadlines

Date	Note
11/15	Sending of the first inquiry on grassland loos and grazed proportion
01/16	Cloture of the first inquiry period
04/16	Grassland loss and grazed proportion in Luxembourg, Denmark and Belgium in 2015: Report
10/18	Sending of the second inquiry on grassland loss and grazed proportion
01/19	Cloture of the second inquiry period
04/19	Grassland loss and grazed proportion in Luxembourg, Denmark and Belgium in 2018

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

	Oct 2015	April 2016	August 2016	Transition	January 2017	May 2017	August 2017
Site	Experimental farm – Sart Timan			Experimental farm – Sart Timan => CTA Strée	CTA-Strée		
	Winter		Summer		Winter		Summer
	Test 1		Test 2		Test 3		Test 4
	Compound rich in Starch	Compound rich in Fat	Different amounts of concentrates vs grazing		Compound rich in Fat Extruded Linseed (ELS)	Compound rich in Fat Extruded Canola seed (CS)	Dry ration vs grazing

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Problems encountered

2015-2016

- *Latin square design*: cows fed with the control feed produced more milk than those with the test feed => mixing of the groups during test 2
- *More delay needed for rumen adaptation*
- *Concentrate rich in fat:* problems in distribution
- *Methane calculations* (Pr Nicolay)
- *Reduction of methane emissions*

Delays due to all these problems => increased DIM in the herd

Lower milk yield => less concentrate fed

=> lower methane decrease than expected

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Problems encountered

2015-2016

Grazing season

Poor meteorological conditions => muddy pathways + low grass growth

Increase mastitis rate => culling of some cows – early drying off of some others

⇒Important decrease in herd size

⇒We proposed to change from experimental site

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Problems encountered

2016-2017

CTA- Strée

Analysis of problems encountered:

- 1. Still using a compound rich in fat (ELS vs CS)
- 2. Waiting for beginning the trials to get well balanced groups
- 3. Increasing the proportion concentrate vs forage => %Fat >>>
- 4. Switching from ELS to CS : no need for increasing the transition period

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Problems encountered

2016-2017

CTA- Strée

Technical difficulties to adapt the Guardian® in the barn

2016-2017 Summer season

Trials lasted for 2 months with comparison of dry ration vs grazing

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Composition (kgDM)	Total mixed ration Trial 1	Total mixed ration Trial 2
Grass silage	5,4	6,6
Maize silage	6,4	7,1
Sugar beet pulp	2,6	3,4
Cereal crop silage	2,7	-
Compound feed*rich in protein	2,3	1,8
Salt - minerals	0,1	0,1
Total	19,6 kg	19,1 kg
Milk yield allowed	**20,6 kg**	**20,6 kg**

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Composition of tested compounds

g/kgDM	Control	ELS	CS
DM	889	883	888
VEM	942	1180	1179
CP	238	232	229
DVE	135	148	143
OEB	22	8	11
Starch	157	229	237
Sugars	62	45	45
Fat	41	113	112
Cellulosis	155	86	92
NDF	364	267	243
ADF	197	130	130

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Composition	Trial ELS		Trial CS	
g/kgDM	TMR +Control (Control feed)	TMR + ELS (rich in fat)	TMR +Control (Control feed)	TMR +CS (rich in fat)
DM	360	360	360	360
VEM	910	950	930	970
CP	158	158	149	148
DVE	84	85	84	85
OEB	6	3	-3	-5
Starch	139	151	142	157
Sugars	38	35	37	34
Fat	36	48	34	47
NDF	410	391	413	392
Concentrate feeding (kg/cow/d)	5,0	4,6	5,0	4,8

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Results

2016-2017

CTA- Strée

- A drop by 5% of methane/cow/d in ELS
- A drop by 11% of methane/kgmilk in ELS
- A drop by 7% methane/kg milk in CS

- **Unit: /kg milk?**

✓ **foreseen in the proposal**

✓ **different methods exist for calculationg ECM**

✓ **important Standard error between animals : Fat globules very difficult to manipulate – important variations from milking to milking and from day to day**

It seems us more clear to speak about /kg milk

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

To be highlighted:

- The TMR included 74% of forages = real situation of commercial farms
- Decreasing rate slightly lower with CS
- Choice of CS or ELS to be discussed regarding the CF – production costs
- High N efficiency of the rations

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Milestones

Date	
10/15	Choice of winter diet 2015-2016
03/16	Test 1 –concentrate rich in starch – concentrate rich in saturated fat (Linseed)
04/16	Choice of summer diet 2016 – Test 2
05/16	Results report of the feeding test Test1 => Progress report
09/16	Choice of winter diet 2016 – Test 3 – concentrate rich in fat (Linseed vs canolaseed)
09/16	Test winter diet 2016 -2017 – Test 3
10/16	Results report of the summer diet – Test 2
04/17	Choice of diet 4 – Test 4
03/17	Test 3
05/17	Results report of the feeding test 3 => Mid term report
09/17	Test 4
09/17	Results report of the feeding test 4 => collection of results
10/17	Final report of the feeding tests => under redaction

C.2: Defining at the experimental farm best feeding strategies for dairy cows to mitigate CF and GHG emissions

Deliverable	Deadline	Status, remarks
C2 report Feeding trials Test 1	5/2016	Delivered
C2 report Feeding trial Test 2	10/2016	Delivered
C2 report Feeding trial Test 3	05/2017	Delivered – included in Mid Term
C2 report Feeding trial Test 4	09/2017	Under redaction
C2 report of the feeding tests	10/2017	

C.3 Development of precision grazing methods

Responsible beneficiary: ULg

- Foreseen start date: 1/5/2016 Actual start date: 22/4/2016
- Foreseen end date: 30/9/2017 Actual end date: 30/9/2017

C.3 Development of precision grazing methods

- Milestones

Milestones		
Beginning of the first test at grazing	05/2016	OK
End of the first test at grazing	09/2016	31/08/2016
Beginning of the second test at grazing	05/2017	OK
End of the second test at grazing	09/2017	30/9/2017
Beginning of the third test at grazing	05/2018	
End of the third test at grazing	09/2018	

Deliverables

Deliverable	Deadline	Status, remarks
C3 report of the first grazing test	10/2016	Delivered
C3 report of the second grazing test	10/2017	About to be finalised

C.3 Development of precision grazing methods

Problems encountered and solutions

- Difficulties for obtaining the Grasshopper®

=> in 2016:

- measurements of grass height were made by the rise plate meter Jenquip® - specific file “Observatoire de l’Herbe”, already used in the EU project Autograssmilk.

⇒ in 2017:

- Measurements with the EC20 – specific file “Observatoire de l’Herbe”

C.3 Development of precision grazing methods

C.4 Follow-up and application of best feeding strategies and precision grazing on the experimental and pilot farms

Beneficiary responsible for this action: Convis

Foreseen start date: 1/6/2016

Actual start date: 30/6/2016

Foreseen end date: 19/8/2019

Actual end date: 19/8/2019

C.4 Follow-up and application of best feeding strategies and precision grazing on the experimental and pilot farms

Deliverable	Deadline	Status, remarks
Report on characterization of pilot farms	10/2017	Running
Satisfaction questionnaire in pilot farms	12/2017	
Final statisfaction questionnaire	3/2019	
Report on best feeding strategies, precision grazing, CF	8/2019	
Milestones		
Agreements with pilot farms	3/2016	OK
Observation phase in pilot farms	06/2016	OK
Beginning of implementation of best feeding strategies in pilot farms	10/2017	In preparation
End of implementation period	7/2019	

Overview of the C4 action at midterm

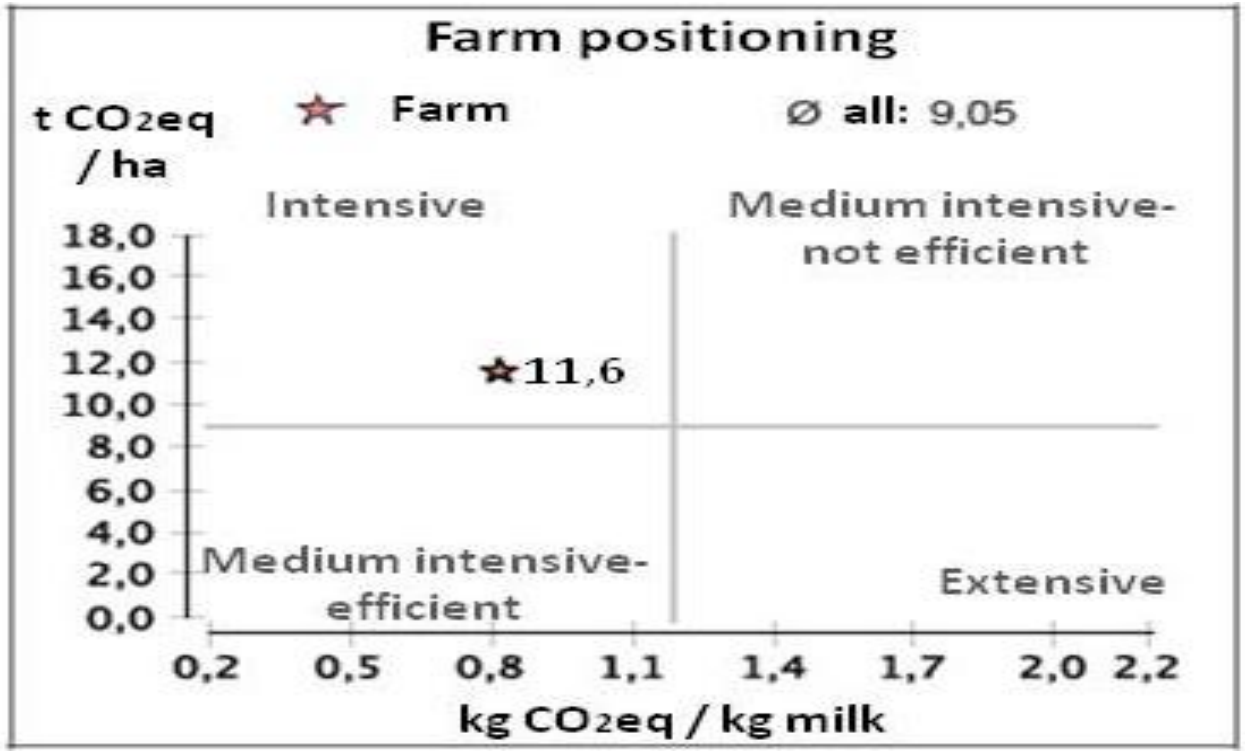
Beneficiary responsible for implementation: CONVIS

- Choice of pilot farms in Luxembourg, Wallonia and Denmark
- Harmonization of data collection for calculating carbon footprint with Danish and Luxembourgish methods

Choice of pilot farms [12 farms, 4 for each country]

A) Luxembourg

	Prod. m	efficient	Intensive
Herd size		96	120
Farm size	a	92	106
Intensity		072	9.358
Results CF1		1,3	1,0
Results CF2		2,8	11,2



Choice of pilot farms [12 farms, 4 for each country]

B) Denmark

Prod. method		Conventional	Conventional	Conventional	Organic
Herd size	cows	325	340	120	200
Farm size	agricultural area - ha	325	250	125	300
Intensity	kg ECM/ha	13.000	16.592	11.520	7.333
Results CF1	kg CO2 per kg ECM	0,94	1,04	1,00	1,03
Results CF2	t CO2 per ha	12,2	17,3	11,5	7,6

Choice of pilot farms [12 farms, 4 for each country]

C) Belgium

Prod. method		Conventional	Conventional	Conventional	Conventional
Herd size	cows	121	65	102	75
Farm size	agricultural area - ha	95,6	110	81,5	84
Intensity	kg ECM/ha	11.056	5.420	8.813	7.553
Results CF1	kg CO2 per kg ECM	n.y.a.	n.y.a.	n.y.a.	n.y.a.
Results CF2	t CO2 per ha	n.y.a.	n.y.a.	n.y.a.	n.y.a.

Choice of pilot farms [12 farms, 4 for each country]

Common criteria for farm choice:

- willingness to collaborate
- interest to participate in demonstration and development activities
- interest in environmental topics

Harmonization of data collection [Surfaces]

Crops	Info	Total surface (ha)	Feed surfaces (ha)	Surfaces for biogas (ha)	Cash crops (ha)	Yeald (dt/ha)
Oat						
S-Wheat						
W-Wheat		20			20	70
Spelt						
Corn						
Braley for brewery						
S-Barley						
W-Barley		10	10			60
Rye						
Triticale						
Rape		25			25	40
Sunflower						
Peas						
Faba beans		10	5		5	30
Potatos						
Sugar beets						
Forage beets						
Mais silage		20	10		10	
Alfa alfa, clover, gras-clover						
Permanent grasland		60	40	10	10	
Temporary grasland						
Gras for seed production						
Others (specify)						
Set a side						

Harmonization of data collection [Animals]

Kategorie	Code	Number	Months in stable	% slurry	% FYM
Young animals fem. <6 months	821001	24	12		100
Young animals fem. >6 months; <1 year	821002	23	8		100
Young animals fem. 1-2 years	821003	37	6	100	
Young animals fem. >2 years (heifers)	821004	4	6	100	
Fattening haifers	821005				
Dairy cows	821006	80	12	100	
Fattening cows	821007				
Breeding bull	821010				
Calfs males <6months	821011	13	12	100	

Harmonization of data collection[Inputs to the cultures

Crops	Oat	S-Wheat	W-Wheat	Spelt	Corn	Braley for brewery	S-Barley	W-Barley	Rye	Triticale	Rape	Sunflower	Peas	Faba beans	Potatos	Sugar beets	Forage beets	Mais silage	Alfa alfa, clover, gras-clover	Permanent grasland	Temporary grasland	Gras for seed production	Others (specify)	
Pesticides																								
Herbicides																								l (kg)
Total herbicides																								l (kg)
Fungicides																								l (kg)
Regulators																								l (kg)
Insecticides																								l (kg)
Molluscicides																								l (kg)
Pesticides for seeds																								l (kg)
Other pesticides																								l (kg)
Seeds																								
Cereals																								dt
Mais																								dt
Fine seeds (grasses, clover)																								dt
Fine seeds (rape)																								dt
Sunflower																								dt
Peas, beans																								dt
Potatos																								dt
Beets																								dt
Fertilizers (without mineral fertilizer with only nitrogen)																								
Superphosphate 45																								dt
Superphosphate 18																								dt
Thomasphosphate																								dt
Superphosphate triple																								dt
Kainit																								dt
Kalisalz 40																								dt
Kalisalz 60																								dt
Patent Kali																								dt
Kalisalz 50																								dt
MAP 11/52/0																								dt
NP 17/7																								dt
NP 18/46																								dt
NP 20/20																								dt

Harmonization of data collection [Other inputs]

Mineral nitrogen fertilizers	Quantity	Quant. on mais	
Ammonium nitrate 20%+5%MgO			dt
Ammonium nitrate 27%			dt
Ammonium nitrate 33%			dt
Ammonium nitrate 22%			dt
Ammonium nitrosulfate 26%			dt
Urea			dt
Ammonium sulphate 21%			dt
AHL 30%			dt
Calcium nitrate			dt

Energies, other production means	Quantity	
Fuel (Diesel)		l
Fuel (heating)		l
Fuel (Diesel) for biogas		l
Oils, fats		l (kg)
Plastic for silage		kg
Mill and mix grain		t
Tractor h (80-100PS)		h

Purchase of animals	Number	weight	
Young animals fem. <6 months			dt
Young animals fem. >6 months; <1 year			dt
Young animals fem. 1-2 years			dt
Young animals fem. >2 years (heifers)			dt
Fattening haifers			dt
Dairy cows			dt
Fattening cows			dt
M-Fresser			dt
M-Mastbullen			dt
Breeding bull			dt
Calfs males <6months			dt

Corferments for biogas	Quantity	
Specify.....		t
Specify.....		t
Specify.....		t

Electricity, Water, medicaments	Quantity	
Electricity		kWh
Water		m3
Medicaments for animals		€

Feeds and straw	Quantity	
Calf muesli		dt
Concentrate 12 % meal		dt
Concentrate 12 % pellets		dt
Concentrate 13% meal		dt
Concentrate 13% pellets		dt
Concentrate 14 % meal		dt
Concentrate 14 % pellets		dt
Concentrate 15% meal		dt
Concentrate 15% pellets		dt
Concentrate 16% meal		dt
Concentrate 16% pellets		dt
Concentrate 17% meal		dt
Concentrate 17% pellets		dt
Concentrate 18% meal		dt
Concentrate 18% pellets		dt
Concentrate 19,5% meal		dt
Concentrate 19,5% pellets		dt
Concentrate 20% meal		dt
Concentrate 20% pellets		dt
Concentrate 21% meal		dt
Concentrate 21% pellets		dt
Concentrate 22% meal		dt
Concentrate 22% pellets		dt
Concentrate 23 % meal		dt
Concentrate 23 % pellets		dt
Concentrate 25% meal		dt
Concentrate 25% pellets		dt
Protein concentrate 30% meal		dt
Protein concentrate 30% pellets		dt
Protein concentrate 35% meal		dt
Protein concentrate 35% pellets		dt
Protein concentrate 40% pellets		dt

Harmonization of data collection[Products / Output]

Categories	Products	Units	Weight	
Renewable energies	Fuel (l) - [heat from biogas]			l
Renewable energies	Electgricity from biogas			kWh
Animals	Young animals fem. <6 months			dt
Animals	Young animals fem. >6 months; <1 year			dt
Animals	Young animals fem. 1-2 years			dt
Animals	Young animals fem. >2 years (heifers)			dt
Animals	Fattening haifers			dt
Animals	Dairy cows			dt
Animals	Fattening cows			dt
Animals	Breeding bull			dt
Animals	Calfs males <6months			dt
Animals	Death calfs			dt
Animals	Death adult animlas			dt
Milk and eggs	Milk (dairy cow) (4.00/3.45)			dt
Organic manures	Biogasslurry			m3
Organic manures	Cattle-slurry			m3
Mashine work outside	Tractor h (80-100PS)			ha
Mashine work outside	Tractor h (101-125PS)			ha
Mashine work outside	Tractor h (126-150PS)			ha

Harmonization of data collection[Soil organic matter]

Data needed for calculating humus balance of arable land

Cover crops

Mustard / Rape	20	ha
Ryegras	0	ha
Alfa-alfa, clover	0	ha
Gras-clover	0	ha
Others	0	ha

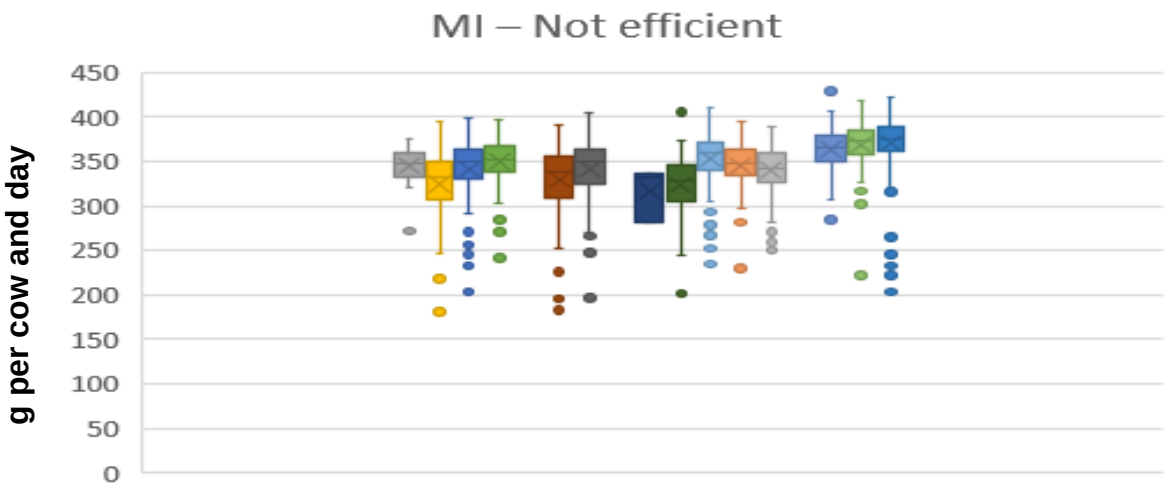
Surfaces with ploughing straw and other crop residues into the soil

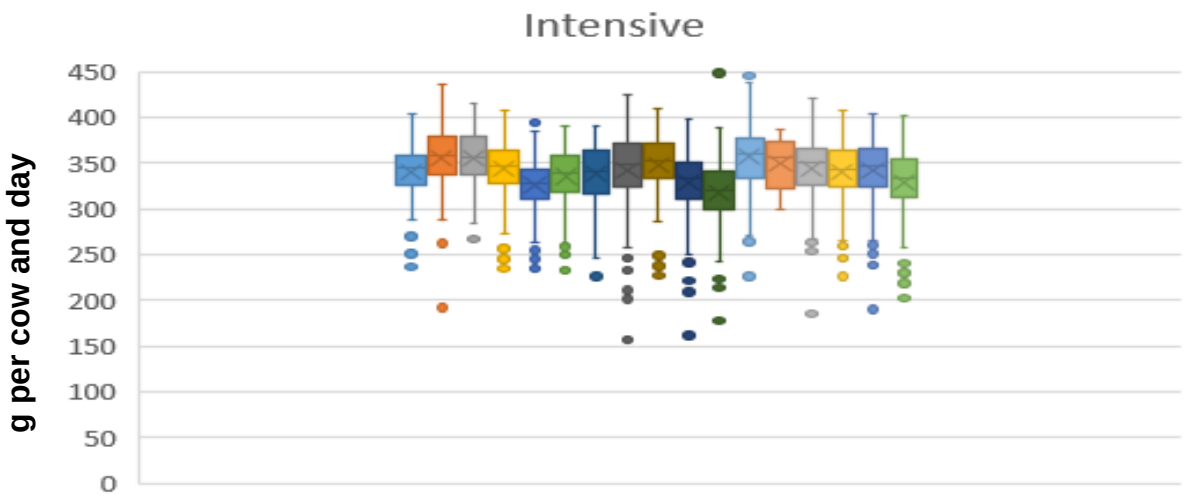
Cereals	22	ha
Rapes	25	ha
Peas / Faba beans	32	ha
Cover crops	20	ha

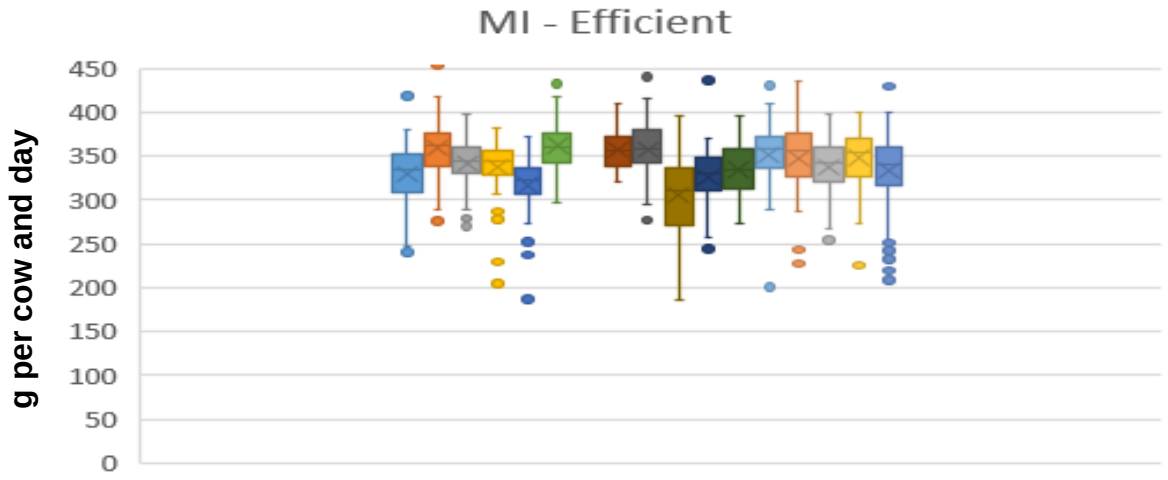
Spreading organic manures of the farm on arable land surfaces (total arable land and mais silage)

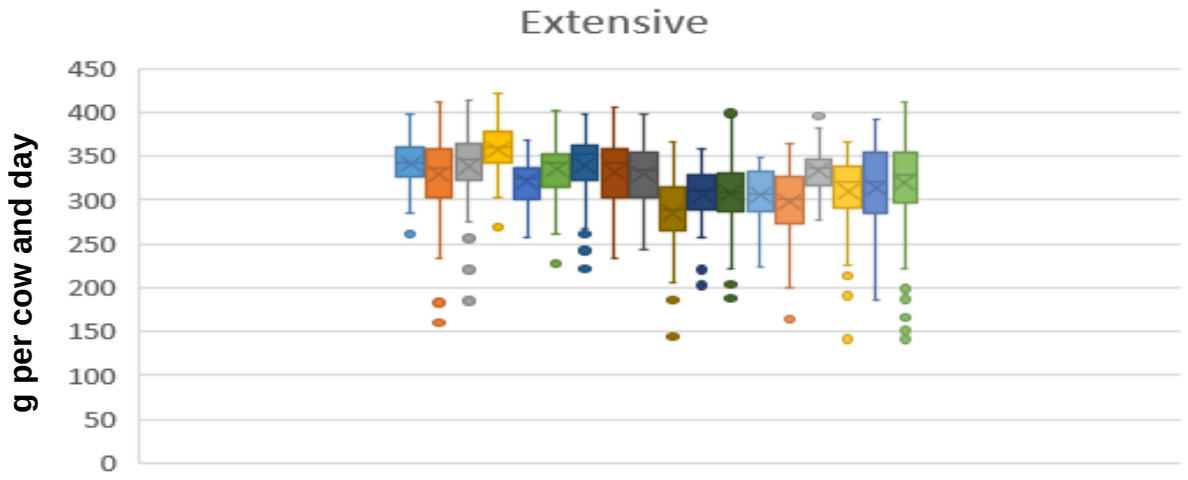
Manure	Arable land		Mais		Dry matter	
FYM	216.5	t	100	t		
Cattle slurry	0	m3	0	m3	8	%
Porc slurry	0	m3	0	m3	0	%
Biogas slurry	1000	m3	500	m3	7	%

Methane prediction [Milk spectral data]









D1: Life cycle assessment of tested diets, implementation of these diets and the impact of grassland loss and grazed proportion.

Start 01/10/2015 End 30/09/2019

Deliverable	Deadline	Status, remarks
Report on LCA of 1st grassland loss and grazed proportion survey	04/2017	Sept 2017
Report on LCA of feeding and grazing management	11/2018	First primarily report done
Report on LCA pilot farms	09/2019	Final report together with C4.
Milestones		
Define data to LCA (feeding & grass)	01/2016	OK
Data obtained to grass LCA	02/2016	09/2016
Data obtained to first feeding trial LCA	11/2016	OK
Data obtained to LCA pilot farms (together with C4)	11/2017	Year 2015 OK; Year 2016 OK by 09/2017
Data obtained from last grass survey	03/2019	
Data obtained from pilot farm - implementing	08/2019	

LCA Grassland

Country	Luxemburg	Belgium	Denmark	
System	Conventional	Conventional	Organic	Conventional
General data				
Soil, clay %	19	19	5	5
Rainfall, mm annually	865	821	842	842
Precipitation, mm annually	653	530	547	535
Specific data				
Herd, dairy cows n	74	70	169	168
- milk, kg per cow	8 389	8 254	9 199	9 980
Stocking rate, LSU per ha	1,99	1,73	1,26	1,95
Milk, kg per ha farm land	9 519	8 102	6 641	11 103
Croptype, % of farmland				
-Permanent grassland	57%	55%	9%	7%
-Temporary grassland	11%	11%	48%	32%
-Maize	18%	5%	3%	31%
Feedintake-herd, kg DM per cow				
-pasture	2 355	2 956	2 161	550
-grass silage/hay	1 898	2 838	3 358	2 792
-maize silage	2 225	693	925	3 525

LCA – grassland

Table 2. Product environmental impact for milk and meat – after allocation

	Luxemburg	Belgium	Denmark	
	Conventional	Conventional	Organic	Conventional
Proportion to milk. %	85%	83%	87%	88%
Per kg milk				
GHG, g CO_2 eq.	1.010	999	933	949
Soil carbon sequestration, g CO_2 eq.	44	82	38	37
Land use, m^2	1,12	0,94	1,47	1,00
Biodiversity damage index	0,36	0,26	0,12	0,52
Per kg live weight gain				
GHG, g CO_2 eq.	6.850	6.976	6.174	6.223
Soil carbon sequestration, g CO_2 eq.	301	569	252	240
Land use, m^2	7,59	6,58	9,75	6,58
Biodiversity damage index	2,41	1,79	0,81	3,39

LCA – grassland

Table 9. Summary – impact of grassland

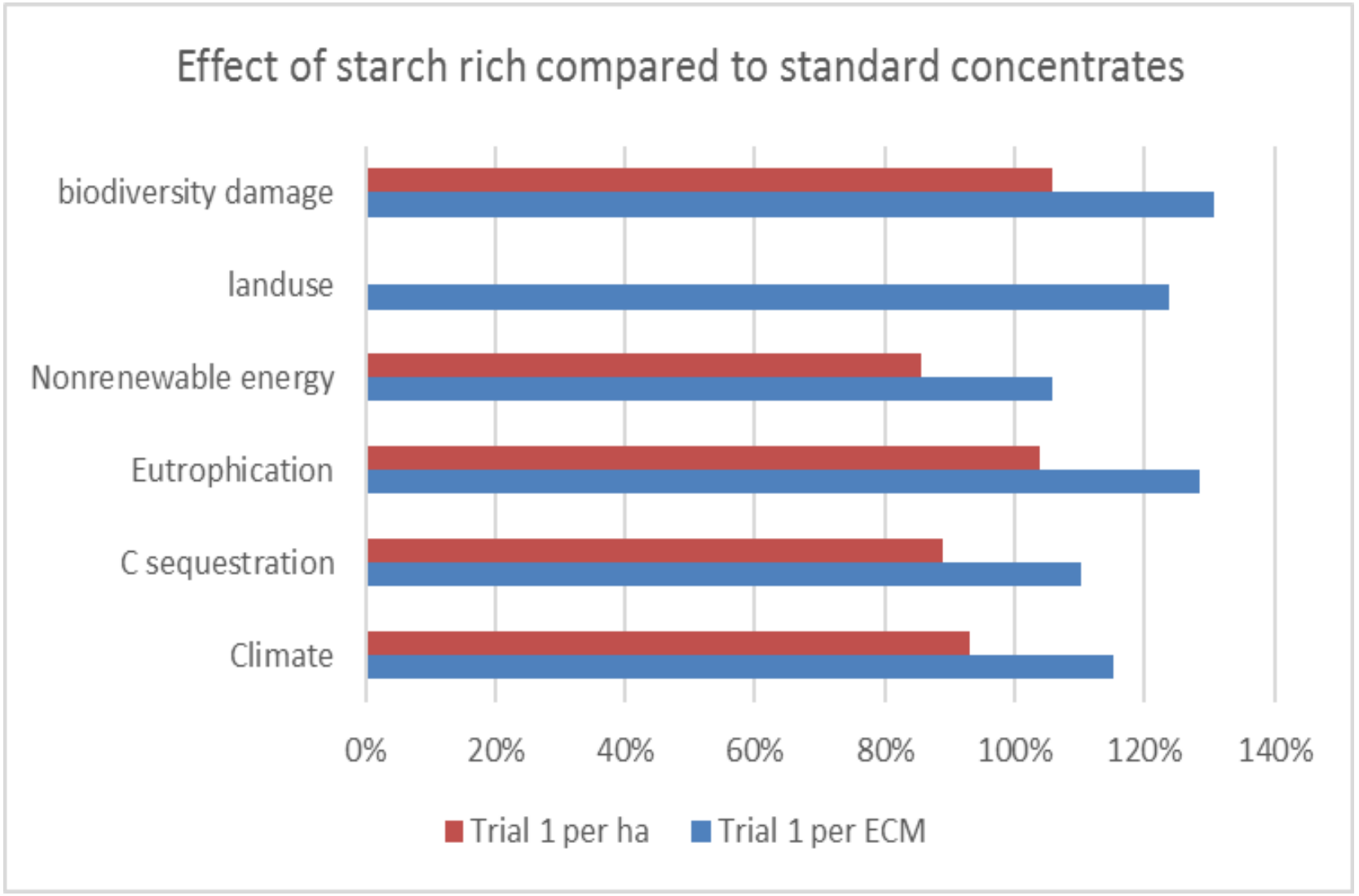
	Luxemburg	Belgium	Denmark	
	Conventional	Conventional	Organic	Conventional
Land				
Grassland, % of farm	68	66	57	39
Permanent grassland, % of farm	57	55	9	7
Grazed area, % of grassland	55	51	39	18
Production grassland, kg DM per ha	7.144	8.635	7.006	9.421
Herd				
Pasture, % of DMI	28	34	23	6
Grass silage, % of DMI	22	33	36	28
Farm				
Intensity, kg milk per ha	9.514	8.102	6.641	11.103
Fertilizer, kg N per ha	92	136	0	71
On farm produced, % of DMI	85%	96%	89%	85%
Environment – farm area				
N surplus, kg N pr ha	141	132	87	146
GHG, kg CO_2 eq per ha	10.083	8.993	6.728	10.704
Soil sequestration, kg CO_2 per ha	569	980	286	551
Environment – product (LCA)				
GHG, g CO_2 eq per kg milk	1,010	999	933	949
Biodiversity damage index, per kg milk	0,36	0,26	0,12	0,52

LCA – feeding experiment

- Table 4. Environmental impact due to crop production, transport and processing of four different type of feed , per kg DM

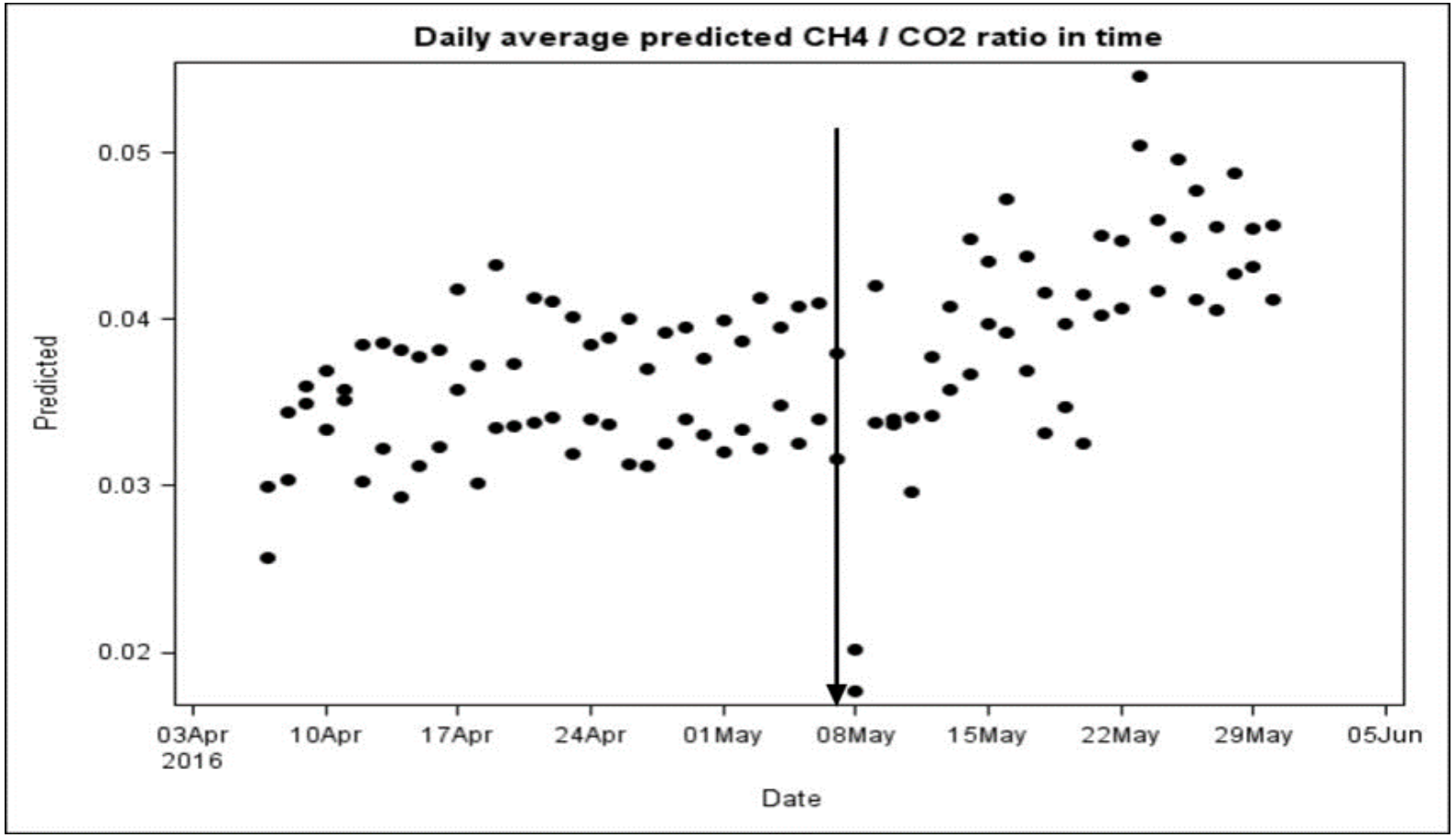
	Climate g CO_2 eq	C seq. g CO_2	Eutrophication, g NO_3 eq.	NRE, MJ	LU, m^2	BD, PDF-index
	per kg DM					
TMR	433	10,23	28,03	3,22	0,95	0,27
Concentrate AT1	524	-37,11	29,04	5,98	1,07	0,62
High starch AT2	552	-47,10	46,07	4,79	1,47	0,86

LCA – feeding experiment



Complementary action outside LIFE

Enteric methane during transition from indoor to pasture



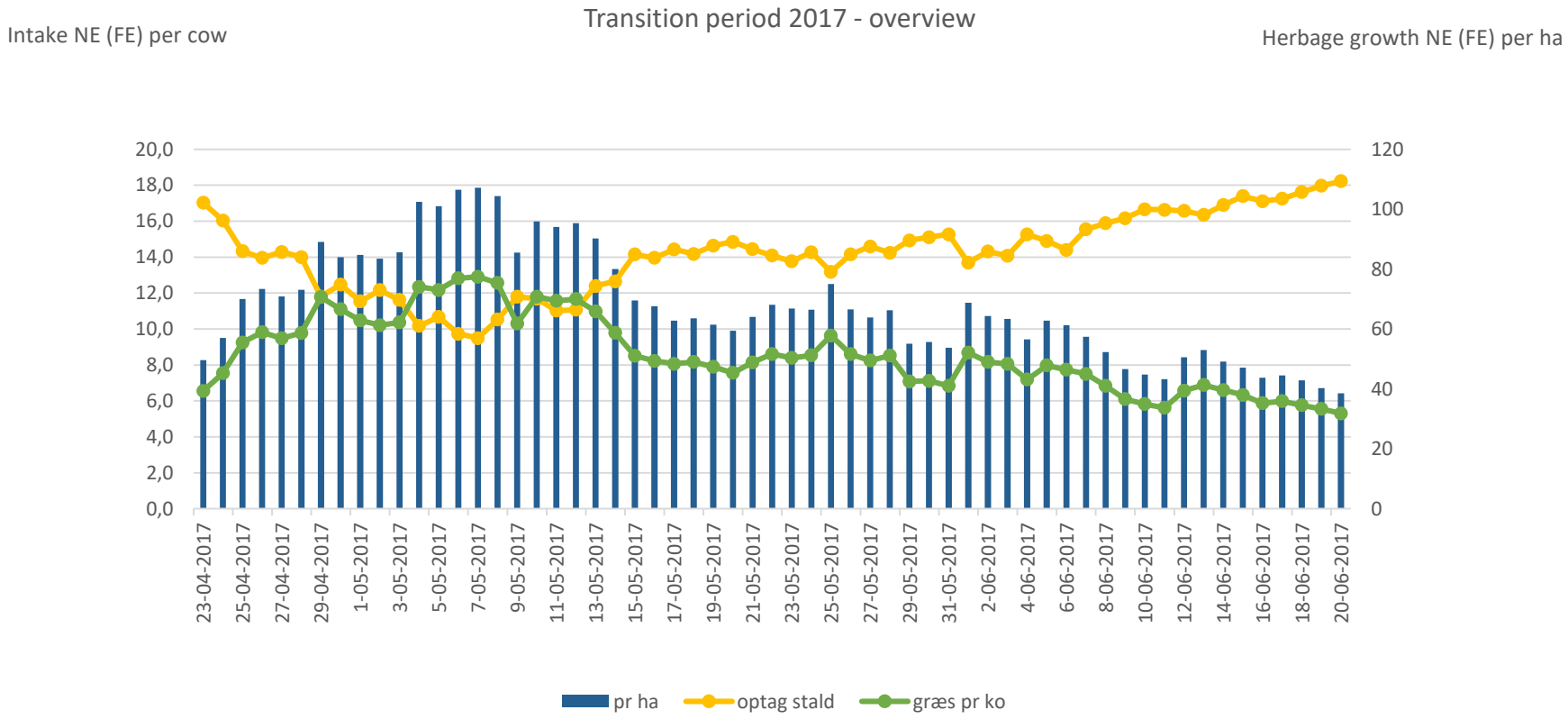
Marcin Szalanski1, Troels Kristensen2,Gareth Difford1, Peter Løvendahl1

19th EGF Symposium on "Grassland resources for extensive farming systems in marginal lands: major drivers and future scenarios"

Grassland Science in Europe, **volume 22**, 652 pages

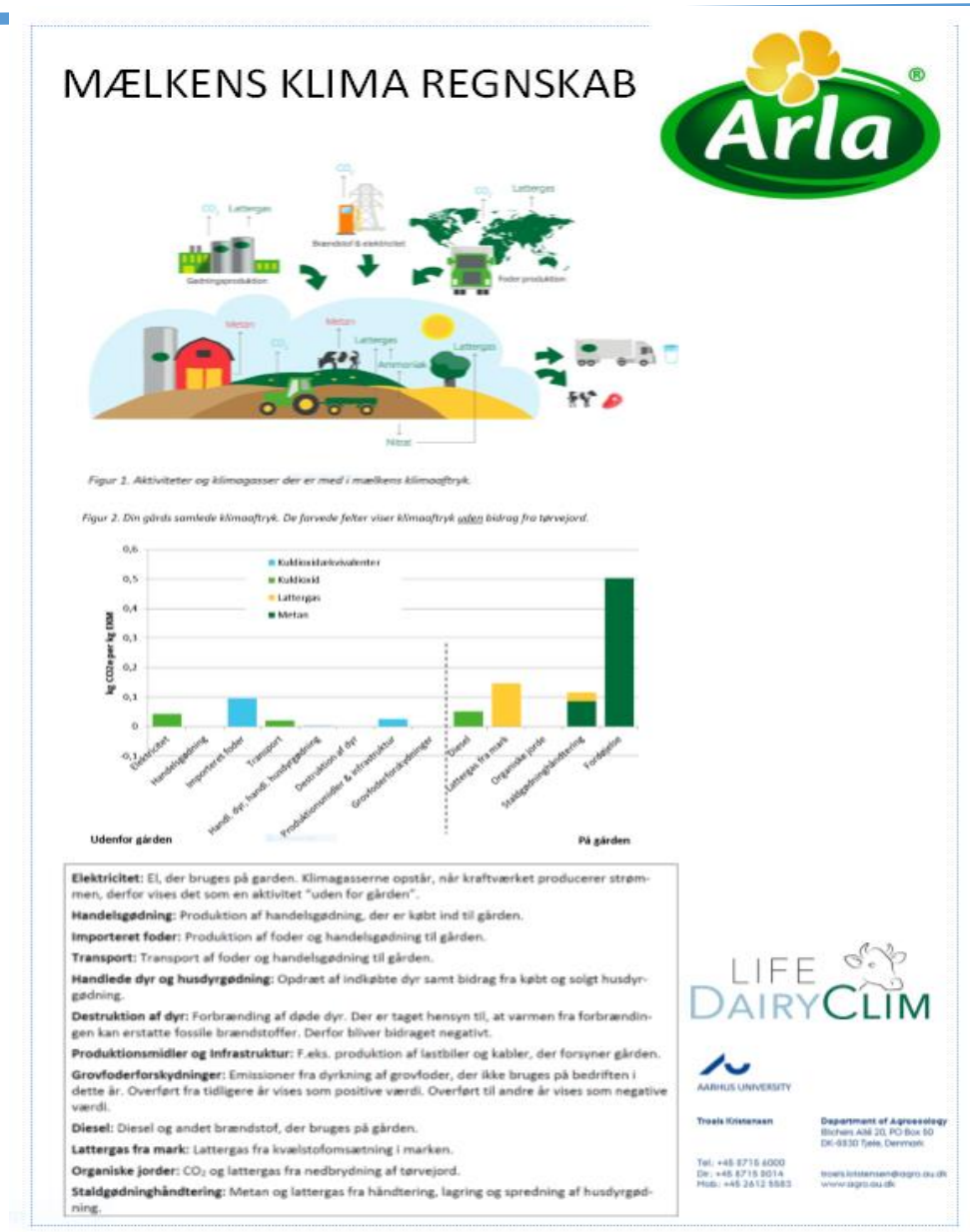
EUR 50 Book available PDF available for free download from November 2017

Complementary action outside LIFE



Blue = growth per ha, yellow = intake supplement, green = intake pasture

Poster Presentation of CF case farm



MÆLKENS KLIMA REGNSKAB

Arla

Figur 1. Aktiviteter og klimagasser der er med i mælkens klimaaftryk.

Figur 2. Din gårds samlede klimaaftryk. De farvede felter viser klimaaftryk uden bidrag fra tørvejord.

Elektricitet: El, der bruges på garden. Klimagasserne opstår, når kraftværket producerer strømmen, derfor vises det som en aktivitet "uden for gården".

Handelsgødning: Produktion af handelsgødning, der er købt ind til gården.

Importeret foder: Produktion af foder og handelsgødning til gården.

Transport: Transport af foder og handelsgødning til gården.

Handlede dyr og husdyrgødning: Opdræt af indkøbte dyr samt bidrag fra købt og solgt husdyrgødning.

Destruktion af dyr: Forbrænding af døde dyr. Der er taget hensyn til, at varmen fra forbrændingen kan erstatte fossile brændstoffer. Derfor bliver bidraget negativt.

Produktionsmidler og infrastruktur: F.eks. produktion af lastbiler og kabler, der forsyner gården.

Grovfoderforskydninger: Emissioner fra dyrkning af grovfoder, der ikke bruges på bedriften i dette år. Overført fra tidligere år vises som positive værdi. Overført til andre år vises som negative værdi.

Diesel: Diesel og andet brændstof, der bruges på gården.

Lattergas fra mark: Lattergas fra kvælstofomsætning i marken.

Organiske jorder: CO_2 og lattergas fra nedbrydning af tørvejord.

Staldgødninghåndtering: Metan og lattergas fra håndtering, lagring og spredning af husdyrgødning.

LIFE DAIRYCLIM

AARHUS UNIVERSITY

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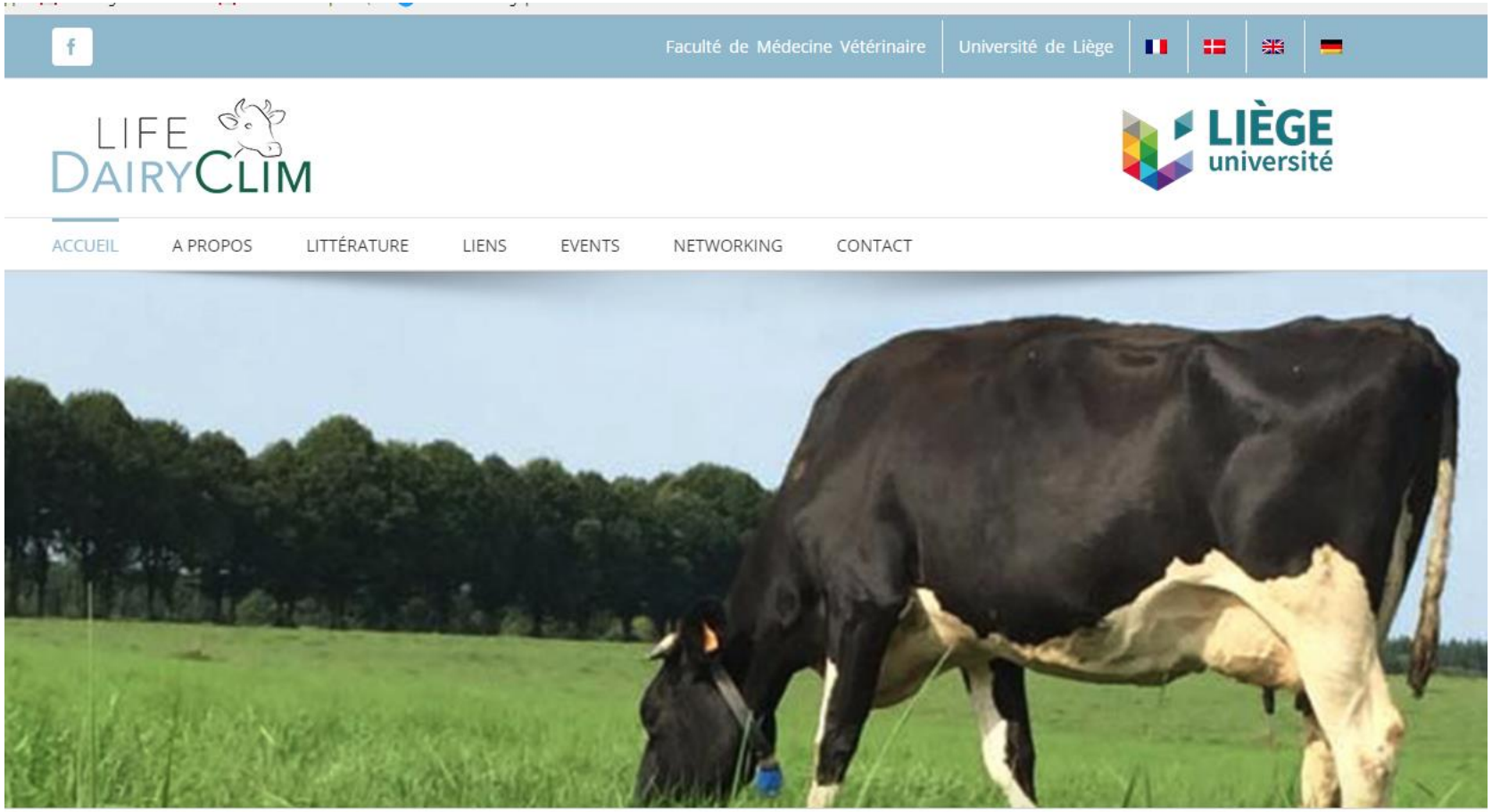
https://økodag.dk/landbrug/lille-djernaes

E.1: Dissemination

Different actions to disseminate results and increase awareness :

ULg

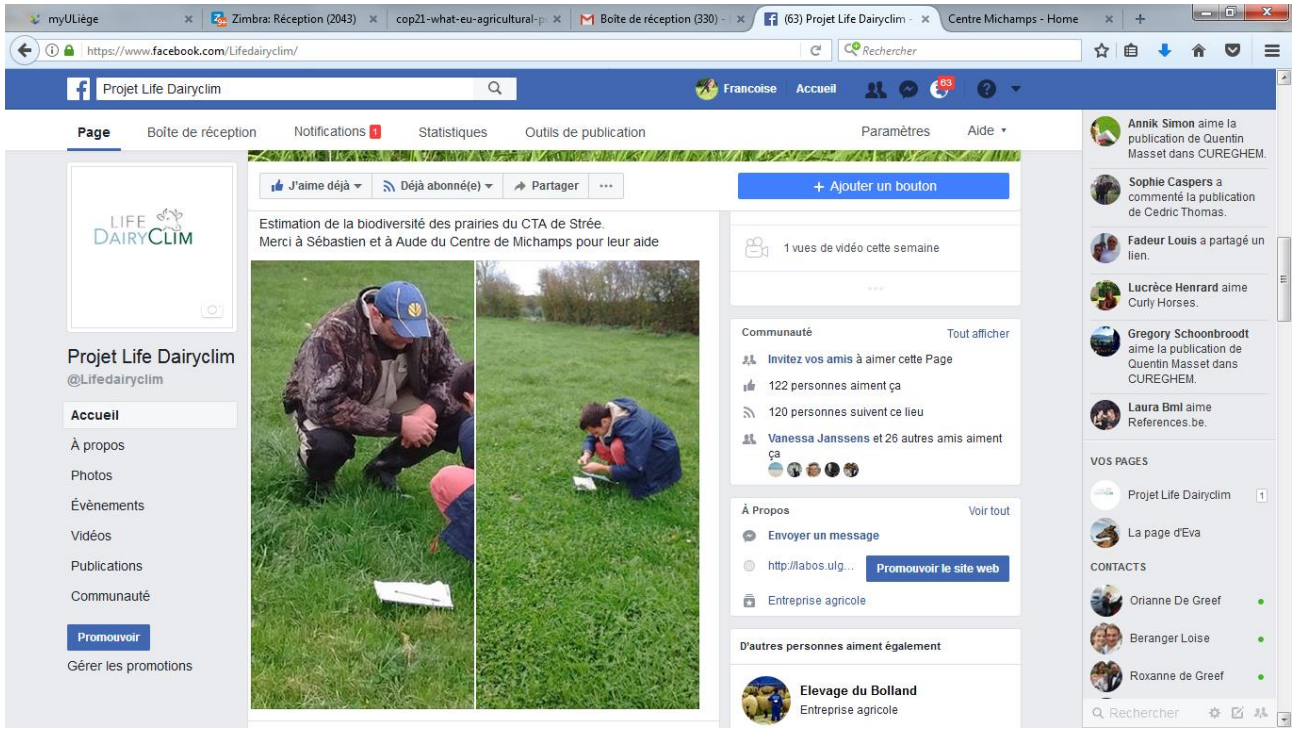
The **website** is available since 15 December 2015



E.1: Dissemination

Different actions to disseminate results and increase awareness :

a page **Facebook** was created and is regularly implemented with outcomes of the projects, events organized and publications in relationship with the project. Some publications reached 611 persons. https://www.facebook.com/pg/Lifedairyclim/



E.1: Dissemination

Different actions to disseminate results and increase awareness :

Short movies were made, the first one presented how methane emissions are measured by the Guardian®:

E.1: Dissemination

Different actions to disseminate results and increase awareness :

The project was presented at **agricultural events**

- Agribex (Bruxelles, Belgium) and description of the project in a leaflet entitled “Feed the future”: 105.878 visitors
- fair of Libramont (Belgium) 2016: posters explaining the project – leaflets in German and French: 195.177 visitors
- fair of Libramont (Belgium) 2017: posters explaining the project – leaflets in French : 212.173 visitors
- fair of Ettelbruck (Luxembourg) 2016: 37.128 visitors
- fair of Ettelbruck (Luxembourg) 2017: 37.246 visitors
- fair of Battice (Belgium) : September 2017: poster and leaflets presenting the outcomes of the project: around 22.000 visitors
- Annual meeting of the dairy department in Convis site: March 2016 (50 farmers)
- Annual meeting of the dairy department in Convis site: March 2017 (150 farmers) During these 2 events, presentation of the project was made.

E.1: Dissemination

Fair of Ettelbruck , 2017

Fair of Libramont (Belgium) 2016: posters

E.1: Dissemination

fair of Libramont (Belgium) 2016: posters

fair of Libramont (Belgium) 2017: posters

E.1: Dissemination

Different actions to disseminate results and increase awareness :

Scientific meetings

- Poster presented at Terra Innovation Fair (Gembloux – 20/5/2016)
- Oral presentation at the conference “Elevage Bovin et Gaz à effet de serre” on 13/9/2016 in Gembloux (Belgium) http://www.gembloux.ulg.ac.be/wp-content/uploads/2016/09/Pr%C3%A9sentation-Gembloux-d%C3%A9f-13_9_2016-%C3%A0-diffuser.pdf
- Participation to EGF 2016 : posters presentation – presentation of the project and presentation of first results of the survey in Wallonia: 300 participants
- Participation to meeting of the “project Methagene” 60 participants
- Participation at EGF 2017: 300 participants
- Participation to EmiLI 2017

E.1: Dissemination

Different actions to disseminate results and increase awareness :

Workshops

- Sustainability indicators. Workshop organized by Arla. November 2016.
- Holistic grazing. Workshop organized by dairy farmers. Oktober 2016.
- “Quoi de neuf au pâturage”: workshop about importance of grazing in Walloon dairy farms : organization of the event in coordination with the Walloon Agriculture Ministry – several presentations in relationship with grazing and the project: 200 participants
- Journée Légumineuse: workshop about grazing topics for several schools and high schools in Agriculture from Wallonia: 150 participants
- Journée Fermes Ouvertes : 500 visitors

E.1: Dissemination

Different actions to disseminate results and increase awareness :

Newspapers, media

- Articles in newspapers:15e Jour (University of Liège) and “La Meuse”, Le Sillon Belge (20.000 subscribers – estimation of the total audience : 80.000 persons), De Lëtzebuerger Ziichter

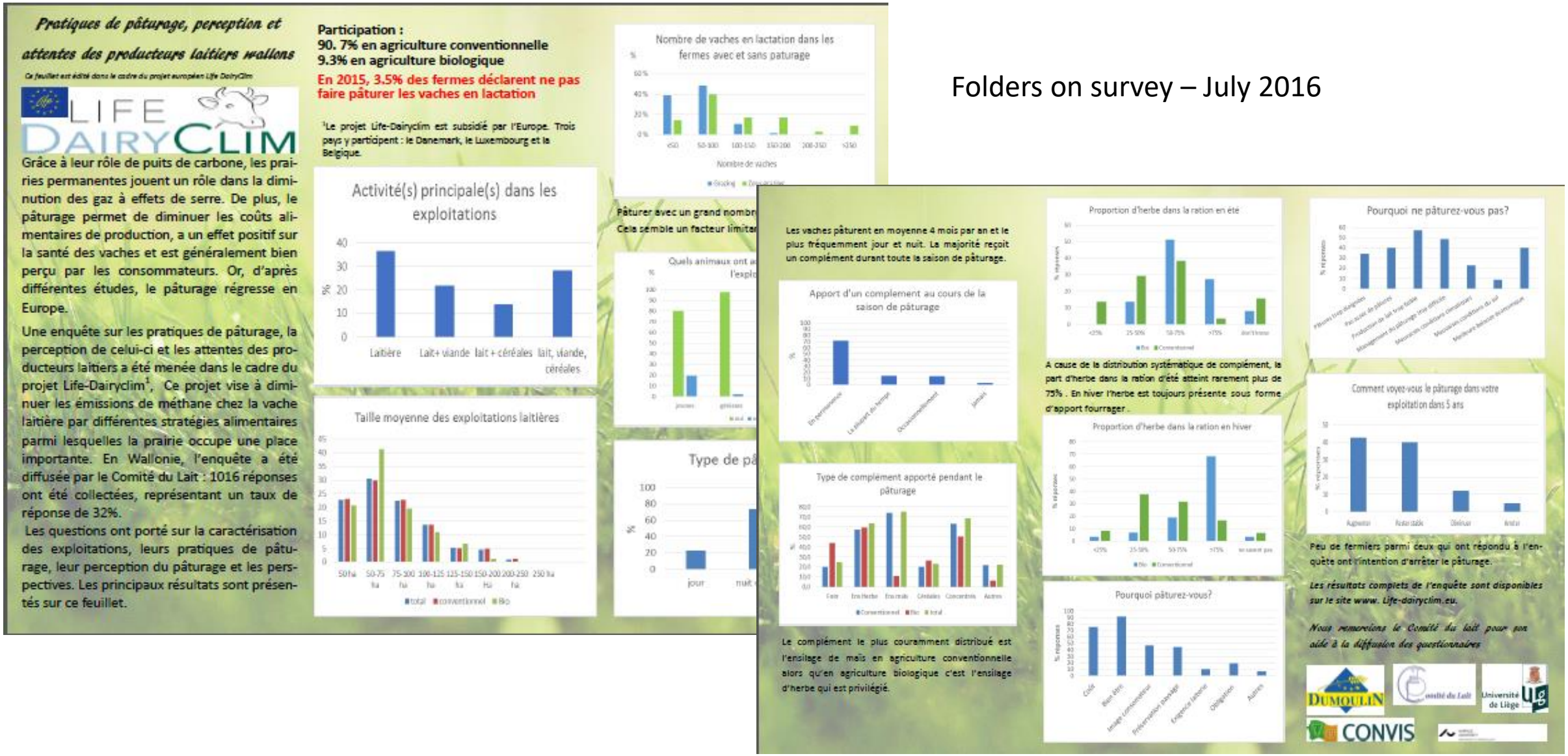
- Radio program « Première » Questions-clé : « Faut-il mettre les vaches au régime pour limiter les gaz à effet de serre ? » 14/4/2016

- Radio program « La minute de l’Europe » 1/6/2017 : presentation of the project
-
- Folders on survey: were edited in French and German. Dissemination during the fair of Libramont, on the website and through collaboration with the industrial partner Dumoulin and the Comité du lait: 150 edited by Dumoulin – 50 by ULg – 100 by Convis

- Folders were edited in July 2017: 150 edited by Dumoulin – 50 by ULg- 100 by Convis

- Folders were edited in September 2017: 100 edited by Dumoulin

E.1: Dissemination



Folders on survey – July 2016

E.1: Dissemination

Folders edited in July 2017

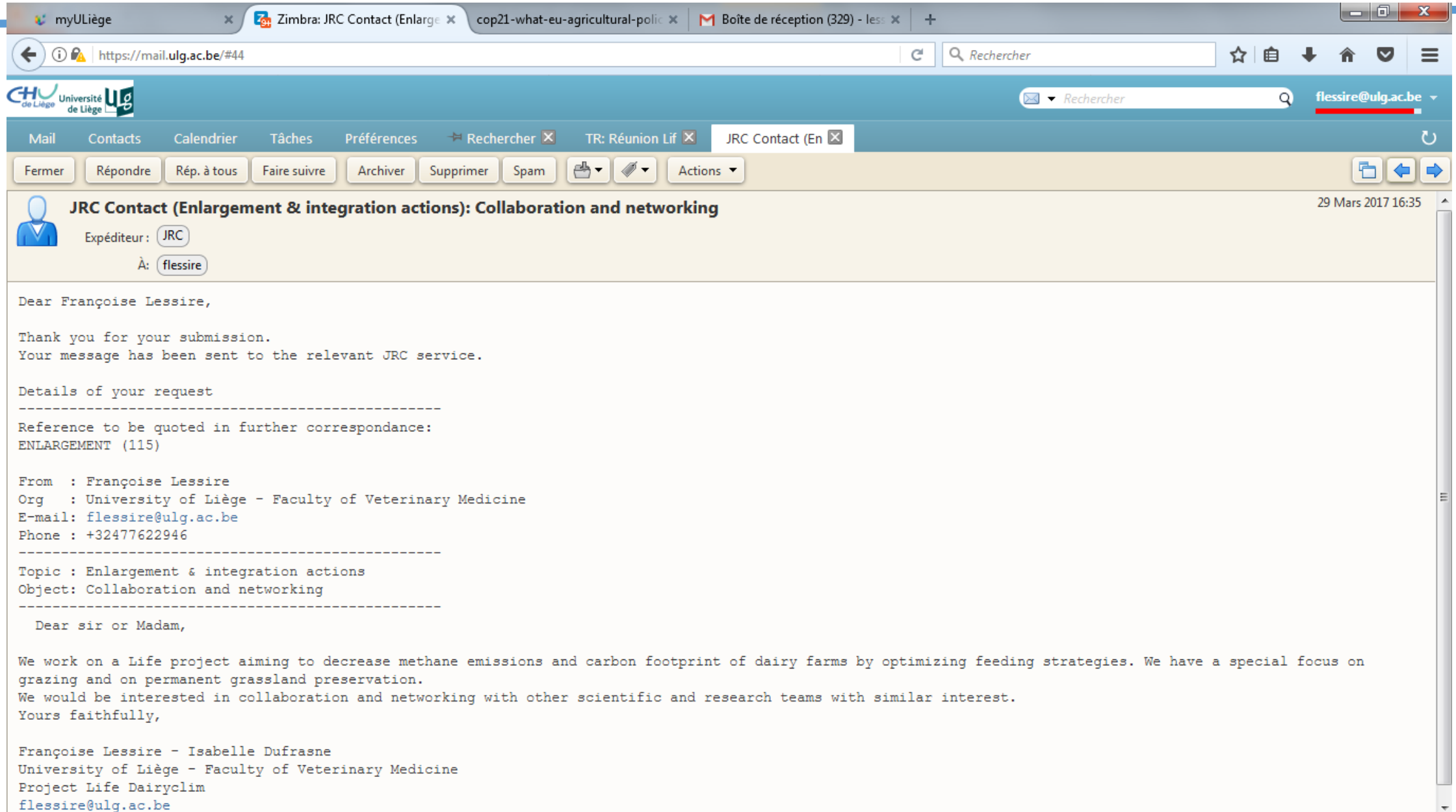
E.1: Dissemination

Different actions to disseminate results and increase awareness :

Networking

- Collaboration and networking with the Life-project Carbon dairy and Life Beef Carbon has been initiated with share of files.
- Project Methagene
- Contacts with SERIDA (Spain) – Life Climatree – Life Forage4climate
- JRC was contacted-

Contacts with JRC



myULiège | Zimbra: JRC Contact (Enlarge | cop21-what-eu-agricultural-polic | Boîte de réception (329) - less

https://mail.ulg.ac.be/#44

Rechercher

Université de Liège

flessire@ulg.ac.be

Mail | Contacts | Calendrier | Tâches | Préférences | Rechercher | TR: Réunion Lif | JRC Contact (En

Fermer | Répondre | Rép. à tous | Faire suivre | Archiver | Supprimer | Spam | Actions

JRC Contact (Enlargement & integration actions): Collaboration and networking

29 Mars 2017 16:35

Expéditeur : JRC

À: flessire

Dear Françoise Lessire,

Thank you for your submission.
Your message has been sent to the relevant JRC service.

Details of your request

Reference to be quoted in further correspondance:
ENLARGEMENT (115)

From : Françoise Lessire
Org : University of Liège - Faculty of Veterinary Medicine
E-mail: flessire@ulg.ac.be
Phone : +32477622946

Topic : Enlargement & integration actions
Object: Collaboration and networking

Dear sir or Madam,

We work on a Life project aiming to decrease methane emissions and carbon footprint of dairy farms by optimizing feeding strategies. We have a special focus on grazing and on permanent grassland preservation.
We would be interested in collaboration and networking with other scientific and research teams with similar interest.
Yours faithfully,

Françoise Lessire - Isabelle Dufrasne
University of Liège - Faculty of Veterinary Medicine
Project Life Dairyclim
flessire@ulg.ac.be

E.1: Dissemination

Different actions to disseminate results and increase awareness :

Publications

Kristensen, T., Mogensen, L. Hermansen, J.E. 2016. Climate smart cattle farming – management and systems aspects. *Invited paper. Methagene Cost – Padova October 2016.*

Kristensen, T. Klimabelastning fra økologiske kvægbrug – fodring og produktionsstrategier I stalden. *Invited paper. Kvægkongres, februar 2017.*

Lund, P., Kristensen, T. 2017. Kvæg & klima. Momentum, 1, 35-38.

Monitoring of methane during transition period – one dairy farm. April –Juni 2016. Paper prepared for EGF 2017.

Lessire, F., Bernard, M., Lioy, R., Reding, R., Kristensen, T., Reuter, W., & Elias, E. (2016). Grazing practices, perception and expectations of Walloon dairy farmers. In The multiple roles of grassland in the European bioeconomy (pp. 125-127). Wageningen, The Netherlands, Wageningen Academic Publishers.

Lessire, F. , Bernard M. , Reding R. , Lioy R. , Kristensen, T. , Reuter W. , Elias E. , Dufrasne I. (2016) Life-Dairyclim, European project aiming to mitigate methane emissions and carbon footprint of dairy cows In The multiple roles of grassland in the European bioeconomy (pp 805-807). Wageningen, The Netherlands: Wageningen Academic Publishers.

E.1: Dissemination

Different actions to disseminate results and increase awareness :

Policymakers contact

- Effektivitets- og klimaværktøj til landbruget. Several meeting organized by Ministry of Energy, Utilities and Climate. Okotober 2016 – January 2017.

- Klimaregnskab. Møde klimarådet. February 2017.

- Contacts between the Belgian partner and the Walloon Ministry of Agriculture were initiated leading to the organization in partnership of a workshop about grazing practices and to the dissemination of the main finding of the survey (Walloon data) on the website of the Socopro, organism depending on the Walloon Ministry of Agriculture and dedicated to the dairy sector.

- Convis has got the opportunity to present the project to the Luxembourg ministry of Agriculture during the annual meeting held at the Convis site.

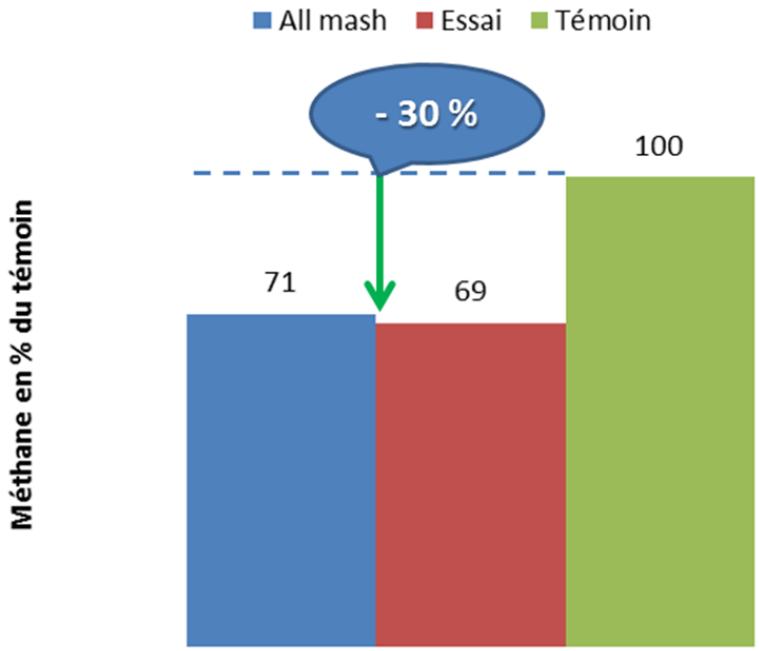
E.1: Dissemination

Complementary action :

Dumoulin plays an important role in the dissemination of the outcomes of the project and the promotion of the project and is preparing the “After-life” of the project:

research on lowering methane emissions in ruminants

reduction of methane emissions by 30% thanks to an adapted feeding strategy of Belgian White Blue double muscled bulls,



Les émissions de méthane par des taureaux Blanc-Bleu Belge culard durant les phases de croissance et de finition sont fortement influencées par les régimes alimentaires

cra-w

M Mathot[a], N Demande[a], D Deswysen[b], S Vermaut[c], D Stilmant[a]

E.1: Dissemination

Avantages :

- Environnement:
  - **Local** : matières premières 100% EU ➔bilan CO2
  - **Sociétal** :
    - 80% des MP sont des sous-produits et/ou des fourrages valorisables uniquement par le ruminant
  - **ARM** : **A**limentation **R**éductrice de **M**éthane
  - Economie circulaire :
    production animale ←→ productions végétales
- Santé consommateurs :
  - Teneurs + profil en **oméga3** de la viande
- Filière :
  - **Performances** technico-économiques identiques // gamme intensive (coût du kg carcasse =)
  - **Qualités** de la viande identiques (tendreté, couleur, …)
  - Revalorisation de l'**image** de la viande rouge

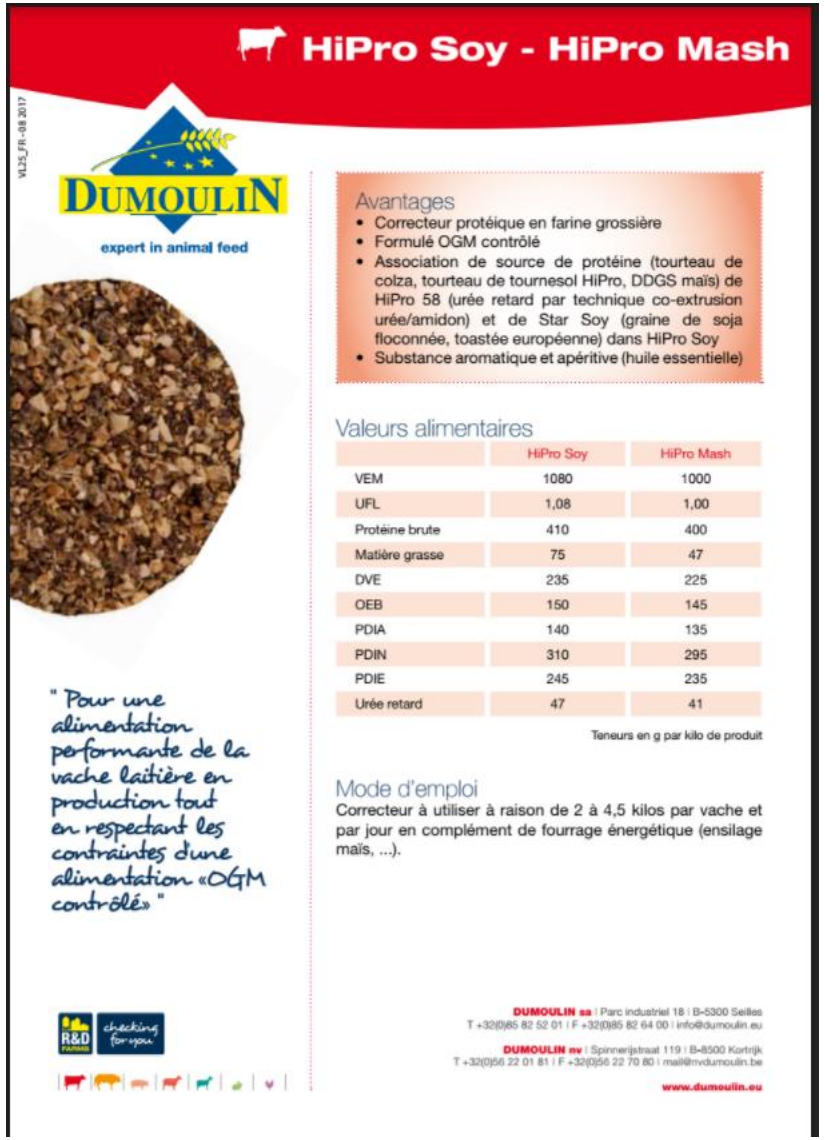
E.1: Dissemination

the first step for Dumoulin was to create a range of compound feeds for the growth and finishing phases of young beef cattle, mainly bulls. This range has been launched in summer 2016, and has been called EUROCLIM®

Recently, once the winter trials at CTA were analysed, the company decided to extend the EUROCLIM range to the dairy cows by adding two extruded compound feeds, Nutex Sweet and Nutex Elit, both rich in polyunsaturated fatty acids from linseed and canola seed

E.1: Dissemination

Two more products are in progress, based on unsaturated fat coming from European Soybeans, and rich in dietary proteins, so called “protein concentrates”, which will help the farmer to get the nitrogen input and the nitrogen needs in better balance (nitrogen efficiency) which will result in less nitrogen emissions, as nitrous oxide (GHG) and ammonia to the environment. These products will be called Hipro Soy and Hipro Mash.



HiPro Soy - HiPro Mash

DUMOULIN

expert in animal feed

Avantages

- Correcteur protéique en farine grossière
- Formulé OGM contrôlé
- Association de source de protéine (tourteau de colza, tourteau de tournesol HiPro, DDGS maïs) de HiPro 58 (urée retard par technique co-extrusion urée/amidon) et de Star Soy (graine de soja floconnée, toastée européenne) dans HiPro Soy
- Substance aromatique et apéritive (huile essentielle)

Valeurs alimentaires

	HiPro Soy	HiPro Mash
VEM	1080	1000
UFL	1,08	1,00
Protéine brute	410	400
Matière grasse	75	47
DVE	235	225
OEB	150	145
PDIA	140	135
PDIN	310	295
PDIE	245	235
Urée retard	47	41

Teneurs en g par kilo de produit

Mode d'emploi

Correcteur à utiliser à raison de 2 à 4,5 kilos par vache et par jour en complément de fourrage énergétique (ensilage maïs, ...).

" Pour une alimentation performante de la vache laitière en production tout en respectant les contraintes d'une alimentation «OGM contrôlé» "

R&D checking for you

DUMOULIN sa | Parc industriel 18 | B-5300 Seilles
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DUMOULIN nv | Spinnerijstraat 119 | B-8500 Kortrijk
T +32(0)56 22 01 81 | F +32(0)56 22 70 80 | mail@nvdumoulin.be

www.dumoulin.eu

E.1: Dissemination

Diminution des émanations de méthane des bovins :

Une réduction de 15% par litre de lait et 30% par kg de viande bovine produite, c'est possible !

Pour preuve, Dumoulin est partenaire du projet Life Dairyclim qui vise à démontrer l'efficacité d'une alimentation spécifique riche en matières grasses sur la réduction de la production de méthane par la vache laitière. Plus d'informations: www.labos.ulg.ac.be/dairyclim/
Retrouvez nos produits parmi la gamme EUROCLIM présente sur notre site internet dans la rubrique Produits en Bovin-lait et en Bovin-viande

E.1: Dissemination

Envisaged progresses till the next report

C1:

✓ revised report available on the website of Life Dairyclim - sent to the Climate Cell in Belgium.

C2:

✓ the report on best feeding strategies at grazing Y2 is quite ended => C2: ended

C3:

✓ Third grazing period will be completed -reports Y2 and Y3

C4:

✓ Report about characterization of the pilot farms

✓ The implementation of best feeding practices

✓ . Open days in pilot farms will be held.

Envisaged progresses till the next report

D1:

✓Report on LCA on feeding trials Y2

✓LCA characterisation of pilot farms

D2:

✓ Monitoring of indicators will be made and the table of completed evaluation will be annexed in the Report.

E: Dissemination

✓ EGF 2018: participation planned.

✓Communication through the Website – Facebook : improved

✓A third short movie will be produced

✓Workshop is planned on 12/12/2017 at the CTA of Strée

✓Participation to agricultural events

F:

Annual meeting in Denmark in 2018