Once-daily milking ability of the Lacaune ewes : synthesis of the results of a 4 years French study

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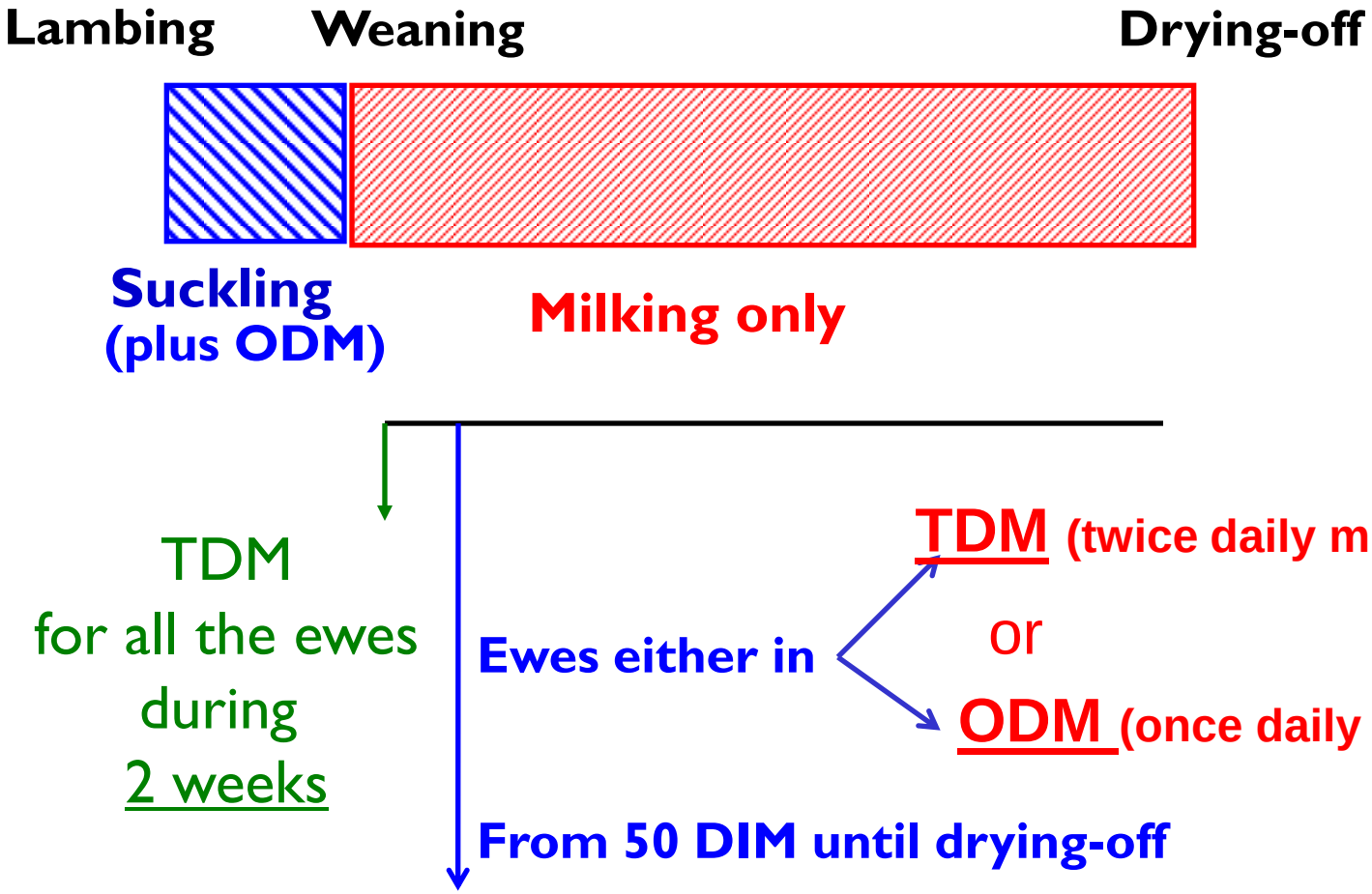
64th EAAP, 27th August 2013, Nantes, France

AIM

- To study once-daily milking ability of the dairy Lacaune ewes….French breeder demand to reduce milking labor
- To produce available parameters for modelling at the farm level and dairy plant level breeding systems using once-daily milking during all or a part of the milking period.
- To describe/analyse anatomo and physiological criteria related to the once-daily milking ability of the Lacaune ewes.

DESIGN applied for lactation management



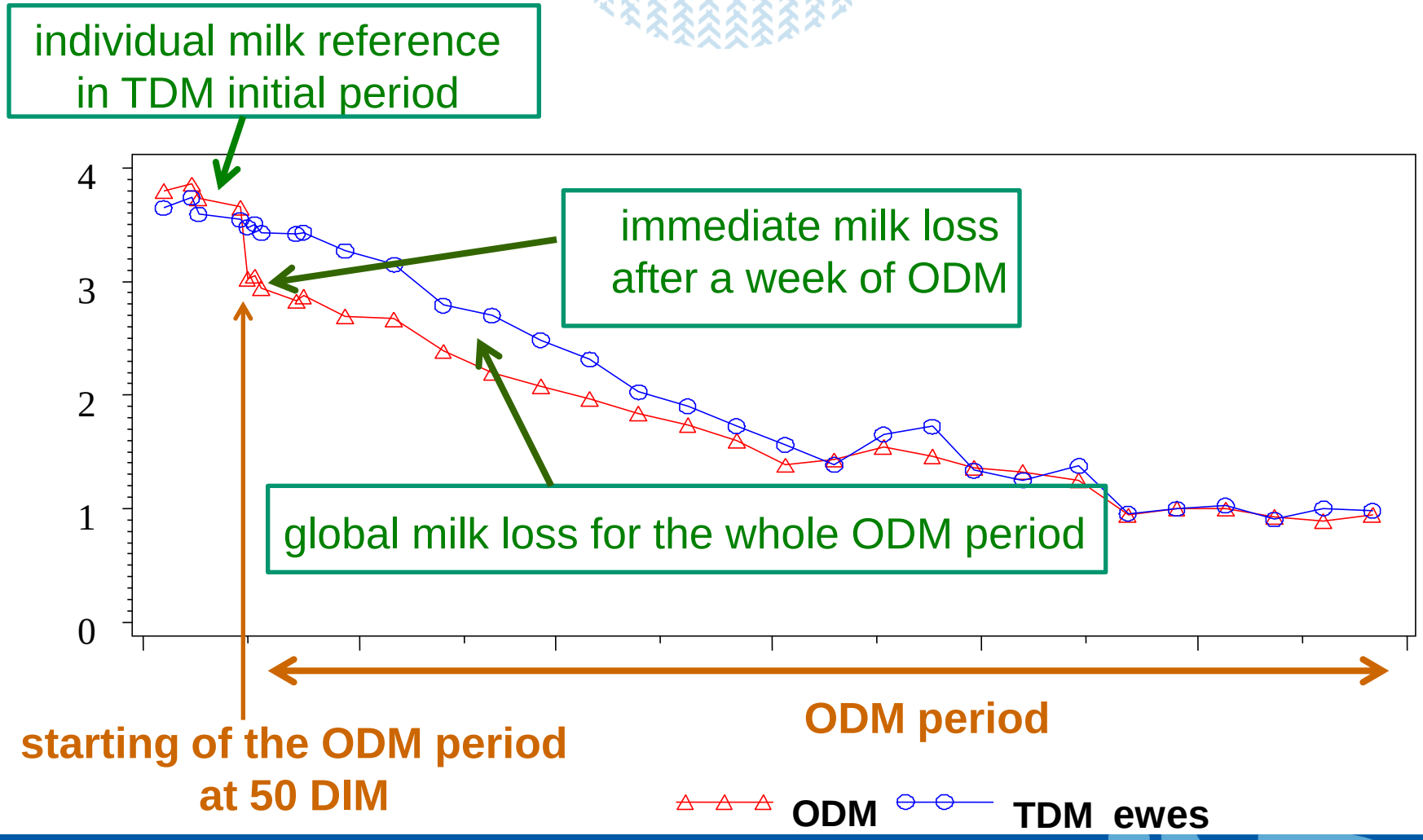
Analysis of the milk production data

- milk traits considered only from starting of the once daily milking period, i.e. from 50 DIM to the end of the lactation

- comparison of ODM and TDM ewes results within each experiment (8 in flock 1 and 2 in flock 2), and between experiments (meta-analysis)

- individual approach (variability) :
  - reference : individual MILK in TDM situation between 30 and 50 DIM
  - individual milk loss (after 50 DIM) / individual reference

Flock 1 : Lactation curves of multiparous ODM or TDM ewes

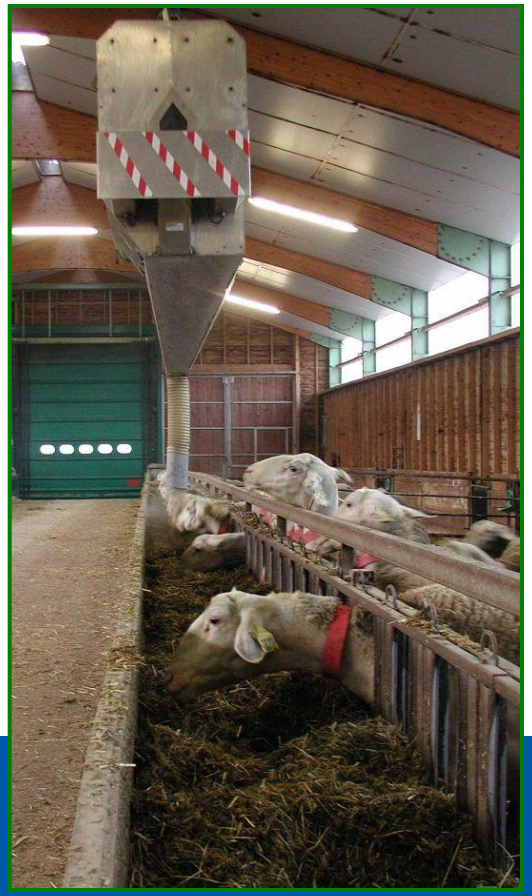


DESIGN : 574 lactations / 10 trials / 2 flocks

	YEAR				
	2009	2010	2011	2012	
FLOCK 1 (La Fage)	24 TDM 24 ODM	24 TDM 24 ODM	24 TDM 24 ODM	24 TDM 24 ODM	PRIMIPAROUS
FLOCK 1 (La Fage)	24 TDM 24 ODM	24 TDM 24 ODM	24 TDM 24 ODM	24 TDM 24 ODM	MULTIPAROUS
FLOCK 2 (La Cazotte)		25 TDM 25 ODM 25 ODM 25 ODM	25 TDM 25 ODM 25 ODM 25 ODM		MULTIPAROUS

Primiparous and Multiparous Lacaune Dairy Ewes Daily Milked Twice or Once (morning)

Dry matter intake (DMI) measured individually (indv) or in group (grp)



DESIGN with primiparous and multiparous Lacaune Dairy Ewes in ODM or TDM : 2 experimental flocks - La Cazotte & La Fage

Dry matter intake (DMI) measured individually (indv) or in group (grp)

Two flocks and two feeding systems

LA CAZOTTE (2 years)

Mixed forages (*ad libitum >15% refusal*)

+

Concentrates (variable amount)

adjusted or not to the actual milk yield level of the batch

Year 1: 0.9 – 1.2 kg/d/ewe
Year 2: 0.7 – 1.2 kg/d/ewe

LA FAGE (4 years)

Total mixed ration -TMR

(*ad libitum >10% ref.*)

(on DM basis)

Gramineaous silage	(35-65%)
Gramineaous /Lucerne hay	(13-38%)
Concentrates	(19-32%)

Flock 2 : planned feeding design of multiparous ewes

LA CAZOTTE **MULTIPAROUS** (4 groups of 25 ewes)

Two : ewes milked twice per day
One : ewes milked once per day

YEAR 1 and YEAR 2

Two_100 : objective requirements 100% (based on expected initial milk yield of 3.5 l/d)

One_100 : same diet as Two_100

YEAR 1

One_92: objective requirements : 92%

One_85: objective requirements : 85%

YEAR 2

One_75: objective requirements : 75%

One_75c: same diet as One_75 but concentrates adjusted monthly to the milk yield

After 100 – 120 DIM amount of concentrates were adjusted to the milk yield for all groups

Flock 2 : realized feeding design of multiparous ewes

LA CAZOTTE **MULTIPAROUS**

Average daily DMI (kg) of forages and concentrates during 105 days experiment

	YEAR 1		YEAR 2	
	Forages	Concentrates	Forages	Concentrates
Two_100	**2.26**[a]	1.28	2.02[b]	1.32
One_100	2.06[b]	1.18	**1.88**[a]	1.30
One_92	2.01[b]	1.14		
One_85	2.07[b]	0.97		
One_75			2.00[b]	1.16
One_75c			2.11[b]	0.88

RESULTS

- **Flock 1 : MILK traits, udder health and milking speed**
- Flock 2 : MILK traits and udder health
- Flocks 1 and 2 : Dry matter intake, body weigth and body condition score, and metabolic results
- Flock 1 : individual MILK production approach and physiological results

Meta-analysis of primiparous ewes in Flock 1 (La Fage) : LSM estimates for different traits (when significant)

Trait	Number of milking per day (at milking period only)			
	TDM	ODM	difference	%
Milking length		NS		
MILK (litres)	182	156	- 26	- 14 %
Fat content (g/l)	71,6	69,7	- 1,9	- 2,7 %
Protein content (g/l)	54,0	56,5	+ 2,5	+ 4,6 %
SCC (log2)		NS		
Latency time (s)	26,1	23,8	- 2,3	- 9 %

Meta-analysis of multiparous ewes in Flock 1 (La Fage) : LSM estimates for different traits (when significant)

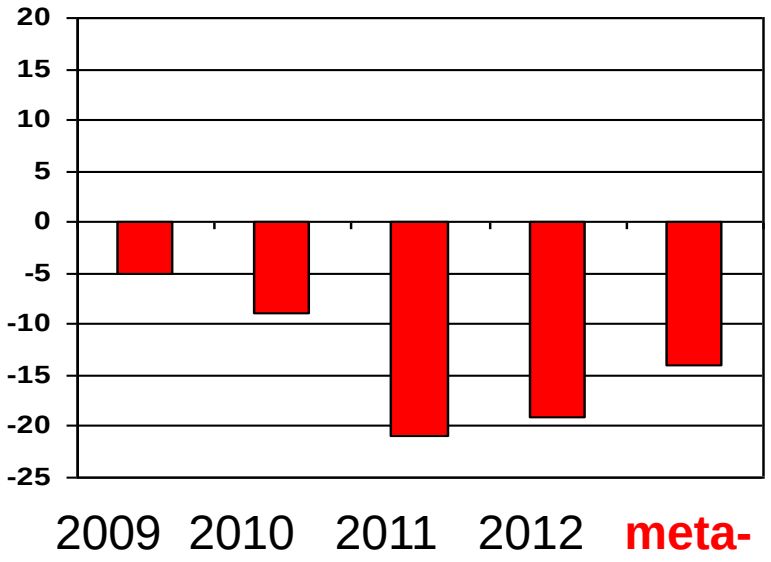
Trait	Number of milking per day (at milking period only)			
	TDM	ODM	difference	%
Milking length		NS		
MILK (litres)	283	240	- 43	- 15 %
Fat content (g/l)		NS		
Protein content (g/l)	56,2	57,5	+ 1,3	+ 2 %
SCC (log2)		NS		
Latency time (s)	26,18	23,4	- 3,4	-- 13 %

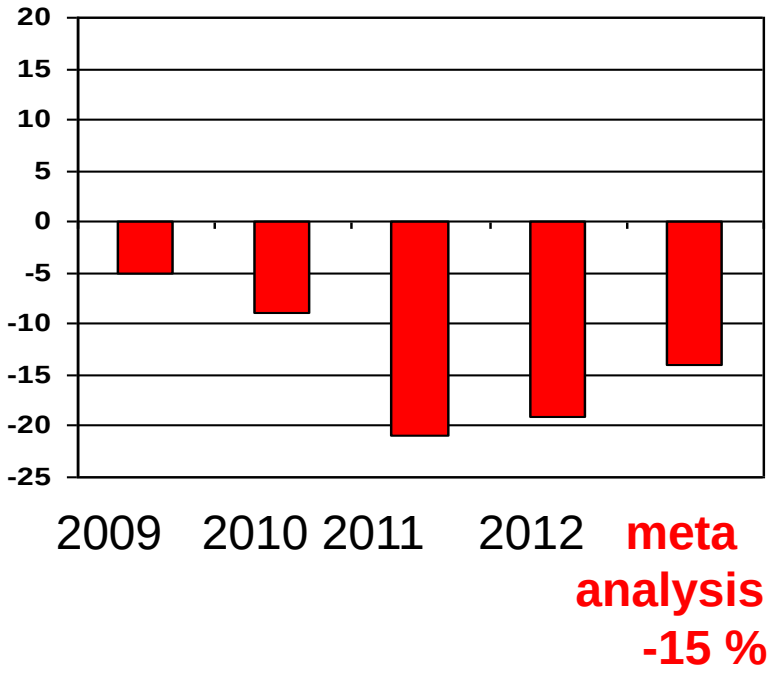
MILK YIELD (Flock 1) : difference TDM – ODM (%)

Primiparous

<u>Flock 1 La Fage</u>

Multiparous





RESULTS

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- **Flock 2 : MILK traits and udder health**
- Flocks 1 and 2 : Dry matter intake, body weight and body condition score, and metabolic results
- Flock 1 : individual MILK production approach and physiological results

Multiparous ewes in Flock 2 (La Cazotte) Year 2011 : LSM estimates for different traits

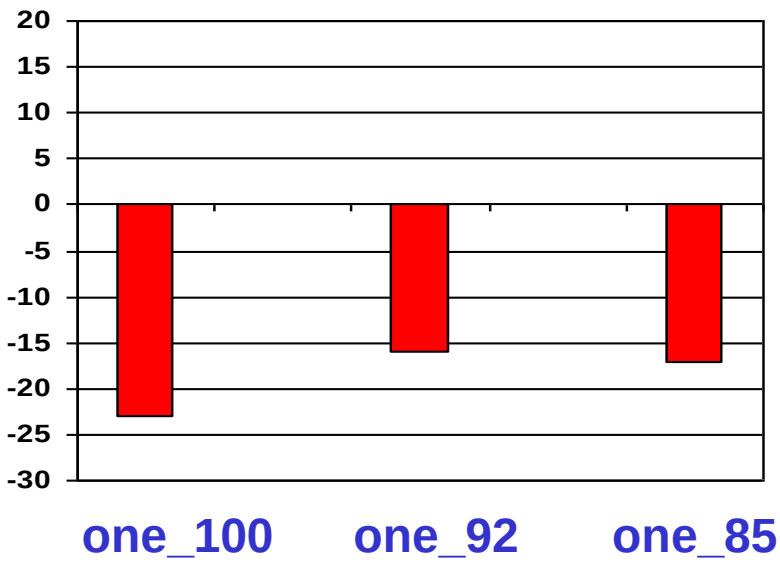
Trait	GROUP			
	Two_100	**One_100**	**0ne_92**	**One_85**
Milking length	193	194	193	194
MILK YIELD	372 (a)	285 (b) **- 23 %**	314 (b) **- 16 %**	307 (b) **- 17 %**
Fat content (g/l)	75,1 (a)	71,3 (b)	74,3 (a)	77,1 (a)
Protein content (g/l)	57,5	56,1	56,8	58,3
SCC (log2)	3,16	3,28	3,17	3,03

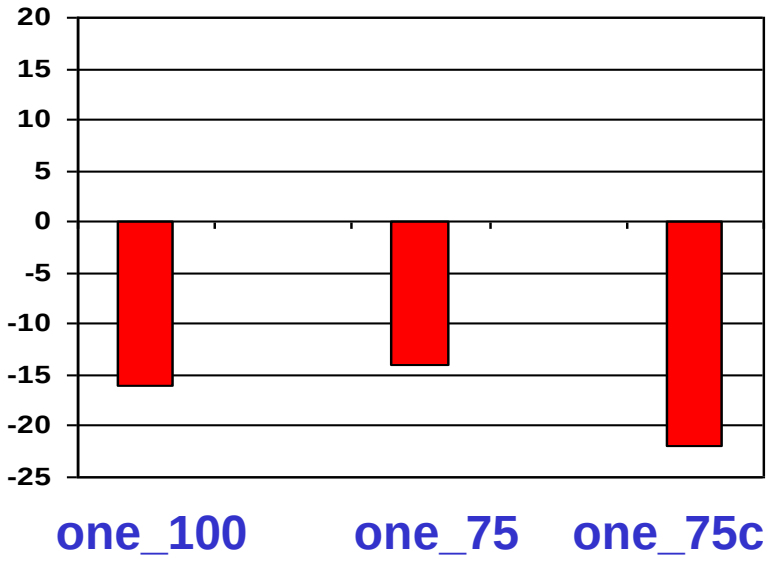
Multiparous ewes in Flock 2 (La Cazotte) Year 2012 : LSM estimates for different traits

Trait	LOT			
	Two_100	One_100	0ne_75	One_75c
Milking length	198	198	198	198
MILK YIELD	387 (a)	324(b) **- 16 %**	332(b) **- 14 %**	303 (b) **- 22 %**
Fat content (g/l)	73,3	74,3	73,0	76;1
Protein content (g/l)	57,9	58,6	58,7	57,8
SCC (log2)	2,91	3,18	2,76	3,36

MILK YIELD (Flock 2) : difference TDM – ODM (%)

2011 **Flock 2 La Cazotte** **2012**





Summary of the ODM milk trait results in Flocks 1 and 2 compared to TDM traits

Trait	Difference TDM – ODM %			
	La Fage primiparous	La Fage adults	Cazotte adults 2011	Cazotte adults 2012
Milking length	NS	NS	NS	NS
MILK yield (l)	**- 14 %**	**- 15 %**	**-16 to -23 %**	**- 14 to –22 %**
Fat content (g/l)	- 2,7 %	NS	NS	NS
Protein content. (g/l)	+ 4,6 %	+ 2 %	NS	NS
SCC (log2)	NS	NS	NS	NS
Latency time (s)	- 9 %	- 13 %		
	ad libitum feeding		Adjusted feeding	

RESULTS

- Flock 1 : MILK traits, udder health and milking speed
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- **Flocks 1 and 2 : Dry matter intake, body weight and body condition score, and metabolic results**
- Flock 1 : individual MILK production approach and physiological results

MEASUREMENTS / DATA

- Flocks 1 and 2 : Dry matter intake (DMI) measured in group (flock 2 and half experiments in flock 1) or individually (half experiments in flock 2)

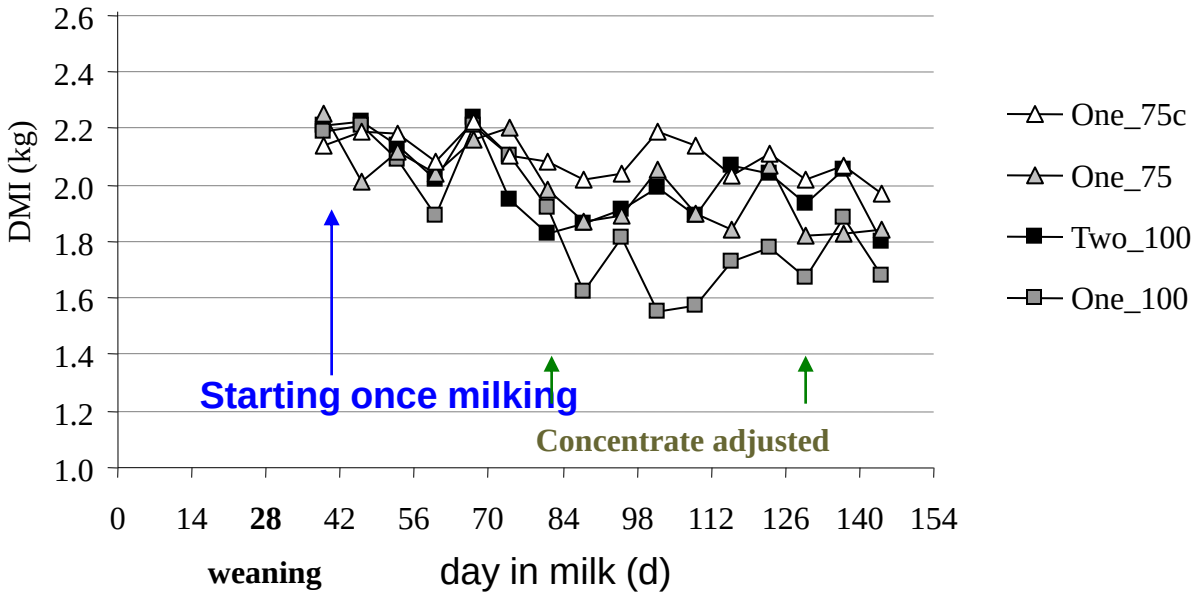
- Flocks 1 and 2 : body weight (BW) and body condition score (BCS)

- Flock 1 : individual blood sampling (biweekly in 2010) for analyses of plasma :
  - metabolites : NEFA, Triglycerides, Glucose
  - hormones : insulin, leptin, tri-iodethyroidienne (T3)

Flock 2 and year 2012 : Dry matter intake (DMI) of multiparous ODM or TDM Lacaune ewes

LA CAZOTTE **MULTIPAROUS**

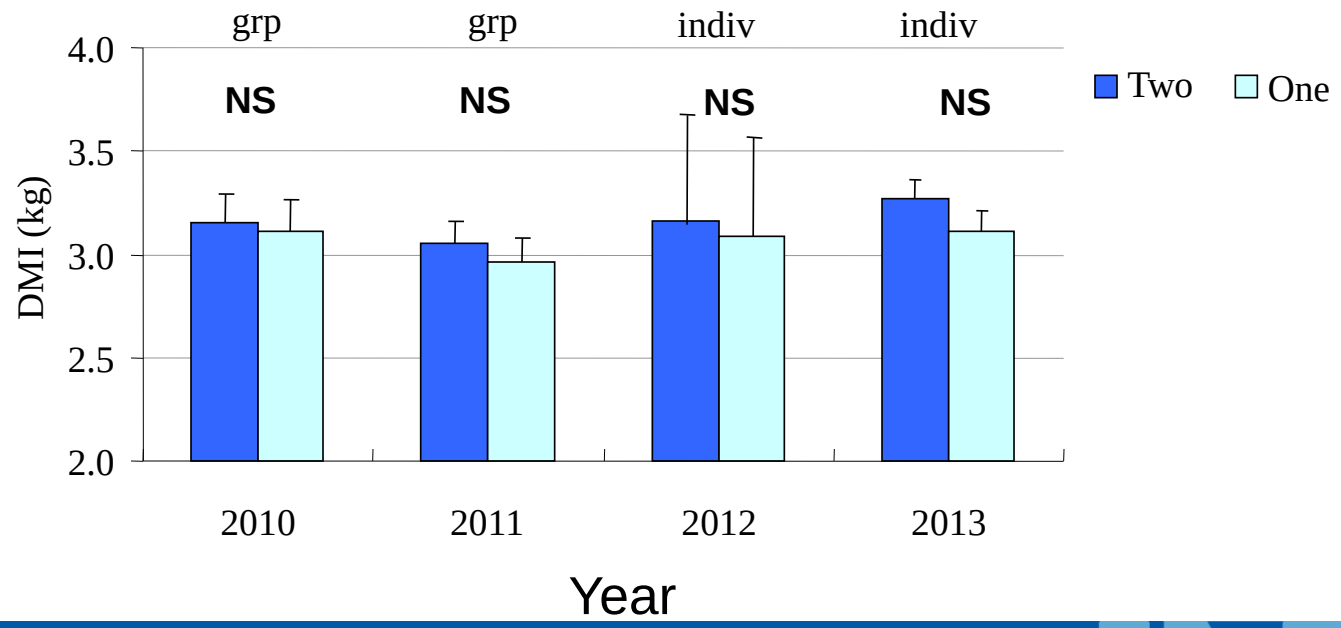
Average forages dry matter intake (DMI) of ewes milked twice (Two) or once (One) and fed in group (year 2)



Flock 1 and 4 years : Dry matter intake (DMI) of multiparous ODM or TDM Lacaune ewes

LA FAGE **MULTIPAROUS**

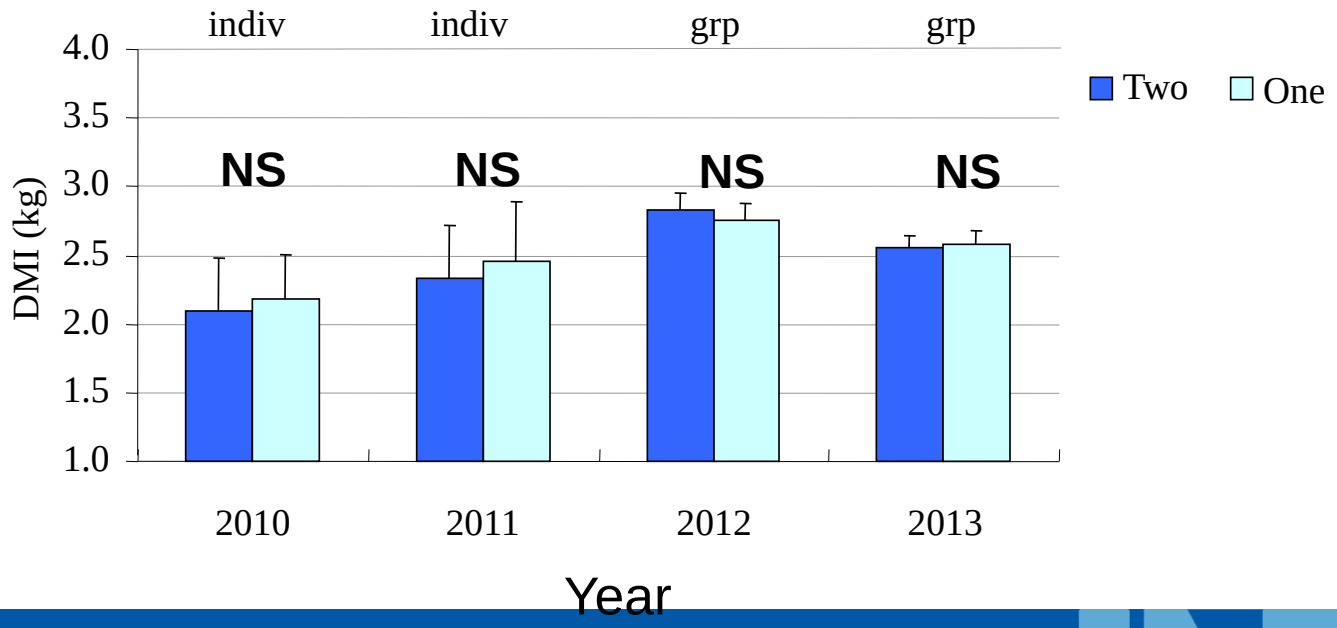
Average total mixed ration dry matter intake (DMI) of ewes milked twice (Two) or once (One) and fed individually (indiv) or in group (grp)



Flock 1 and 4 years : Dry matter intake (DMI) of primiparous ODM or TDM Lacaune ewes

LA FAGE **PRIMIPAROUS**

Average total mixed ration dry matter intake (DMI) of ewes milked twice (Two) or once (One) and fed individually (indiv) or in group (grp)

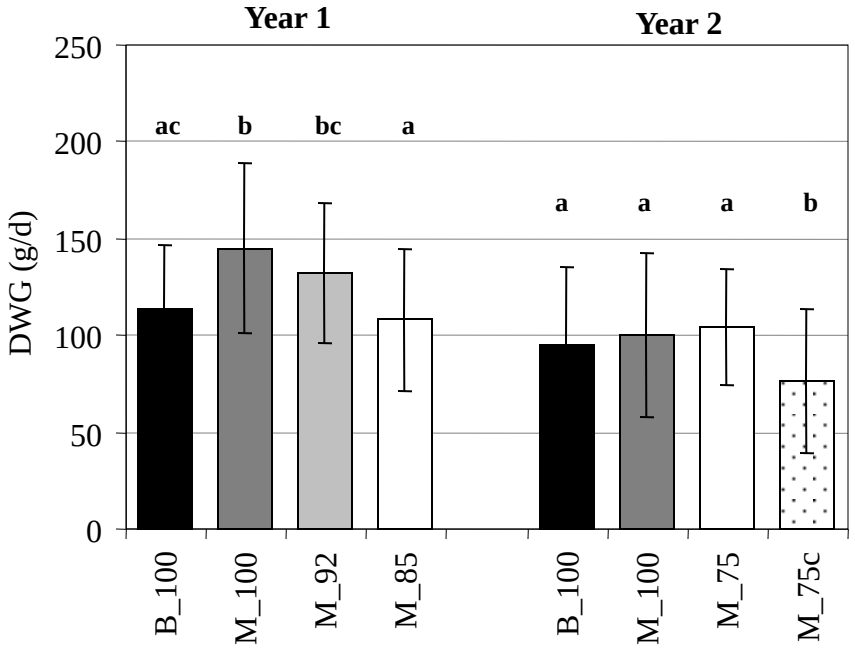


Body weight (BW) and body condition score (BCS)

Flock 2 : Body weight change (DWG) and body condition score (BCS)

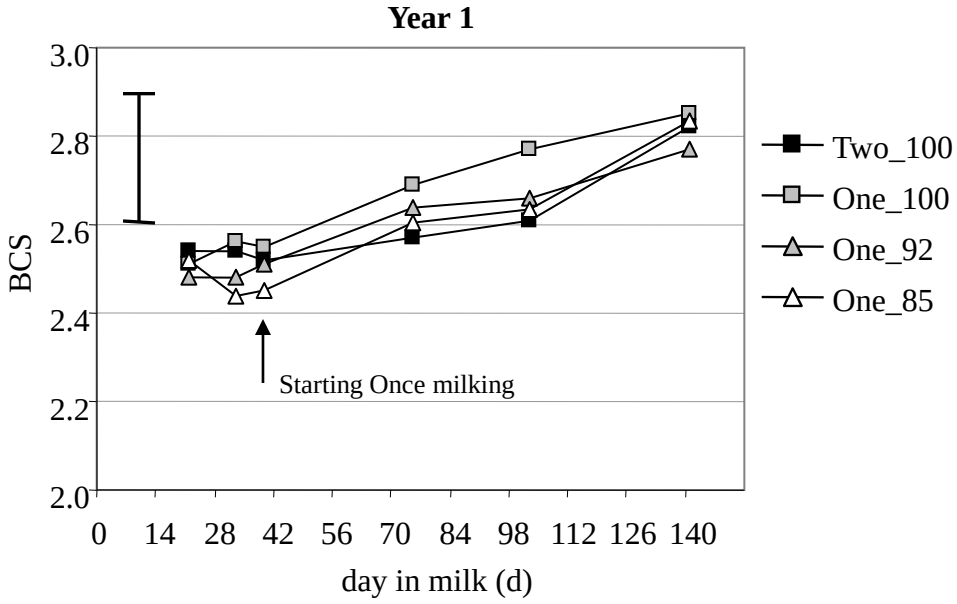
LA CAZOTTE **MULTIPAROUS**

Body weight change (DWG) depending on amount of concentrate



Values with different letter within a year are significantly different (P<0.05)

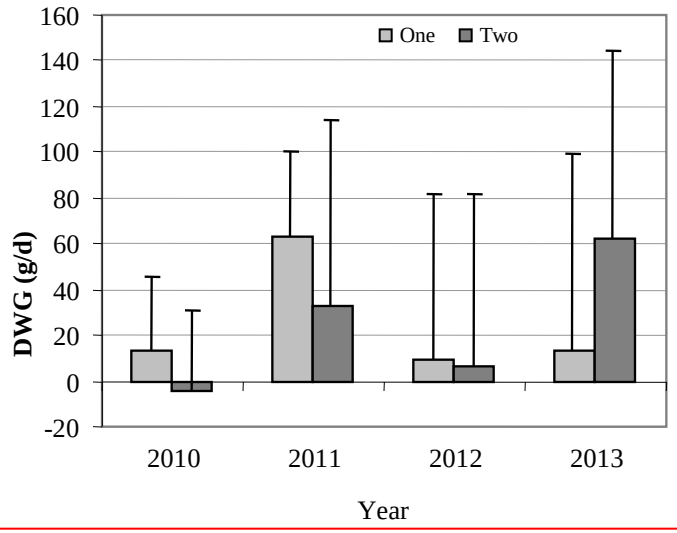
Body condition score (BCS) NO SIGNIFICANT EFFECT



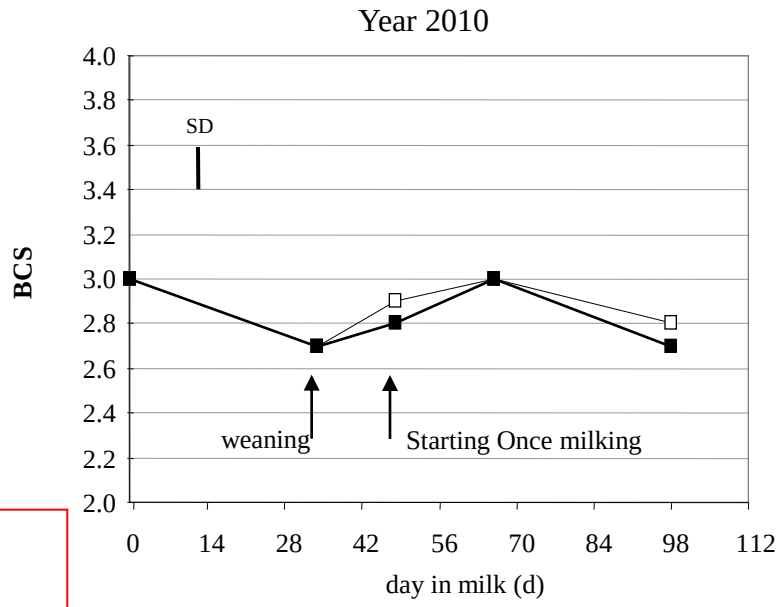
Flock 1 and primiparous : Body weight change (DWG) and body condition score (BCS)

LA FAGE **PRIMIPAROUS**

Body weight change (DWG)



Body condition score (BCS)



No significant effect on BW, DWG or BCS

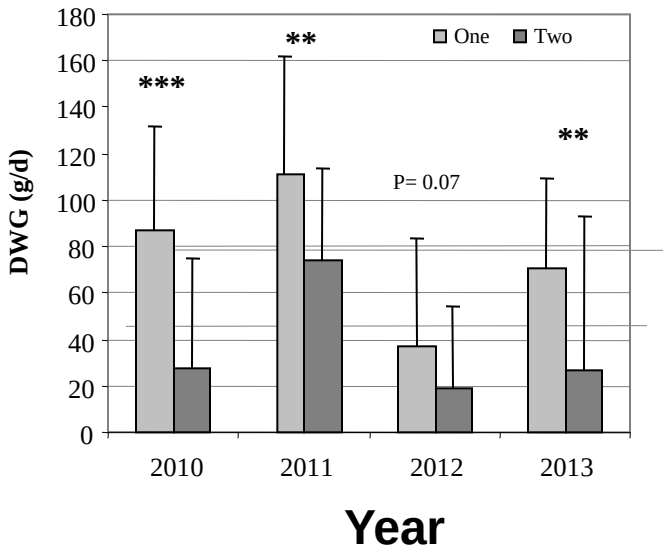
for ODM ewes during indoor feeding

Flock 1 and multiparous : Body weight change (DWG) and body condition score (BCS)

LA FAGE **MULTIPAROUS**

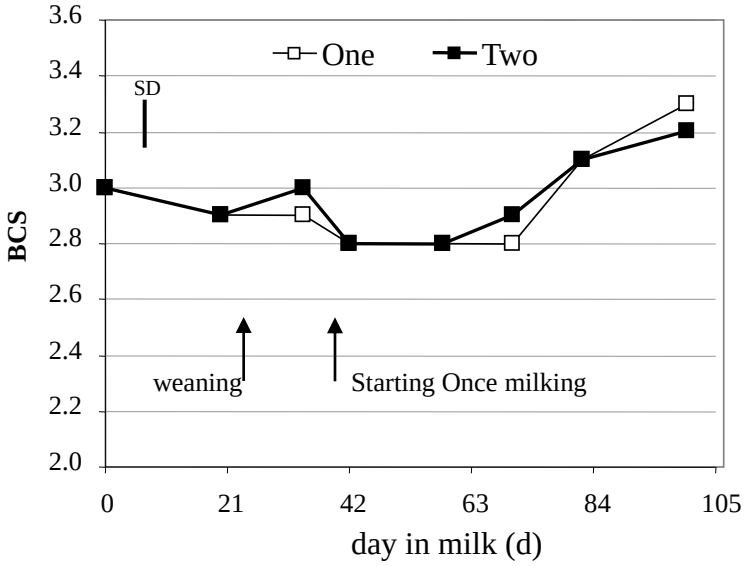
Body weight gain (DWG) :

Higher gain for ODM ewes during indoor feeding



Body condition score (BCS)

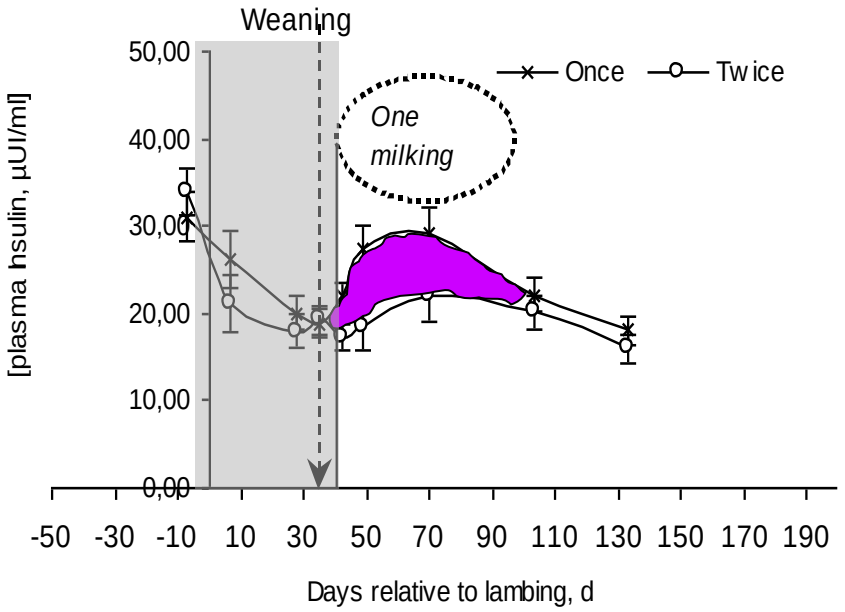
Year 2010



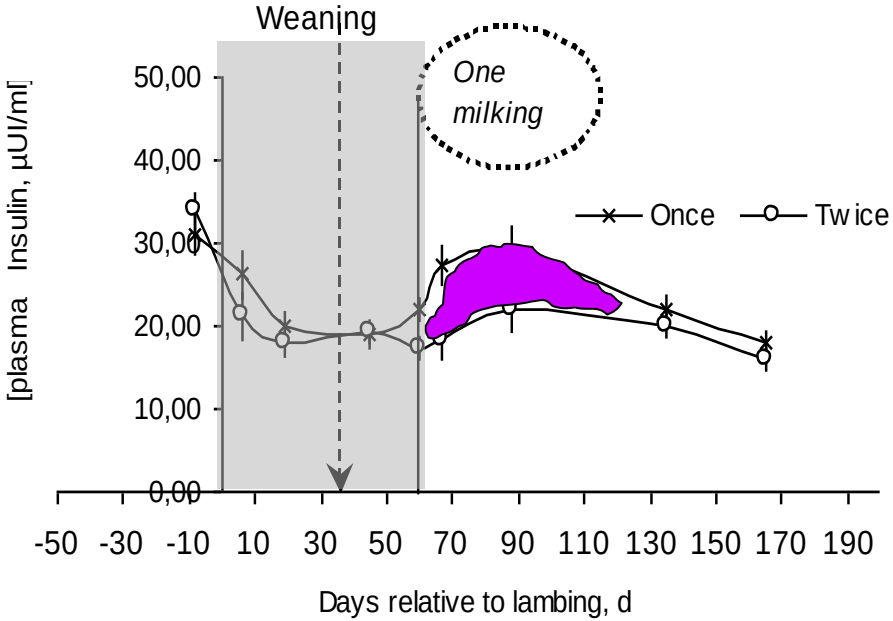
NO SIGNIFICANT EFFECT

Flock 1 and year 2010 : insulin

Primiparous. ***Number of milking per day***



Multiparous. ***Number of milking per day***



Evidence of a difference in body reserves mobilization:

as illustrated by a lower [INS] in ewes milked twice, irrespective of parity

RESULTS

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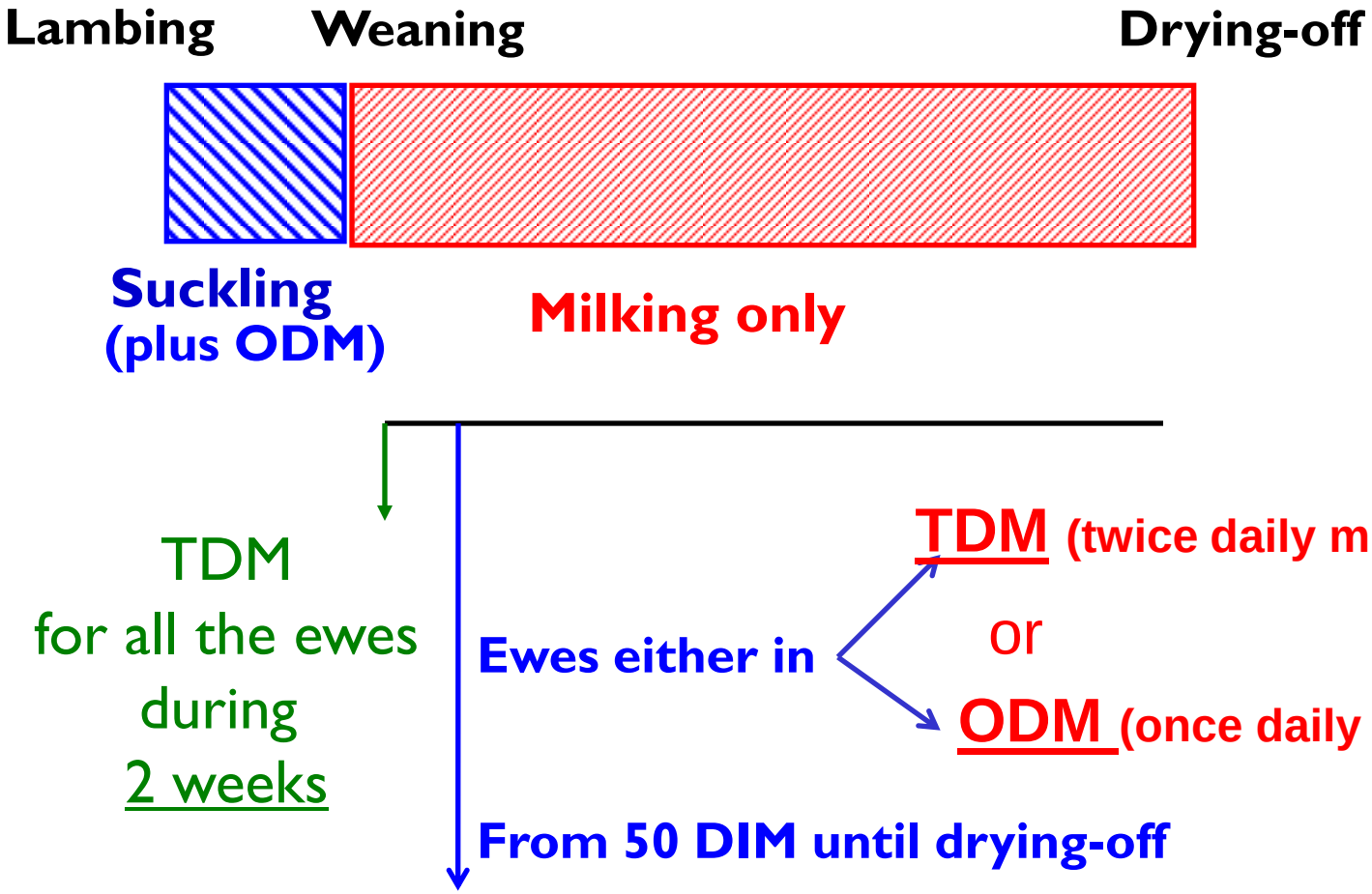
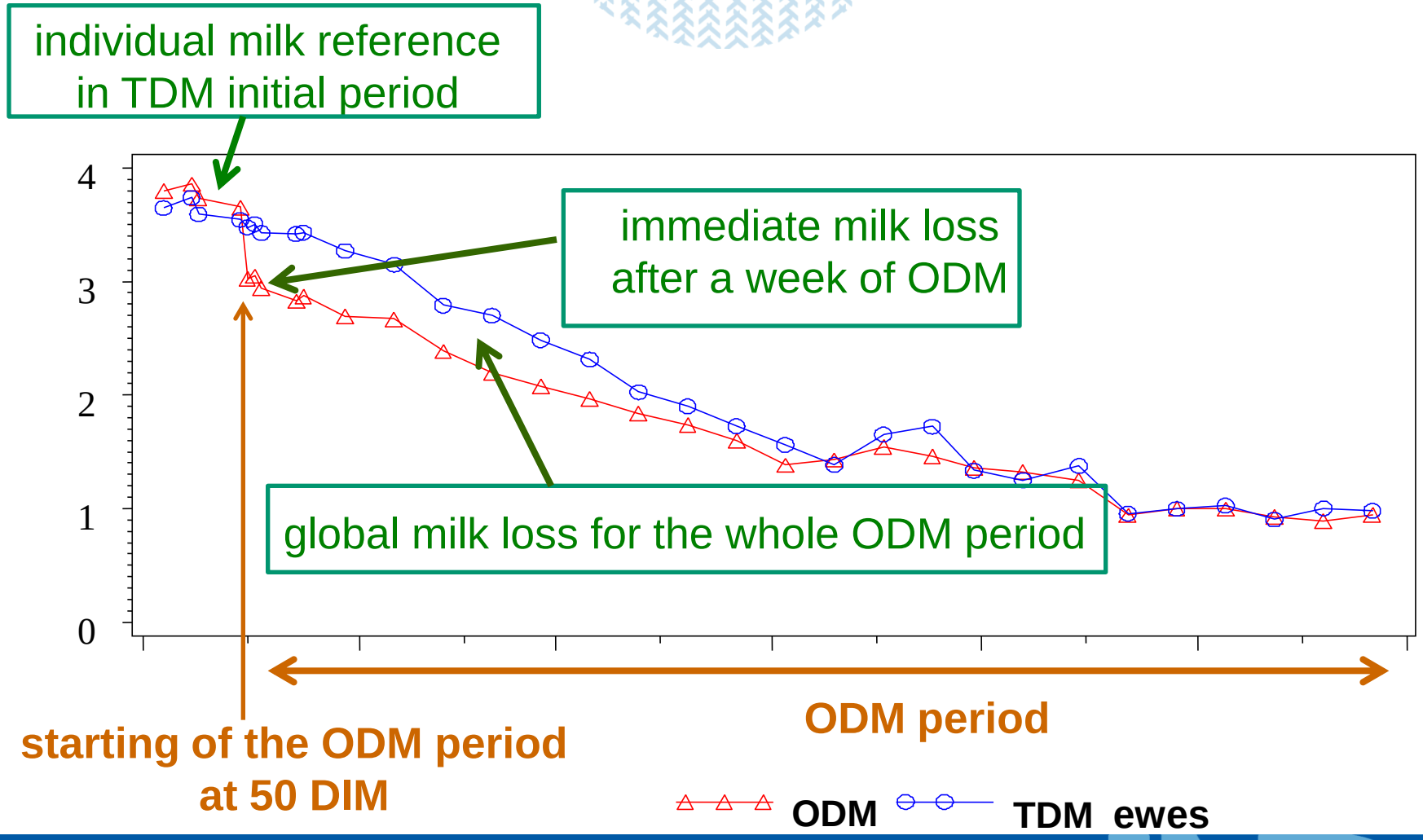
- **Flock 1 : individual MILK production approach and physiological results**

DESIGN for lactation management



Flock 1 : Lactation curves of multiparous ODM or TDM ewes



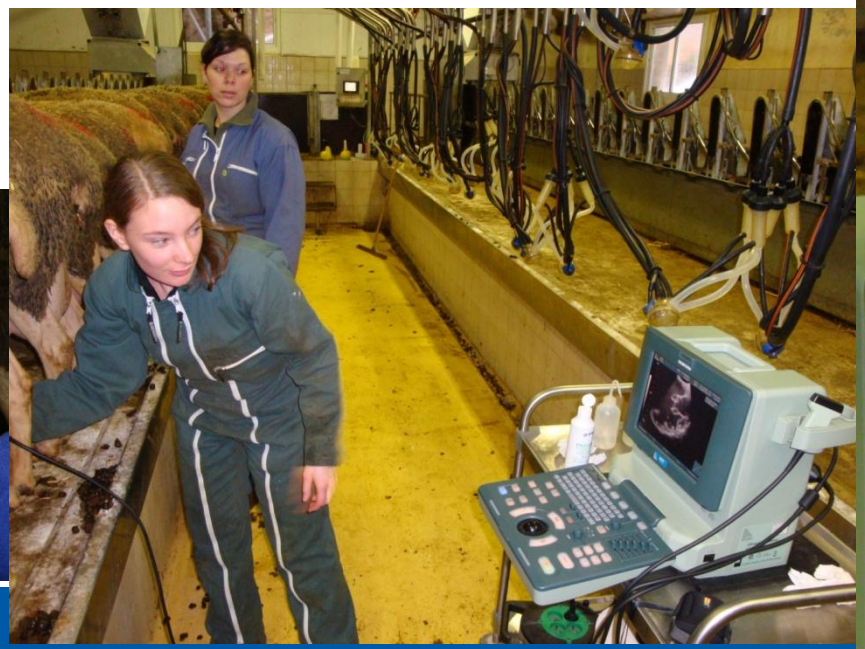
MEASUREMENTS / DATA

- Lactation curves :
  - individual milk loss after the 2 first weeks of ODM period
  - individual milk loss during the whole period of ODM

- Physiological measurements
  - cisternal area by ultrasonography
  - cisternal and alveolar milk by atosiban method
  - tight junction permeability (lactose and Na+, K+ leak)
  - cortisol (animal welfare)

Flock 1 : mammary ultrasonography

- Roquefort'in project



Phenotypic correlations between milk and milk loss at the ODM period

Trait	MILK	2 first weeks LOSS	Total milk LOSS
MILK at the whole ODM period	1 1	0.40 0.23	0.51 0.18
2 first weeks MILK LOSS (%)		1	0.69 0.79
Total MILK LOSS (%)			1

In red PRIMIPAROUS and blue MULTIPAROUS EWES

Physiological results

See you in Paris, on 4-5 December 2013 :
20th Journées 3R

CONCLUSION : main results (1/2)

- MILK decrease due to ODM around 15 % and comparable for primiparous and multiparous ewes
- Milking speed higher for ODM ewes
- Udder health (SCC) of ODM ewes comparable to this of TDM ewes
- Without feeding restriction ODM ewes do not ajust their (forage or mixed ration) feed intake due their milk yield decrease.

CONCLUSION : main results (2/2)

- Compared to TDM ewes, milk protein content of ODM ewes tends to increase slightly, mainly due to soluble proteins increase.

- Overfeeding, which may be responsible for a milk fat content decrease, must be avoided as much as feeding adjustement to the actual milk of ODM ewes does not lead to a greater reduction in milk yield.

- May be body condition score is not a sufficient accurate measurement to show, as with metabolite results, that opportunities exist to economize feeding with body reserves.

CONCLUSION : ODM perspectives

- Pluridisciplinary research in progress : year 2013 to be included in meta-analysis
- Phenotypic results…genetic analysis to be performed
- Perspectives : milk composition and cheese
- Perspectives : many topics regarding nutrition and feeding
- Good ODM ability of the Lacaune breed…to be improved ?

Fundings of Roquefort'in project :

Fond Unique Interministériel (FUI)
Midi-Pyrénées region
FEDER from EU
Aveyron and Tarn departements
Rodez town