Part lactation sampling as a powerful design to select dairy sheep both on milk composition and mastitis resistance provided to maintain ICAR sheep requirements regarding milk recording devices and analysis of sheep milk in laboratories

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Génétique Animale

Part-lactation sampling design

- **Conceived in 1985 *(Barillet)* to select the Lacaune population for fat and protein yields and contents**

- **Implemented in**
  - **the Lacaune nucleus flocks in 1988 in first lactation**
  - **the Lacaune nucleus flocks in 2001 in the 2 first lactations**
  - **in the Manech and Basco-Bearnaise nucleus flocks in 2002-2004 in first lactation**

Simplification of milk composition recording

Milk quality (optional disposition) : part-lactation sampling within AC method for milk yield

Parities 1 (& 2) X X X X X X **Sampling**

A4 method, all ewes ⟶ For 100 ewes : 100 x 2 X 6 = **1200 samplings**

Part-lactation sampling within AC method, parity 1 & 2 ⟶ For 100 ewes : 50 x 3 = **150 samplings**

(12,5 % / A4)

Part-lactation sampling design : in practice

implemented within AC method for milk yield

3/4 (primiparous) to 5/6 (adult ewes) monthly test-days for milk yield per lactation (at only 1 on the 2 daily milkings)

1 to 3 monthly test-days for milk composition (fat and protein), per lactation involved in part-lactation sampling design.

Part-lactation sampling design (in France)

- implemented in
  - the Lacaune nucleus flocks in 1988 in first lactation
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- implemented in
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Genetic parameters (Lacaune breed, *Barillet et al., 2006)*

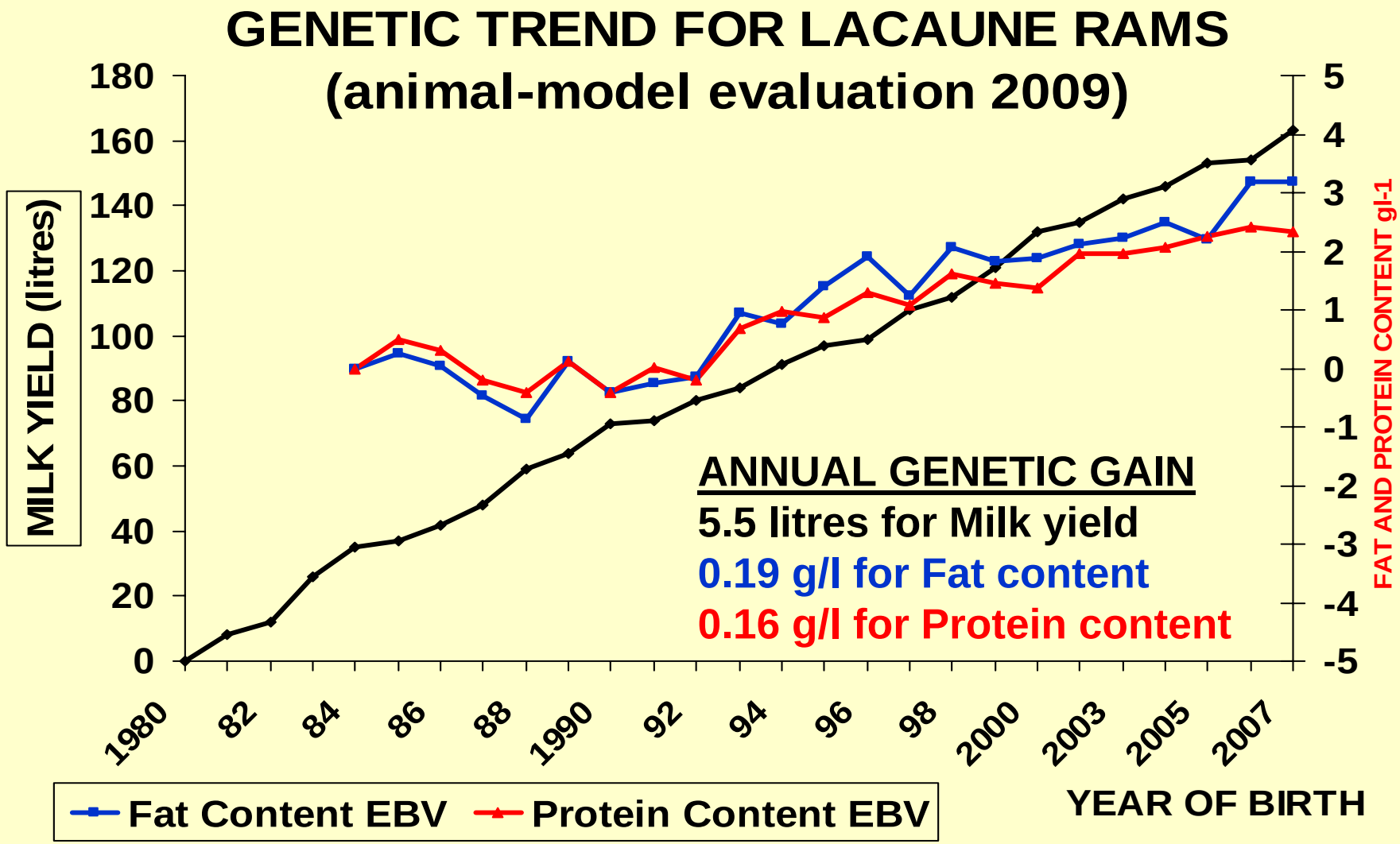
	Lait	QMG	QMP	TB	TP
LAIT	0,32	**+0,77**	**+0,88**	**-0,43**	**-0,48**
QMG	+0,83	0,26	**+0,82**	**+0,24**	**-0,12**
QMP	+0,93	+0,85	0,28	**-0,18**	**-0,01**
TB	-0,20	+0,35	-0,06	0,41	**+0,57**
TP	-0,35	-0,12	0,01	+0,40	0,51

Heritabilities on diagonal

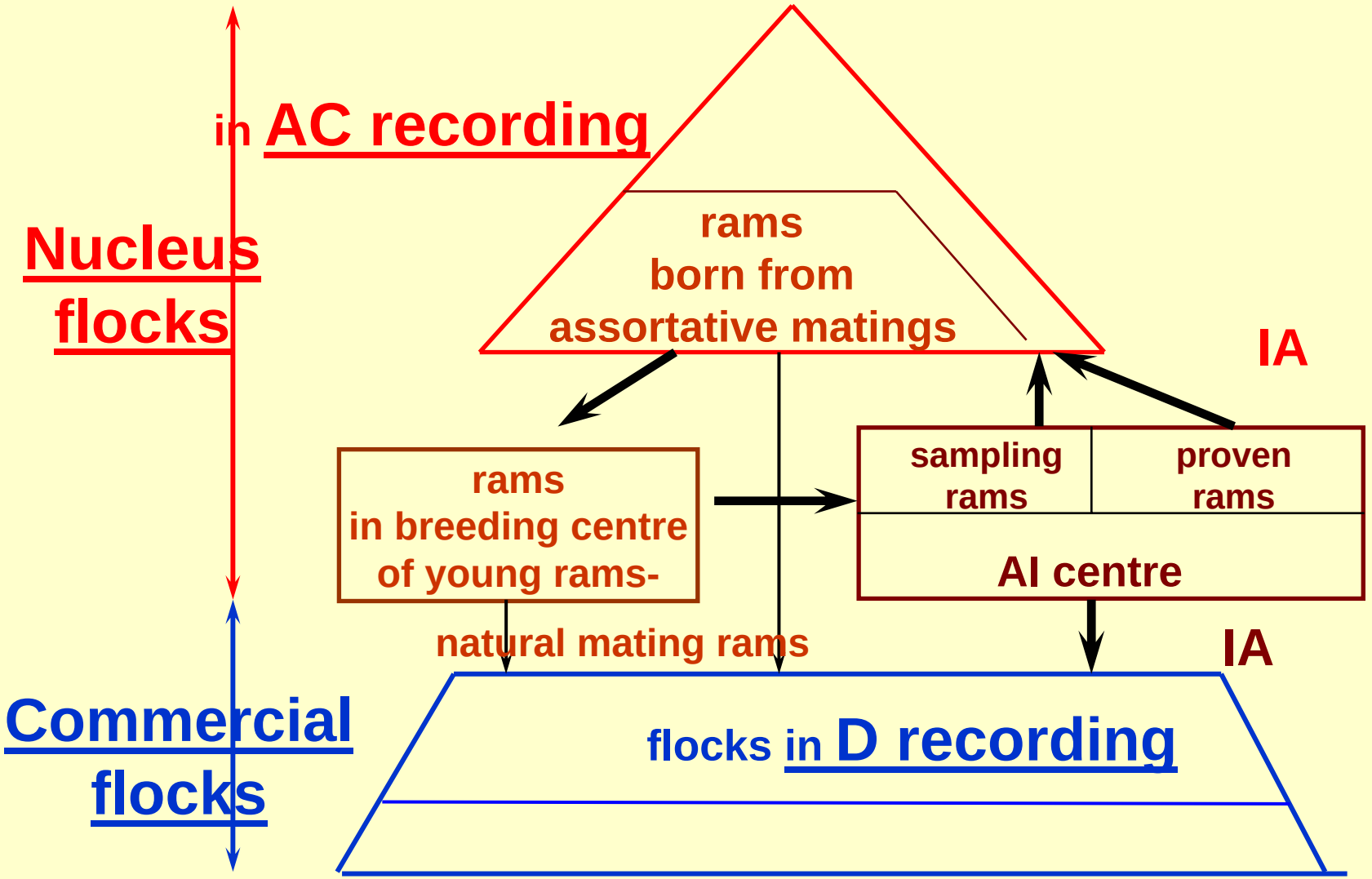
Genetic correlations above diagonal

Environmental correlations under diagonal

Genetic parameters
121,283 first lactations
between 2001 et 2004


GENETIC TREND FOR LACAUNE RAMS
(animal-model evaluation 2009)
MILK YIELD (litres)
FAT AND PROTEIN CONTENT gl-1
180
160
140
120
100
80
60
40
20
0
5
4
3
2
1
0
-1
-2
-3
-4
-5
1980
82
84
86
88
1990
92
94
96
98
2000
2003
2005
2007
YEAR OF BIRTH
ANNUAL GENETIC GAIN
5.5 litres for Milk yield
0.19 g/l for Fat content
0.16 g/l for Protein content
Fat Content EBV
Protein Content EBV

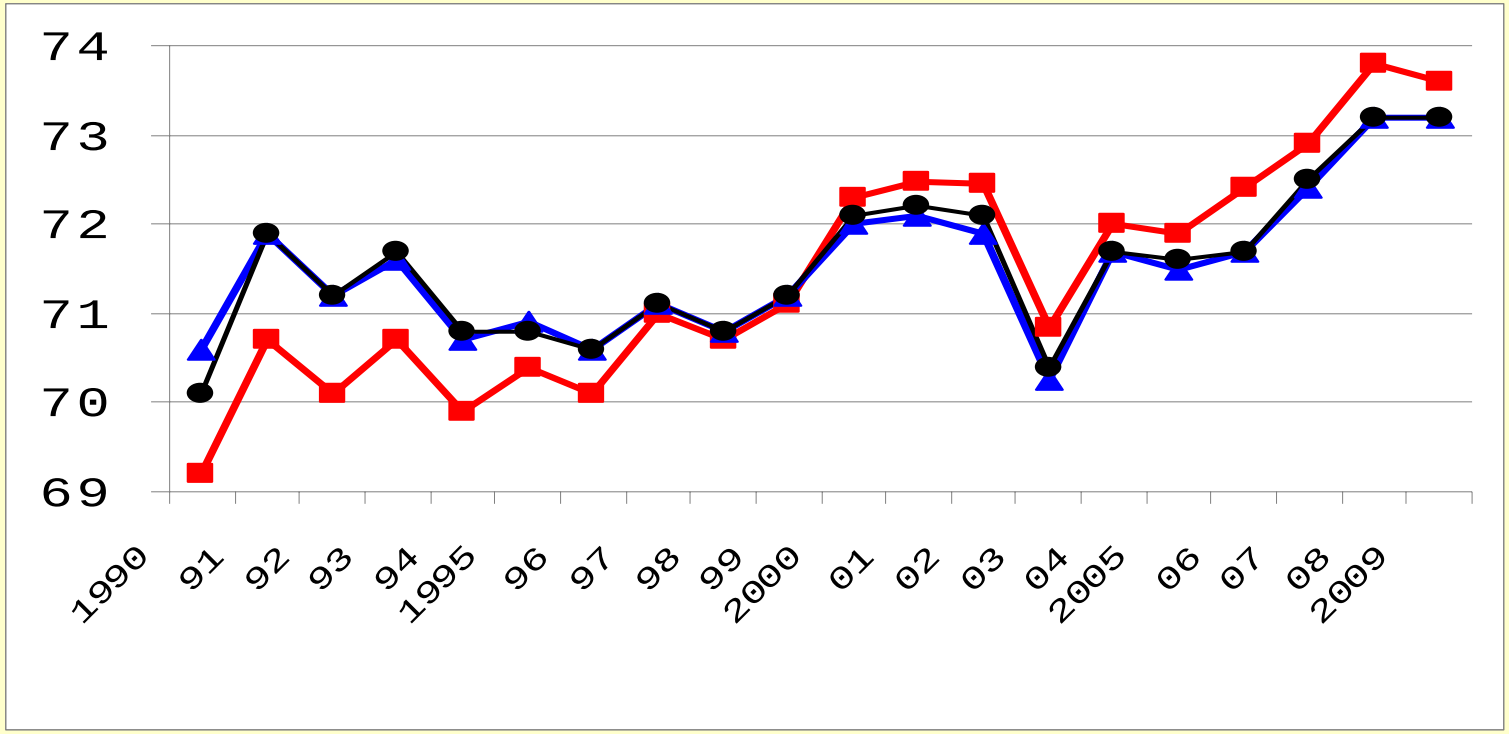
PYRAMIDAL MANAGEMENT OF THE POPULATION



Nucleus flocks and commercial flocks (in D recording) in France according to the French dairy sheep breeds (year 2009)

Countries	Breeds	Size of population		Recorded population (nucleus)		% recorded population	Ewes in D method (commercial flocks)
		#flocks	# ewes	#flocks	# ewes		
France (2009)	**Lacaune**	**2,600**	**900,000**	**376**	**173,568**	**75.3 %**	**504,081**
	Manech red faced	1,150	270,000	203	70,712	33.2 %	18,928
	Corse	420	95,000	72	21,050	24.2 %	1,982
	Basco-Béarnaise	420	80,000	78	21,984	34.3 %	5,427
	Manech black faced	510	100,000	52	14,509	15.4 %	881

Fat content of annual milk tanks * : phenotypic trend according to the type of Lacaune flocks (Roquefort area)



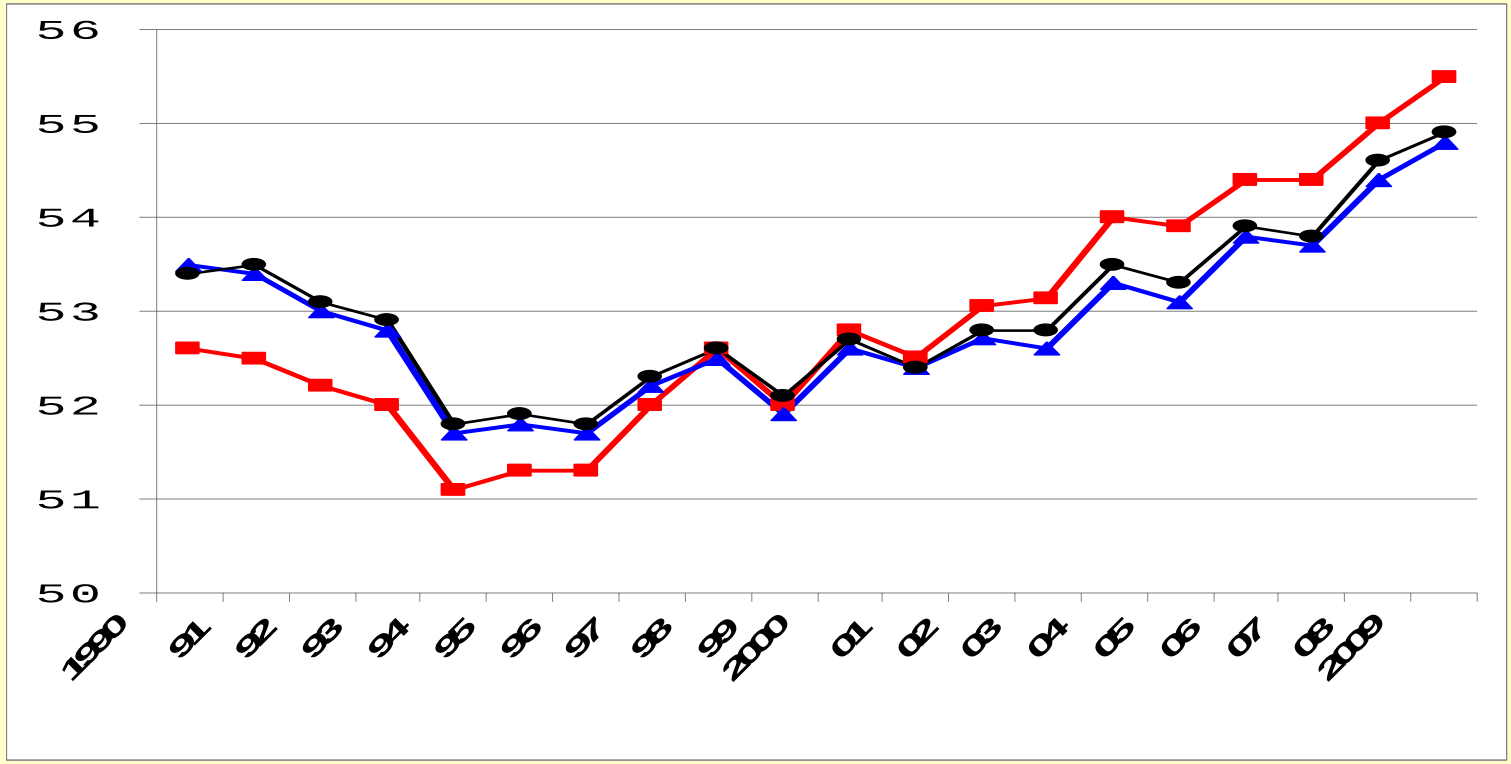
Samplings of milk tanks every 10 days for milk payment design

Nucleus flocks (AC recording)

Commercial flocks (D recording)

All flocks (Lacaune population in Roquefort area)

Protein content of annual milk tanks *: phenotypic trend according to the type of Lacaune flocks



Samplings of milk tanks every 10 days for milk payment design

Nucleus flocks (AC recording)

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All flocks (Lacaune population in Roquefort area)

Part-lactation sampling design (in France)

- **implemented in**
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- **implemented in**
  - **the Manech and Basco-Bearnaise nucleus flocks in 2002-2004 in first lactation**

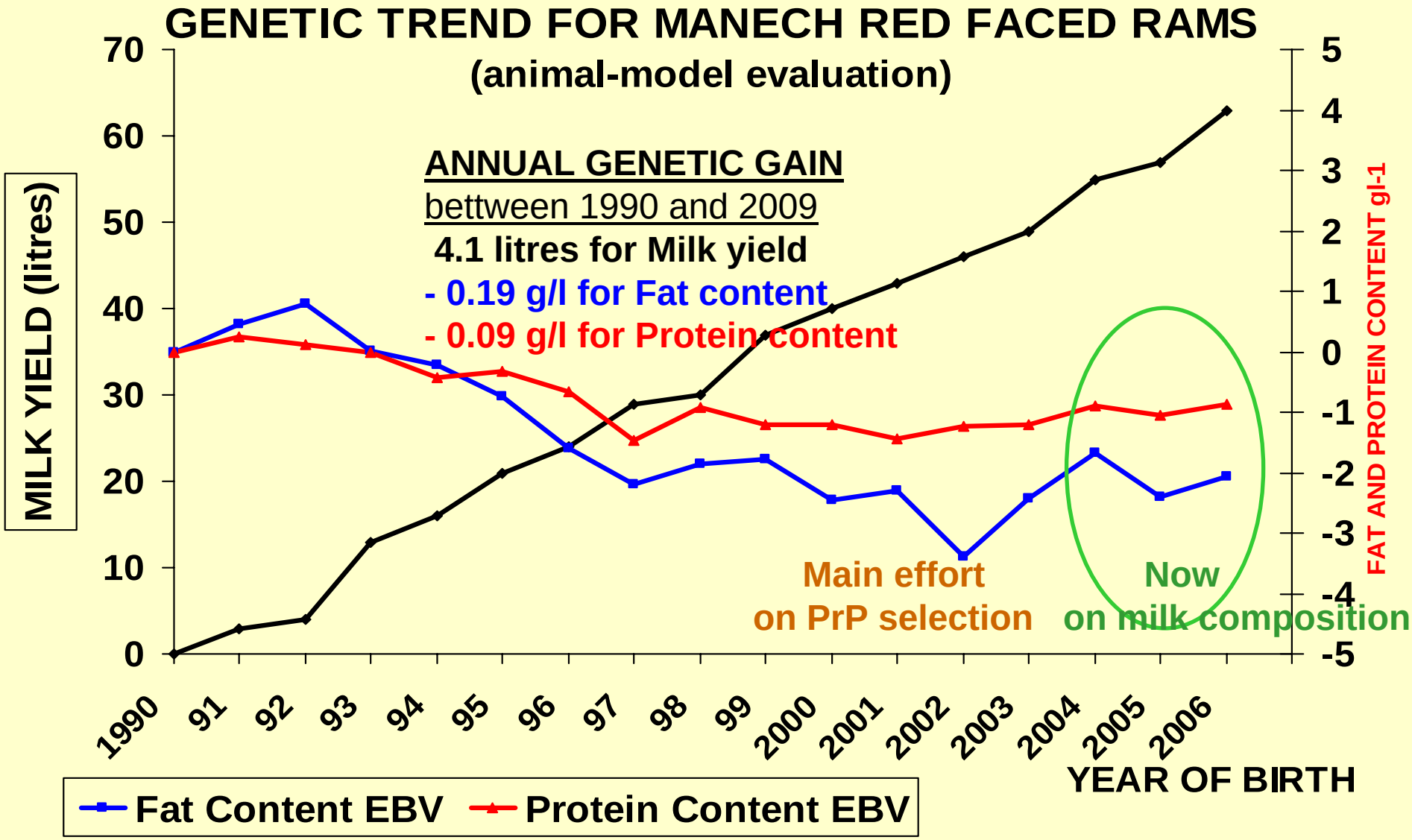
Genetic parameters : Manech red faced breed

(Barillet et al., 2008)

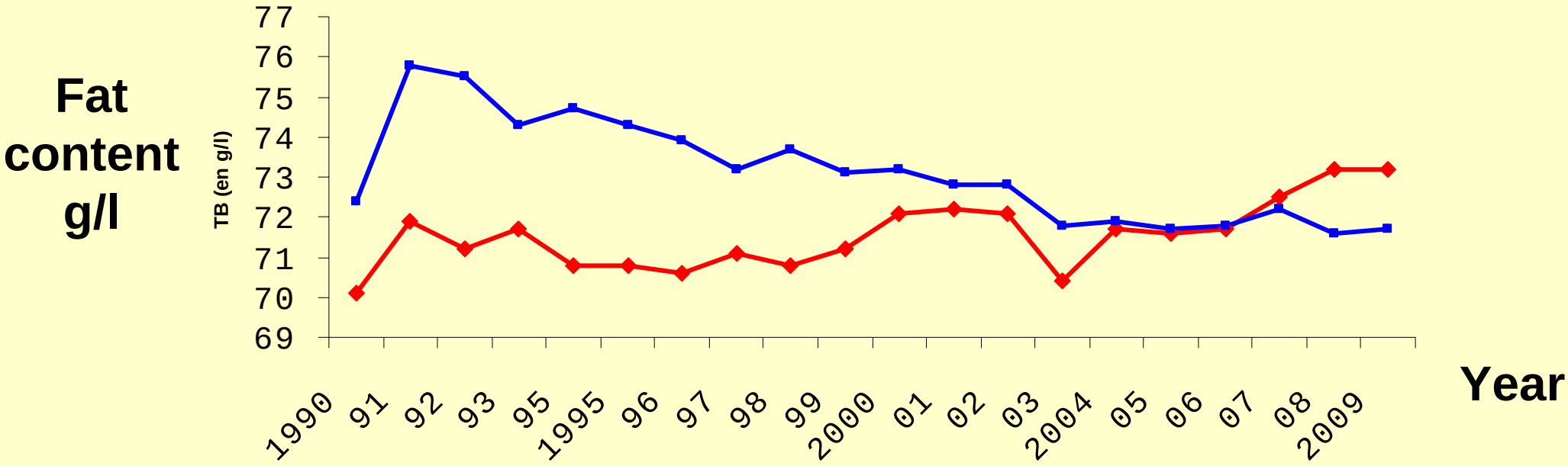
	MY	FY	PY	FC	PC
MILK yield	**0,33**	+0,87	+0,92	-0,39	-0,44
FAT yield	+0,84	**0,28**	+0,91	+0,10	-0,16
PROTEIN yield	+0,96	+0,82	**0,30**	-0,16	-0,06
FAT content	-0,17	+0,34	-0,16	**0,28**	+0,60
PROTEIN cont.	-0,34	-0,20	-0,04	+0,16	**0,51**

Heritabilities on diagonal
Genetic correlations above the diagonal
Environmental correlations under

Genetic parameters
58,378 first lactations
between 2002 and 2007


GENETIC TREND FOR MANECH RED FACED RAMS
(animal-model evaluation)
ANNUAL GENETIC GAIN
bettween 1990 and 2009
4.1 litres for Milk yield
- 0.19 g/l for Fat content
- 0.09 g/l for Protein content
MILK YIELD (litres)
FAT AND PROTEIN CONTENT gl-1
70
60
50
40
30
20
10
0
5
4
3
2
1
0
-1
-2
-3
-4
-5
1990
91
92
93
94
95
96
97
98
99
2000
2001
2002
2003
2004
2005
2006
YEAR OF BIRTH
Main effort
on PrP selection
Now
on milk composition
Fat Content EBV
Protein Content EBV

Fat content of annual milk tanks *: comparison of the phenotypic trend in Lacaune and Pyrenean areas

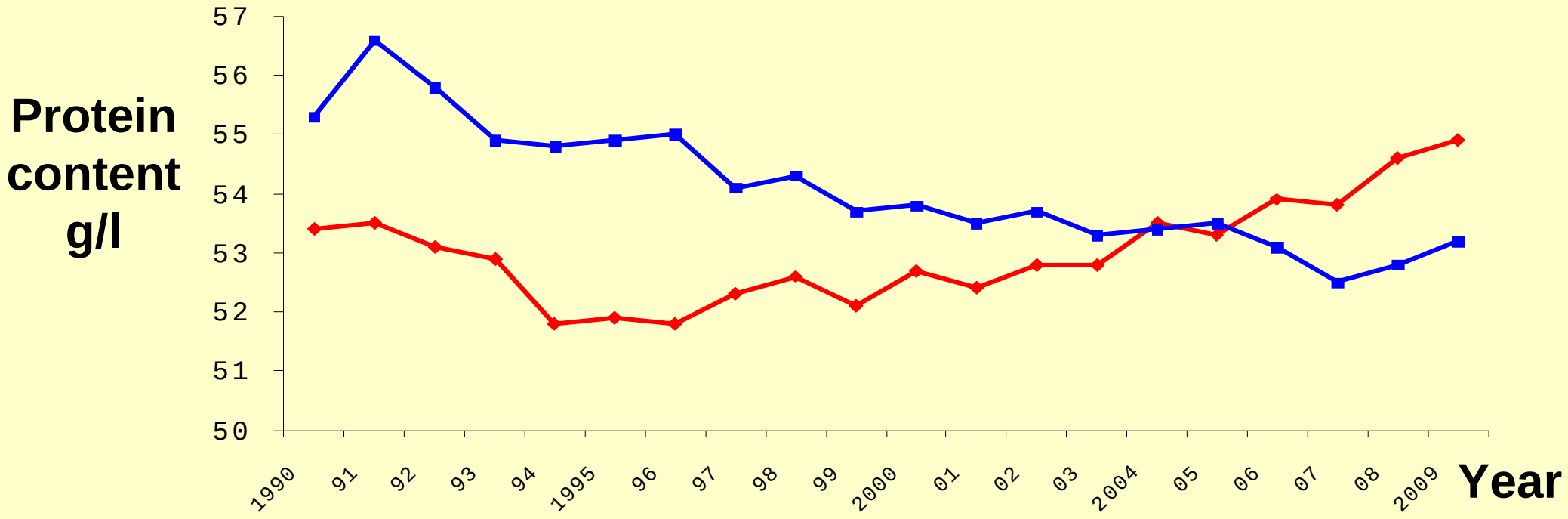


Samplings of milk tanks every 10 days for milk payment design

Roquefort area (Lacaune breed)

Pyrenean area (Basco-Bearnaise and Manech breeds)

Protein content of annual milk tanks *: comparison of the phenotypic trend in Lacaune and Pyrenean areas



Samplings of milk tanks every 10 days for milk payment design

Roquefort area (Lacaune breed)

Pyrenean area (Basco-Bearnaise and Manech breeds)

Part-lactation sampling design

- **Conceived in 1985 (Barillet) to select the Lacaune population for fat and protein yields and contents**

- **New question (by the end of the 90's in the Lacaune breed)**
  is this simplified design relevant also to select for somatic cell count (selection for mastitis resistance) ?

the answer is : YES (Barillet et al., 2001)

Genetic parameters : comparison **Lacaune** (121,283 first lactations) et **MRF** (58,378 first lactations)

	héritabilities	Genetic correlation with milk yield (MY)
Milk Yield	0,32 et 0,33	
Fat content	0,41 et 0,28	- 0,43 et - 0,39
Protein content	0,51 et 0,51	- 0,48 et - 0,44
LSCS	0,15 et 0,10	0,15 et 0.21

New breeding goals in Lacaune dairy sheep breed

- Until 2004 :
  - Fat and Protein yields and contents = Milk traits
  - & PrP gene selection (scrapie resistance)

transition between 2005 and 2007

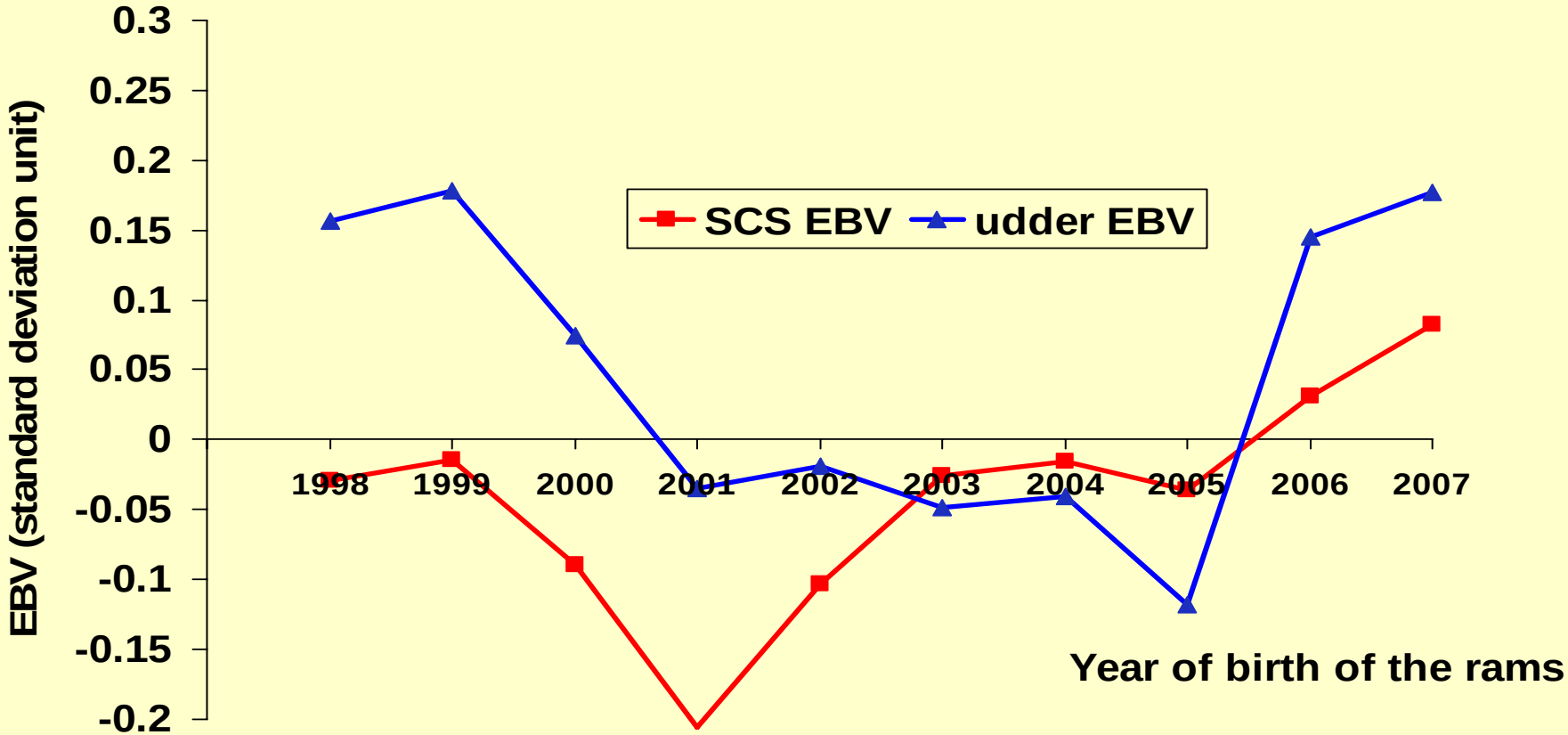
- Since 2007 :
  - ½ Milk traits + ½ udder functional traits

    (udder functional traits = ½ SCS + ½ udder morphology)

    mastitis resistance
  - & PrP gene selection (scrapie resistance)

Genetic trend for Lacaune rams

(animal model evaluation 2009)



scale : positive EBV are favourable EBV

Conclusion (1/2)

- the part-lactation sampling design is relevant both for milk composition and SCC selection in dairy sheep

- if we assume 4 lactations on average per ewe, using AC method for milk yield recording and part-lactation sampling for F%, P% and SCC for the 2 first lactations *(or first lactation only)* :
  - in total 18 to 22 test-days for milk yield
  - and 2 to 6 test-days for F%, P% and SCC
    (or 1 to 3 test-days for F%, P% and SCC)

during the productive live of each ewe

Conclusion (2/2)

- during the production life of each ewe *(whatever the jars or meters, manual or electronic)*, on average 18 to 22 test-days for milk yield, and 1 to 6 test-days for F%, P%, SCC…

- such a very simplified design (1 to 6 milk quality test days recorded per ewe) needs to maintain relevant accuracy for each individual test day as presently defined in ICAR requirements for recording devices and for analytical quality analysis of sheep milk.