

# A NEW WOOL-SHEDDING SHEEP BREED

**D. Allain<sup>1</sup>, B. Pena<sup>1</sup>, D. Marcon<sup>2</sup>, C. Huau<sup>1</sup>,  
D. François<sup>1</sup> and L. Drouillet<sup>1</sup>**

**1 INRA UMR GenPhySE, Auzeville. CS52627. 31326 Castanet Tolosan. France**  
**2 INRA UE Bourges, La Sapinière, 18390 Osmoy, France**



# Why ?

- Today in European countries
  - wool not profitable and often undesirable compared to meat or milk production
    - income from wool < shearing and wool associated costs
- New interest for breeds with no wool or shedding wool
  - Use of Hair sheep or Crossbreds with hair sheep
    - Wiltshire, Barbados Blackbelly, Dorper, ....)

Creation of a new wool-shedding breed derived by selection from a modern meat sheep having a high production potential

# Why ? → How ?

## Fleece evolution from ancestral sheep towards modern woolled sheep for textile use



Double coat



Apparent



to true single coat



Wild hair sheep

Medium wool sheep

Merino sheep

Guard hair (kemp)  
Fine woolly undercoat

Coarse long wool with  
kemp for spinning

Fine wool only  
For fine yarn

Seasonal growth  
and shedding



Permanent fibre growth  
requiring shearing

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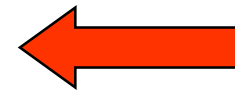
Merino sheep

Fine wool only  
For fine yarn



Permanent fibre growth  
requiring shearing

**Back to a shedding wool sheep ?**



# How ?

By using an original selection strategy in 2 steps

## 1. Creation of a new genotype by introgressing gene pool of fleece shedding

### Martinik BlackBelly



### Romane breed

- hair sheep from French West Indies
- Double coat known to shed

- apparent single coat with some shedding
- high potential production
- meat and adaptive traits :



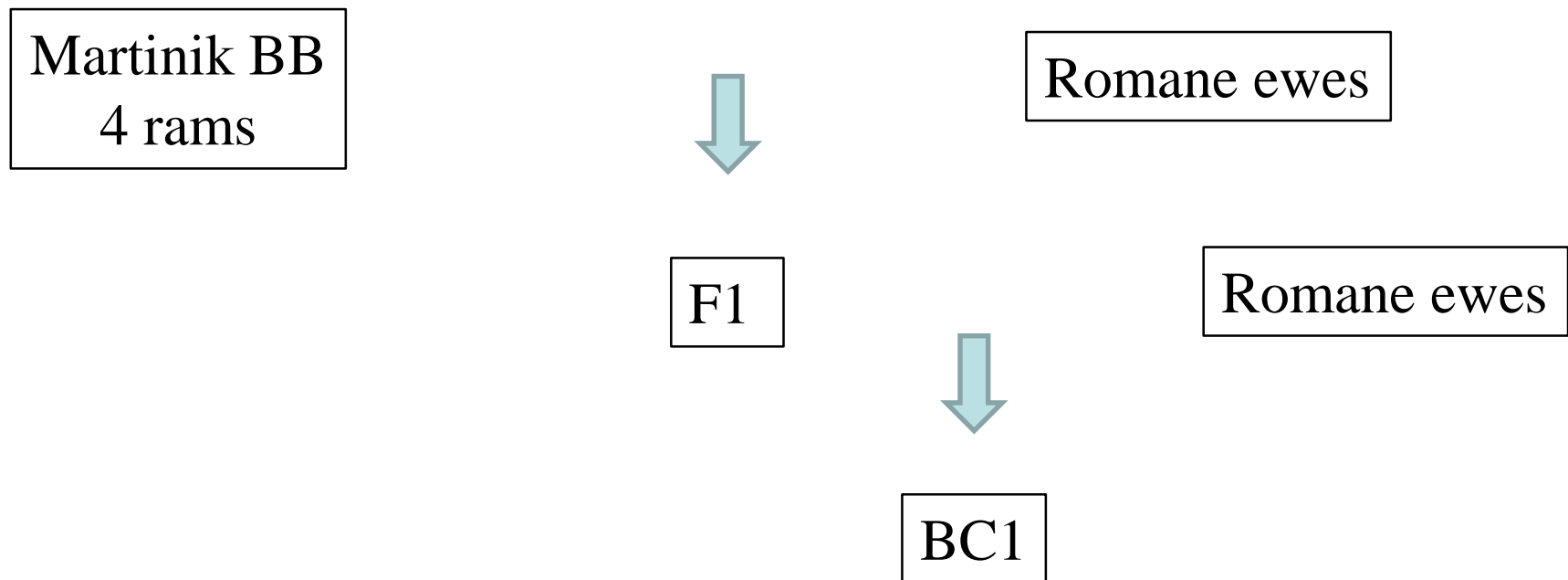
through 4 consecutive backcrossing generations



# How ?

By using an original selection strategy in 2 steps

## 1. Creation of a new genotype by introgressing gene pool of fleece sheeding



# Martinik BB – Romane crosses



*Credit: D. François*

F1 animals

***all F1 animals  
shed completely***



*Credit: D. Allain*

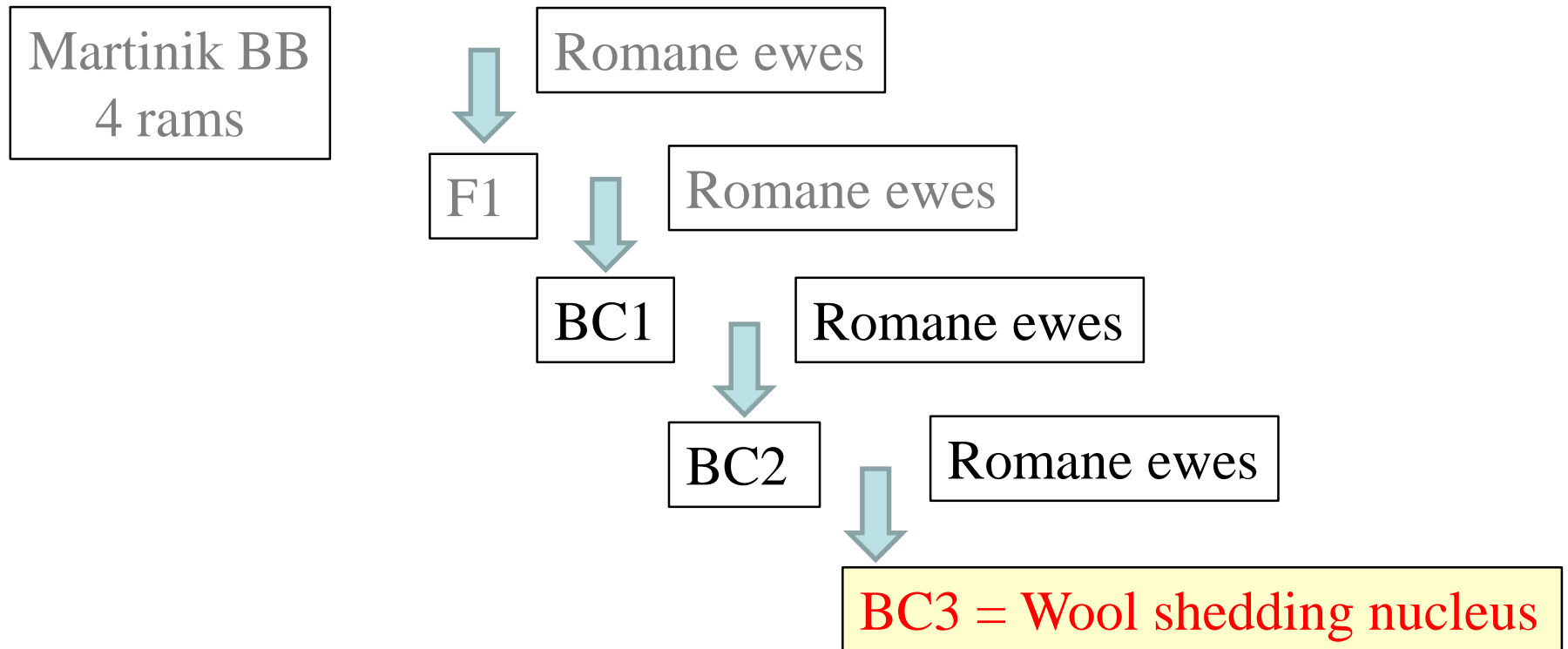
Backcross 1  
Romane Martinik

***some BC1 animals  
shed completely***

# How ?

By using an original selection strategy in 2 steps

## 1. Creation of a new genotype by introgressing gene pool







# How ?

By using an original selection strategy in 2 steps

## 2. Selection on shedding extent over the body

# Wool shedding extent measurements

- Once a year (at summer onset)
  - ~ end of spring shedding period
  - use of standard sheep profile

- » drawn body surface with wool
  - » Each animal
  - » Lambs at 3.5 mo of age

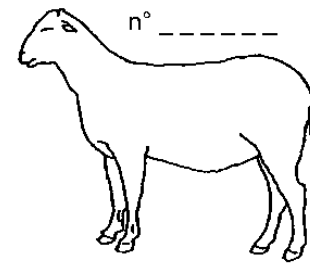


Image analysis software

$$\text{Extent of wool shedding (\%)} = \frac{\text{body surface without wool}}{\text{total body surface}}$$

# How ?

By using an original selection strategy in 2 steps

## 2. Selection on shedding extent over the body

- throughout introgression phase
  - Both backcross rams (BC1, BC2) and Romane ewes
    - Only shedding ewes and shedding BC rams
    - were used for crossing
- Then up to now: during 9 selection generations
  - All introgressed animals from BC3 generation:
    - Ewes , male and female lambs
    - End of spring , lamb age: 3.5mo just before slaughtering and allowing a first culling and again at 7 months of age



# How ?

## Wool shedding nucleus

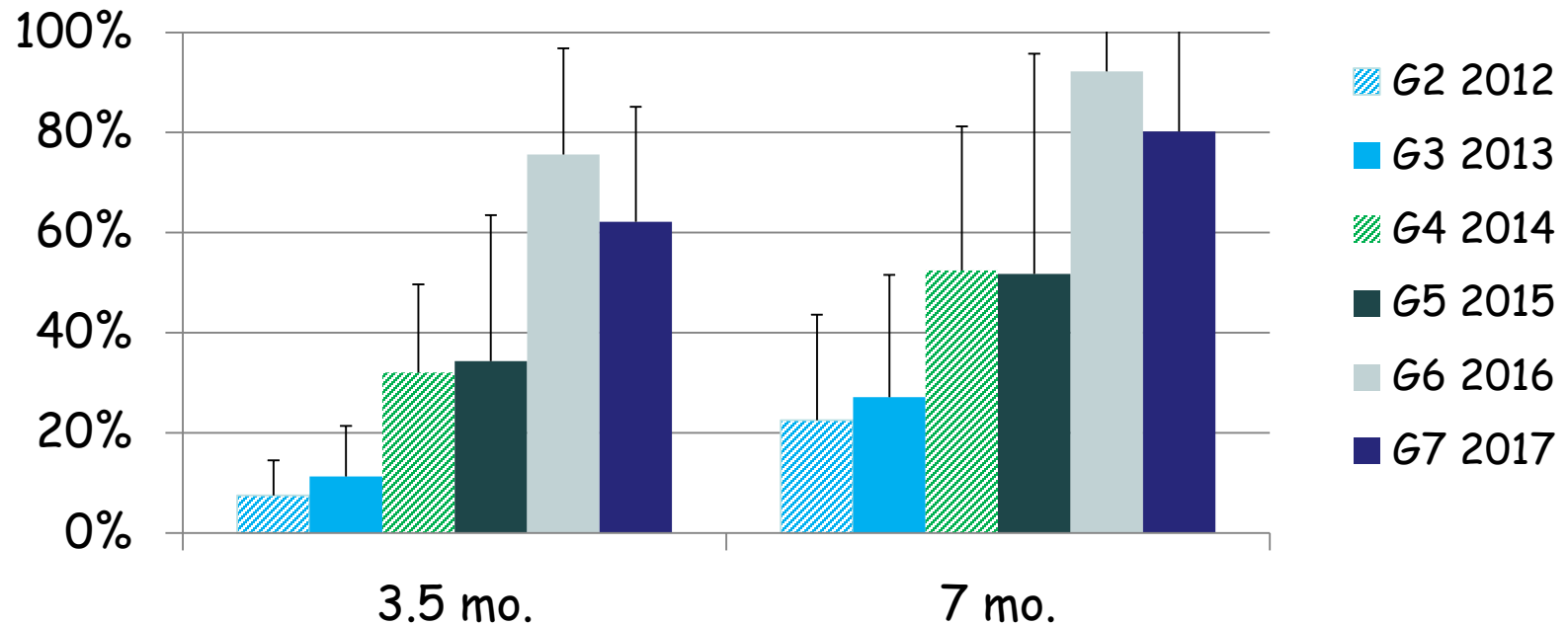
- Nucleus of 150 ewes and 10 males
  - Breeding period in October: once a year
  - 1st mating at 8 mo of age (male and female)
  - Annual renewal of males
  - Female replacement : 30 to 50% / year
- Measurement of fleece shedding extent
  - In mid June
    - Lambs (3.5 mo) then at 7mo in September
    - Ewes : once a year

# Data analysis

- Trait
  - wool shedding extent = % fleece shedding area over total body area
- Dataset from 2011 up today
  - Lambs at 3.5 mo (mid-June) & 7mo (end September)
  - Adult ewes once a year from 16mo of age
    - 2522 records on lambs & 1228 records on ewes
    - 2926 animals in pedigree
- Methods
  - Breeding value and genetic parameters estimation ← ASReml
  - Fixed effects: age of animal, year, age of dam, born and suckling lambs
  - Random effects: genetic additive, permanent environment and residual

# 1- Is shedding extent measurement on lambs at 3.5mo a good criteria?

Shedding extent



Shedding extent increase 3,5 → 7 mo

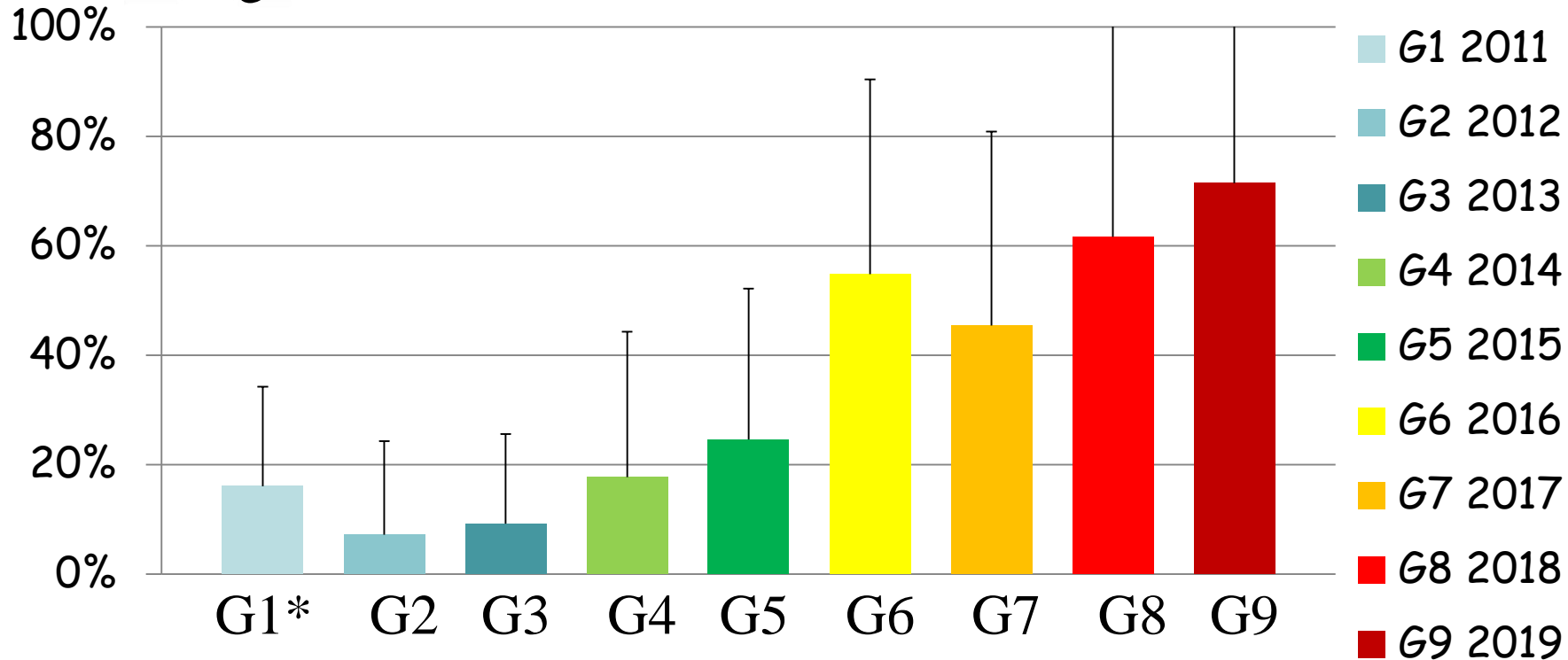
$$rg = 0.91 \pm 0.05$$



Lamb selection 3,5 mo an adequate criteria

# 2- Fleece shedding extent (%) on lambs (3.5mo) along selected generations

Fleece shedding extent



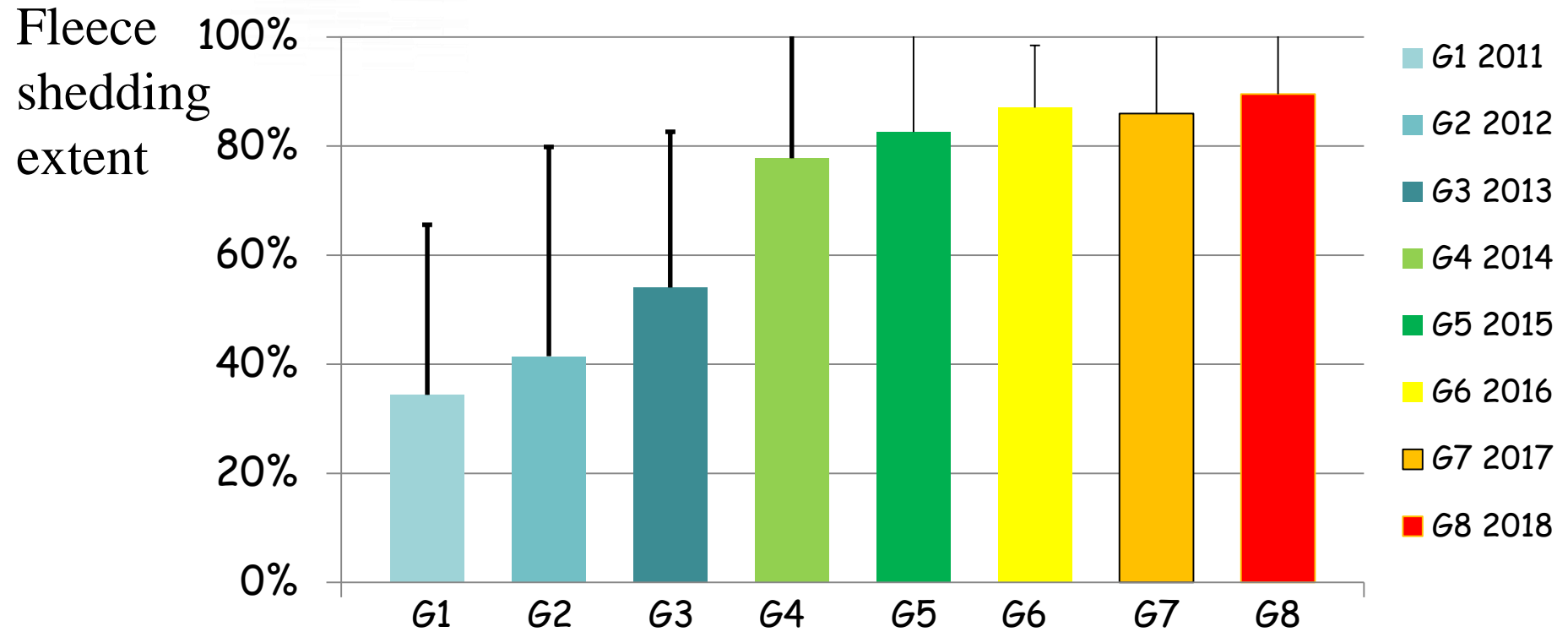
Large increasing of fleece shedding extent on lambs

$h^2 = 0.47$   
 $\pm 0.04$

Genetic gain  $2.7 \sigma_g$  (G1  $\rightarrow$  G9)

**About 50% of lambs are shedding completely at 3.5mo age**

# 3- Fleece shedding extent (%) on ewes (16mo) along selected generations



Large increasing of fleece shedding extent

$$h^2 = 0.47 \pm 0.04$$

Genetic gain 2.6.  $\sigma_g$  (G1  $\rightarrow$  G8)

**Most of ewes are shedding completely their fleece**



# Conclusion 1/2

**A new wool shedding sheep breed was created by using an original selection strategy combining**

1. Introgression of gene pool of wool shedding from a hair sheep to a modern sheep meat having a high production potential through 4 consecutive backcrossing generations
2. Selection on fleece shedding extent on animal during the introgression phase and thereafter along selected generations of animals of the new genotype.

**It has been made easily using the Martink Black Belly and the Romane breed to create a shedding Romane as fleece shedding is a high heritable trait.**

**But it can be easily achieved from any hair sheep and any other European modern sheep.**

## Conclusion 2/2

- 3 - The shedding Romane thus created shows similar production potential as the original Romane breed:
  - high prolificacy, and good growth performances
- 4 - Molecular investigations are currently in progress to identify loci involved in fleece shedding

**This selection strategy is today an efficient P-MAS\* strategy up to a shedding sheep which can be easily achieved from any hair sheep and any other European modern sheep.**

**Gene assisted selection will facilitate the process in the future.**

*\* phenotype-marker assisted selection*

# Acknowledgements

- INRA Experimental Unit, Bourges, La sapinière,
  - Technical staff;



*Credit: D. Allain*



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## Thank you for your attention