Assessment of technical and economic efficiency of French dairy sheep genomic breeding programs

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Genomic selection : many achievements, mainly in dairy cattle, over the last decade

- **Great expectations in increase of genetic gain**

  -Good genomic accuracy

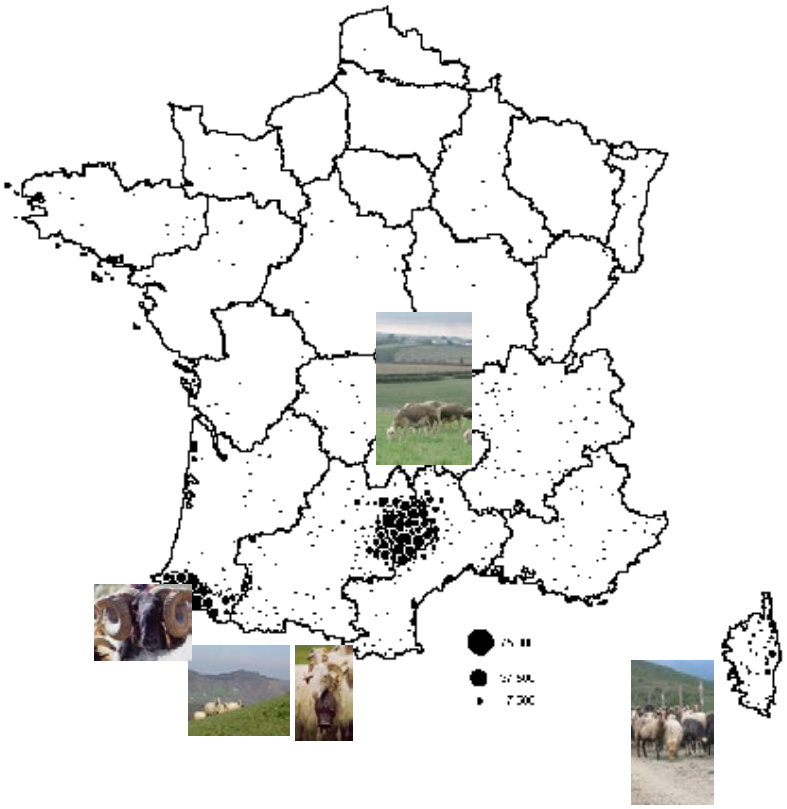
  -Dramatic reduction of generation interval
  (selection decisions made early in the life of bulls)

- **Genotyping affordable regarding animal value & progeny-testing cost**

→ **Genomic breeding programs cost-effective**

And in dairy sheep ?

French dairy sheep breeding programs



Lacaune

AI 85% in nucleus

450 rams progeny-tested / yr

35 daughters / rams

Red-Faced Manech

AI 55% in nucleus

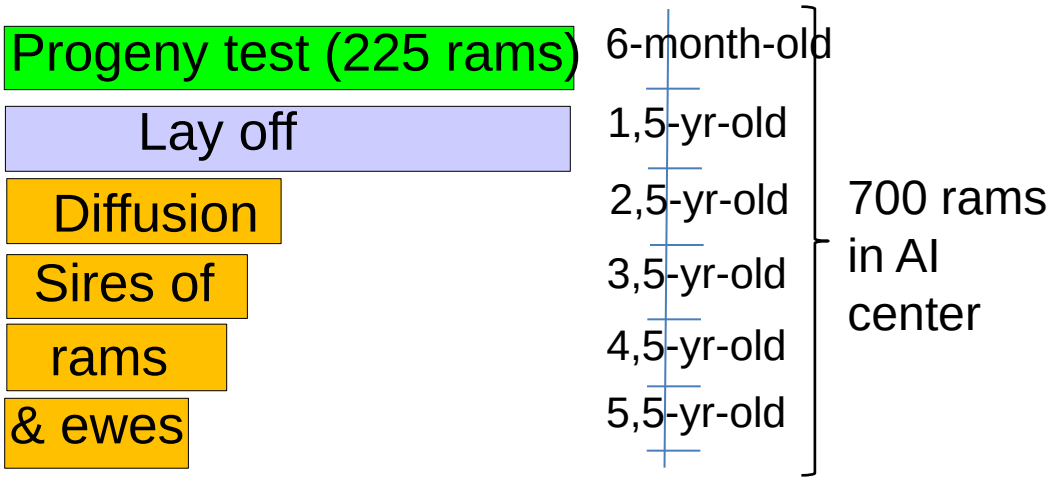
150 rams progeny-tested / yr

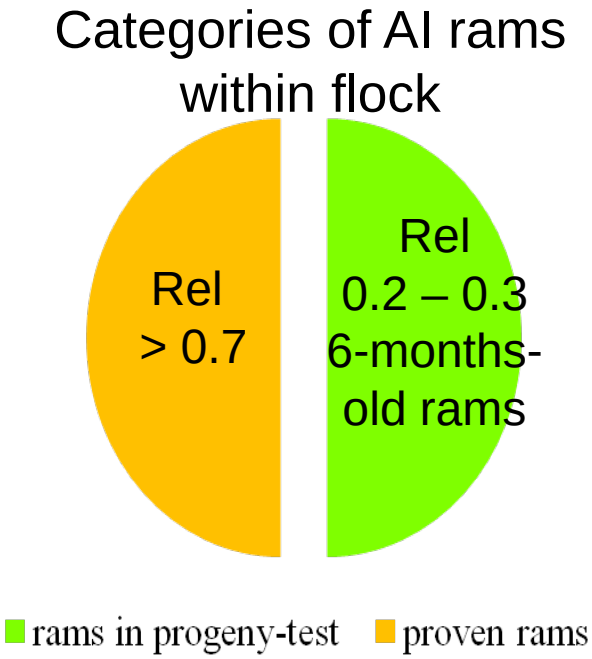
30 daughters / rams

<50 rams progeny-tested / yr

Progeny testing in dairy sheep

Illustration with a Lacaune breeding company





→Few reduction of generation interval to be expected in dairy sheep

R&D programs on genomic selection in French dairy sheep

Lacaune

Roquefort'in

Reference population
2900 rams

Pyrenean breeds

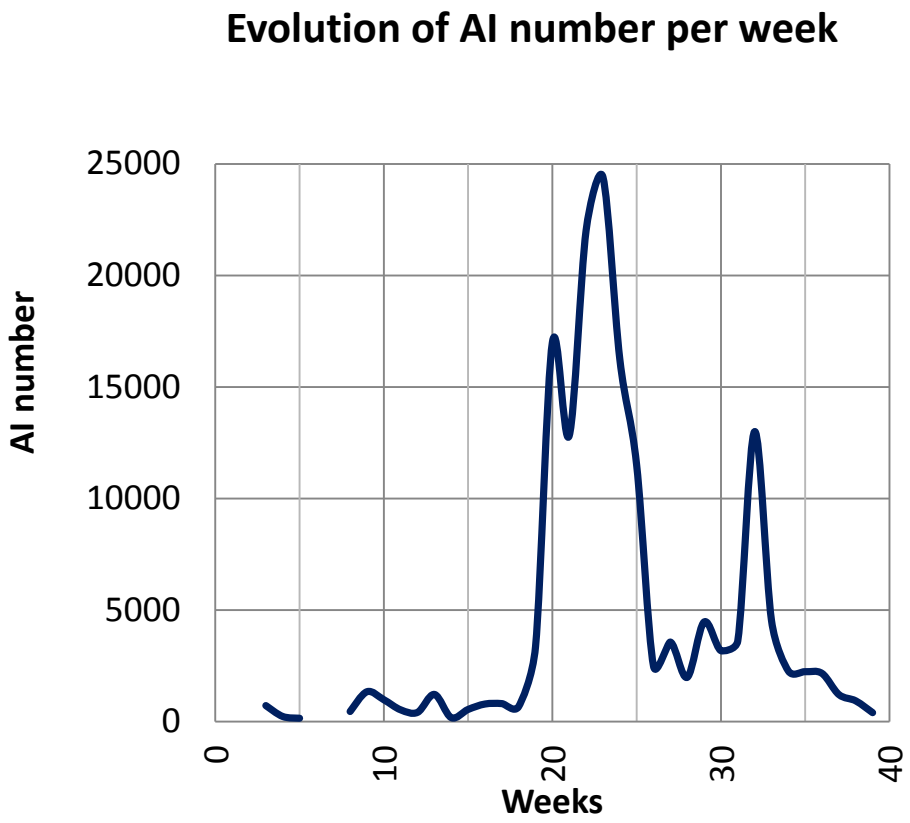
GeHomia

Reference population
(Red-Faced Manech)
1300 rams

GEBV : moderate gain in accuracy (15-40% depending on trait and breed)

→Genomic reliability intermediate (0.4 - 0.5) between parent average and progeny-testing

Constraints of AI in dairy sheep



Fresh semen → Limited power of diffusion of rams

AI period highly seasoned

↓

700 rams required in AI center to supply AI demand

→No more lay-off = hope to reduce number of rams

Challenge : is it possible to get at least a similar genetic gain without extra costs ?

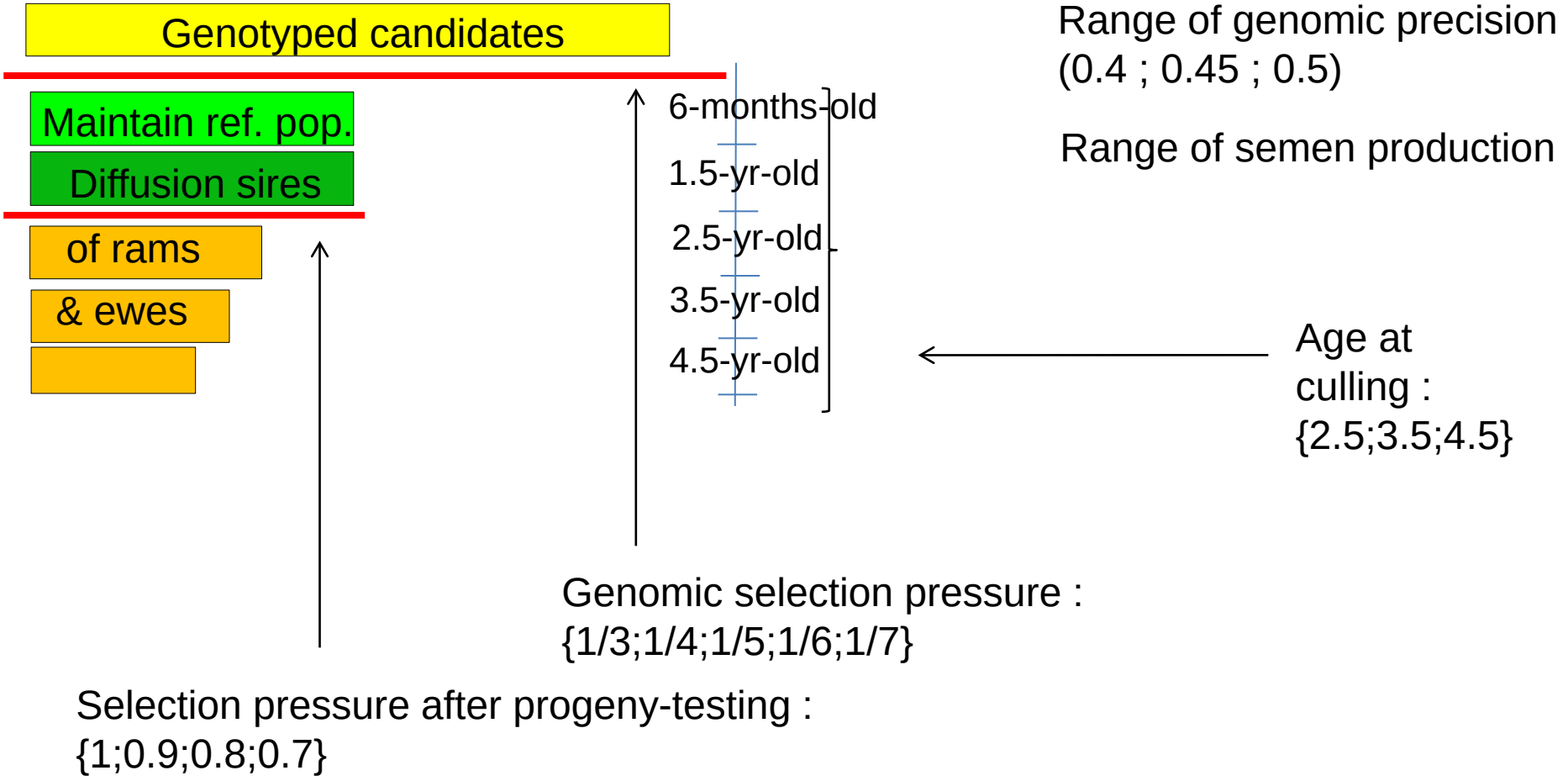
genotypings

↘ number of rams in AI center

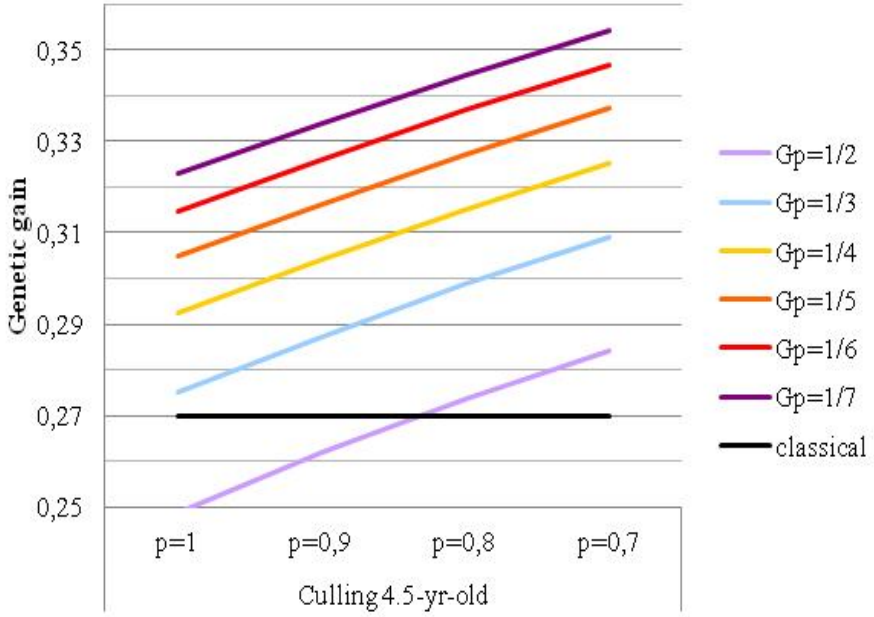
e genetic gain

Modeling a genomic program in dairy sheep

Illustration with a Lacaune breeding company



In most cases, genomic selection increases genetic gain



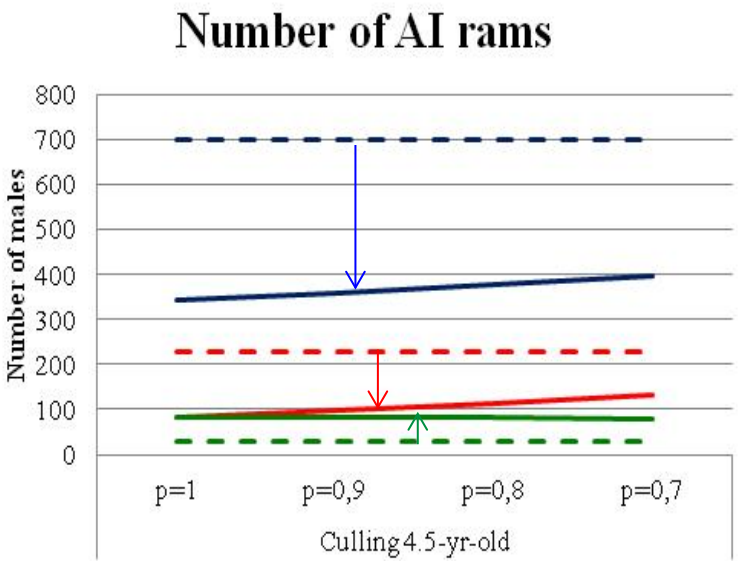
p = selection pressure after progeny
Gp = genomic pressure

Genetic gain increased in (almost) all genomic scenarios

Any genomic pressure cannot be applied regarding genotyping costs and logistical reasons

→ Increase in genetic gain less dramatic than in dairy cattle

Number of AI rams reduced in all designs



p = selection pressure after progeny

Genomic program
Conventional program

Total rams in AI center
Young rams ref.pop. maintenance
Rams' sires

Genomic *vs* conventional scheme :

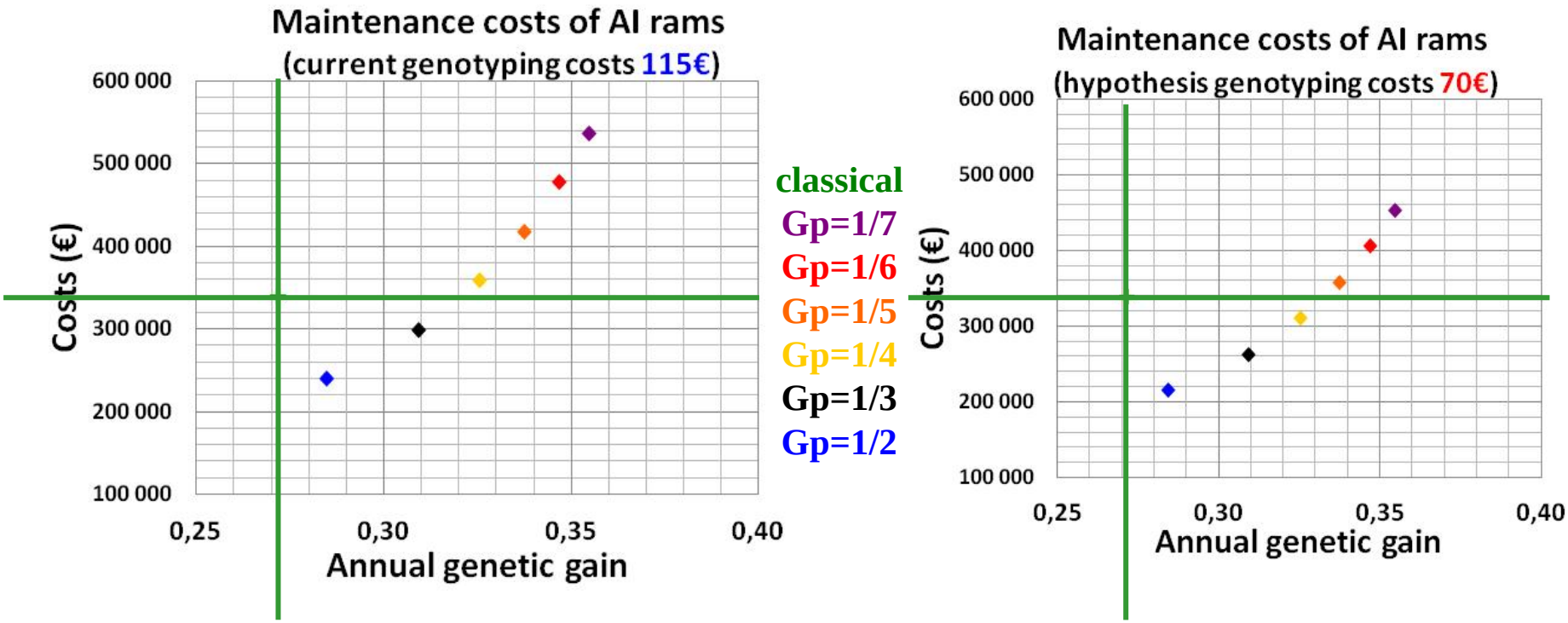
Number of rams in AI center dropped by 40%

Number of rams per cohort (rams required to maintain ref.pop.) fell by half

Number of sires of rams increased more than 2-fold

→Less rams to manage … costs savings

Economic balance : taking into account cost of genotyping & costs of keeping rams



Scenario : culling 4.5, p=0.7

Conclusion

A genomic program may be efficient (at least in Lacaune and Red-Faced Manech) : slightly higher genetic gain ; less rams in AI center to offset genotyping costs.

With current cost of genotyping :
apply **genomic pressure of ½ to ¼.**

Key factors for cost-efficiency : **cost of genotyping** and **semen production** of the rams.

Genomic breeding program : → **more flexibility**

→ **tool for better management of inbreeding**

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