Genetic parameters for semen traits in French Alpine and Saanen bucks

Virginie Clément[(1)], Clémentine Charton[(2)], Hélène Larroque[(2)]

(1) Institut de l'Elevage, Castanet-Tolosan, France

(2) GenPhySE, Université de Toulouse, INRA, ENVT, Castanet-Tolosan, France

69th Annual Meeting of the European Federation of Animal Science, Dubrovnik, Croatia, 27th to 31th August 2018

Introduction

- French dairy goats selection scheme relies on Animal Insemination (AI):
  - 40% AI rate in nucleus selection flocks
  - 0.2 σ_g of genetic gain for Protein Yield
- Around 50% of bucks eliminated before progeny testing
- Maxi'mâle project:

"Optimise the management of AI males in small ruminants breeding programs"

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTERE
DE L'AGRICULTURE
DE L'AGROALIMENTAIRE
ET DE LA FORET
avec la contribution financière du compte d'affectation spéciale «Développement agricole et rural»

Introduction

- Main cause of elimination = semen production
  - Semen quantity (volume, concentration, number of spermatozoa)
  - Semen quality (motility, ability to freezing)

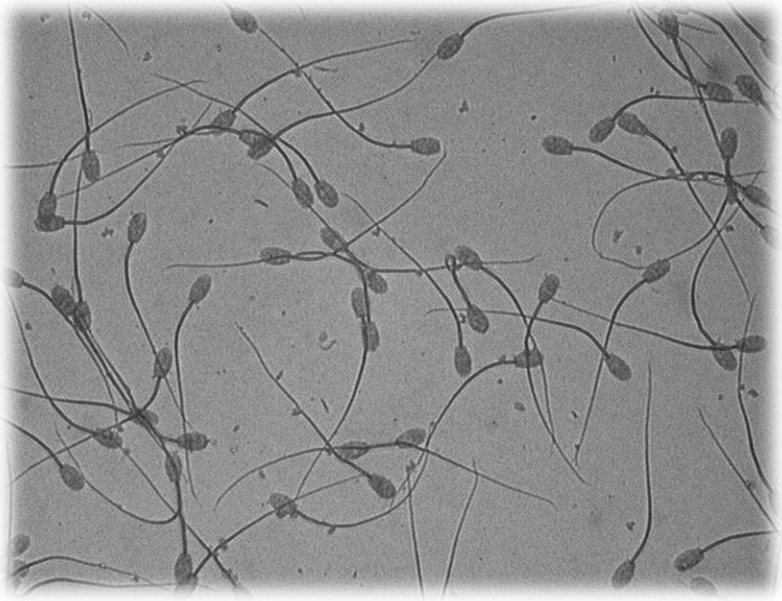
⟹ Include semen production traits in breeding program

- Two steps:
  - genetic parameters estimation
  - genetic evaluation implementation

CAS DAR Maxi'mâle

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTERE
DE L'AGRICULTURE
DE L'AGROALIMENTAIRE
ET DE LA FORET
avec la contribution financière du compte d'affectation spéciale «Développement agricole et rural»

Material and methods



Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTERE
DE L'AGRICULTURE
DE L'AGROALIMENTAIRE
ET DE LA FORET

avec la contribution financière du
compte d'affectation spéciale
«Développement agricole et rural»

Bucks breeding

- French Breeding Organisation Capgenes in charge of selection scheme and bucks breeding
- 2 breeds : Alpine and Saanen

Age of buck	Breeding	Photoperiodism conditions	
7-8 months	Individual testing	Natural	"Young Bucks"
14 months	Semen production Center	Photoperiodic treatment	"Adult Bucks"

INSTITUT DE L'ELEVAGE idele

Data

- 5 traits recorded a each collection:
  - Volume (mL)
  - Concentration (10^9/mL)
  - Number of spermatozoa (10^9)
  - Percentage of living spermatozoa after thawing
  - Motility score after thawing (note 0-5)
- 2,086 bucks collected from 1995 to 2016

  254,000 collections

Methods

- Environmental effects:
  - Age of buck
  - Month and year of collection
  - Rank of collection
  - Set of bucks
  - Interval of time since the precedent collection

  + interactions

- Analyses:
  - Animal model with repeatability
  - Alpine / Saanen breeds separately
  - young / adult bucks separately

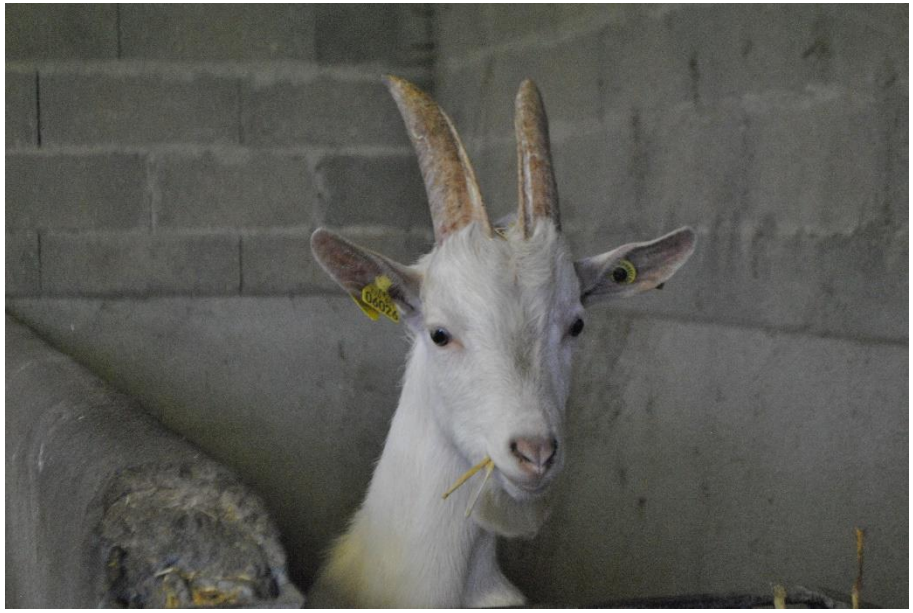
Methods

- Genetic parameters estimation:
  - Restricted maximum likelihood
  - Wombat software(1): using phenotypes
  - Gibbsf90 software(2): using phenotypes and genotypes obtained with Illumina Goat SNP50 BeadChip(3)
- Genetic evaluation implementation:
  - Genekit software(4)

(1) Meyer K., 2007
(2) Misztal I., 1999
(3) Tosser-Klopp G., et al., 2014
(4) Ducrocq V., 1998

INSTITUT DE L'ELEVAGE idele

Results and discussion



Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTERE
DE L'AGRICULTURE
DE L'AGROALIMENTAIRE
ET DE LA FORET

avec la contribution financière du compte d'affectation spéciale «Développement agricole et rural»

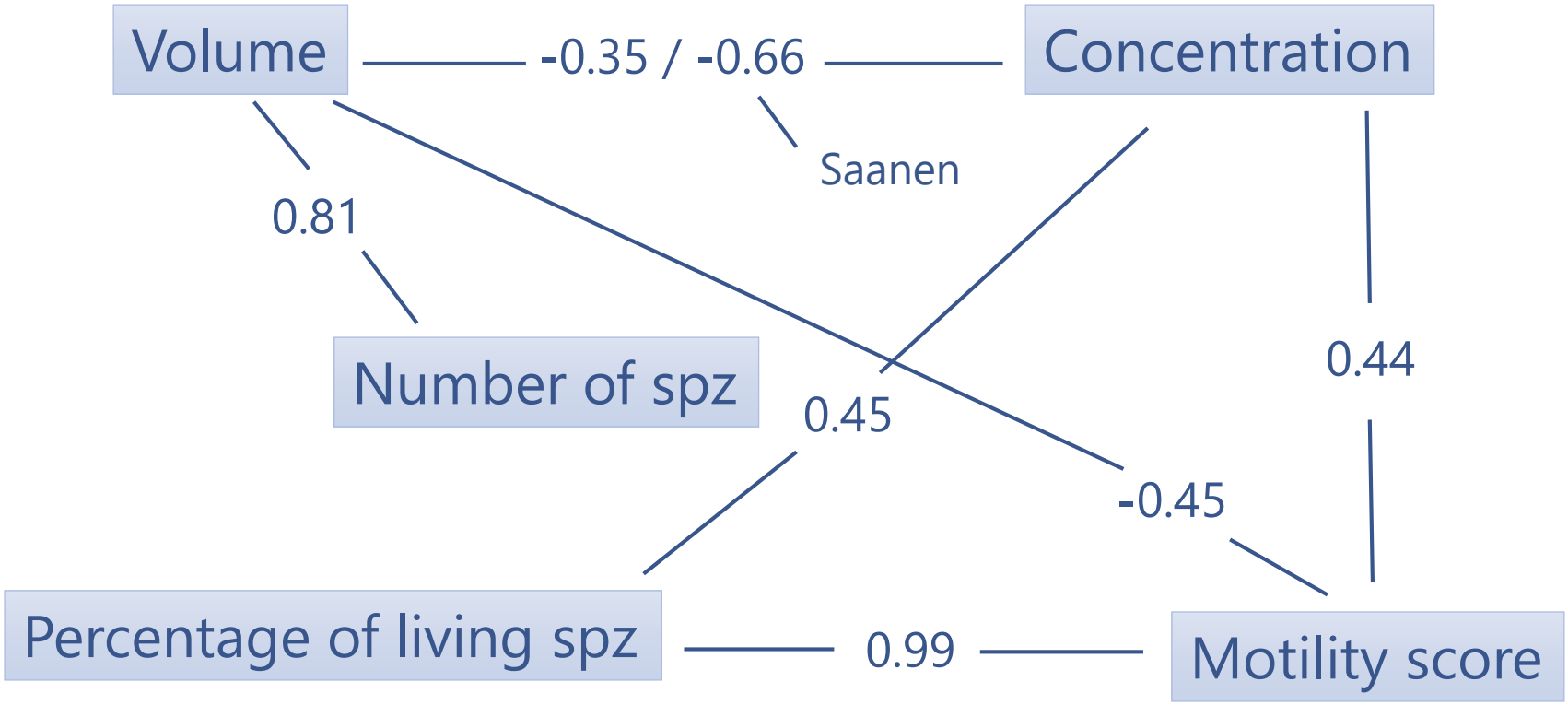
Heritability of semen production traits
Young bucks

Traits	Alpine	Saanen
Volume	0.17	0.23
Concentration	0.22	0.19
Number of spz	0.13	0.13
Percentage of living spz	0.06	0.10
Motility score	0.08	0.10

Spz: spermatozoa

INSTITUT DE L'ELEVAGE idele

Genetic correlations between traits
Young bucks – Alpine breed

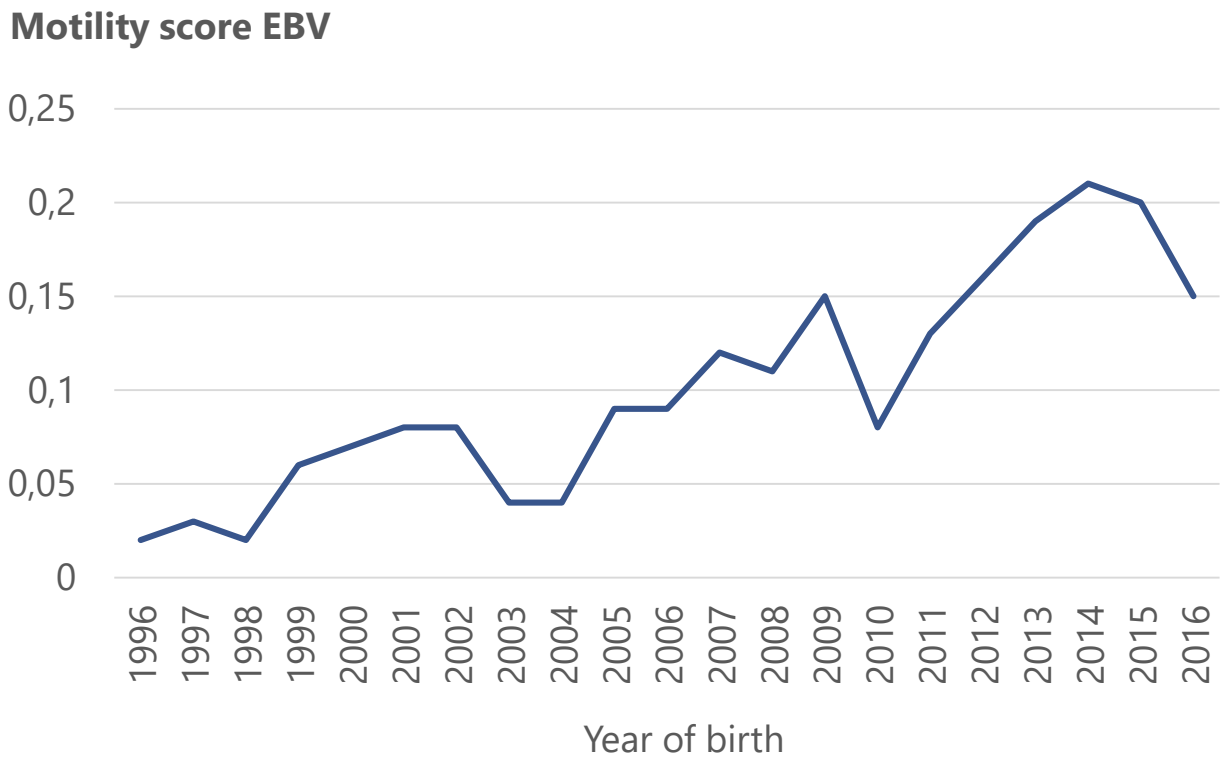


Genetic correlations between young and adult bucks

Alpine breed

Traits	Alpine
Volume	0.96
Concentration	0.94
Number of spz	0.74
Percentage of living spz	0.97
Motility score	0.95

Genetic trend for motility score

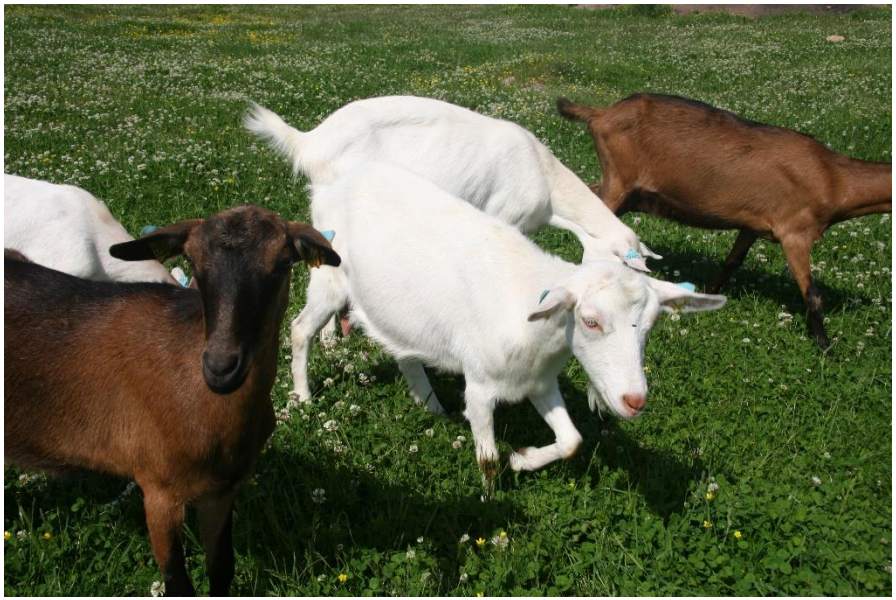


Genetic trend of +0.13 in 20 years
Saanen breed

Conclusion and perspectives

- Heritabilites estimation suggests that selection for semen production traits could be efficient
- Perspectives:
  - Implementation of a genomic evaluation of semen production traits to select bucks few months after birth
  - Estimation of genetic correlations with selected traits (milk production and udder morphology)
  - Introduction in a total merit index (which traits, which weights compared to other traits)

Thank you for your attention



Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

MINISTERE
DE L'AGRICULTURE
DE L'AGROALIMENTAIRE
ET DE LA FORET

avec la contribution financière du compte d'affectation spéciale «Développement agricole et rural»