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▶ **To cite this version:**

Helene Larroque, Gilles Lagriffoul, A. Combasteix, Jean-Michel Astruc, Dominique Hazard, et al.. Characterization of dairy sheep and goats production systems in France: first step for a GxE study. 69. Annual Meeting of the European Federation of Animal Science (EAAP), Aug 2018, Dubrovnik, Croatia. Wageningen Academic Publishers, Annual Meeting of the European Association for Animal Production, 24 (1ère ED.), 705 p., 2018, Book of Abstracts of the 69th Annual Meeting of the European Federation of Animal Science. hal-02735582

HAL Id: hal-02735582
https://hal.inrae.fr/hal-02735582

Submitted on 2 Jun 2020

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Characterization of dairy sheep and goats production systems in France: First step for a GxE study

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Introduction

Breeding dairy small ruminants in France:

⇨ News practices:
↗ herd feed resources → → feed autonomy
+ concerned by environment and societal demands
⇨ Diversity of pedoclimatic conditions

⇨ New questions for genetic selection:
Effective regardless of breeding environments ?
GxE interactions?

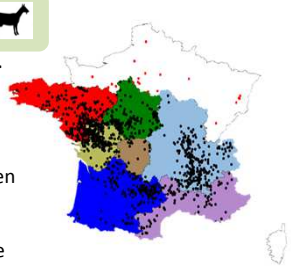
Objective: first step for a GxE study
Categorization of environment
Using a multiple-trait herd cluster analysis based on a large panel of descriptors (from the animal to the system)

Materials and methods

Dairy Goats
1136 herds⇨514
2 main breeds


Saanen


Alpine



Dairy Sheep
1001 flocks⇨637


Western Pyrenean Blond faced


Manech
Basco-Béarnais


Roquefort area
Lacaune

Corsica island
Corsica breed



Characteristics of animals
Number of females
Breed(s)
Average phenotypic levels (milk, fat and protein contents, SCC)

EBVs & herd-year effects
Milk yield, Fat and protein contents, SCC

Herd-year identification
Geolocation
Herd in nucleus or in production
Area of production

Available data

Farming system
Feeding system
Cheese maker/supplier to industry
Reproductive season
Amount of forages and concentrates distributed (Lacaune)
Indoor and pasture periods

Meteorological data
THI
Grass growth indicator

Herd-year management
%AI
% females in 1st lactation
Age at 1st lambing/kidding
Average age of the herd
Evolution of flock size
Lambing/kidding periods
Milking only/suckling period
AI Fertility
% of long lactations
Interval between kidding

- **Selection** of the most discriminating variables (within breed in sheep):
  Principal component analysis (PCA), Multiple correspondence analysis (MCA)
- **Cluster** analysis:
  Based on the MCA components for each herd
- **Test** of the significant differences between clusters for the selected variables

(SAS® software)

Results

Breeds (number of herds)	Lacaune (300)	Basco-béarnais (84) Blond-faced Manech (218)	Corsica (35)	Goats – Alpine & Saanen (514)
Number of clusters	4	4 / 7	3	4
Discriminating variables	• Geographical location • Precocity of grass growth (altitude) • Amount of distributed concentrate and forages (Lacaune)	• Location-altitude • Rate of 1st lactation at 2 years • Flock size	• Location-altitude • Milk yield level • Artificial insemination rate	• Geographical location (West→East) • Breeding goal (milk yield/composition) • System of sales (cheese maker/deliverer) • Herd size • Reproduction organization (out of season or not)

Conclusion

Main discriminating factors of environments:
- Geographical location (Lacaune, goats), altitude (precocity of grass growth)
- Herd breeding goal: milk yield/composition
- Herd management: size, rate of 1st lactations at 2 years-old
- System of sales and of feeding (Goats)
- Amount of concentrate and forages (Lacaune)

Next step:
Are these contrasted breeding practices and conditions a source of GxE interactions?

Toulouse research center
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The authors thank sheep and goat breeding companies, France Conseil Elevage, Météo France, AgroClim, Bio Agency for furnishing data.

iSAGE (Innovation for Sustainable Sheep and Goat Production in Europe) project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 679302.

69th EAAP Meeting - 2018, Dubrovnik, Croatia – Session 65 – Abstract 29439