

CLIMATE-SMART
Agriculture
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Le Corum, Montpellier France

Adaptation of Mediterranean livestock to climate constraints: Genetic diversity and breeding systems

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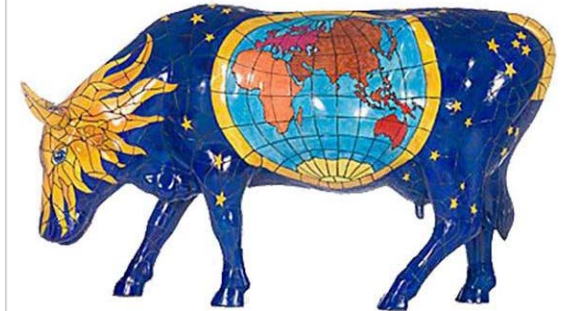
Montpellier

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GALIMED project:

Genetics of adaptation of cattle livestock and production systems in the Mediterranean area

- Global climate change and ecosystems
 - Consequences on the mediterranean climate
 - Consequences on the livestock
 - Importance of adaptive traits
 - Modifications of breeding practices



Multidisciplinary approach that combines population genetics and knowledge of livestock production systems.

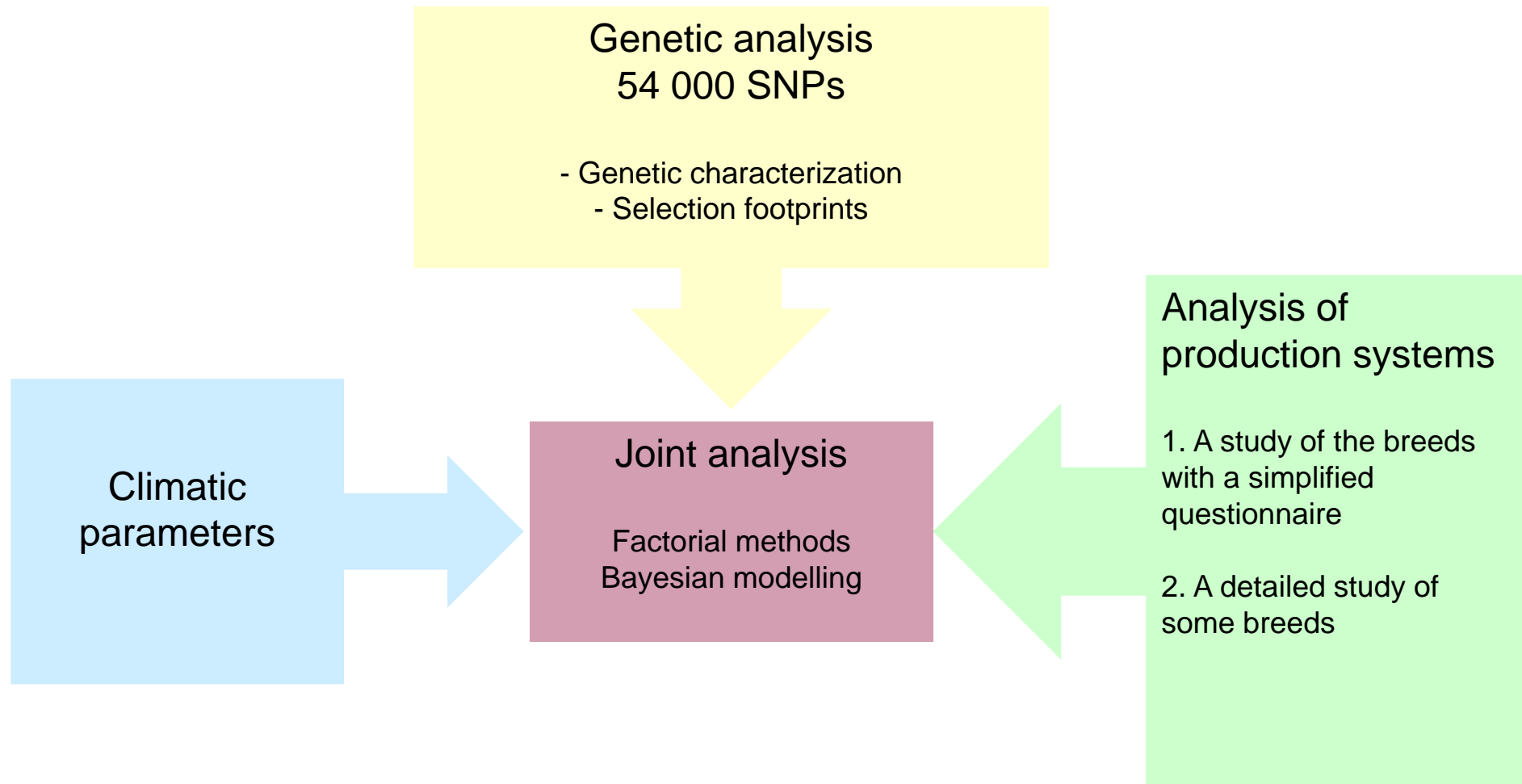
Objectives

- A global view of the genetic diversity of Mediterranean cattle breeds
- Identification of selection footprints in the bovine genome and identification of the selective driving forces.
- Analysis of breeders practices
- Analysis of the point of view of breeders about adaptation



A joint analysis of genetic, production systems and breeding practices through geographical and climatic parameters

Approach



Countries/Organizations



Some of the breeds involved in Galimed



Guelmoise (Algeria)



Cheurfa (Algeria)



Chélifienne (Algeria)



Biskra (Algeria)



Baladi (Egypt)



Corse (France)



Raço di Biou (France)



Brachykeratiki (Greece)



Modicana (Italy)



Sarda (Italy)



Maremmana (Italy)



Ouilmès-Zaer (Morocco)



Tidili (Morocco)



Negra-Andaluza (Spain)

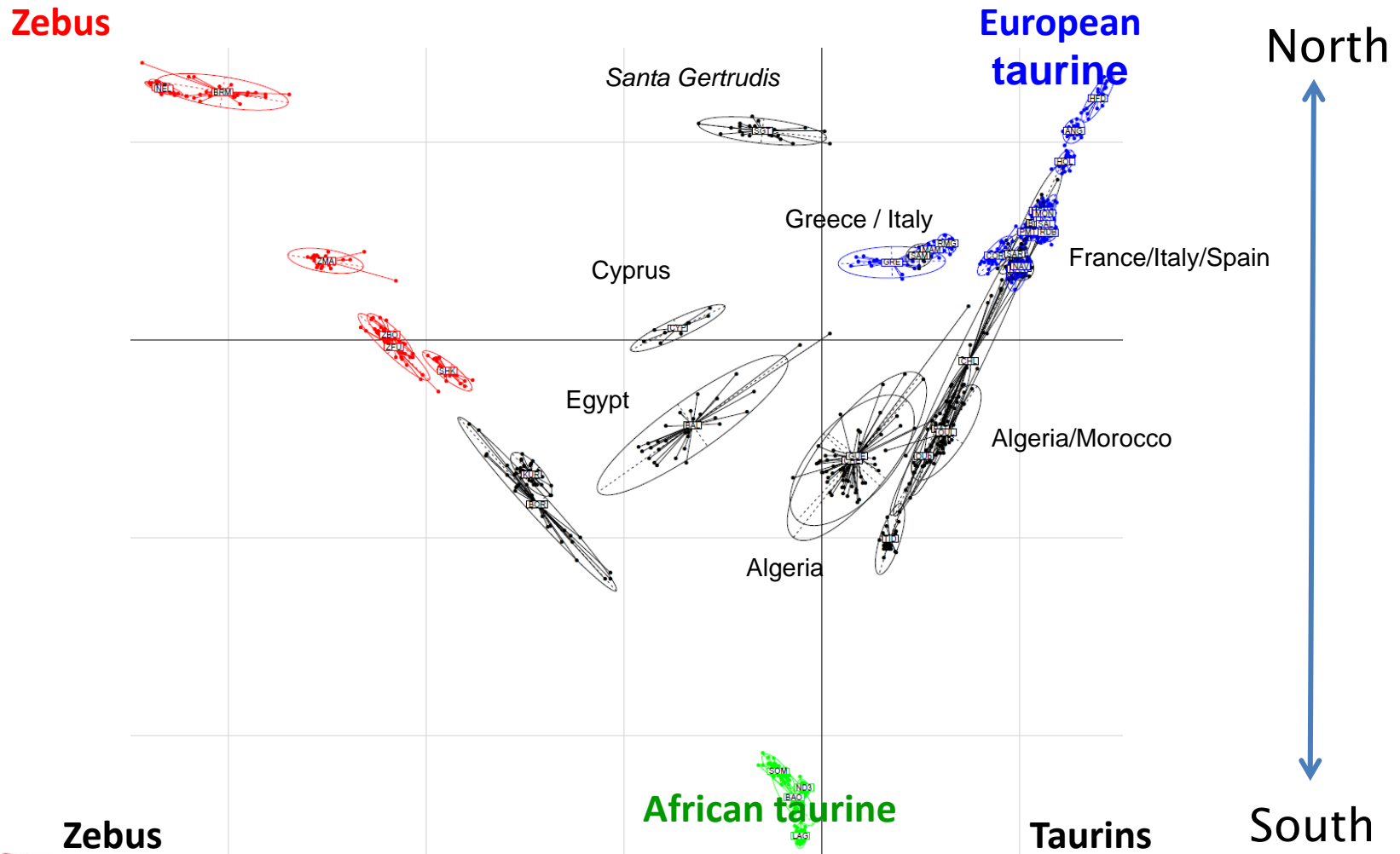


Menorquina (Spain)

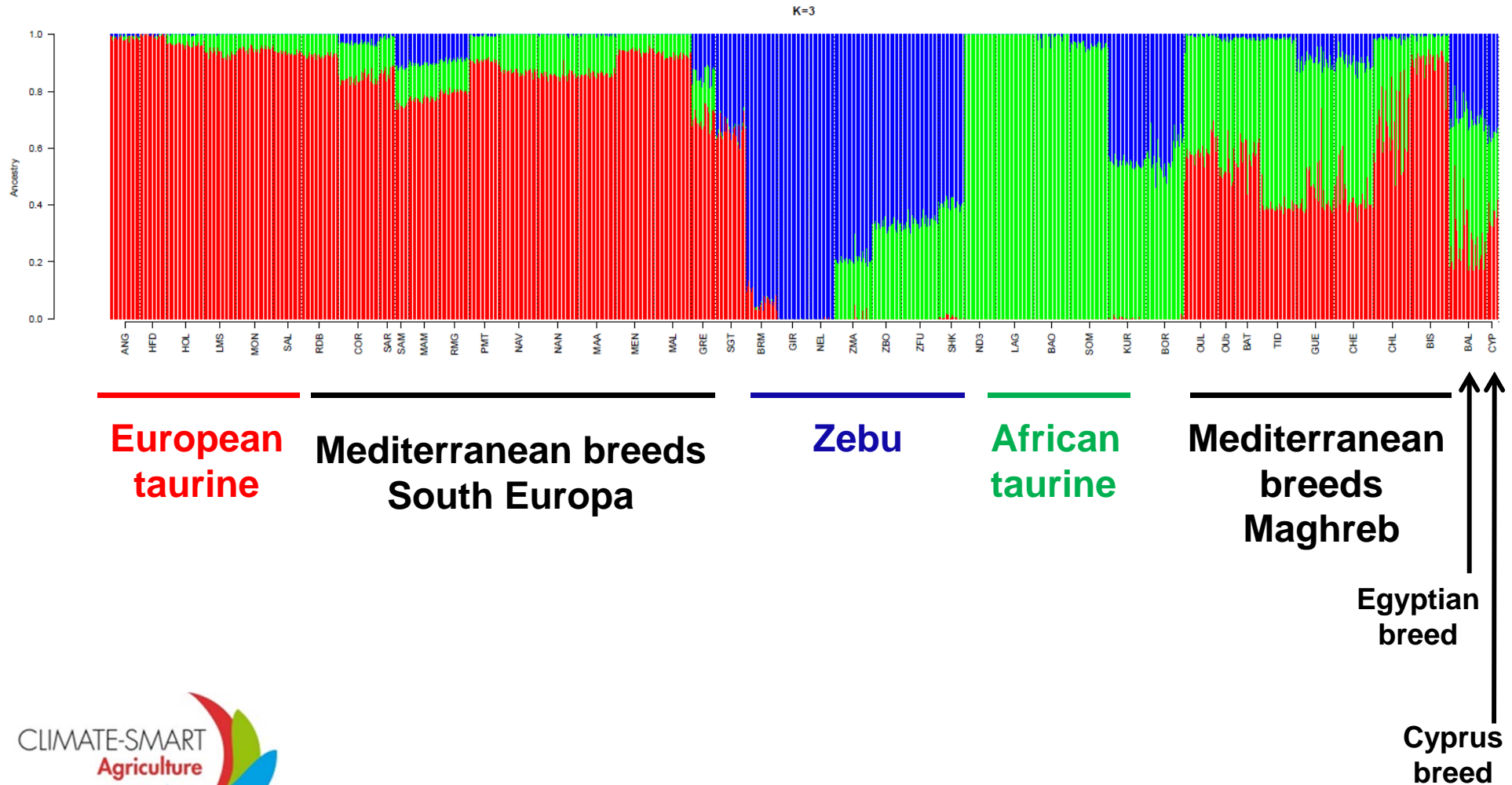


Marismena (Spain)

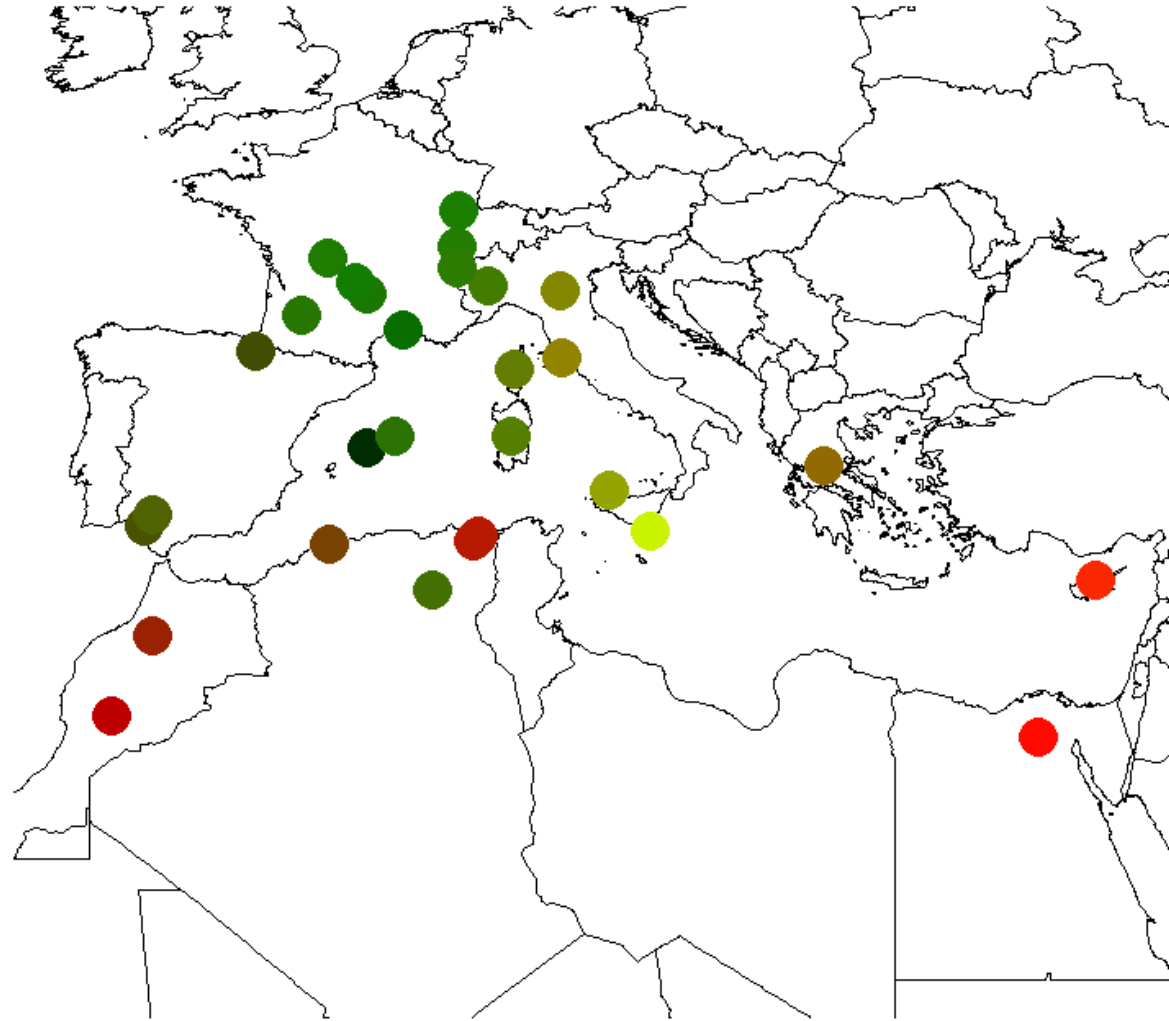
Genetic diversity of Mediterranean cattle breeds



Genetic characterization of Mediterranean cattle breeds



Spatial Principal Component Analysis (Geography + Genetics)

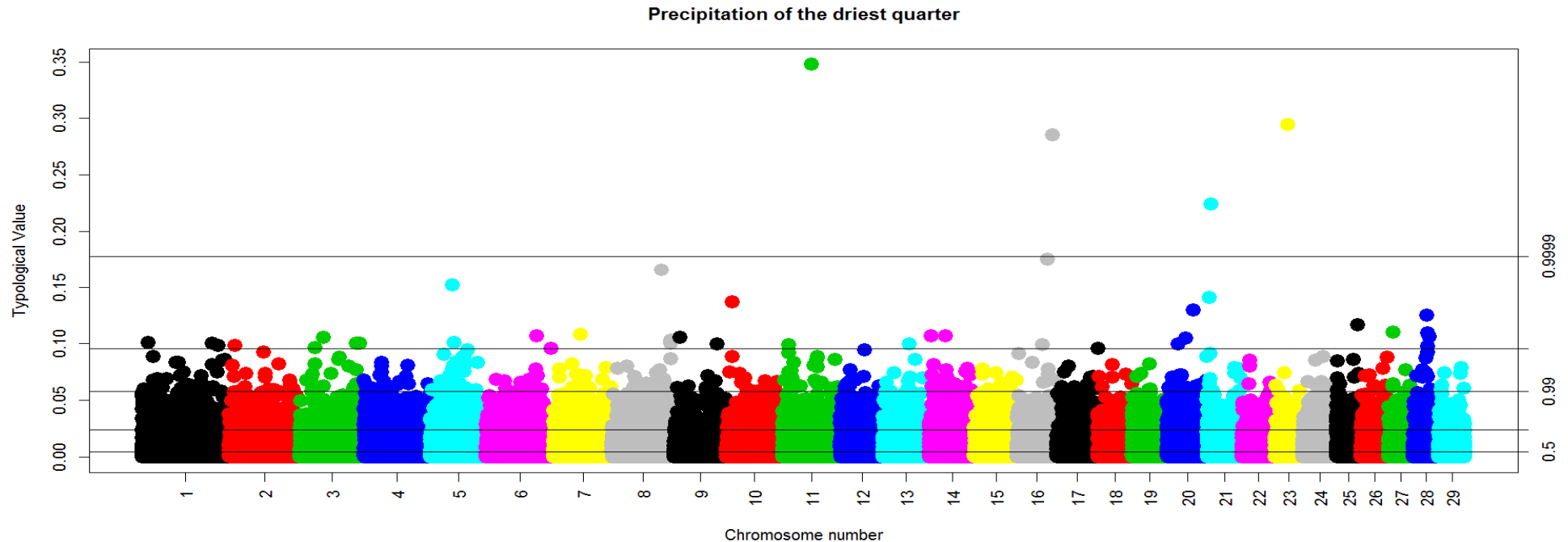


Environment and Genetics

Identification of the loci underlying local adaptation using environmental variables

Which SNPs contribute the most to the differentiation according to an environmental variable ?

SNPs contribution (Fst-like) to the genetic variability according to Drought



Why and how to take into account farming and breeding systems?

Farmers -> farming and breeding practices

- Farmers develop **strategies** to deal with climate and other environmental or supply chain constraints
- Farming **practices** contribute to the orientation of the genetic resources

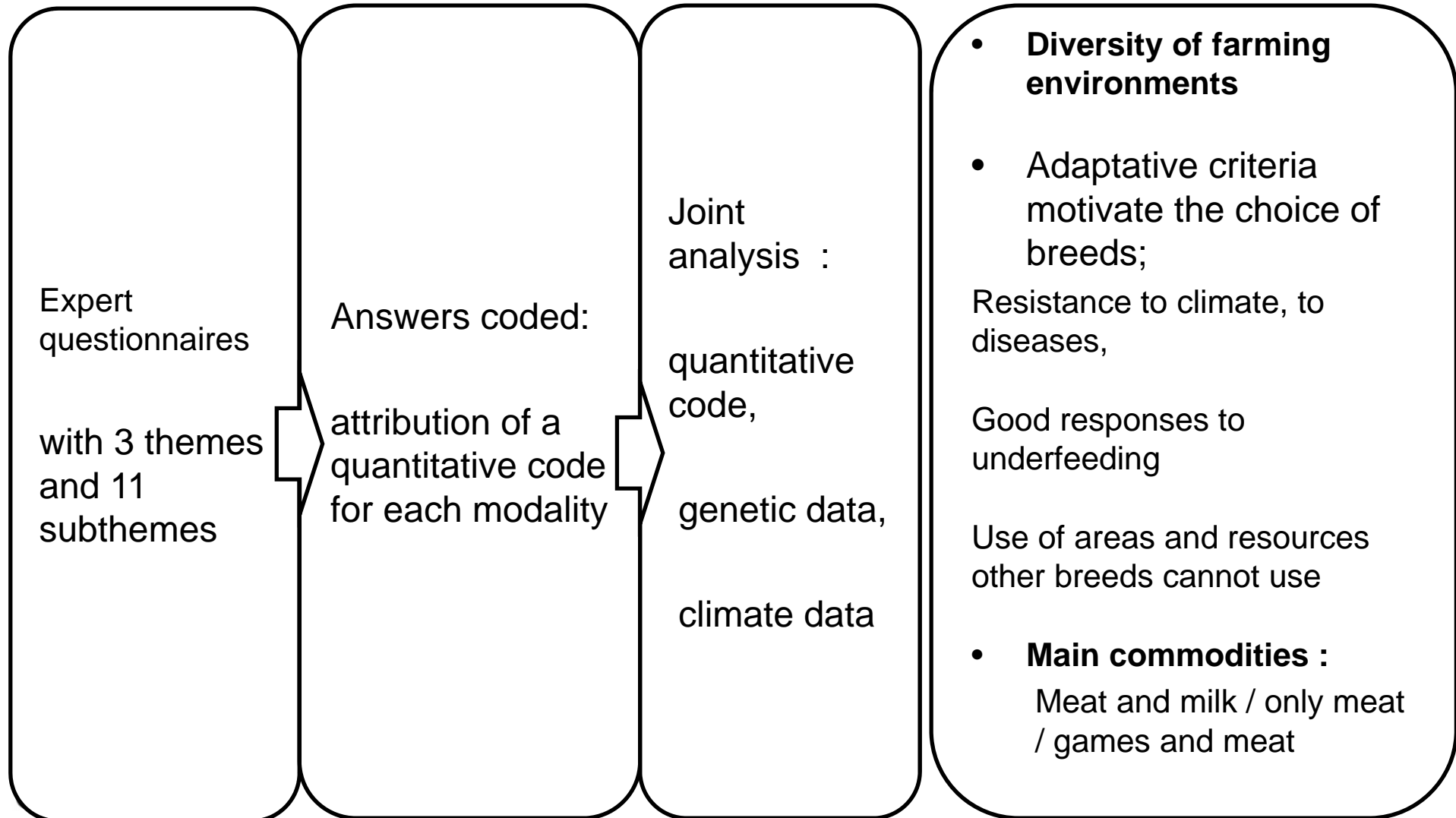
What are the main categories of systems/practices in each situation?

For all the breeds of the study: questionnaire to some experts on the main features

How breeders consider adaptation of their breed / what are the main abilities of the animals?

For a few cases: semi structured interviews to a diversity of breeders

The main characteristics of farming systems : a questionnaire to experts



Expert questionnaires

with 3 themes and 11 subthemes

Answers coded:

attribution of a quantitative code for each modality

Joint analysis :

quantitative code,

genetic data,

climate data

- **Diversity of farming environments**

- Adaptative criteria motivate the choice of breeds;

Resistance to climate, to diseases,

Good responses to underfeeding

Use of areas and resources other breeds cannot use

- **Main commodities :**

Meat and milk / only meat / games and meat

How farmers consider adaptation of their breed?

a focus on Corsica (France) and Tuscany (Italy)

**Corsican
cattle** (Corsica)
20 farmers

**Maremma
cattle** (Tuscany)
8 farmers

Interviews
recorded ->
integral
retranscription
for the part on
adaptation

History

Farming system

Point of view on
adaptation

Collective
actions

Identification
of themes and
subthemes
from breeders'
speeches

Codage and
count for each
interview

Similar themes in both cases :

**feeding capacities,
reproduction, morphology,
behaviour, resistance,
adaptation to territory,
meat quality**

- In Corsica, « **feeding autonomy** »

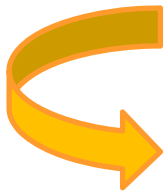
sub themes: few needs, feeding
behaviour, body condition,
consequences and causes of this
autonomy

Coherence with most extensive
systems where human intervention
is limited

- In Italy, quotation of various
themes more homogeneous

Conclusion

- Main characteristics of farming systems (resistance, underfeeding, use of specific areas)
- High genetic diversity of Mediterranean cattle breeds
- Genetic fits with geography and environment



Identification of loci involved in local adaptation of mediterranean breeds to climate and links with Livestock Farming Systems