



# Genetic heritage of the Eastern Belgium Red and White breed, an endangered local breed

F.G. Colinet<sup>1</sup>, A. Bouffieux<sup>1</sup>, P. Mayeres<sup>2</sup>, M. Malzahn<sup>3</sup>, L. François<sup>4</sup>, S. Janssens<sup>4</sup>, N. Buys<sup>4</sup>, S.J. Hiemstra<sup>5,6</sup>, J.J. Windig<sup>5,6</sup> & N. Gengler<sup>1</sup>

<sup>1</sup> University of Liège, Gembloux Agro-Bio Tech, 5030 Gembloux, Belgium - <sup>2</sup> Walloon Breeding Association, 5590 Ciney, Belgium

<sup>3</sup> Fondation rurale de Wallonie, 4950 Faymonville, Belgium - <sup>4</sup> KU Leuven, Department of Biosystems, Livestock Genetics, 3001 Leuven, Belgium

<sup>5</sup> Animal Breeding and Genomics Centre, Wageningen University and Research Center, 6700 AH Wageningen, the Netherlands

<sup>6</sup> Center for Genetic Resources, the Netherlands, Wageningen University and Research Center, 6700 AH Wageningen, the Netherlands

Under the holsteinization pressure and in the absence of a commitment of the Red and White Herdbook to the dual-purpose breed type, the Eastern Belgium Red and White (EBRW) was considered extinct in the 1990s. Nevertheless, several farmers still kept these cattle because they were perfectly adapted to their more extensive, grazing based production system on less productive medium-altitude (Ardenne-Eifel) meadows.

## Framework

- ❖ Safeguarding and conservation of EBRW
- ❖ *Public Service of Wallonia* project funded



## Conclusions

- ❖ EBRW is different from Red Holstein.
- ❖ EBRW belongs to red-pied dual-purpose breeds group in North-Western Europe.
- ❖ Based on breed standards, EBRW is still distinct from MRV and Kempen breed.

## Aim

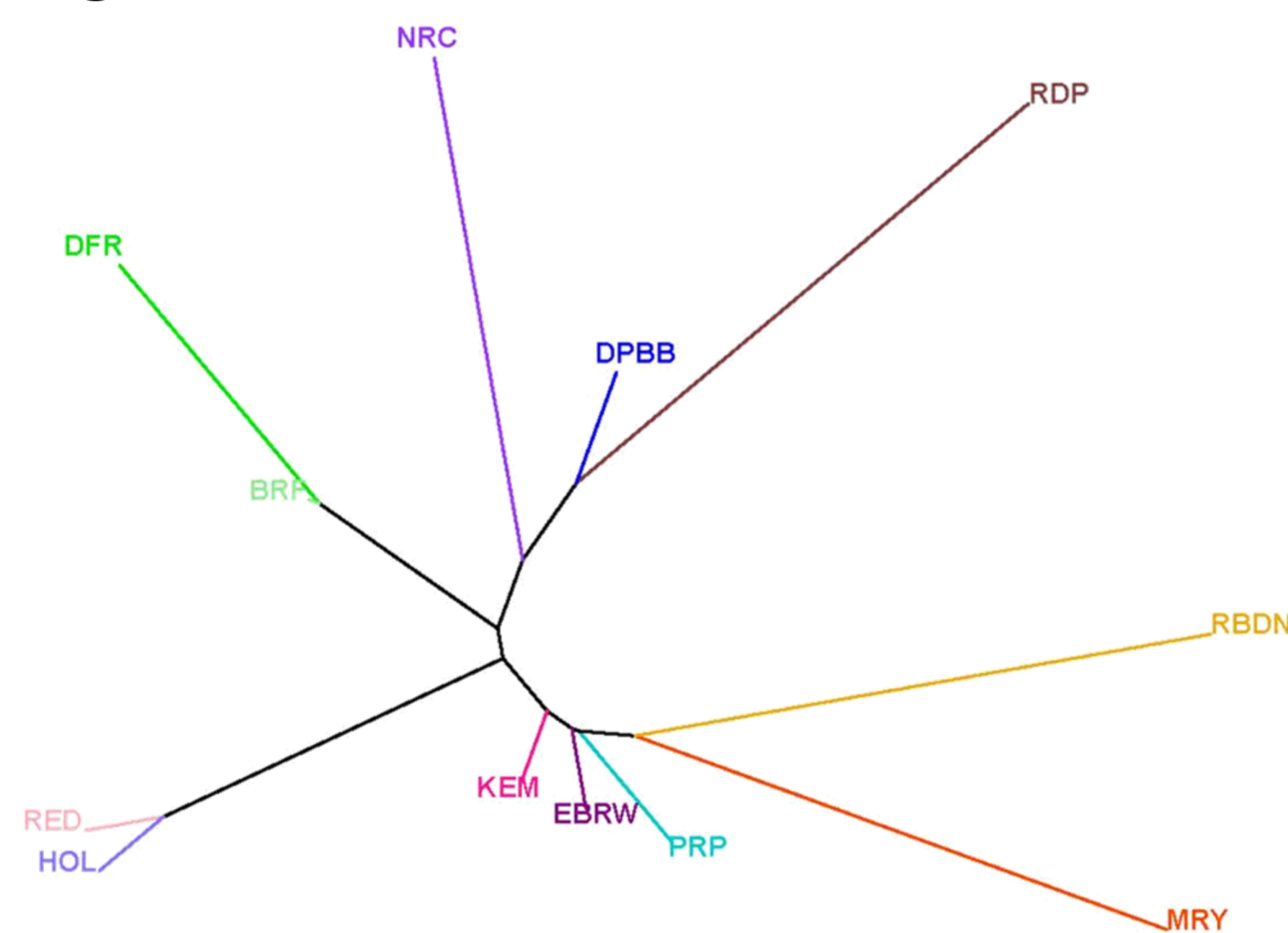
- ❖ Positioning of the EBRW breed in relation with 12 bovin breeds based on SNP data

## Data

- ❖ 50K genotypes (572 animals, 39 903 SNP after editing)
  - 12 breeds: British Friesian (BRF), Dual-Purpose Belgian Blue (DPBB), Dutch Friesian (DFR), Eastern Belgium Red and White (EBRW), French Red Pied Lowland (PRP), Holstein (HOL), Kempen breed (KEM), Meuse-Rhin-Yssel (MRV), Norwegian Red Cattle (NRC), Red Holstein (RED), Rouge des Prés (Maine-Anjou, RDP), Roodbunte DN (RBDN)
  - Genotype sources: ULg-GxABT, KU Leuven, Wageningen UR, Gautier *et al.* (2009, 2010) and Matukumalli *et al.* (2009)

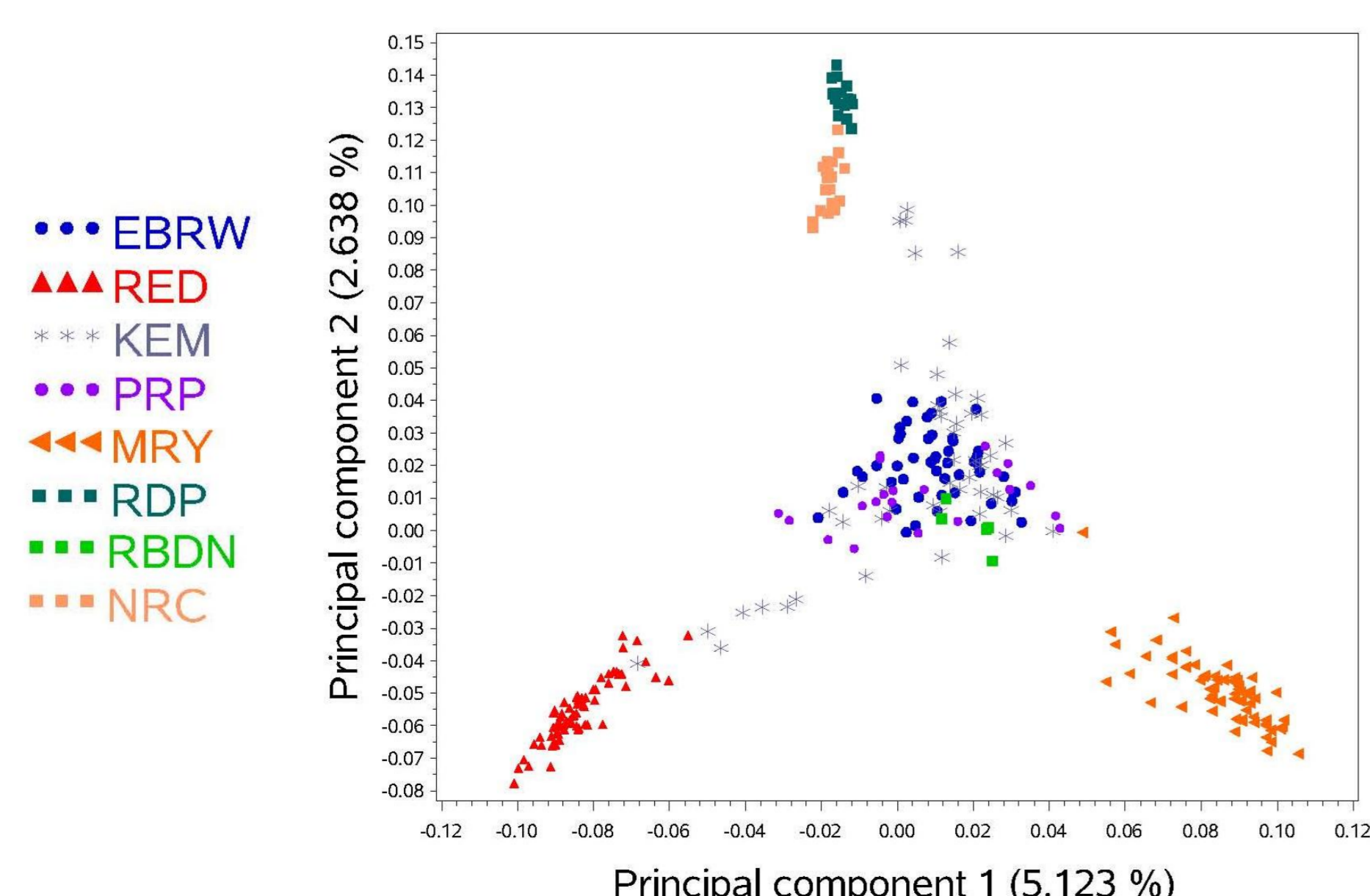
## Results

- ❖ Unrooted neighbor-joining consensus tree constructed using Nei's genetic distance of 12 breeds



- The 5 red-pied dual-purpose breeds of North-Western Europe grouped together

- ❖ Plot of individuals from 8 breeds according to the coordinates on the first two principal components



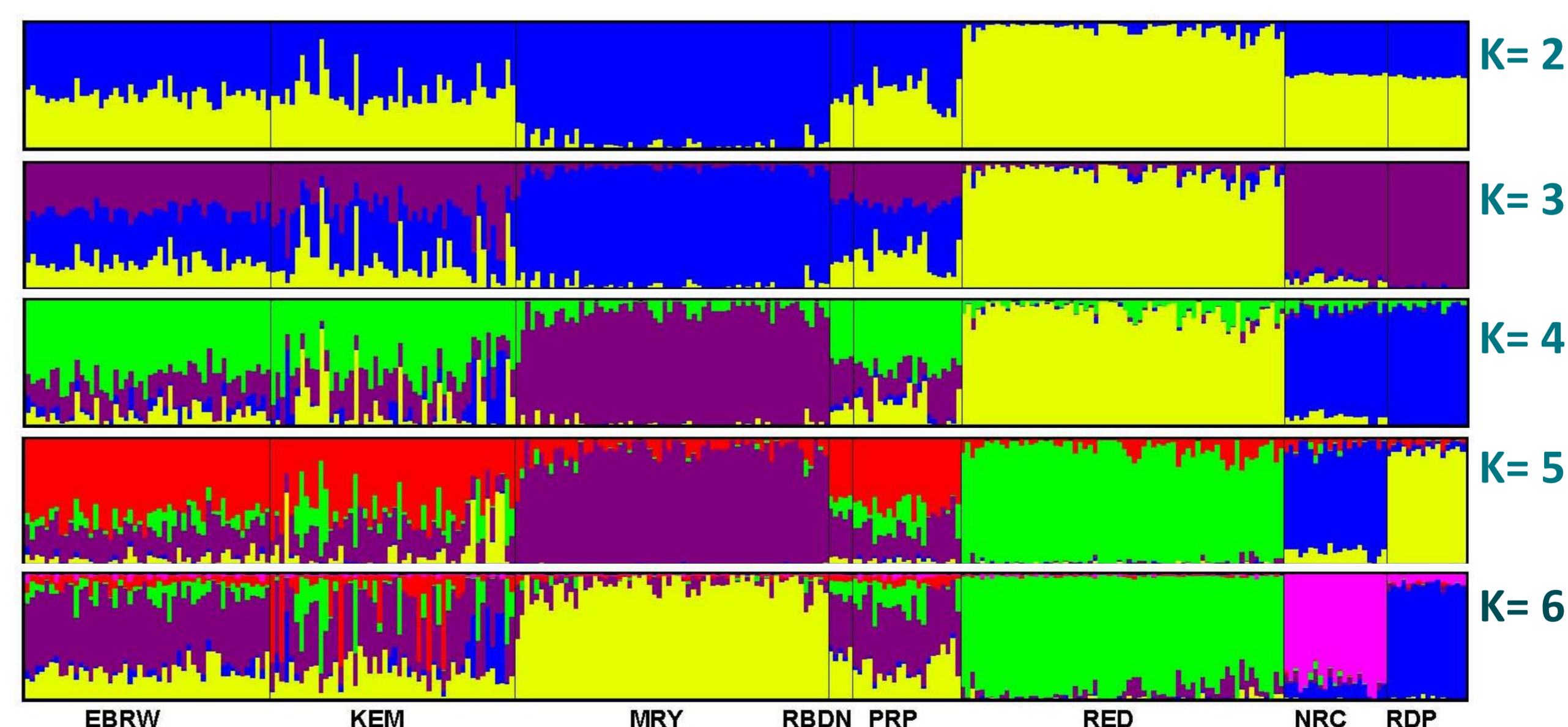
## Achievements

- ❖ Set up of a dedicated breeding commission
- ❖ Creation of a dedicated Herdbook
- ❖ April 2015, official recognition of EBRW by Government of Walloon Region
- ❖ Meat valorization in short distribution channels

## Analysis

- ❖ Nei's genetic distance
  - Computed with R package StAMPP (Pembleton, 2014)
  - Neighbor-joining tree built with R package ape (Paradis *et al.*, 2014)
- ❖ Principal Component Analysis with PreGSF90 (Aguilar *et al.*, 2014)
- ❖ Genetic structure
  - Inferred with STRUCTURE 2.3.4 (Pritchard *et al.*, 2000)
  - Number of clusters (value K) ranging from 2 to 12
  - 10 independent runs for each value K
  - Burn-in 10 000 repeats followed by 20 000 MCMC repeats
  - Results analyzed with Structure Harvester (Earl *et al.*, 2012), CLUMPP (Jakobsson, 2007) and DISTRICT (Rosenberg *et al.*, 2007)

- ❖ STRUCTURE based clustering at the level of individuals from 8 bovine breeds



- 6 is the most likely number of clusters based on the method proposed by Evanno *et al.* (2005).
- Clear separation of MRV, RED, NRC and RDP breeds

- ❖ EBRW, KEM, PRP and RBDN are distinct from:
  - HOL and RED, and also BRF and DFR
  - NRC, RDP and DPBB (breeds with a strong influence of Shorthorn breed in their ancestry)