

REDIVERSE: Biodiversity within and between European Red Dairy Breeds — conservation through utilization

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The Challenge

The advent of genomic selection in dairy poses a critical challenge to the future of the European Red Dairy Breeds.

- 🌿 Holstein dairy cattle are leaving European Red Dairy Breeds behind in terms of genetic gain.
- 🌿 European Red Dairy Cattle are increasingly replaced by Holstein cattle.



Genetic Trends



Holstein

- Genomic selection boosts genetic gain in Holstein
- Extra annual gain: €16 per cow-year since about 2008



Red Dairy Cattle

- In Nordic Red Dairy Cattle GS brought less extra gain
- Extra annual gain: €9.7 per cow year
- ... since introduction of Eurogenomics LD chip in 2011

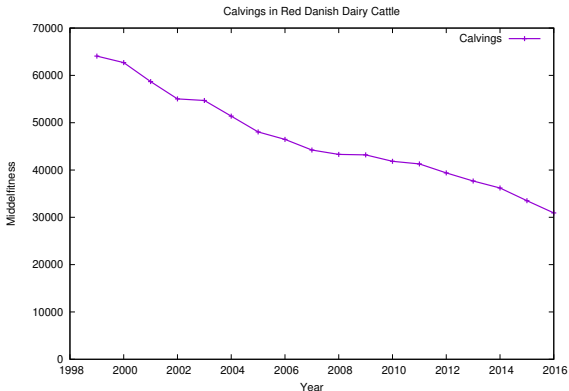


Admixture from other breeds

- 🌿 Increasing admixture from breeds with high milk production
- 🌿 1970: Danish Red distinct
- 🌿 1980: Admixture with Brown Swiss
- 🌿 1990: Admixture with Brown Swiss and Holstein
- 🌿 After 2000: Admixture with Swedish and Finnish Red



Declining numbers



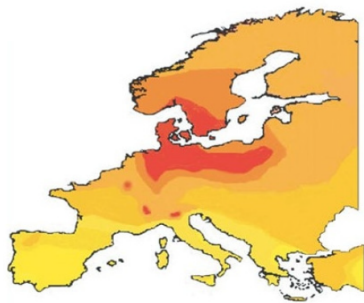
Steep decline



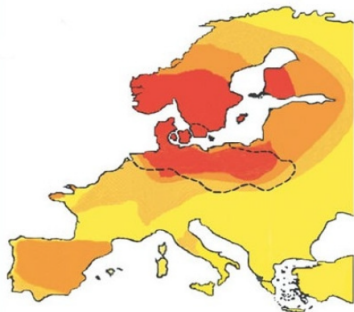
In the fifties around 1,000,000 red cows in Denmark



Genetic Diversity



Milk protein diversity



Incidence of lactose tolerance

Adapted from Beja-Pereira *et al.*, Nature (2003)



Superior characteristics

Red Dairy breeds in Northern Europe have

- 🌿 Superior functional characteristics
- 🌿 Local adaptation from long local histories
- 🌿 Complex histories of gene flow and connectedness
- 🌿 Cultural heritage



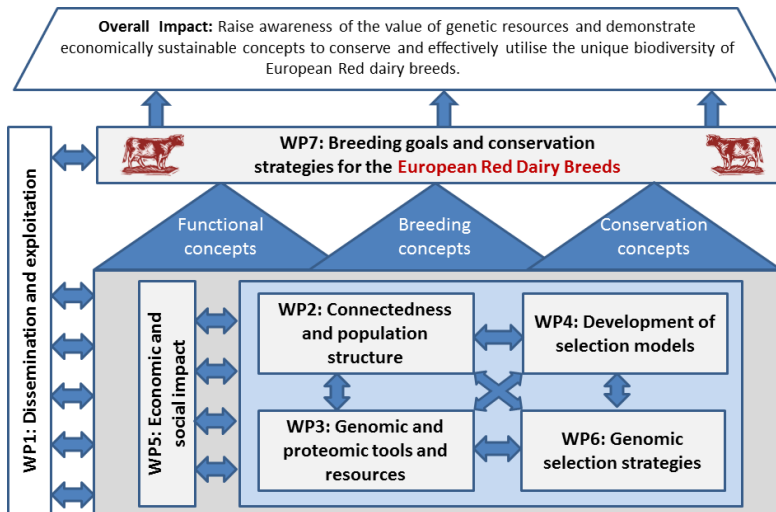
REDIVERSE

What is needed?

To prevent Red Dairy Cattle from falling ever further behind Holstein in genetic level, we need:






- 🍃 Improved tools (statistical and biotech).
- 🍃 Improved selection.
- 🍃 Identify value to farmers through surveys.
- 🍃 Focus on superior qualities of European Red Dairy Breed.
- 🍃 Foster more and better collaboration.









Objectives

Objectives for REDIVERSE

-  Improve collaboration between European Red Dairy Breeds
-  Create a shared customized LD chip and genomics resource
-  Map distinct milk protein variation
-  Map and exploit genetic diversity of European Red Dairy Breeds
-  Create a shared genotypic reference




Improved selection through REDIVERSE

-  Status: only 3 or 4 of 19 Red Dairy Breeds have genomic selection program
-  Adapt, connect and optimize genomic breeding schemes for a highly structured population
 -  Protect unique genetic variation
 -  Strategies for conserving *and* utilizing endangered red populations




REDIVERSE Partners

REDIVERSE has academic partners in


 Germany (Berlin, Kiel, Hohenheim)


 The Netherlands (Wageningen)

 Denmark (Aarhus)

 Sweden (Uppsala)

 Norway (Ås)






 Lithuania (Vilnius)

 Poland (Wrocław)



REDIVERSE Partners

REDIVERSE industrial partners

-  CRV
-  Viking Genetics
-  Animal Breeders' Association of Latvia
-  Lithuanian Red Cattle Improvement Association
-  Rinderzucht Schleswig-Holstein eG

More are joining



Expected Outcomes

- 1 Sustainable management of genetic diversity and uniqueness of Red Dairy Cattle
- 2 Joint sustainable breeding program
- 3 Shared genomics resources
- 4 Ultimately: preserve the red dairy breeds by improved breeding utilizing their unique characteristics

Thank you to the ERA-NET program for funding!

