

RUMiGen

TOWARDS IMPROVEMENT OF RUMINANT BREEDING THROUGH GENOMIC AND EPIGENOMIC APPROACHES

Results and impact for resilient ruminant breeding

Genomic and epigenomic approaches for cattle, sheep and goats



RUMIGEN connected farm data, genomics, epigenomics, gene editing and societal dialogue to support breeding programmes for resilience, efficiency and diversity.

1 Why it matters



Climate adaptation

Animals and systems need to cope with heat and changing conditions.



Animal health & welfare

Breeding goals increasingly include resilience, health and welfare.



Genetic diversity

Long-term progress depends on managing diversity and genetic load.



Trust & governance

Innovation uptake depends on transparency, purpose and fair benefits.

2 How RUMIGEN worked



Farm records & weather



Genomics



Epigenomics



Societal dialogue



Breeding strategies

3 What we learned

1. Heat tolerance can be measured and modelled using performance, pedigree, genotype and weather information.
2. Genetic diversity management remains central for both local and more widely used breeds.
3. The EpiChip creates a practical route to study cattle methylation and future resilience traits.
4. Gene-editing experiments in goats and sheep showed practical potential for disease resistance and heat resilience.



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Horizon 2020 project • Cattle • Sheep • Goats • Ruminant breeding



Impact and uptake

What RUMIGEN means for breeding organisations, farmers and policymakers.



For breeding organisations

- Heat-tolerance trait definitions
- Selection strategies using genomic and epigenomic information
- Tools to balance progress, diversity and resilience



For farmers & advisors

- Clearer evidence on heat stress, fertility and udder health
- Near-term priorities for breeding objectives
- Training and knowledge transfer materials



For policymakers

- Room of Acceptance method for responsible innovation
- Citizen engagement evidence from Europe
- Scenario tools for trade-off discussions



For researchers & service providers

- EpiChip and epigenomic models for future evaluations
- Methods for rare alleles and edited variants
- Dashboard and open materials for uptake
- Evidence from edited founder animals and evaluation methods

From research to usable outputs



Examples of project outputs



Heat tolerance traits

Indicators and models for performance under heat stress and performance decline.



EpiChip

First cattle-specific methylation array for large-scale epigenomic profiling.



Diversity toolbox

Methods combining pedigree and genomics to map inbreeding depression and genetic load.



Room of Acceptance

A reusable framework to assess when breeding innovation is seen as legitimate and responsible.



Gene-editing experiments

Case studies included prior-resistant goats and heat-stress-resistant sheep.



RUMIGEN helps connect science, breeding practice and policy for more resilient ruminant production under changing conditions.

