



Scaling selection for sustainability traits through commercial beef breeding programs

A beef x dairy case study: US & UK

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ABS Global

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The Challenge

- To feed 10 billion people: Address food security and improve nutrition by focusing on quality calories and sustainable production¹
- Fewer resources & lower environmental impact: Balance productivity, biodiversity, GHGs, social license and profit²
- Animal agriculture is a critical contributor to sustainably feeding people, but truly scalable solutions are needed to meet supply chain demand for sustainable products

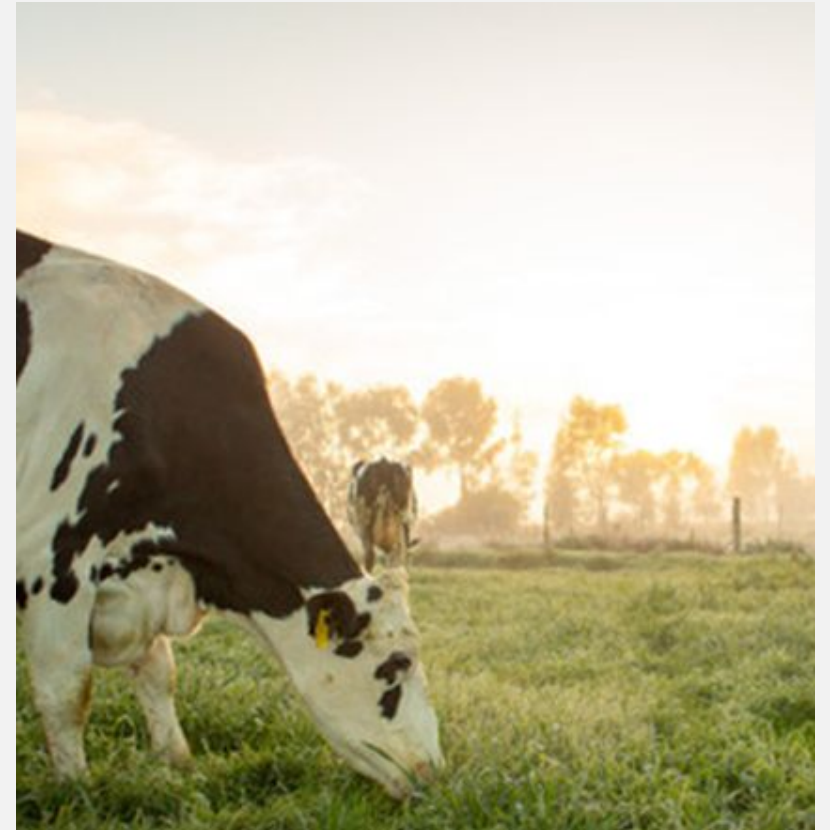
¹Ritchie and Rodes-Guirao, 2024; FAO, IFAD, UNICEF, WFP and WHO. 2025 ²Bilotto et al., 2025

A close-up photograph of a horse's face, showing its eye and part of its muzzle. The image has a strong blue color cast. The text is overlaid on the left side of the image.

Genetic innovation is the most important tool for permanent reduction of environmental impact and more sustainable livestock production

Aligning farm-level decisions with value chain goals is challenging

- Genetic improvement practice decisions are made at the farm level
- Limited integration has led to under-investment in optimal genetic strategies that benefit stakeholders across the value chain
- There is a disconnect between long-term value creation and short-term farmer ROI
- Farm-level solutions aren't always properly incentivized and don't scale well



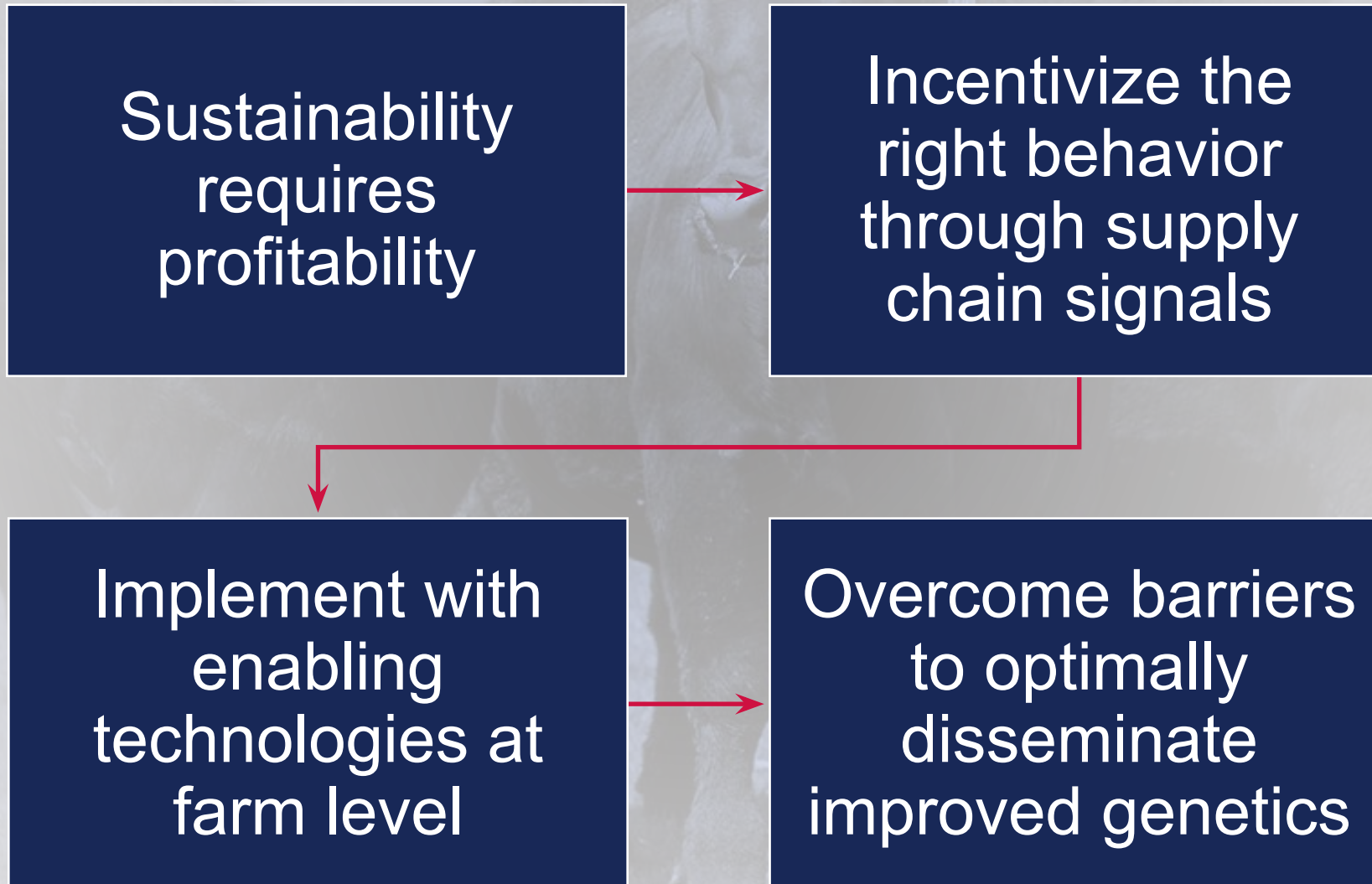
Genetic
improvement
is just the
beginning

Implementation enablers

- Targeted breeding programs
- Enhanced data collection
- Artificial insemination
- Sexed semen
- Reproductive management

→ Genetic management

Scaling genetic innovation to create more sustainable commercial systems



Case Study

NuEra Genetics:
Implementation of
bespoke beef
genetics to improve
long term on-farm
profitability and
credibly reduce
environmental
impact



Our hypothesis

Genetic gain for traits relevant to BxD profitability contributed to a decrease in the environmental impact of beef produced from BxD animals sired by NuEra genetics.

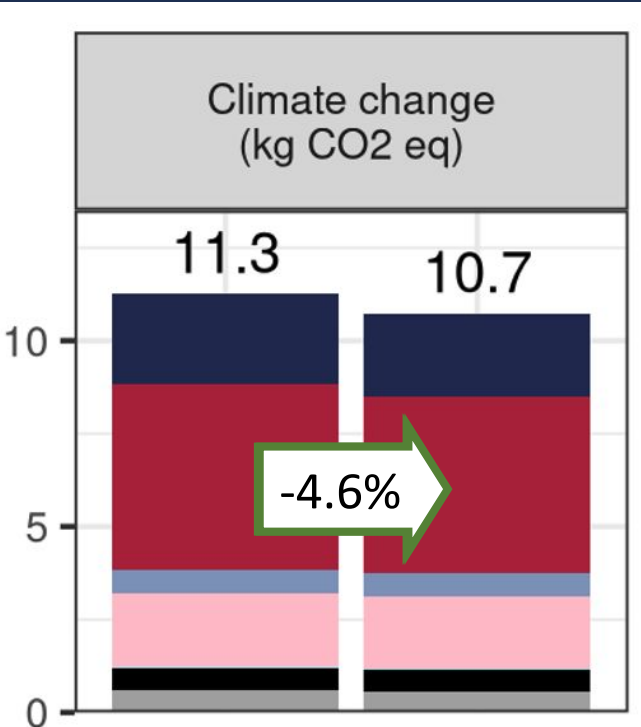
Quantifying the genetic impact on beef x dairy environmental footprint



- ✓ Two beef genetic lines selected for beef x dairy supply chain performance in US and UK
- ✓ First LCA for beef x dairy production; framework to account for genetic merit
- ✓ Climate change impact reduction potential due to genetic improvement

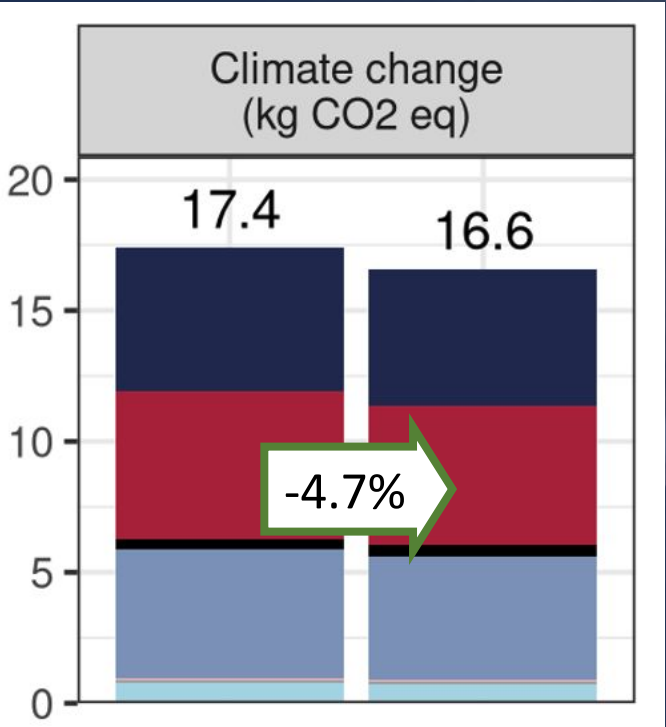
Climate change impact profile

US – T14



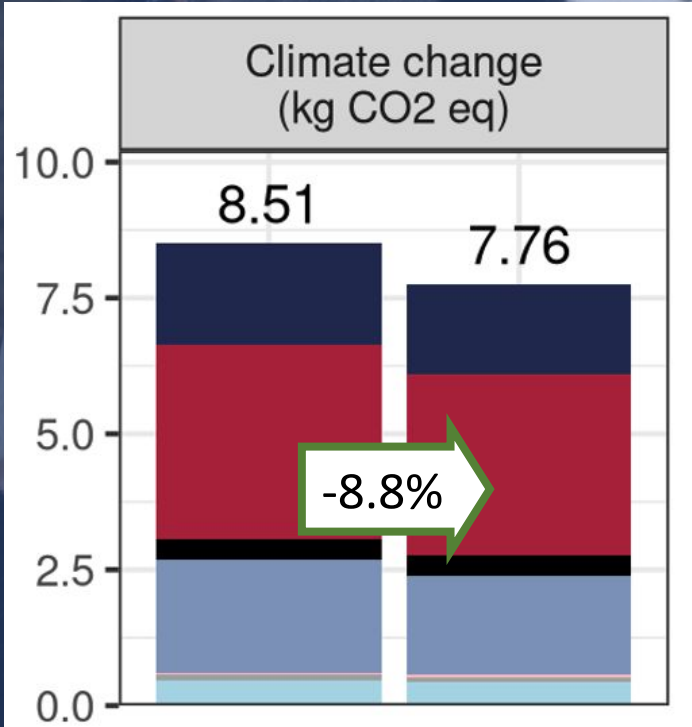
Benchmark NuEra

UK – T14



Benchmark NuEra

UK – T15



Benchmark NuEra



Targeted genetic improvement has the potential to reduce **beef x dairy** climate impact by nearly 1 million tonnes CO₂e over five years in the UK, while continuing to improve productivity and profitability

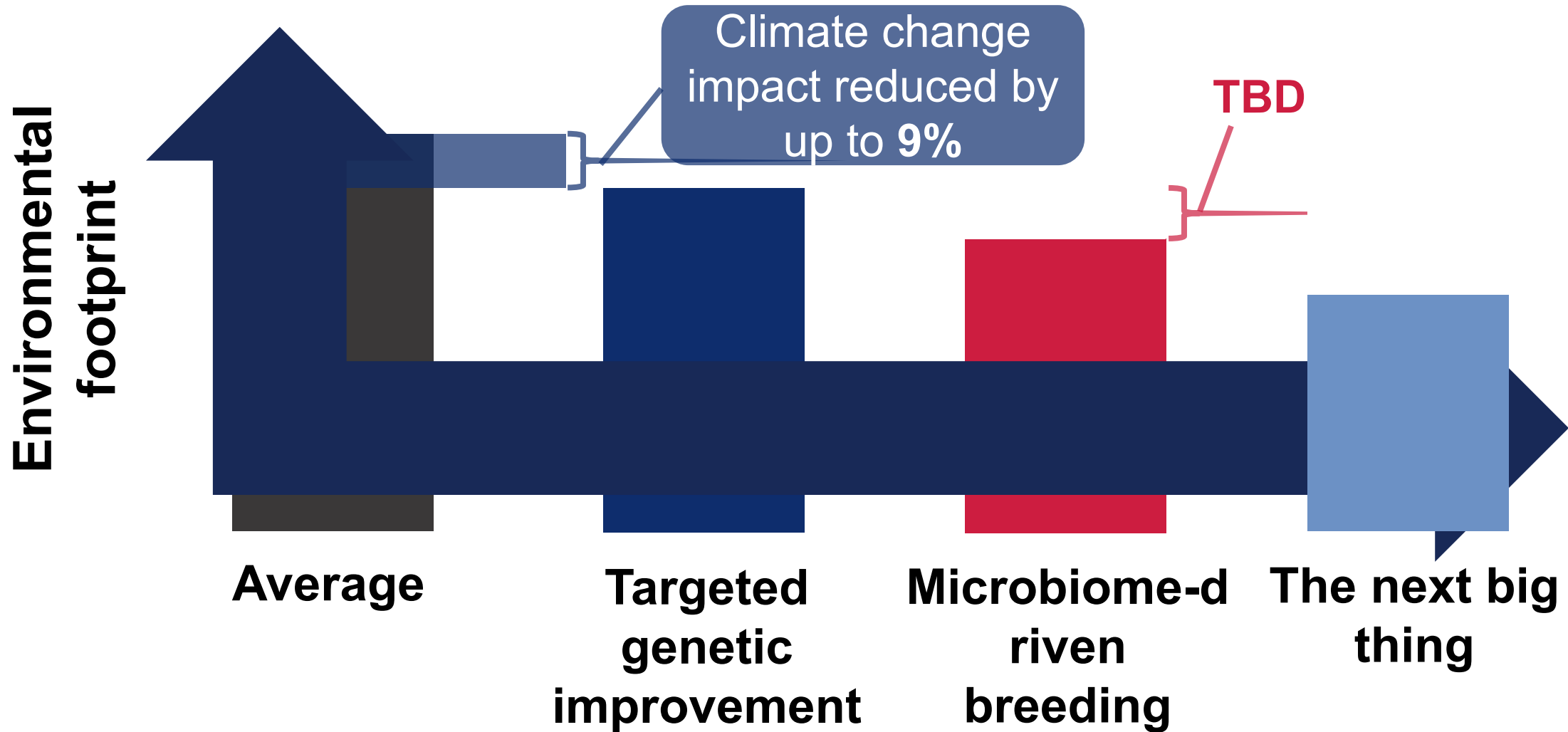
- Microbial gene abundance as a phenotype for genomic selection
- Rumen microbial genes:
 - Improve feed efficiency
 - Reduce methane
 - Improve animal health
- Feed efficiency can be improved and methane production reduced simultaneously
- Trials in progress to validate microbiome-driven breeding predictions

Integration of microbiome-driven breeding into the ABS commercial breeding program

Prof. Rainer Roehe



Accelerating environmental impact reduction in commercial beef x dairy systems



Robust phenotypes and new breeding approaches are key to scaling production of more sustainable products



Diet composition



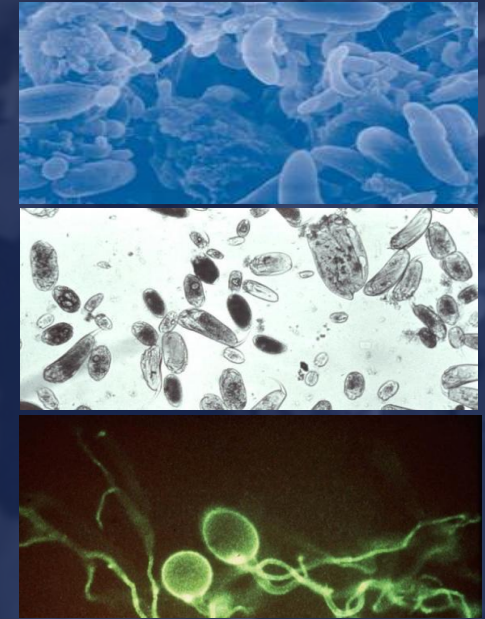
Feed & water intake



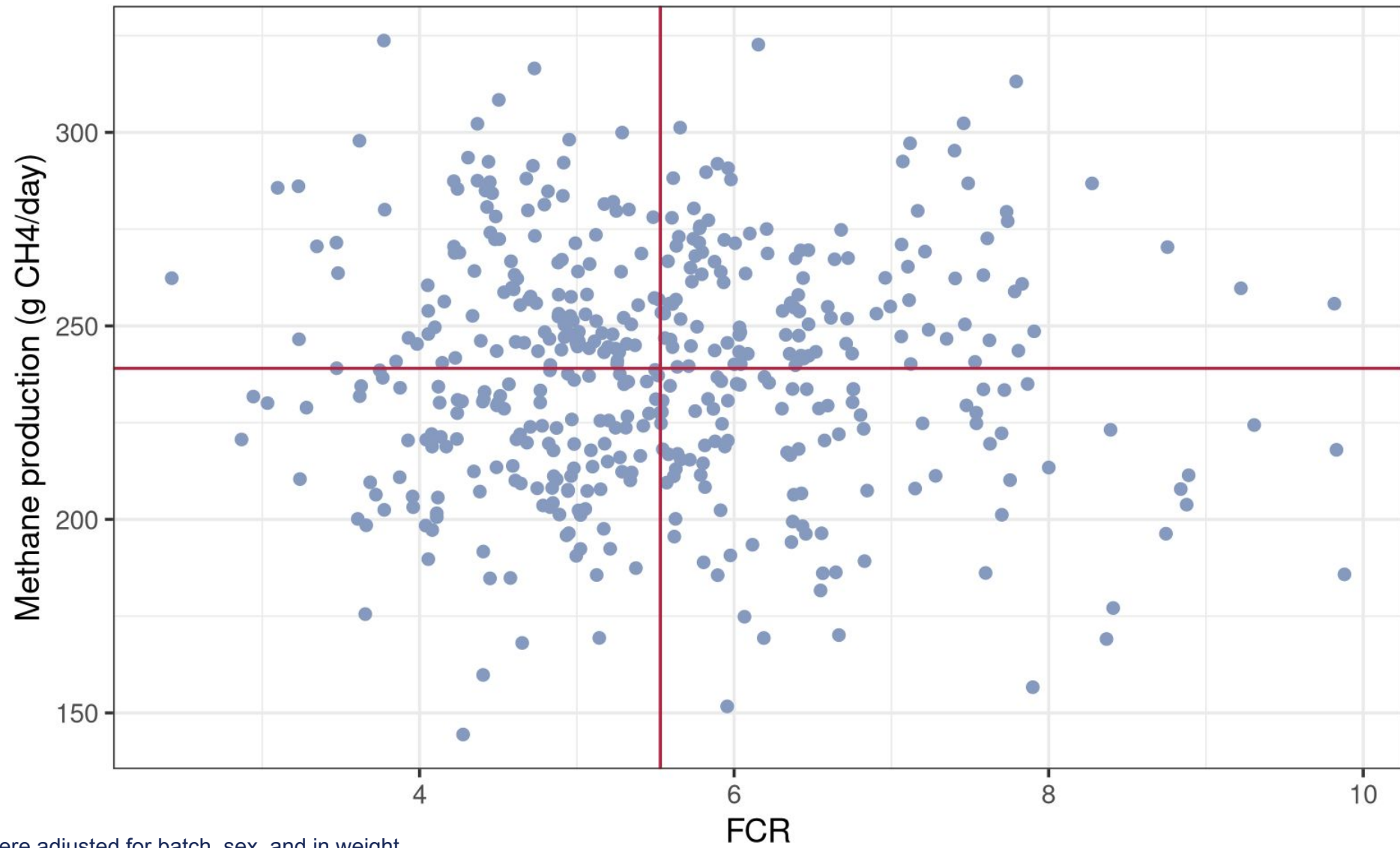
Enteric emissions



Whole-animal emissions



Rumen composition



MeP and FCR were adjusted for batch, sex, and in weight
Red lines indicate the means

Factors to consider

- Commercial genetic improvement is guided by market signals
- Productivity improvement has a clear economic value and a strong value proposition for sustainability
- Most markets lack incentives for direct reduction of methane – Will this change?
- More work needed to understand how to effectively use new sustainability traits in a commercial breeding program

Concluding thoughts

Genetic improvement can be an impactful lever for sustainability

Interventions need to work at farm level, but must also scale

Incentives should align with long-term environmental goals, but provide short term ROI

Market demand and economics will drive breeding decisions

A more sustainable food supply starts with genetics.

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