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AGRISCIENCE CONSULTANTS

Validating the impact of genetic progress for novel and difficult to measure traits in commercial herds

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Context

Greenhouse gas emission accounting

Genetic Improvement as Mitigation Strategy

ISO-Aligned Evidence

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How to illustrate to non-geneticists that breeding for methane works

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Two angles

Contrast **herds** with **increasing / decreasing genetic trend** for GHG emissions

Compare offspring of (maternal grand-) **sires** with **high / low genetic merit** for GHG emissions

Traits

Phenotypes ↓ Low values desirable

- MIR-predicted methane production (g/day)
- MIR-predicted methane intensity (g/kg)
  Methane production per kg solids

Breeding Values ↑ High values desirable

- Methane production
- Methane efficiency
  Methane production adjusted for yields (milk, fat, protein)

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Herd-level analyses

Data

Breeding Values from 2023 genetic evaluation by Lactanet

- Methane Production
- Methane Efficiency
- [milk, fat, protein yield]

Phenotypes from 2024 and 2025 (and 2017)

- MIR predicted Methane production (g CH4 per day)
- MIR predicted Methane intensity (g CH4 per kg solids)
- [milk, fat, protein yield]
- ~ 1800 herds

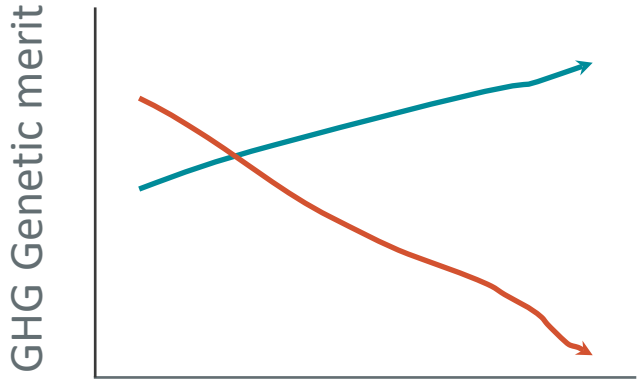
Approach

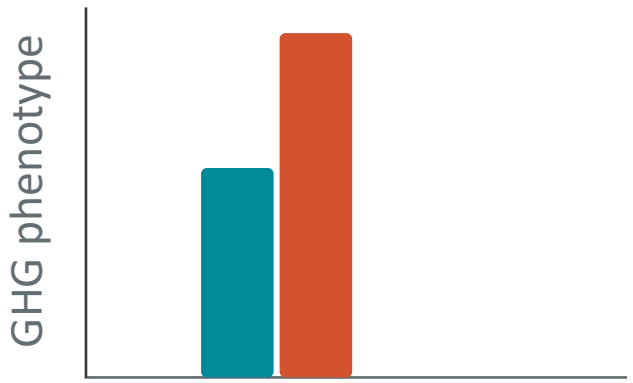
Genetic trend

- Herd level
- Between 2017 – 2023
- Primiparous cows
- Identify divergent herds

Phenotypic level

- 2024 and 2025
- Primiparous cows
- Adjust for differences in 2017





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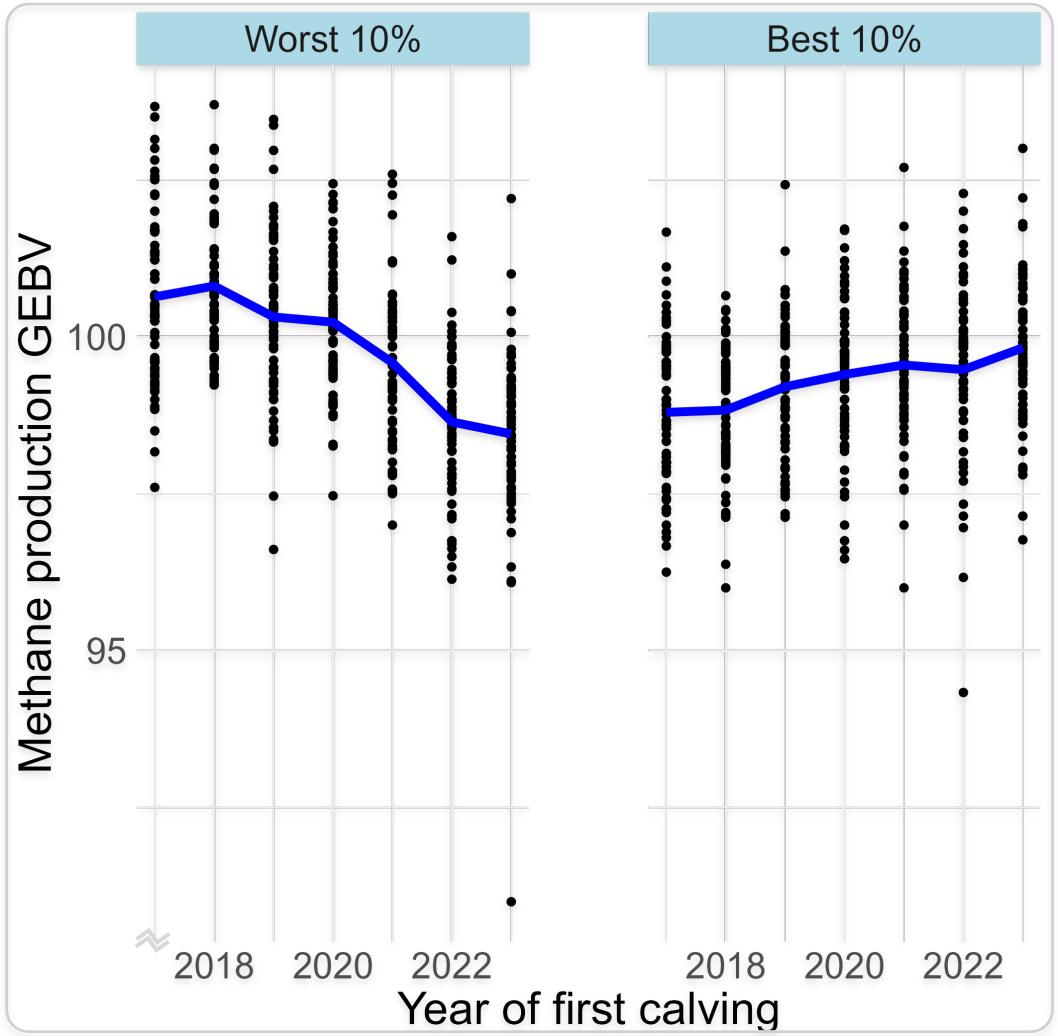
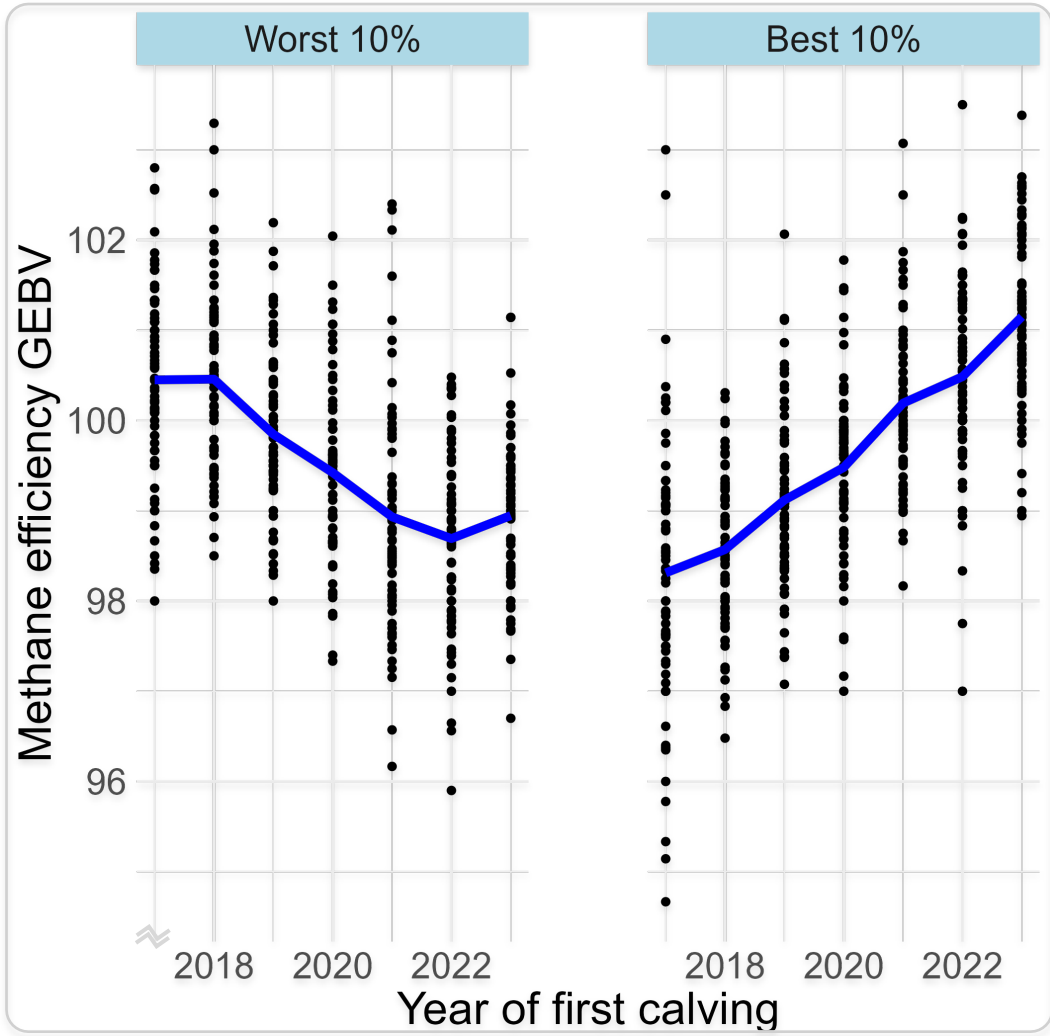
Genetic trends 2017 – 2023



Methane production GEBV · N = 66 herds



Methane efficiency GEBV · N = 66 herds

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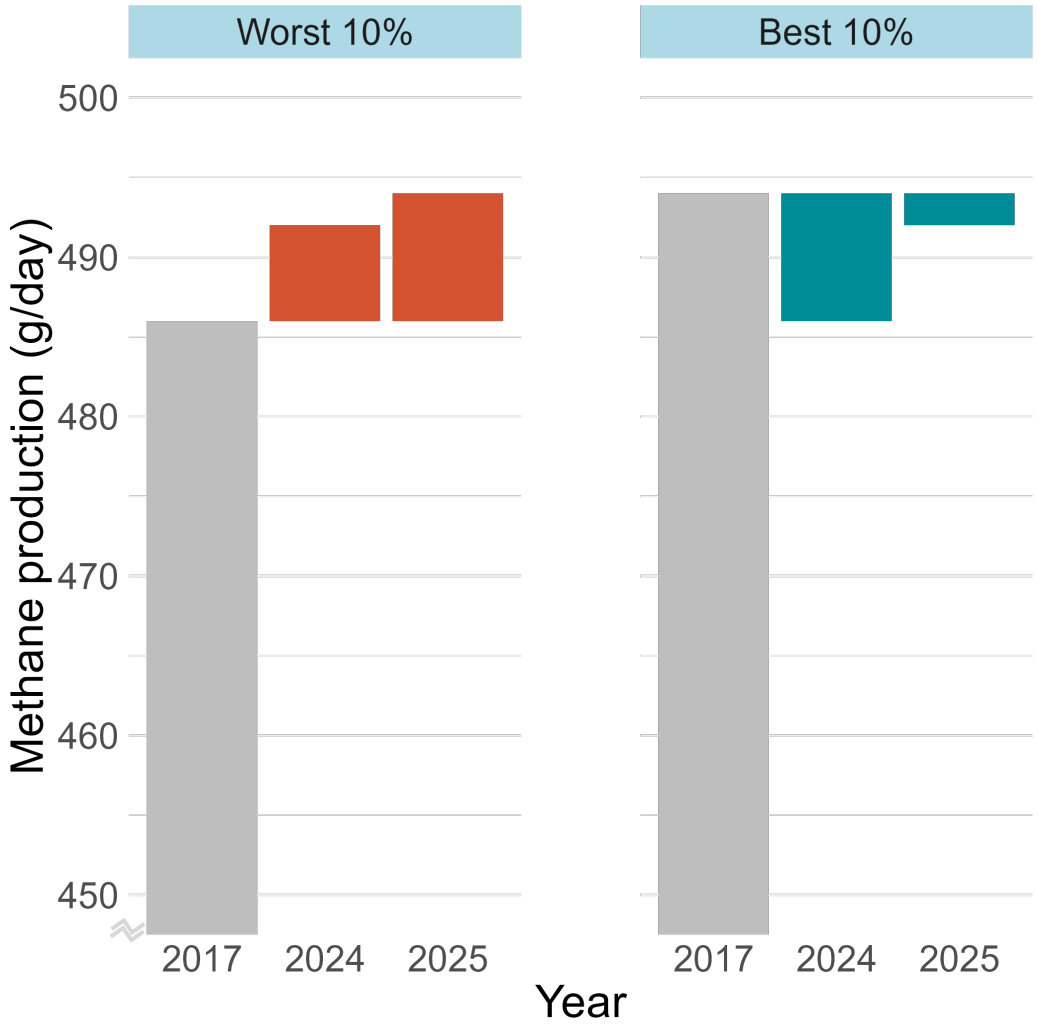
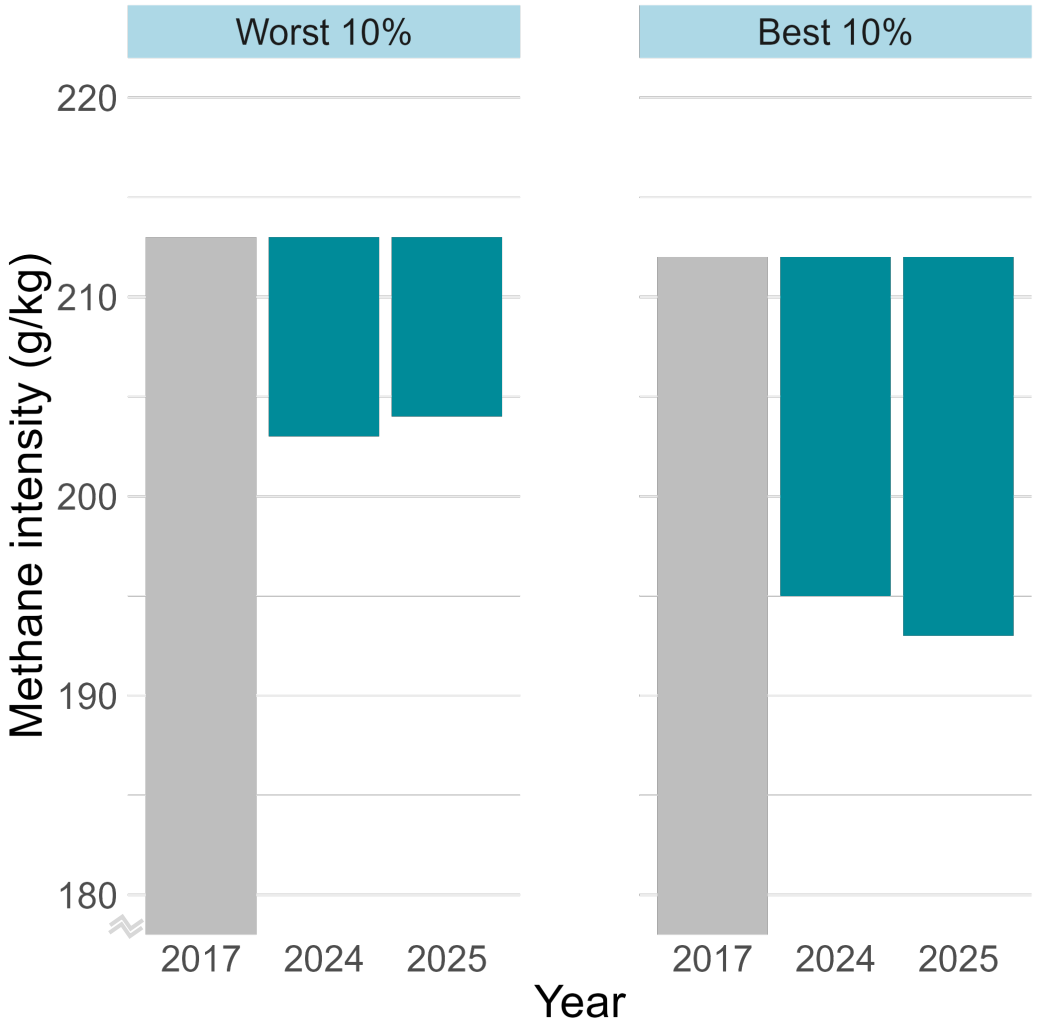
Results





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Two angles

Contrast **herds** with **increasing / decreasing genetic trend** for GHG emissions

Compare offspring of (maternal grand-) **sires** with **high / low genetic merit** for GHG emissions

Trans-generational analyses

Data

Breeding values from 2023 genetic evaluation by Lactanet

- Methane production
- Methane efficiency
- [milk, fat, protein yield]

Phenotypes from 2024 and 2025

- Cows first calving in 2024 and 2025 (n = 94,000)
- MIR predicted Methane production (g CH4 per day)
- MIR predicted Methane intensity (g CH4 per kg solids)
- [milk, fat, protein yield]
- Test-day records, 120 – 185 DIM

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Approach

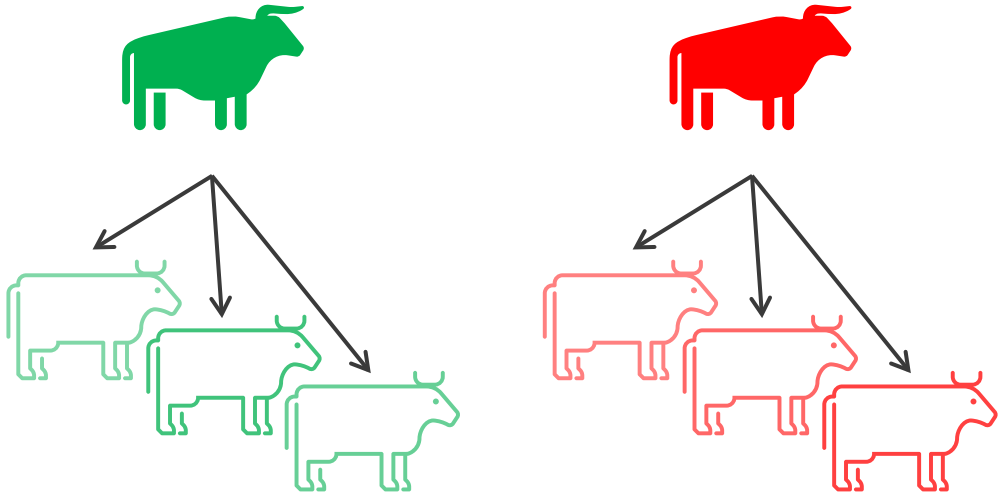
Separate analysis for cows first calving in 2024 and 2025

- Rank cows by the breeding value of their (maternal grand) sire
  - 10 equi-sized groups

- Fixed effect model

  phenotype ~ herd + decile group

  Contrast between highest and lowest decile



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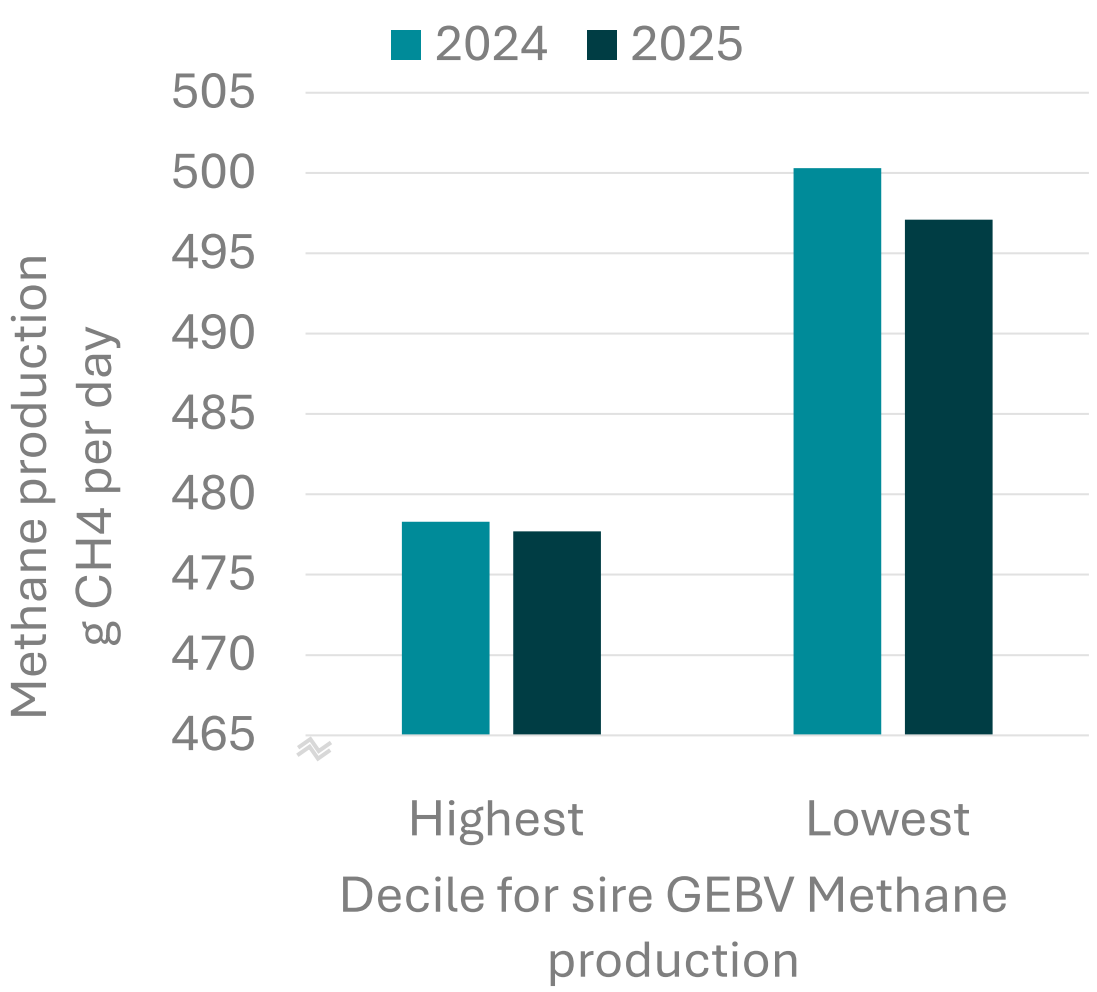
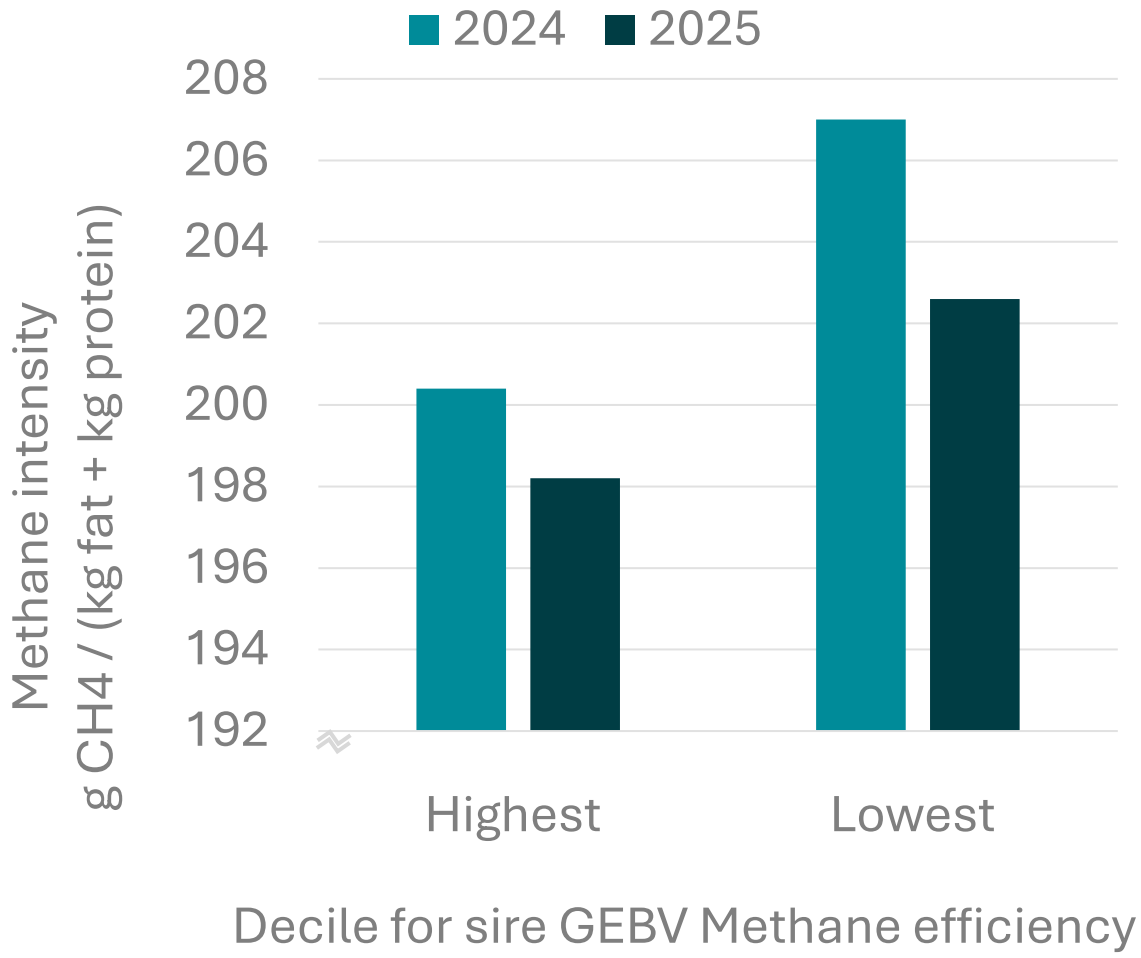
Results





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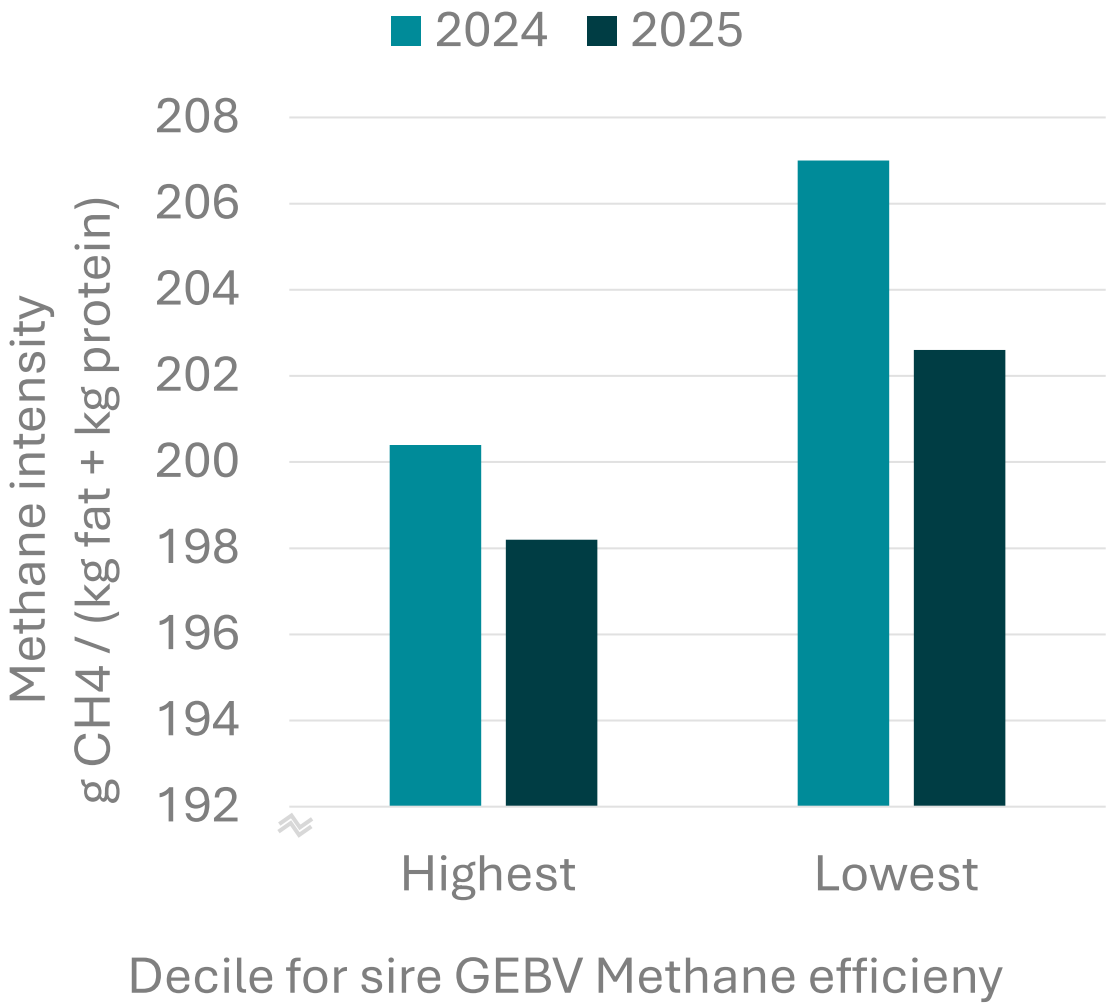
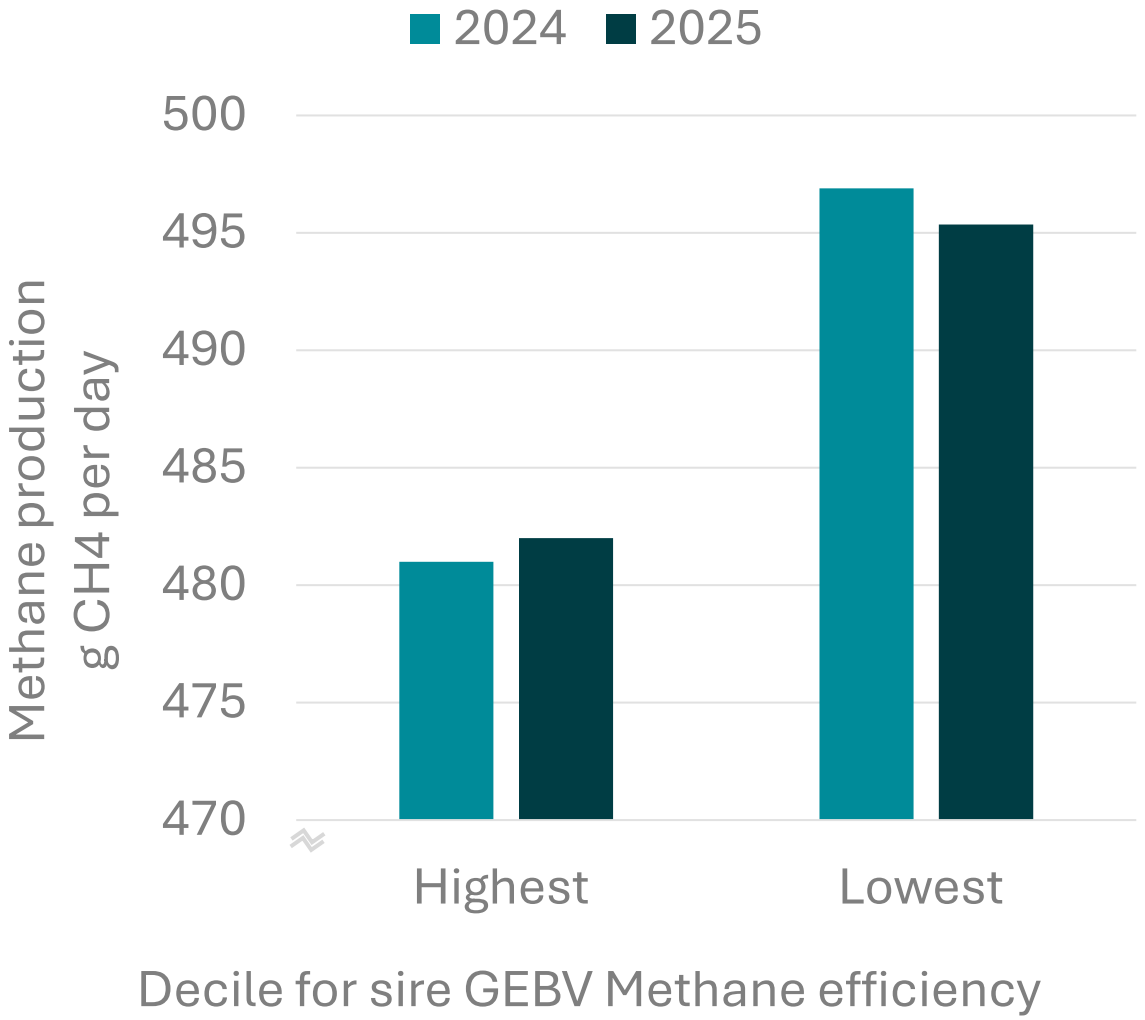
Selection on Methane efficiency decreases Methane production





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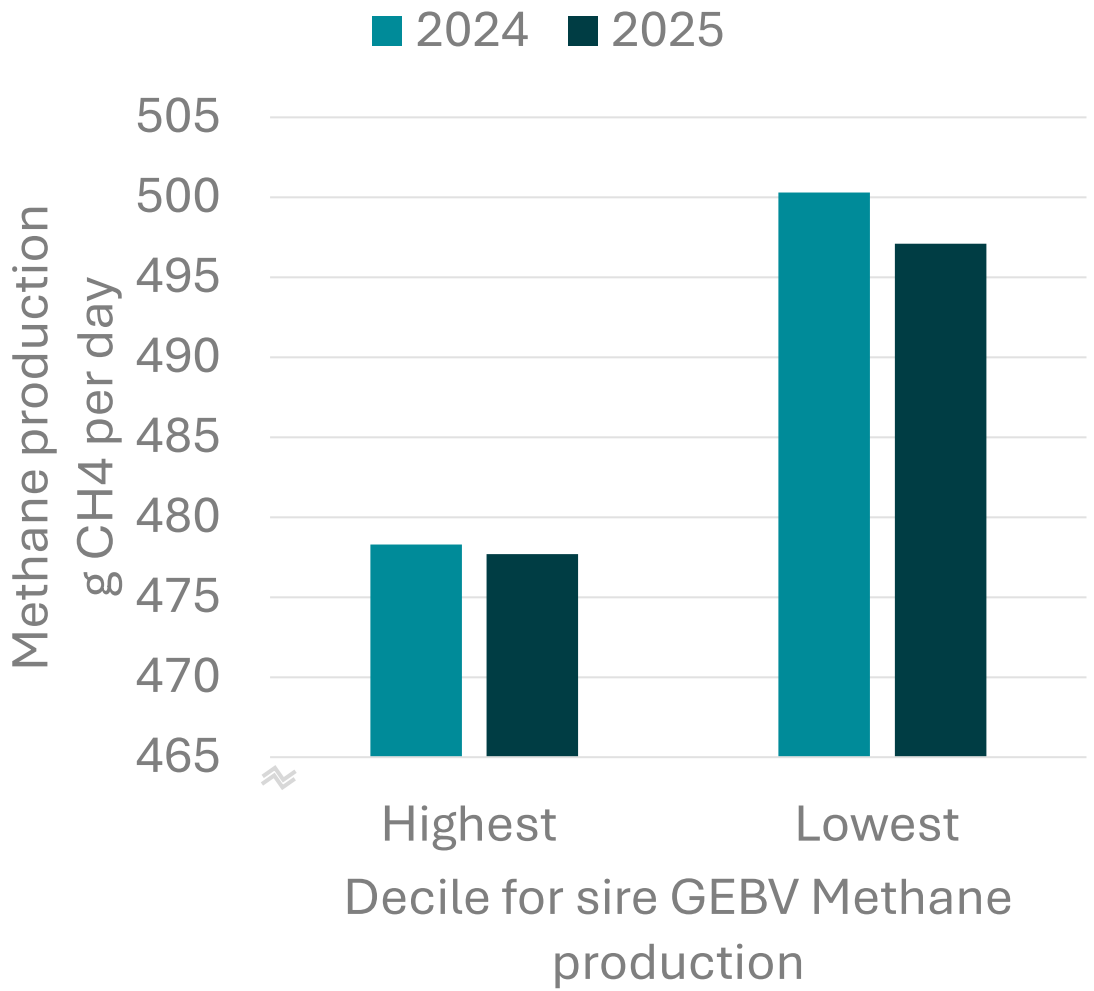
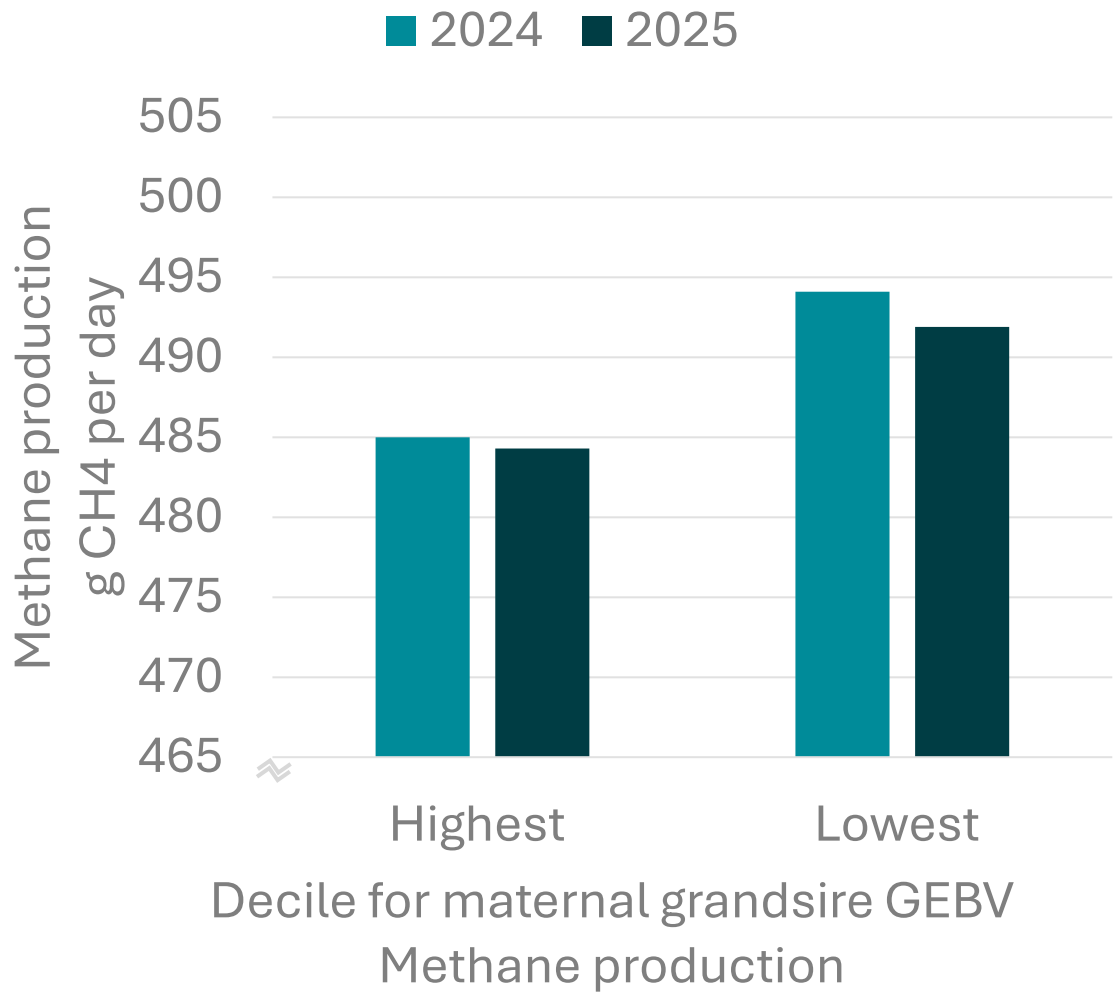
Consistent results for maternal grand sires





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Summary

Herd-level analyses

- Herds with desirable genetic trend for Methane have lower Methane emissions

Trans-generational analyses

- Sires with desirable breeding values for Methane get offspring with lower Methane emissions

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