Economics of breeding schemes for improved methane efficiency in dairy cattle

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Introduction

CH_4

- Perspective of a dairy producer, not genetics company
- Reduce methane emissions through genetic selection
- Methane genetic traits (being) developed
- No economic value (in the USA)
- Financial incentives needed(?)

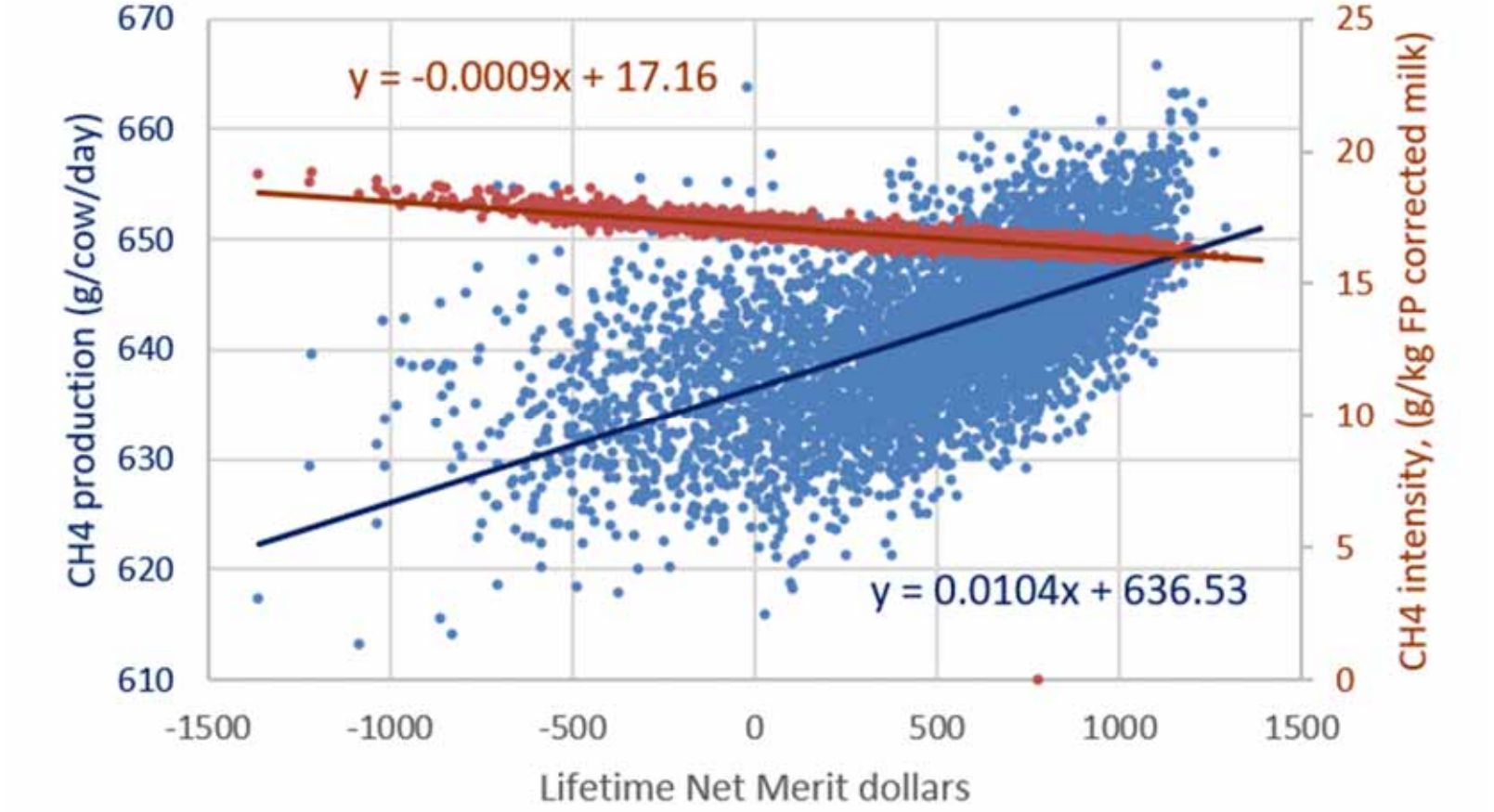
- Project goal: *Evaluate the economic impact of different breeding schemes related to methane reduction at the farm level. Determine financial support needed.*

Materials and Methods

- Commercially available sires for artificial insemination:
  - 4736 sires from 9 brands with April 2026 evaluation (selectsires.com)
  - Lifetime Net Merit economic selection index (NM$, 17 traits) https://www.ars.usda.gov/ARSUserFiles/80420530/Publications/ARR/nmcalc-2025_ARR-NM9.pdf
  - Including 340 sires with *Can. Methane Efficiency* trait (Lactanet, Semex)
- Methane production per sire:
  - CH4 = f(MILK, FAT, DPR, BWC, RFI, PL) *effect on dry matter intake*
  - CH4 = f() + g(Canadian Methane Efficiency trait) *residual effect*
- Select 100 sires on:
  - NM$ ($/lifetime), methane production (g CH_4/cow/day), and/or methane intensity (g CH_4/kg fat-protein corrected milk)

NM$, CH4 production, and CH4 intensity of 4736 sires
April 2026 evaluation

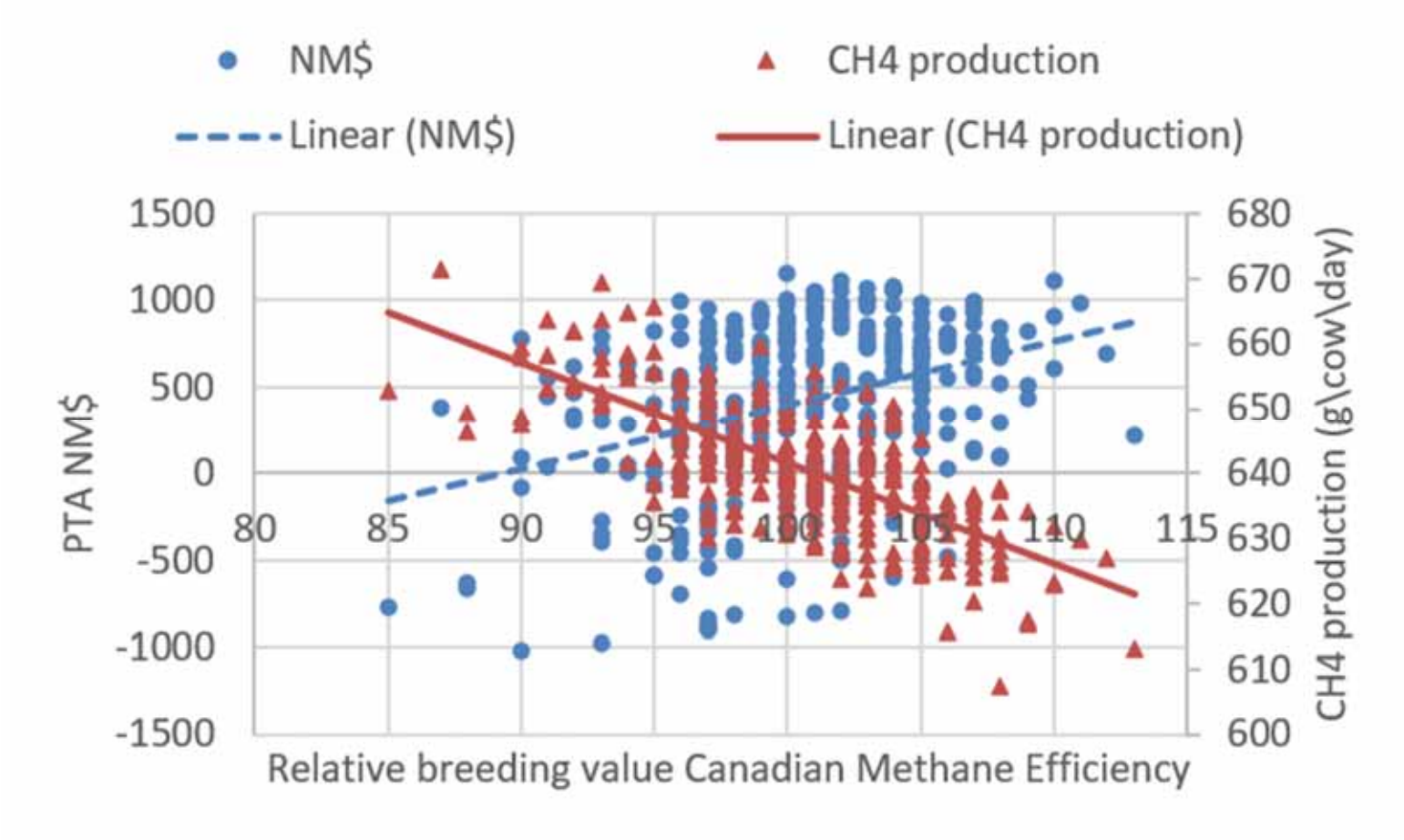
CH4 = f(MILK, FAT, DPR, BWC, RFI, PL) through dry matter intake



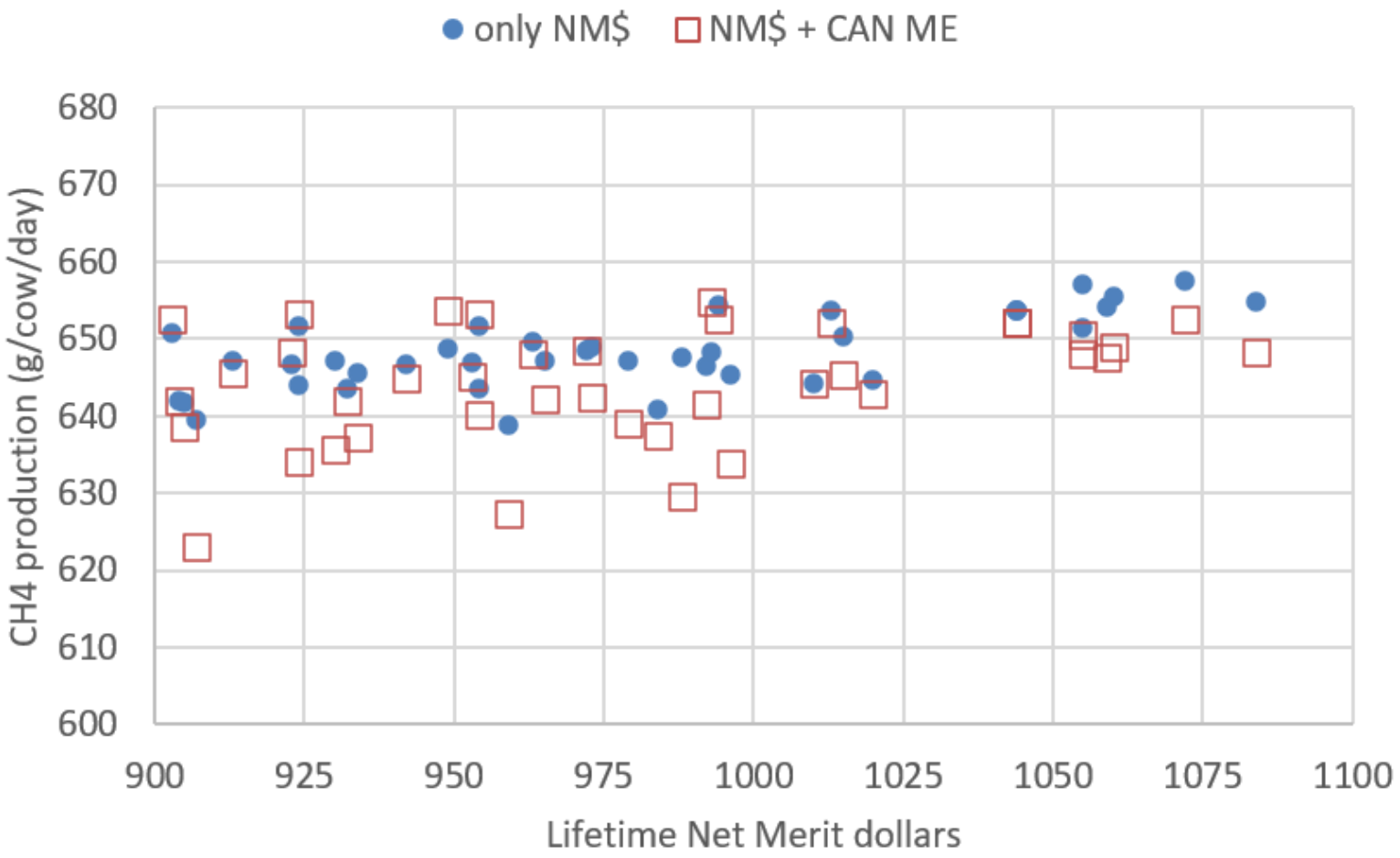
Average results of the top 100 out of 4736 sires ranked by 5 selection criteria

Selection criterion	NM$	CH4 production (g/cow per day)	CH4 intensity (g/kg milk)
100% on NM$	$1140	653	16.21
50% on CH4 production, 50% on NM$	$625	630	16.43
100% on CH4 production, 0% on NM$	-$145	624	17.26
50% on CH4 intensity, 50% on NM$	$1091	649	16.06
100% on CH4 intensity, 0% on NM$	$1014	645	16.04

340 sires with NM$ and Canadian Methane Efficiency evaluations (April 2026)



Effect of Canadian Methane Efficiency evaluation on CH4 production (sires 900≤NM$≤1100 shown)



Average results of the top 100 out of 340 sires ranked by 9 selection criteria

Selection criterion:	CAN.ME trait included?	NM$	CH4 production (g/cow/day)	CH4 intensity (g/kg milk)
100% on NM$		$891	646	16.34
50% on CH4 production, 50% on NM$	YES	$693	632	16.26
50% on CH4 production, 50% on NM$	NO	$663	638	16.46
100% on CH4 production, 0% on NM$	YES	$371	630	16.54
100% on CH4 production, 0% on NM$	NO	$89	634	16.95
50% on CH4 intensity, 50% on NM$	YES	$870	640	16.20
50% on CH4 intensity, 50% on NM$	NO	$879	645	16.31
100% on CH4 intensity, 0% on NM$	YES	$815	638	16.17
100% on CH4 intensity, 0% on NM$	NO	$843	645	16.29

Changes 2026 - 2056

	2026	2056	Change
Net Merit $	$891	$3110	+$2219
CH4 production	646	674	+28
CH4 intensity	16.34	14.85	-1.49

Assume genetic changes in the 17 traits in the NM$ index as calculated in
https://www.ars.usda.gov/ARSUserFiles/80420530/Publications/ARR/nmcalc-2025_ARR-NM9.pdf

Conclusions

1. Small reductions in CH4 production and CH4 intensity is possible through emphasis on conventional traits, at high NM$ cost
2. Inclusion of Canadian Methane Efficiency trait reduced CH4 production and CH4 intensity, still at some NM$ cost
3. Financial support needed: equal to reduction in NM$(?)

Thank you