Genetic correlation between methane production and Saved Feed index

Martin Lidauer, Riitta Kempe, Maria Leino, Napoleon Vargas, Enyew Negussie

Natural Resources Institute Finland (Luke)

NAV Workshop Dairy Cattle, Copenhagen, 20 January 2026

Contents

Recording methane

GreenFeed devices

- New Jokioinen research barn, 180 cows (RDC): 3
- Helsinki research barn, 60 cows (RDC): 1
- Kiuruvesi, commercial farm, 240 cows (RDC+HOL) 1

Yet, **137 000 daily GreenFeed methane measurements from 318 RDC cows**

Sniffers

- 2 equipment and 3 equipment (with multiplex system) are procured

Methane research projects

- **DigiDairy:** → establishing methane emission recording on commercial farms (LivingLabs)

  → estimation of genetic parameters for methane traits using research farm data

- **Global methane Genetics**: → Nordic consortium on mitigating CH_4 from RDC (Sweden, Finland, Denmark, Norway + Canada and UK)

- **DairyCross:** → trends in methane emissions from Finnish cattle sector

Genetic correlations between methane production and Saved Feed index

Data

- 537 primiparous RDC cows with 20,665 weekly feed efficiency records (recorded at Luke Jokioinen research farm)
- 107 cows had 2,604 weekly CH_4 records, derived from 16,395 daily records
- CH_4 records were collected by 2 GreenFeed equipment

Weekly averages	N	Mean	SD
Dry matter intake (DMI, kg)	16 904	20.02	2.87
Energy corrected milk (ECM, kg)	20 665	29.54	4.49
Body weight gain (BWG, kg)	15 645	0.35	0.24
Methane production (MP, kg)	2 604	0.44	0.07

Genetic correlations between methane production and Saved Feed index

Statistical model

- Multi-trait repeatability animal model
  - Fixed effects: regression function on days in milk, calving age, production year x month
  - Random effects: permanent environment, additive genetic animal, residual
  - DMU was used for the REML analysis

Assessed Saved Feed indices

- Saved Feed index $_{\mathbf{NAV}}$: $SF_{NAV} = -(aDMI) + 0.40 \times aECM + 4.00 \times aBWG$
- Saved Feed index $_{\mathbf{Luke}}$: $SF_{Luke} = -(aDMI) + 0.43 \times aECM + 3.09 \times aBWG$
  (based on new Luke feeding tables, Luke 2026,
  1 kg DM has on average 11.5 MJ ME)

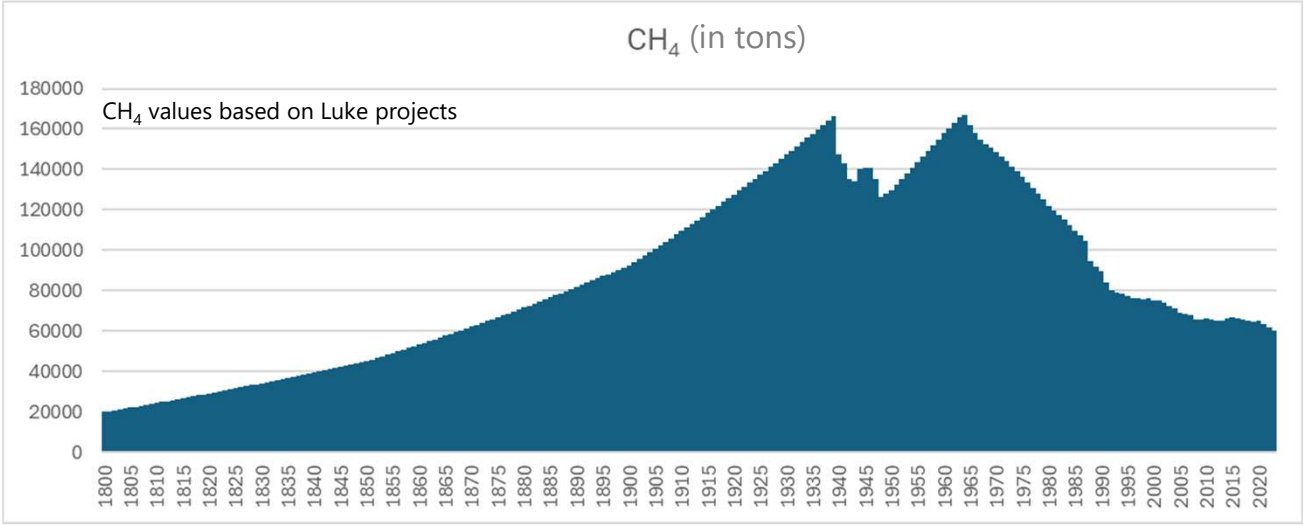
Genetic correlations between methane production and Saved Feed index

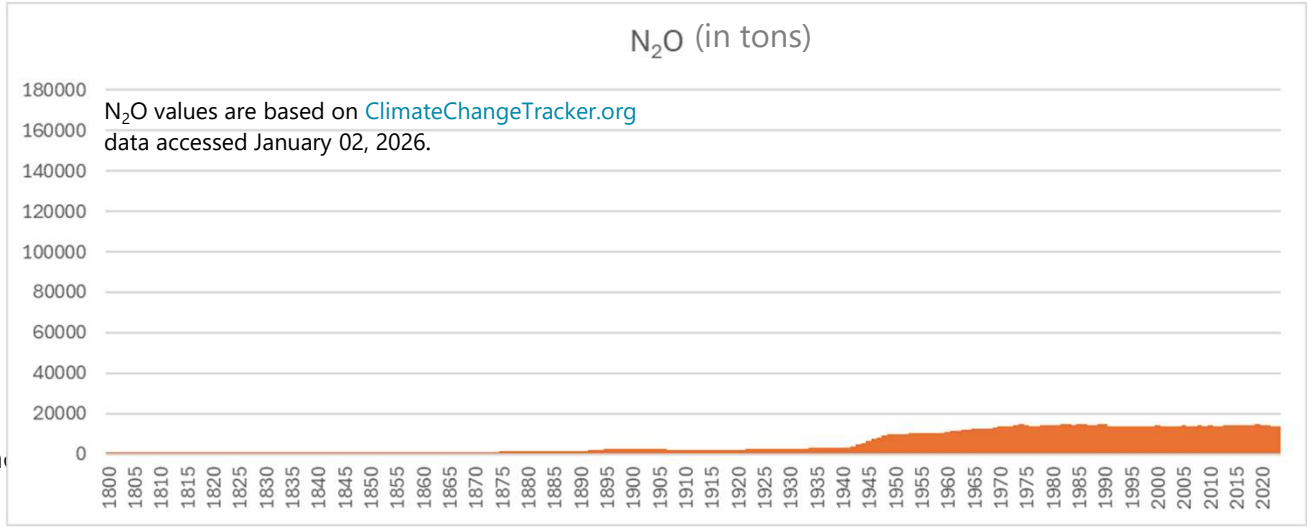
Results

	h^2		Genetic correlations				
			ECM	BWG	MP	SF_{NAV}	SF_{Luke}
Dry matter intake (DMI)	0.30		0.72	0.22	0.76	-0.46	-0.33
Energy corrected milk (ECM)	0.43			-0.43	0.26	0.18	0.38
Body weight gain (BWG)	0.30				0.52	-0.47	-0.66
Methane production (MP)	0.38					-0.65	-0.61
Saved Feed index $_{NAV}$	0.08						0.96
Saved Feed index $_{Luke}$	0.10						

Methane and nitrous oxide emissions from Finnish Agriculture

Yearly CH_4 and N_2O emissions from Finnish agriculture





Luke

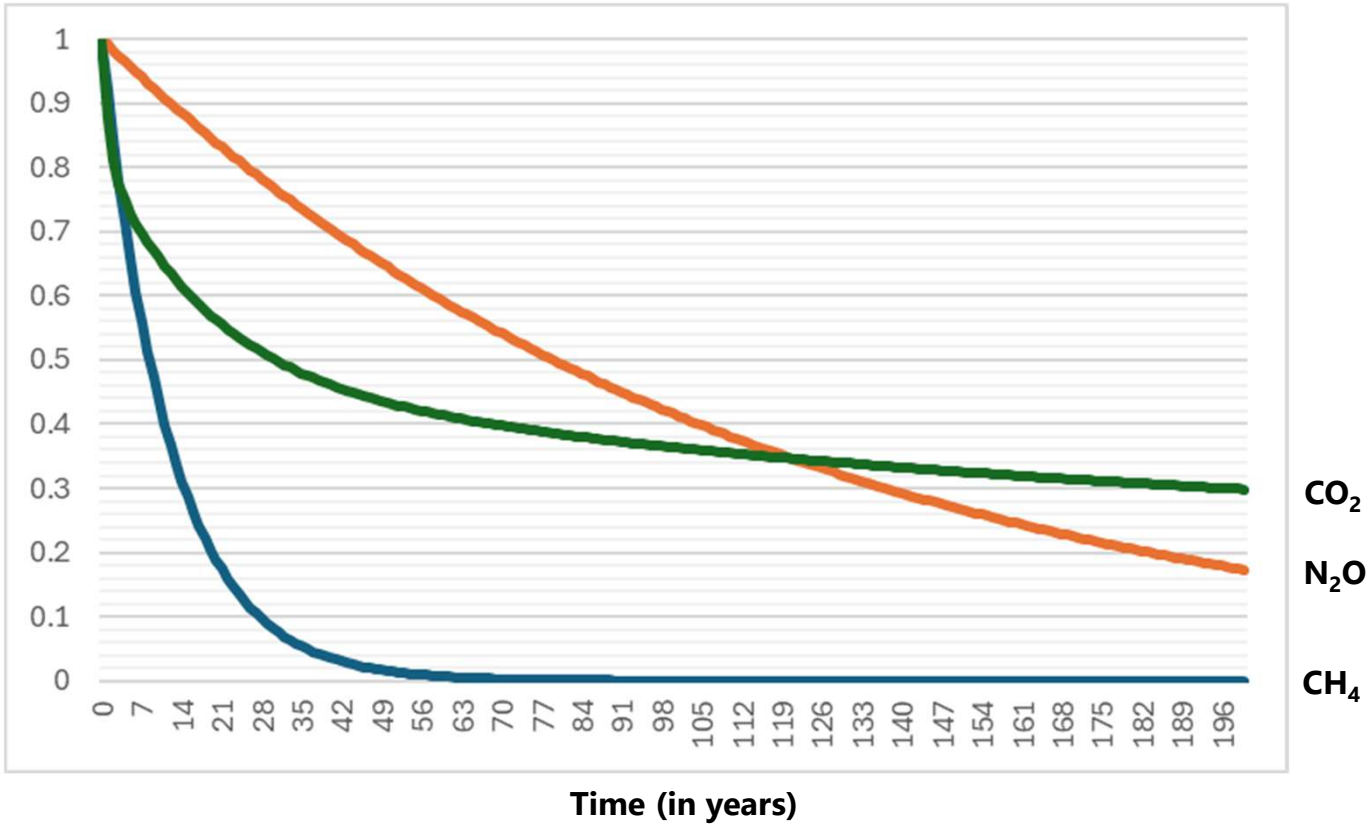
NAV Worksh

Methane and nitrous oxide emissions from Finnish Agriculture

Removal/decay of GHG in the atmosphere

Bern model

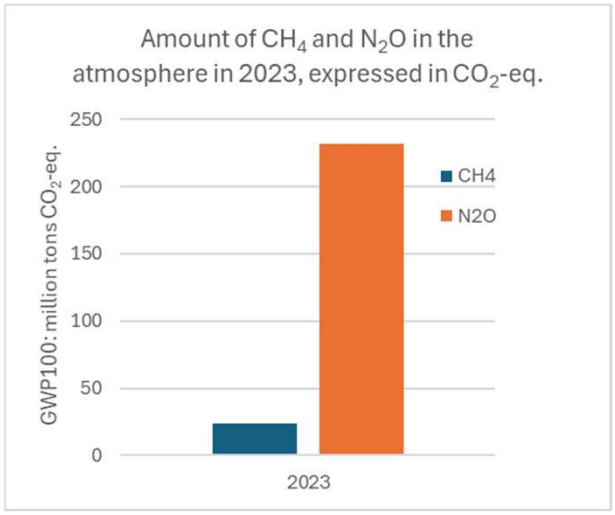
Edwards, M., Trancik, J. Climate impacts of energy technologies depend on emissions timing. *Nature Clim Change 4, 347–352 (2014)*. https://doi.org/10.1038/nclimate2204

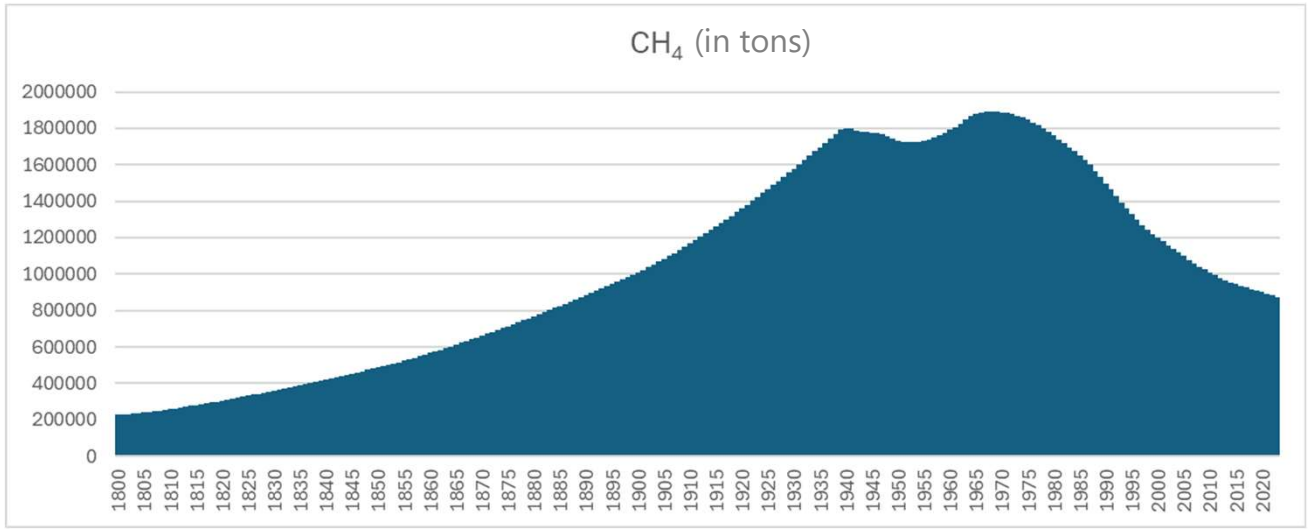


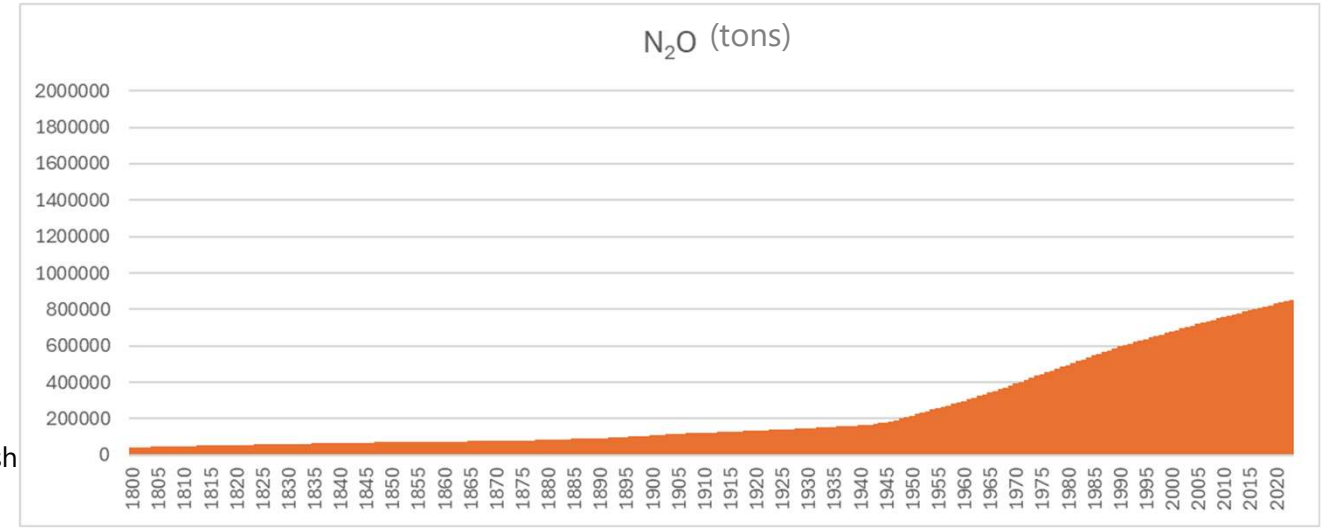
Methane and nitrous oxide emissions from Finnish Agriculture

Amount of CH_4 and N_2O in the atmosphere at a given year

(Amount that originated from the Finnish agriculture)







Luke

NAV Worksh

Thank you!

Funding
Luke
DigiDairy project partners (Valio Ltd, VikingGenetics)
Suomen naudanjalostussäätiö
Niemi-säätiö

luke.fi