

# Methane phenotyping in Finland

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# Gaseous measurements in Finland

## ➤ Focus on gasses

- Carbon dioxide (CO<sub>2</sub>)
- Methane (CH<sub>4</sub>)
- Oxygen (O<sub>2</sub>) and
- Hydrogen (H<sub>2</sub>)

## ➤ Measurement of CO<sub>2</sub>

- Alternative measure of FE

## ➤ Measurement of O<sub>2</sub>

- Indirect calculation of HP

## ➤ Measurement of H<sub>2</sub>

## ✓ Measurement of CH<sub>4</sub>

- Understanding the basics of livestock system emissions
- **Direct individual animal measurements**
- Emission trend monitoring
- Mitigation options and
- National inventory



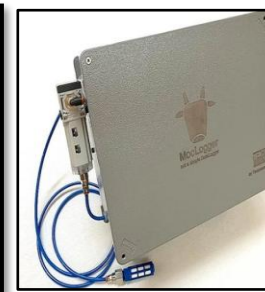
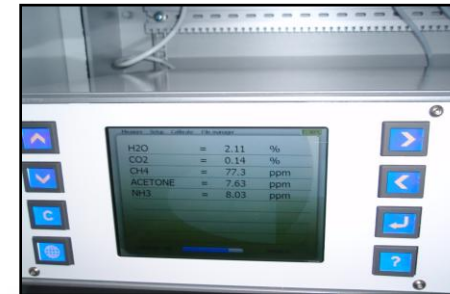
# CH<sub>4</sub> measurement techniques

- CH<sub>4</sub> – difficult & costly gas to measure in individual animals
- No routine on-farm recording & large-scale records are rare
- Success in mitigation depends in part, on our ability to measure it accurately.

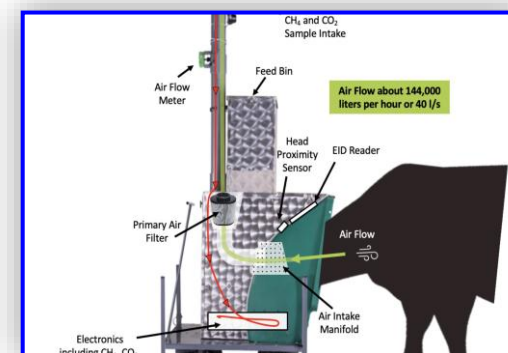


**Cattle respiration chamber**

**Sniffers**



METHOD	ROBUST	COST	THROUGHPUT	INTRUSIVE	ACCURACY
Respiration chamber	👍	👎	👎	👎	👍
GreenFeed	👍	👎	👍	👍	👍
SF <sub>6</sub>	👍	👎	👍	👎	👍
Sniffer methods (CH <sub>4</sub> /CO <sub>2</sub> )	👍	👍	👍	👍	👎

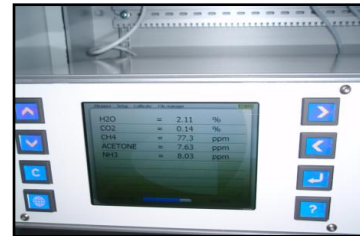


**GreenFeed**

# CH<sub>4</sub> Measurement techniques : Luke



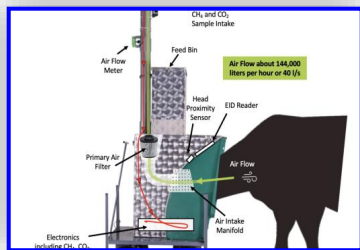
Cattle respiration chamber



F10 multigas analyser, Gasera Oy, Turku, Finland)



NG Guardian, Edinburgh instruments



GreenFeed, C-Lock, South Dakota, USA

# GreenFeed(GF) techniques – since 2021



## 1. Luke invested in 5 GF units

3 GF units at Luke Minkio dairy farm

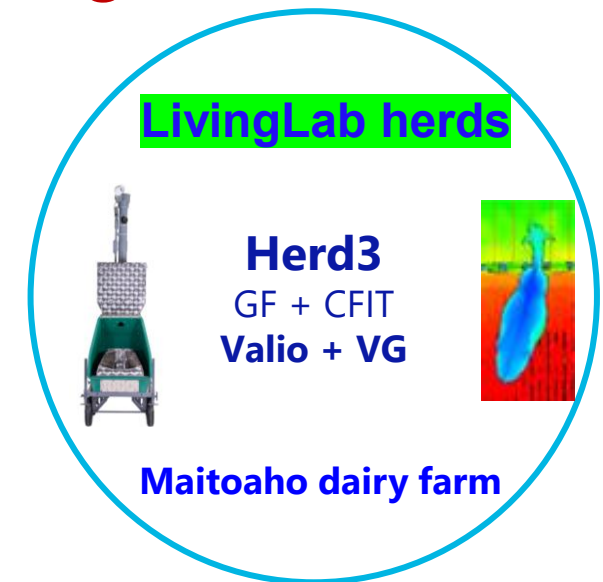
2 GF units in Luke Maaninka dairy farm

## 2. University of Helsinki

1 GF unit integrated with milking Robot

## 3. Maitoaho Living Lab farm

1 GF unit



# GF CH<sub>4</sub> phenotyping in Finland : Current status

Herd	Approx. No. Of cows	No. Of GreeFeed units	Current status GF units
Luke Jokioinen	130	3	Paused, new barn building
Luke Maaninka	55	2	Recording, feeding expt
University of Helsinki	66	1	Recording
Maitoaho Living Lab	130+115	1	Recording
Keskitalon Tila Living Lab	200	-	-

# Current GF CH<sub>4</sub> data in Finland : 1<sup>st</sup> Lact RDC cows

Farms	No Cows With records	No GFs	Repeated daily records	Average daily records	DMI
Luke, Minkio dairy barn	217	3	136 000	40 674	Yes
Maitoaho Living Lab	130	1	22 559	9 608	CFIT
Helsinki university	23	1	8 712	3 864	Yes
<b>TOTAL</b>	<b>370</b>	<b>5</b>	<b>167 271</b>	<b>54 146</b>	

# CH<sub>4</sub> research

## ➤ Trait definitions

- Methane production **MeP** (gCH<sub>4</sub>/day)
- Methane intensity **MeI**, (gCH<sub>4</sub>/kg milk)
- Methane yield (**MeY**, gCH<sub>4</sub>/kg DMI)
- Residual Methane Production (**RMP**, g/d)

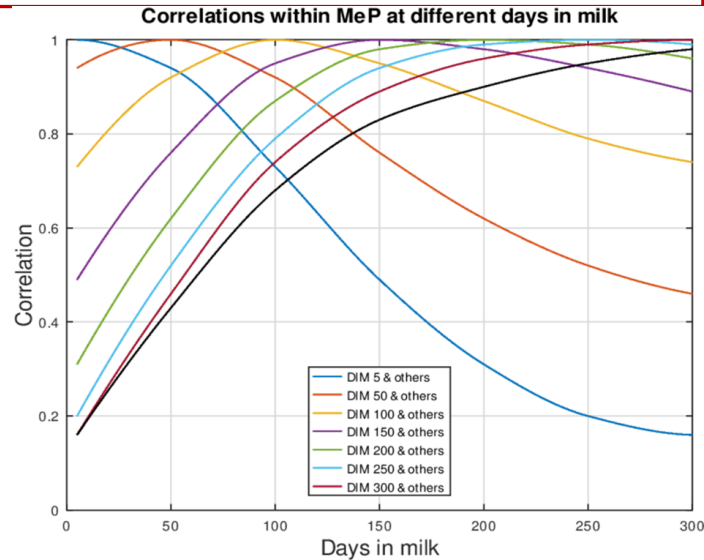
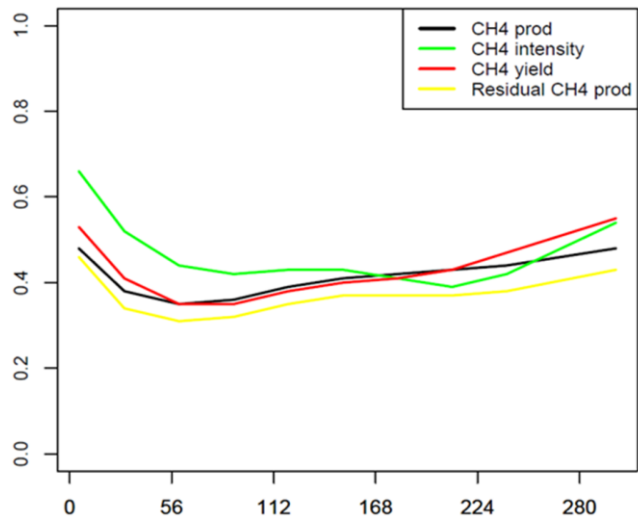
$$\text{MeP} = b_1 \text{DMI} + b_2 \text{Milk} + b_3 \text{mBW} + \varepsilon$$

$$\text{RPM} = \hat{\varepsilon}$$

## ➤ Genetic parameters & associations, genomic predictions

## CH<sub>4</sub> traits

Traits	Mean	SD
<b>MeP</b>	423.5	94.4
<b>MeI</b>	14.3	3.1
<b>MeY</b>	22.0	3.6
<b>RMP</b>	0.0	66.9



# Future CH<sub>4</sub> phenotyping plans

- **Continuation of GF phenotyping:**  
in Luke farms & Living Lab herds

- **Sniffers for CH<sub>4</sub> phenotyping:**
  - ✓ GMG\_RDC initiative: Three units of NG Guardian sniffers(Multiplex)
  - ✓ Two sniffer units from previous

- **Installation & recording plan**

- At Luke Jokioinen new barn - Aug/Sep
- HU one unit installed in July/Aug
- 2 units installed at Living labs
- Expect 1000's of records, hundreds of cows – end 2026



# Thank you!