International collaborations for breeding for novel traits

Yvette de Haas

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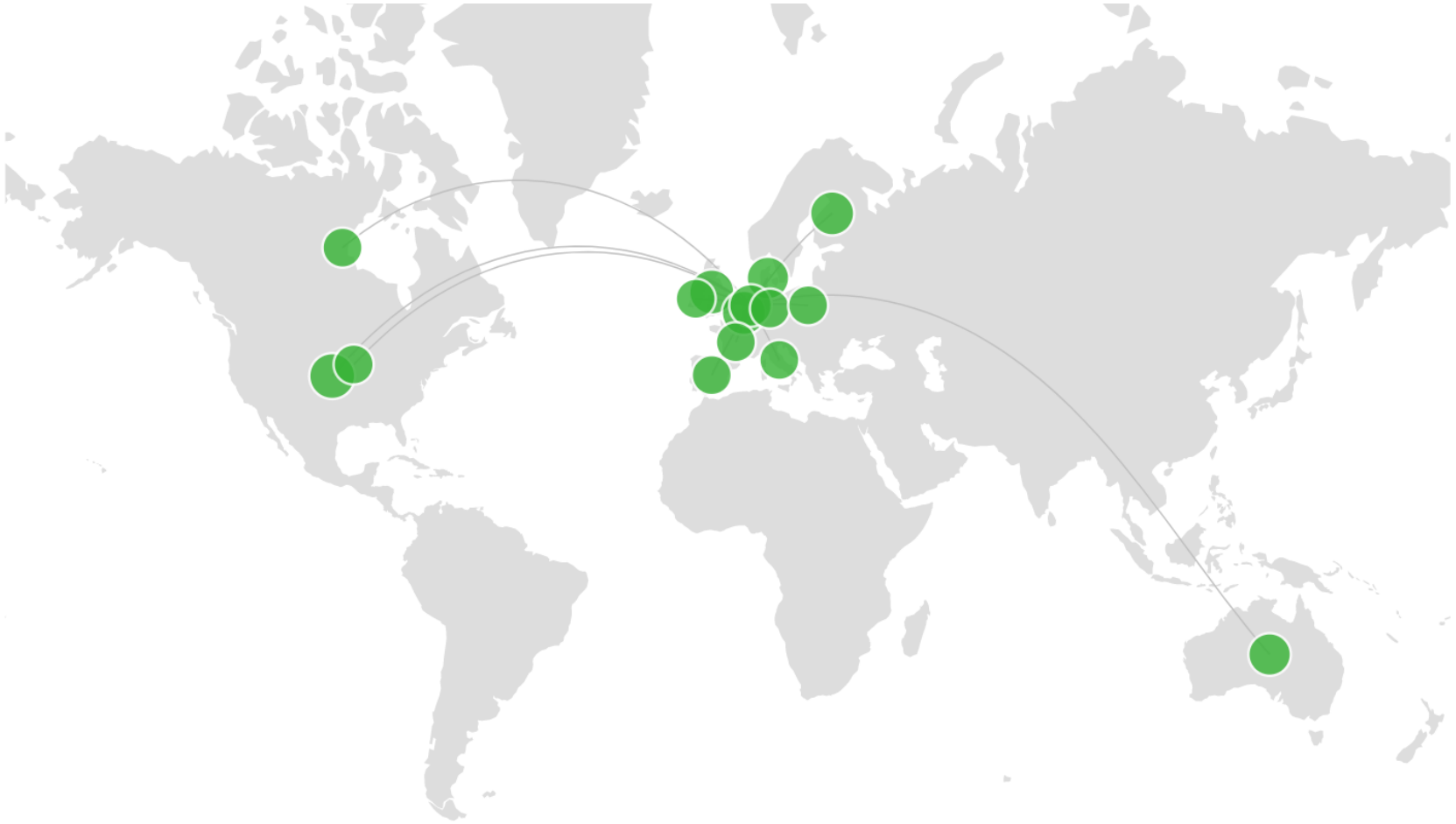
International collaborations for breeding for novel traits



International collaborations for breeding for novel traits

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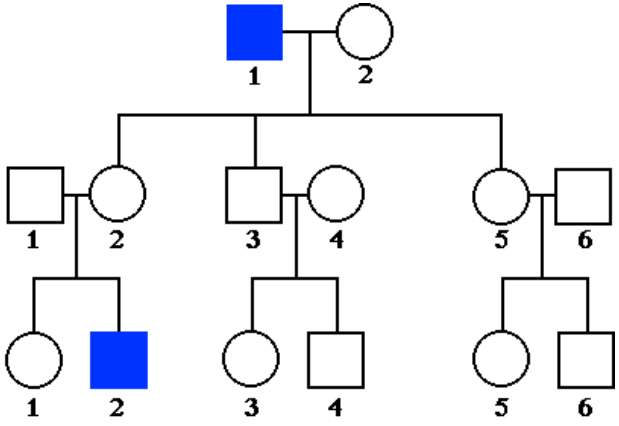
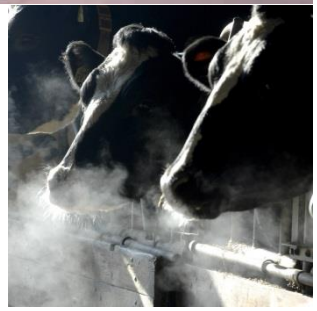
Traditional breeding

Pedigree



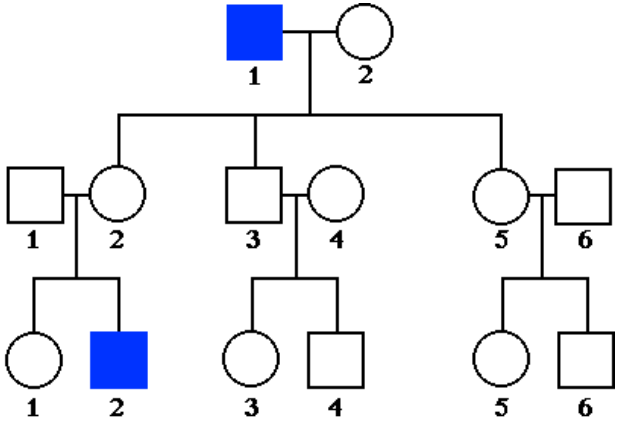
Phenotypes

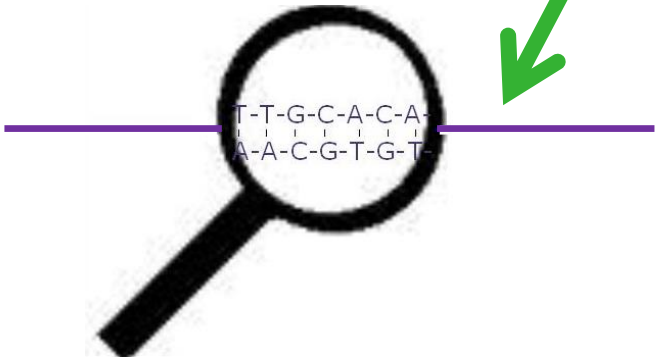


Estimated breeding value (BLUP)

Genomic selection

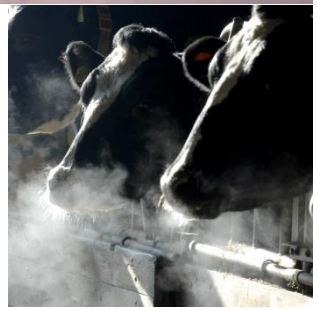
Pedigree





Genomic breeding value

Phenotypes



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Initiatives to enlarge the reference pop.

METHAGENE

gDMI (2012 – 2015)

Reliability of genomic selection r^2(GEBV,TBV)

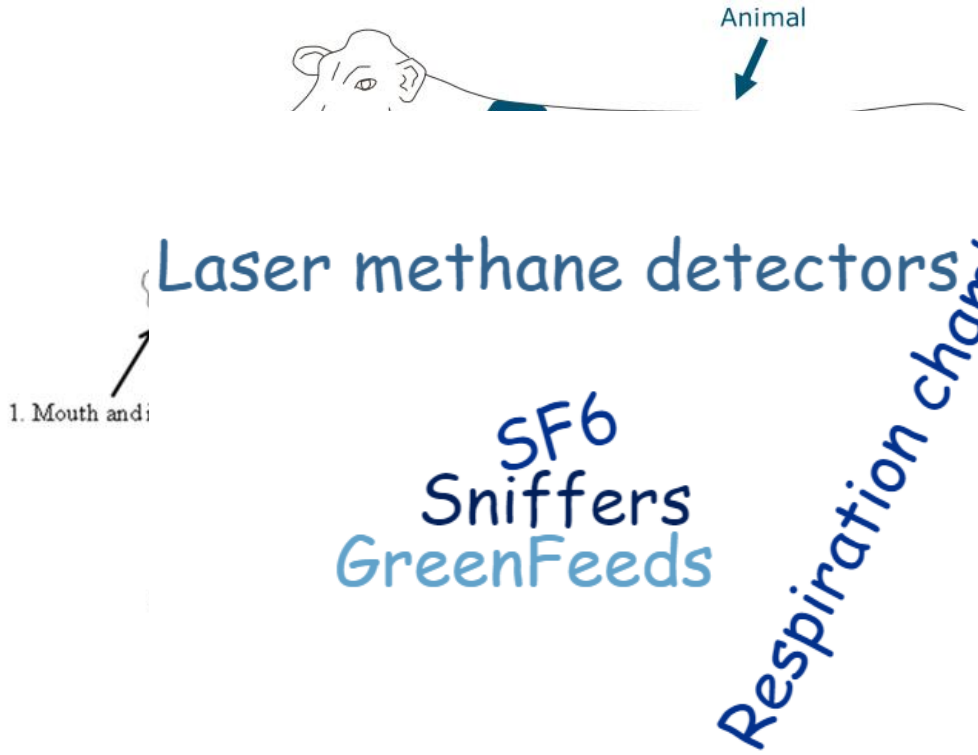
	CAN	DNK	AU_h	NZ_h	GER	IOWA	IRL	NLD	UK	WISC
Rel	0.23	0.20	0.17	0.22	0.25	0.25	0.26	0.30	0.30	0.24
SE	0.09	0.07	0.03	0.05	0.05	0.06	0.05	0.04	0.08	0.07

	Average
Reliability	0.24
Standard error	0.06

De Haas et al. (2015) JDS 98: 6522–6534

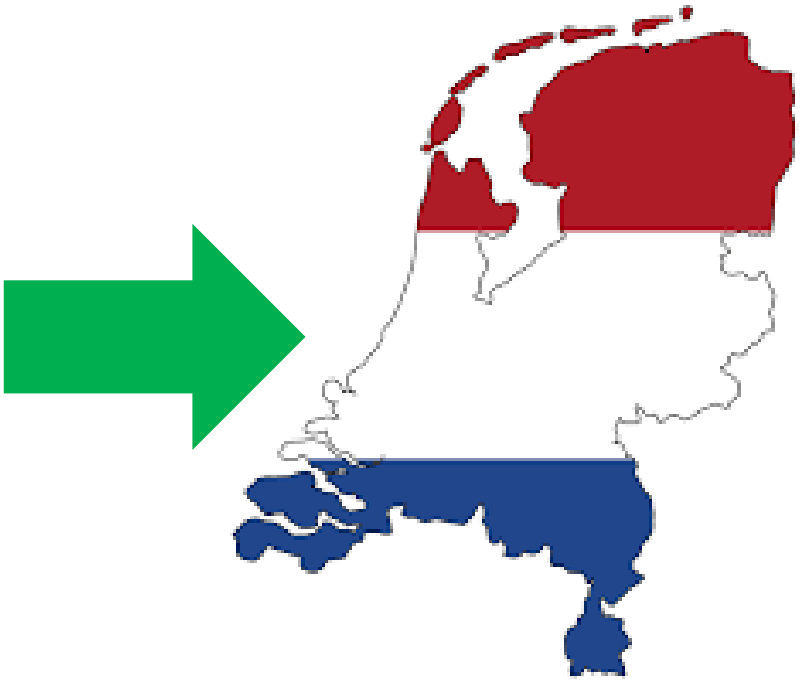
METHAGENE (2013 – 2017)

- Methane determining factors
- Methane phenotypes / trait definitions
- Methane proxies
- Methane recording de



- Benefit for producers

From global to national




3583.
3583.

In The Netherlands

We developed (a procedure to predict) feed intake (DMI) breeding values for Dutch bulls and cows

First genetic evaluation in 2014

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CRV

DMI data

- Data from 1990 onwards:
  - Data providers
    - Wageningen Livestock Research
    - ILVO
    - Trouw Nutrition
    - Schothorst Feed Research
    - AVEVE
  - CRV
    - Alders herd – 240 cows
    - in 2019: 4 more herds to follow

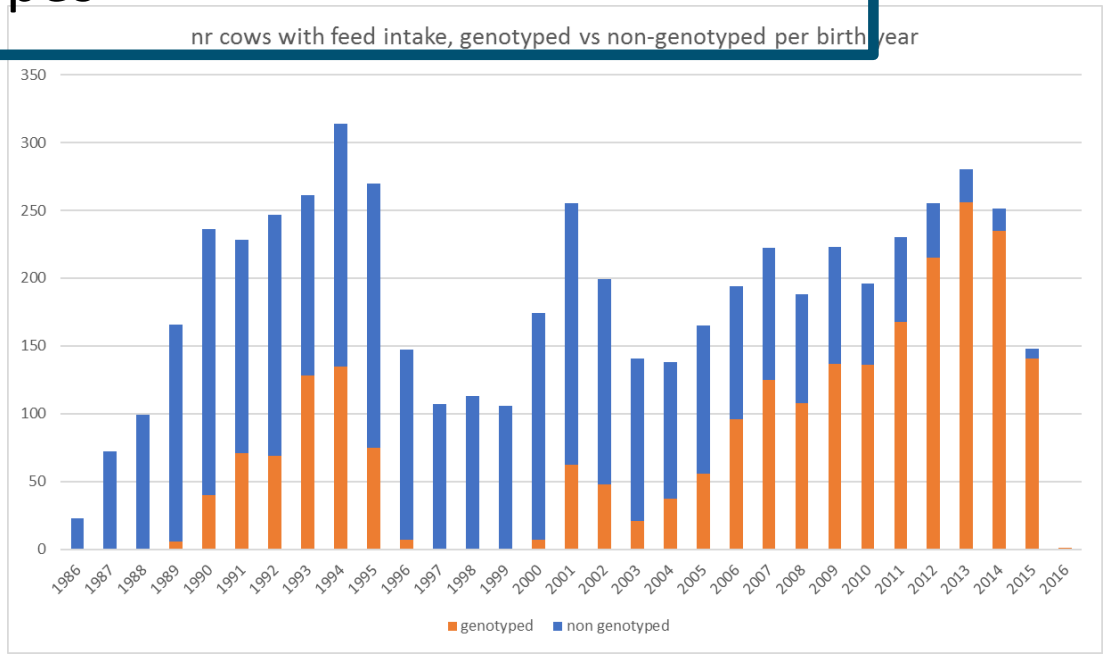
DMI data in December 2018

5649 cows with DMI data

- 2380 cows with data and genotypes
- 3269 cows with data without genotypes

5649 total cows from 1085 sires

- 530 sires with genotypes
- 555 sires without genotypes



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Predictor traits

- Genomic EBV DMI directly from DMI genetic evaluation combined with national EBV for four predictor traits:
  - Kg milk
  - Kg fat
  - Kg prot
  - Live weight

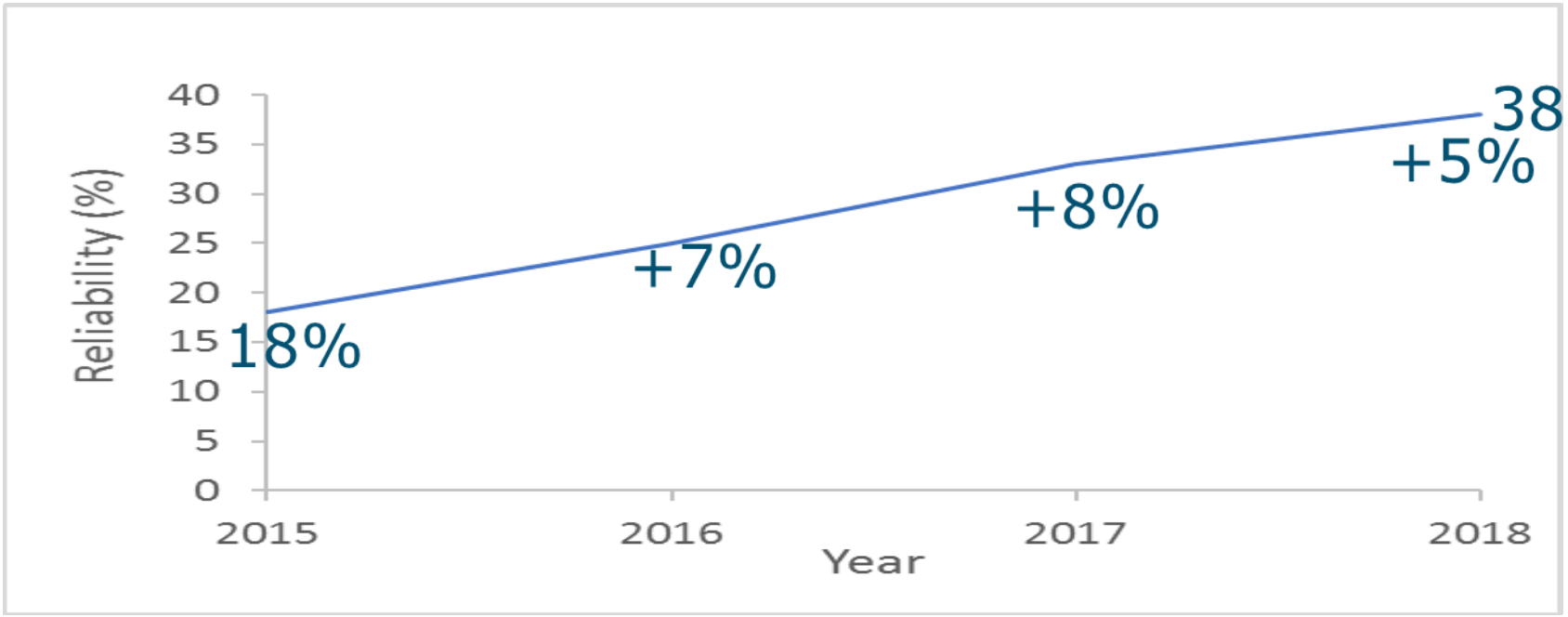
Genetic correlations

	DMI1	DMI2	DMI3
Kg milk	0.55	0.58	0.56
Kg fat	0.58	0.60	0.58
Kg prot	0.59	0.61	0.59
Live Weight	0.67	0.45	0.41

- Selection index weighted based on reliabilities
- Model reliabilities

Reliabilities DMI – only genomics

2015	2016	2017	2018
55,437 rec	+ 22,391 rec	+ 51,610 rec	+ 30,510 rec
2,249 anim	+ 965 anim	+ 1,149 anim	+ 1,082 anim
123 exp	+ 429 exp	+ 368 exp	+ 182 exp
2,922 lact	+ 1,502 lact	+ 2,529 lact	+ 1,409 lact



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Saved Feed Cost (SFC)

- SFC = saved feed cost for maintenance
  = feed intake – feed for production

  -> feed for:
  maintenance
  difference in digestion
  activity

- Unit: euro/lactation

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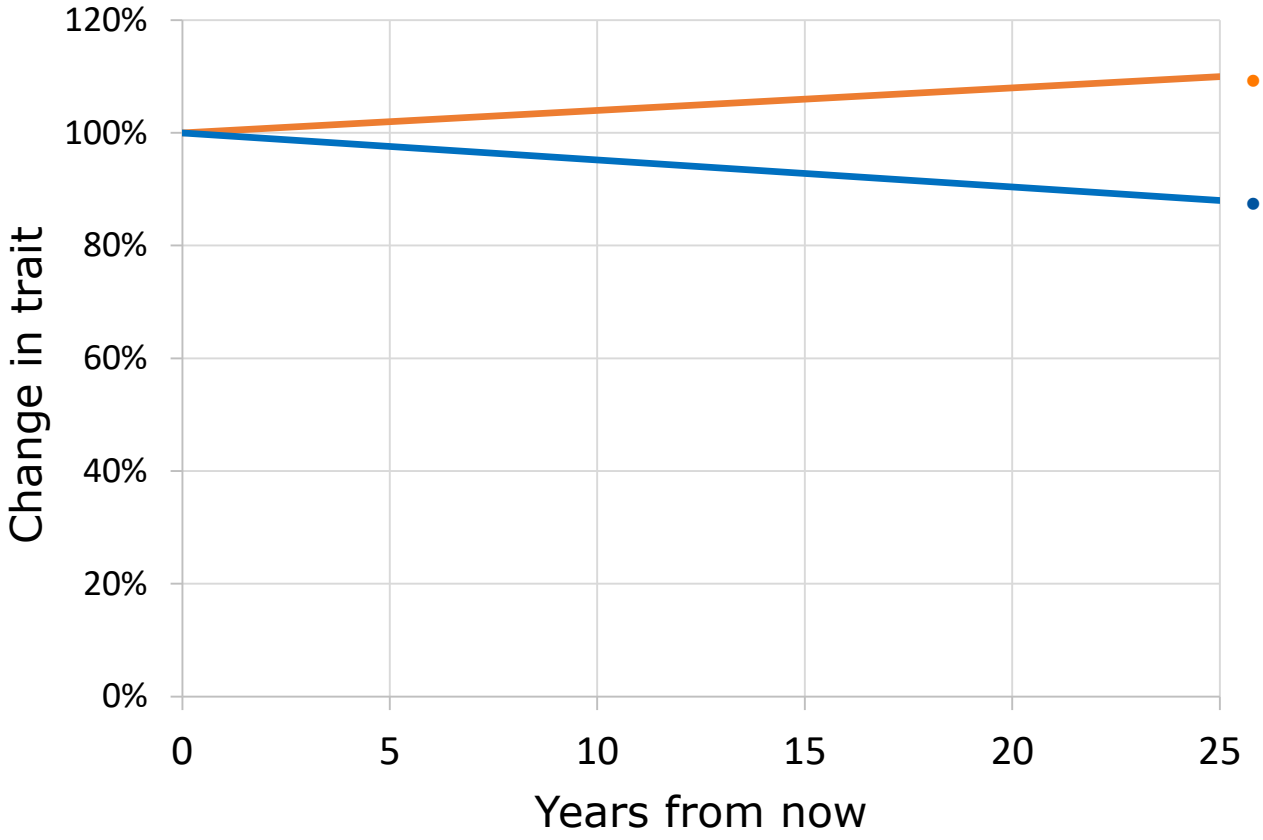
Climate agreement - *klimaatakkoord*

- **Objective** (for NL) is to achieve a greenhouse gas (GHG) emission reduction of 49% in 2030 (compared to 1990) (*and of 95% in 2050)*

- In 1990 – total GHG emissions were 228 megaton CO_2-eq
- In 2030: this has to be reduced to 116 Mton
  - The current mitigation strategies will enable a reduction to 165 Mton
  - The climate agreement has to bridge the gap of 49 Mton

If we continue to do what we already do:

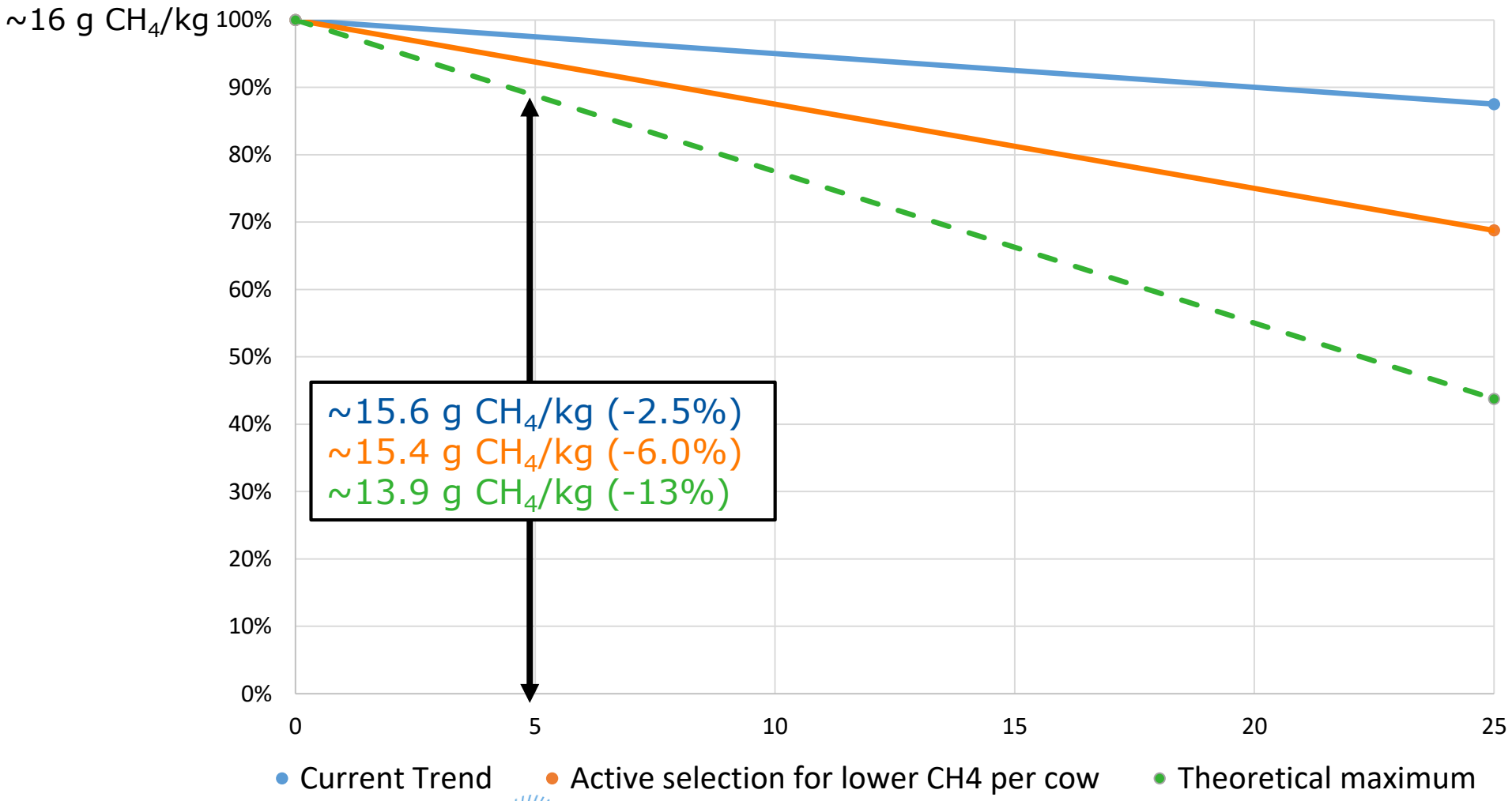


- Methane, g/d
- Methane, g/kg milk

Current pop. means:

CH_4: 392 g/d
Milk: 9000 kg (305 d)
Intensity:
16g CH_4/kg milk

This is what breeding can do:



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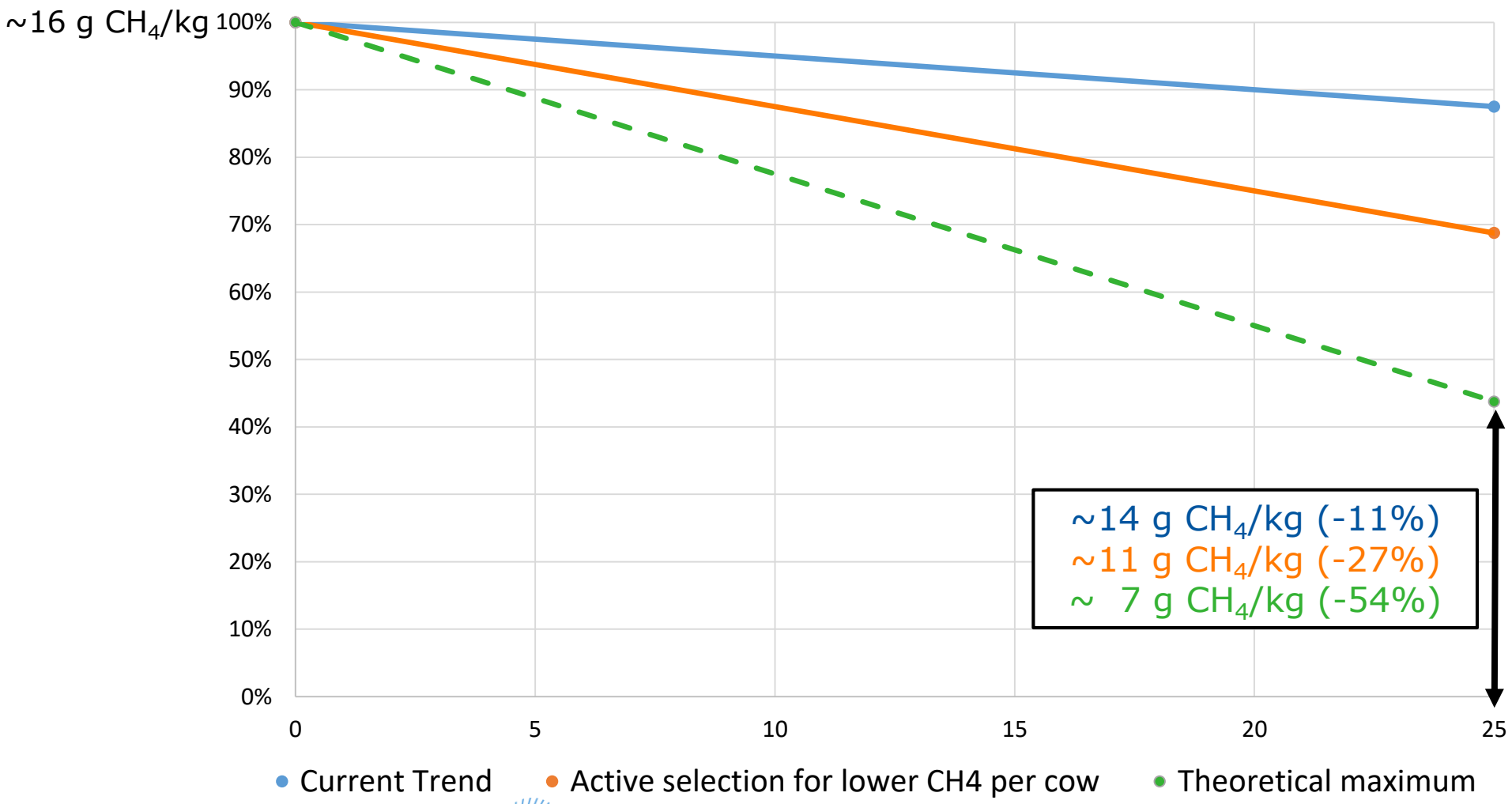

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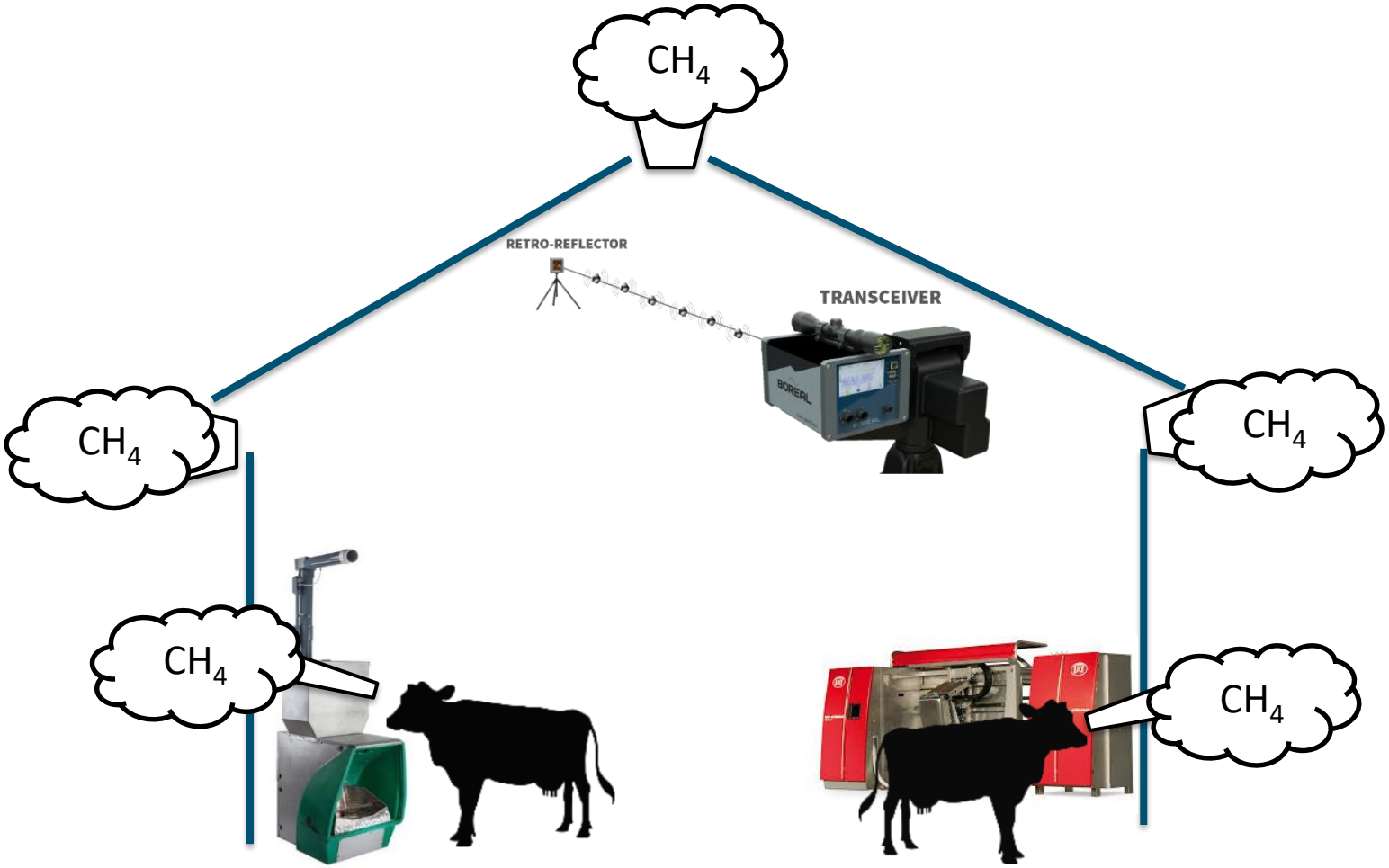
That is why we are collecting data on farm



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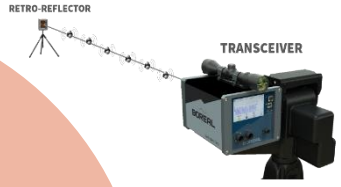


Barn
(18)

5

11

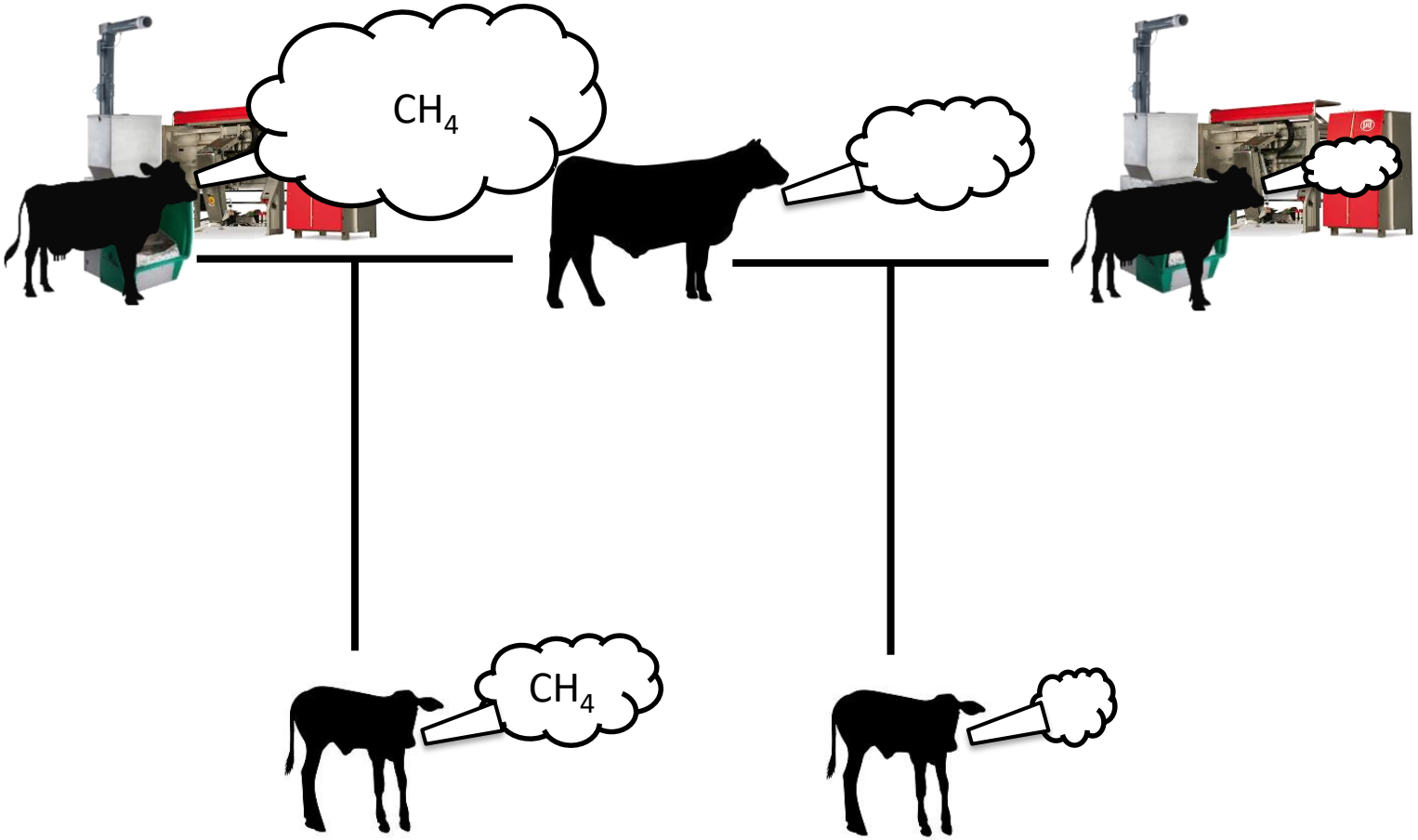
3

GreenFeed
(18)

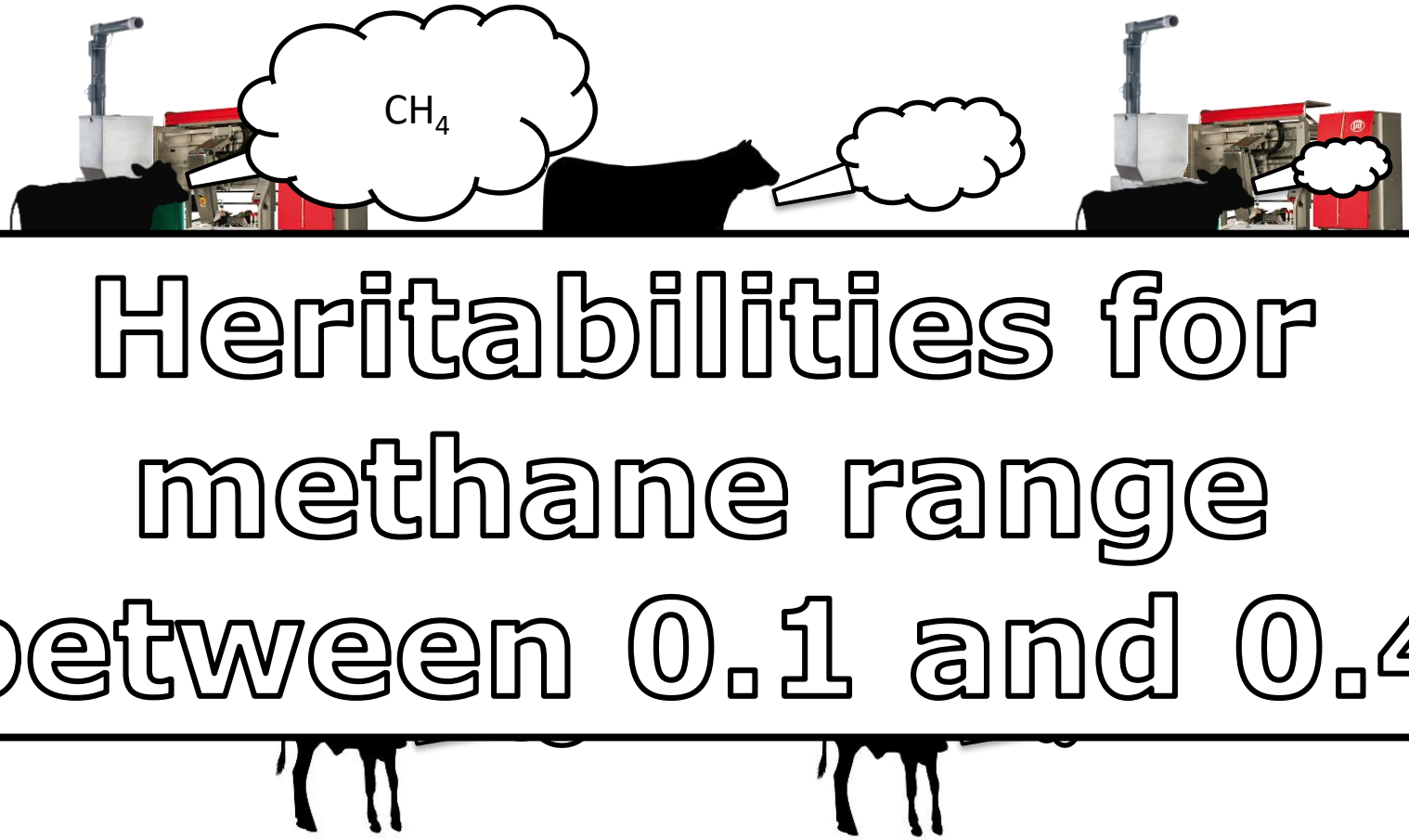
8

Sniffer
(15)

Towards a breeding value for methane

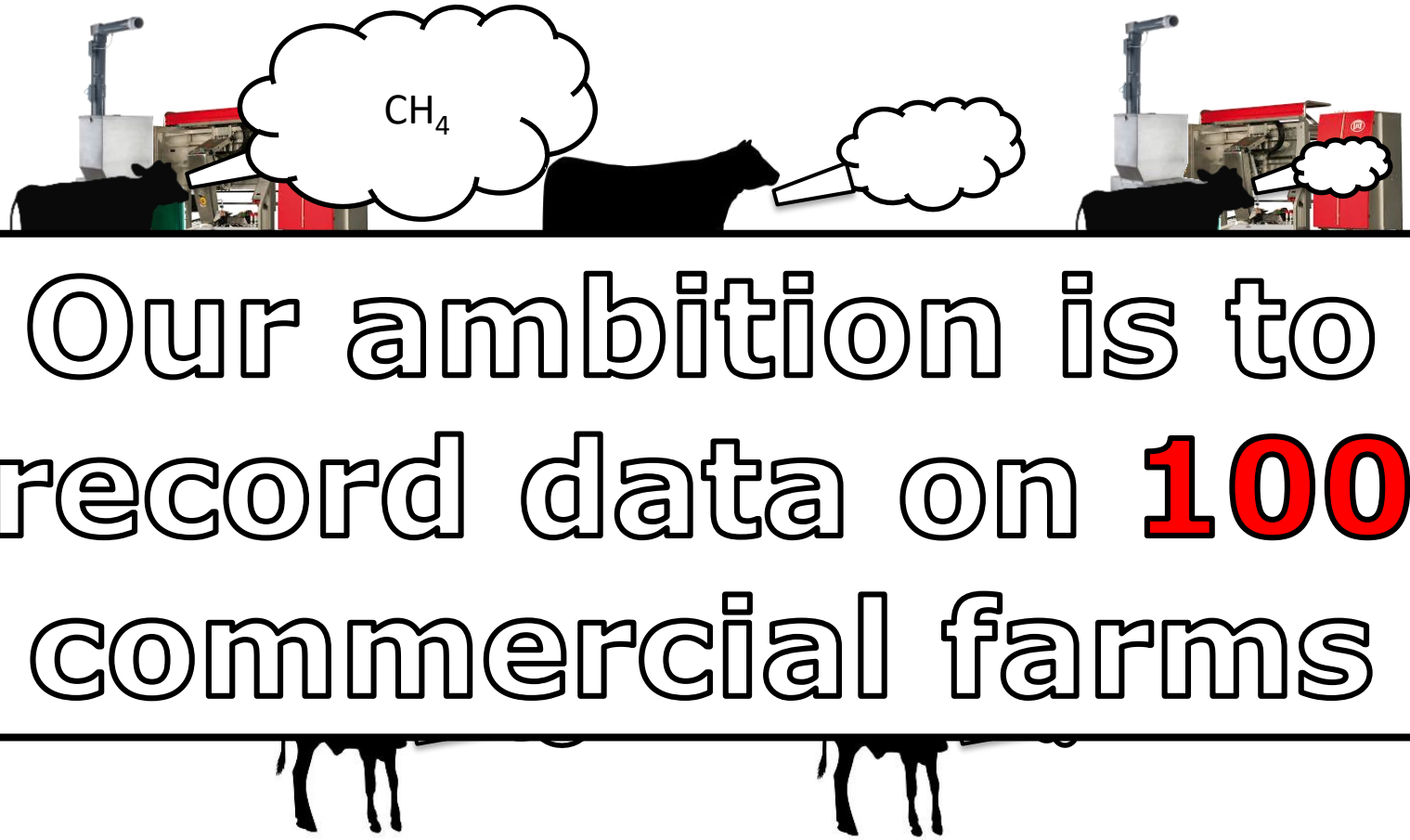


Towards a breeding value for methane



Heritabilities for methane range between 0.1 and 0.4

Towards a breeding value for methane



Our ambition is to record data on 100 commercial farms

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Take home messages

- Genomics did open the era of breeding for novel traits
  - Large reference populations are still needed
  - International collaborations help with these
- Successful publication of EBV for feed intake and feed efficiency in the Netherlands
- Working towards breeding as mitigation tool to reduce enteric methane emissions of dairy cattle

Thank you!

World Congress on Genetics Applied to Livestock Production
Rotterdam | The Netherlands
3 - 8 July 2022

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