BREEDING THE WAY TO
LOW METHANE COWS

Euroopa Maaelu Arenguks
Põllumajandusfond:
Euroopa investeeringud
maapiirkondadesse

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Who Am I?

- **Peter van Beek, MSc**
  International Sales Manager
- Born and raised on a dairy farm in south of the Netherlands
- Obtained a Master degree in Animal Sciences at Wageningen University
- Specialized in genetics, young calf nutrition and dairy farm economics

EVOLUTION OF SELECTION

- *What does the bull's mother look like?*
- *What do his daughters look like?*
- *Does she milk enough?*

Today The Landscape Is Changing

- We take it all for granted
- Now select for lower antibiotic use via Immunity+®, economic and environmental traits and benchmark progress genomically

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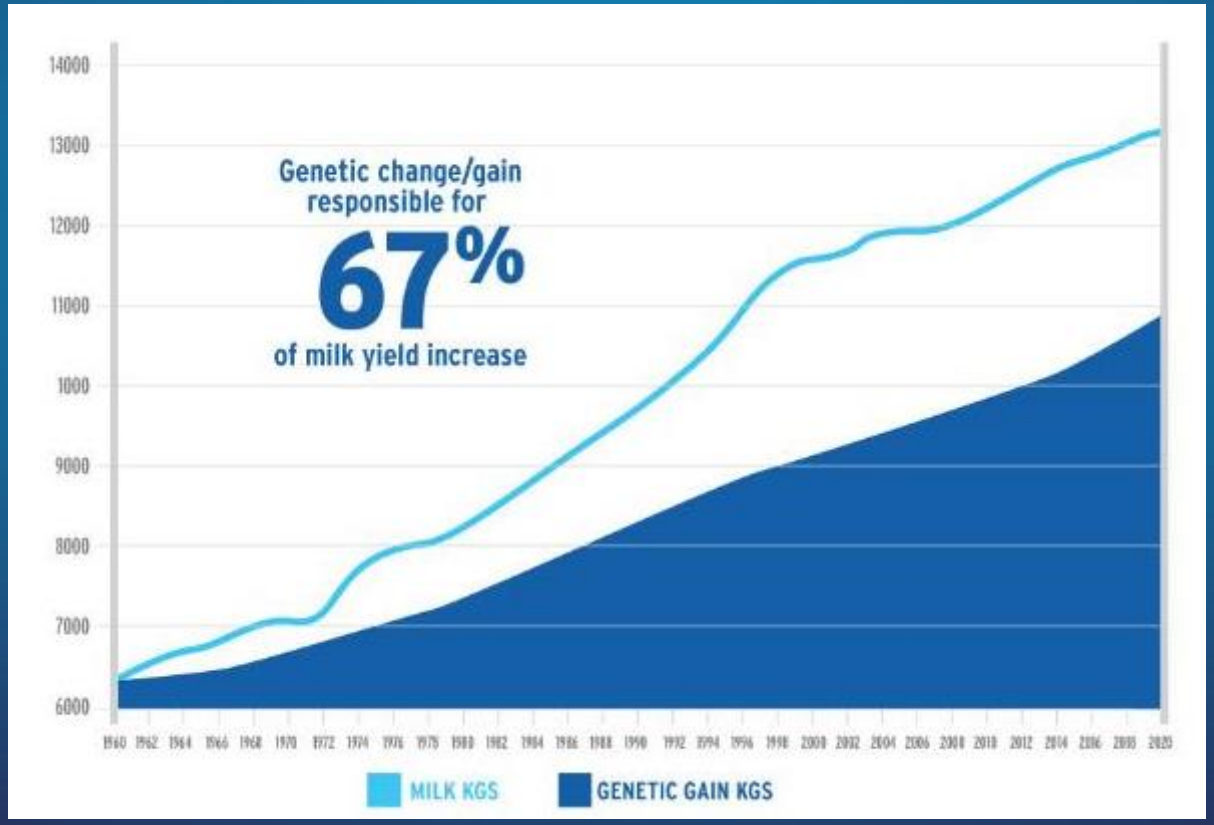
GENETIC GAIN IS CUMULATIVE AND PERMANENT

$$\text{Annual Genetic Gain} = \frac{\text{Accuracy x Selection Intensity x Genetic Variation}}{\text{Generation Interval}}$$



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THE COMPLETE HEALTH PACKAGE

- Ultimate power to minimize disease incidence via genetic selection
- Defence that's robust & broad-based (cows & calves; viral, bacterial & mycobacterial)
- Covers innate (nitric oxide) & adaptive immunity components
- Plus enhanced passive immunity from higher quality colostrum
- Stronger responses to commercial vaccines

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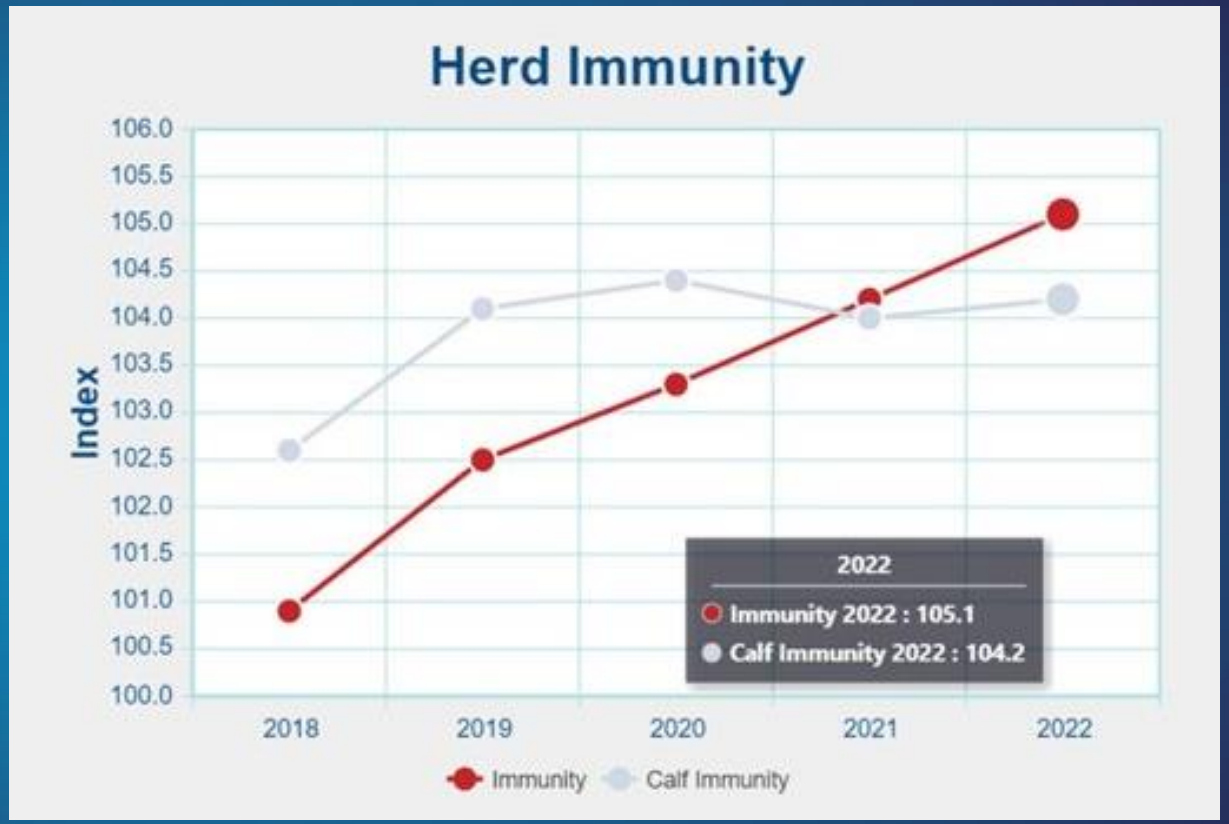
BENCHMARKING PROGRESS VIA ELEVATE®



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GOVERNMENT LEGISLATION

Net zero greenhouse gas target by 2050

Circa 50% greenhouse gas reduction by 2030

In Estonia they want to achieve 70% reduction by 2030

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GLOBAL METHANE PLEDGE – COP 26

122 signatories working collectively reducing global methane emissions across all sectors by at least 30% below 2020 levels by 2030

DAIRY FARMERS OF CANADA

A goal to reach net-zero greenhouse gas (GHG) emissions from farm-level dairy production by the year 2050, with a milestone in 2030

GLOBAL DAIRY PLATFORM

Leading organizations, including some of the largest dairy companies in the world among first to support new global 'Pathways to Dairy Net Zero' climate initiative

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MINIMIZING DAIRY CLIMATE IMPACT HAS FOCUSED ON PRODUCING MORE WITH LESS

- Land use & sustainable feed production on farm
- Limiting purchased resources (nitrogen/protein)
- Manure handling & management
- Feed efficiency
- Renewable energy
- Higher yields/cow, control replacement herd numbers
- Healthier animals

About 44%

of livestock emissions are in the form of methane (CH4)

For ruminants – **cows**, mainly - the greatest promise involves improving animal and herd efficiency. This includes using better feeds and feeding techniques, which can reduce methane (CH4) generated during digestion

Source : FAO (Sept 2013)

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HOW ARE WE MINIMIZING DAIRY CLIMATE IMPACT

METHANE IS THE MISSING LINK

- Land use & sustainable feed production
- Limiting nitrogen/protein
- Manure handling & management
- Renewable energy
- Feed efficiency
- Higher yields/cow, minimize replacements
- Healthy animals

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BREEDING THE WAY TO LOW METHANE COWS

Genomic index launched April 2023

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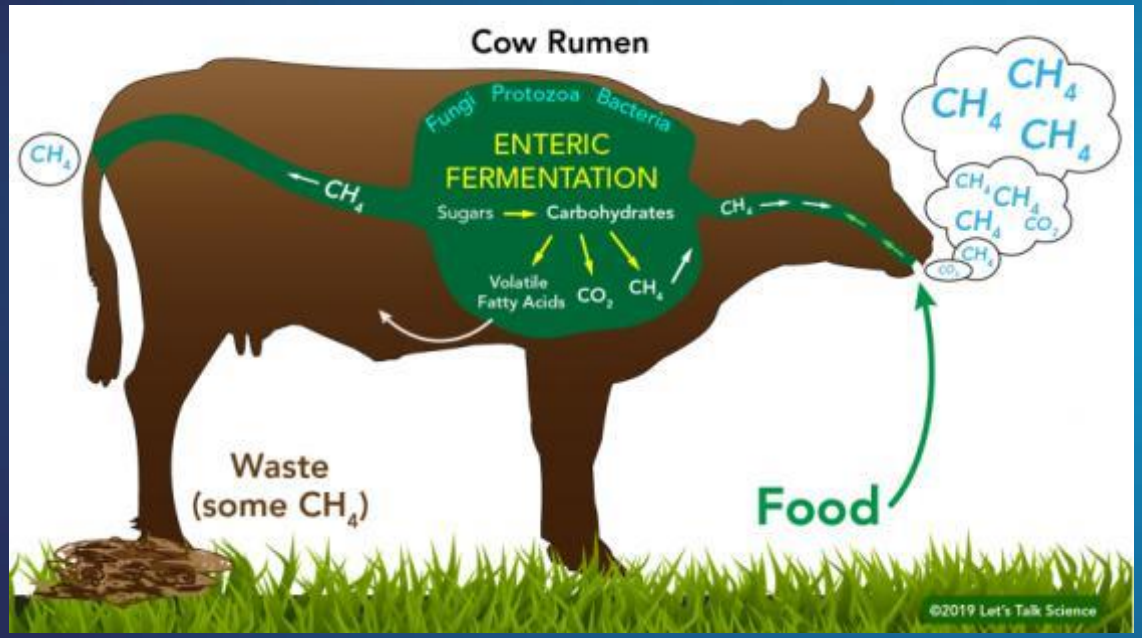
Where does CH4 come from?



- Most CH4 is produced by fermentation during rumination process
- More than 90% is excreted through the breath by eructation (burping)

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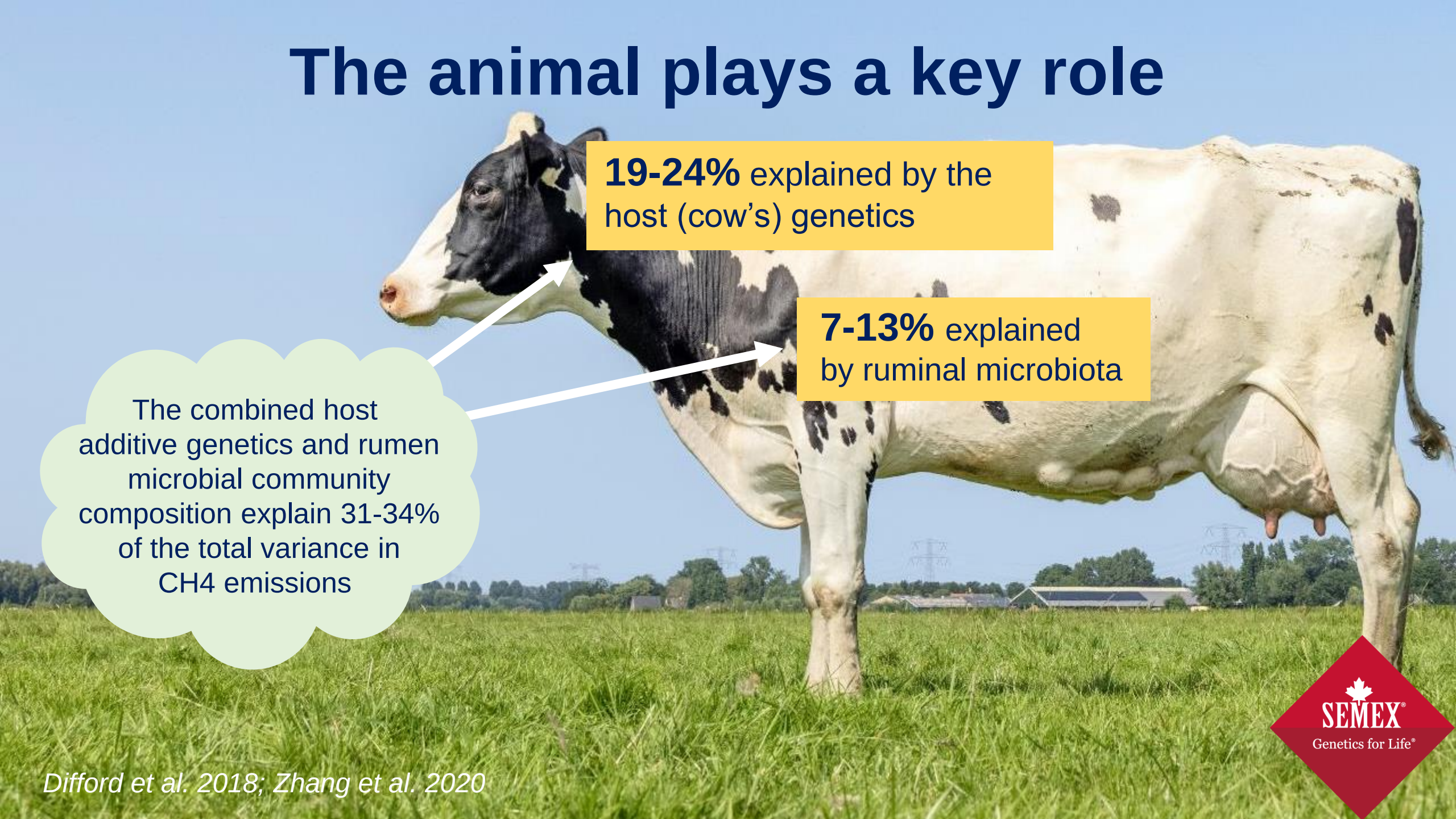
The animal plays a key role



19-24% explained by the host (cow's) genetics

7-13% explained by ruminal microbiota

The combined host additive genetics and rumen microbial community composition explain 31-34% of the total variance in CH4 emissions

Difford et al. 2018; Zhang et al. 2020

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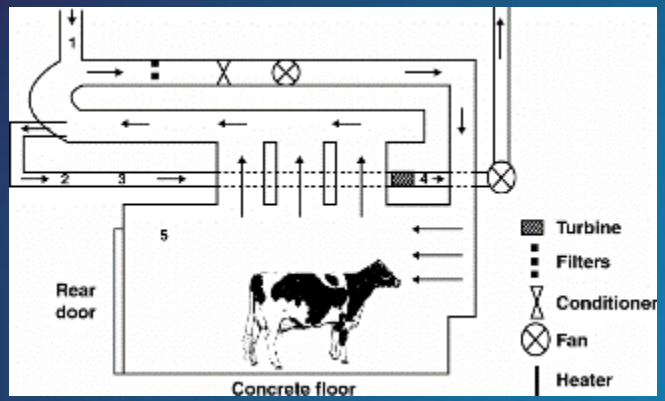
HOW DO WE MEASURE METHANE PRODUCTION?



RESPIRATION CHAMBERS

(GOLD STANDARD)

SF6

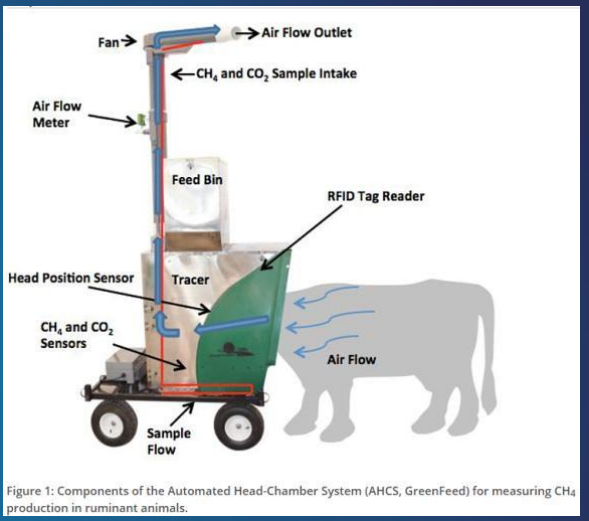


Figure 1: Components of the Automated Head-Chamber System (AHCS, GreenFeed) for measuring CH_4 production in ruminant animals.

GREENFEED

SNIFFERS

LASER

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How do we measure methane production?

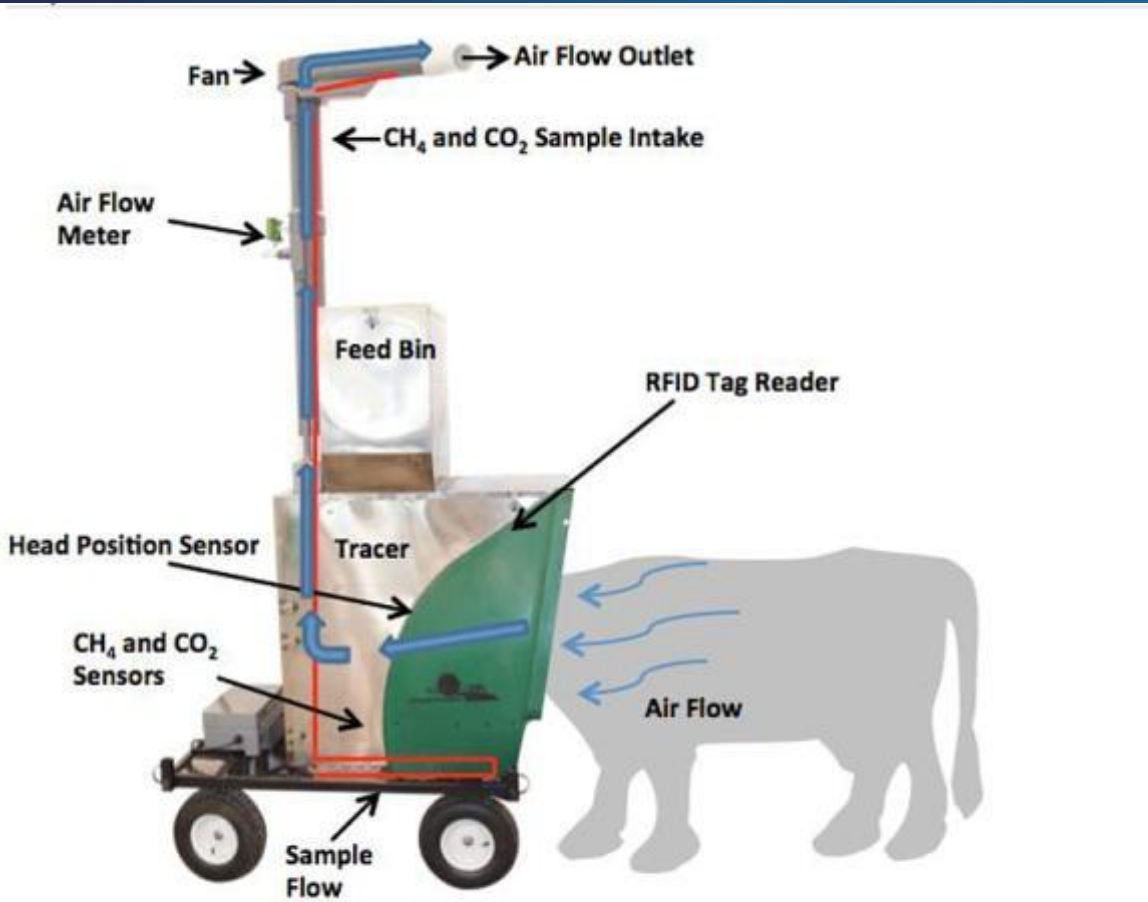

Figure 1: Components of the Automated Head-Chamber System (AHCS, GreenFeed) for measuring CH_4 production in ruminant animals.

- Over 500 cows' individual methane emissions measured with Greenfeed system
  - First lact cows 120 to 185 DIM
- Difficult and expensive process

THE Resilient Dairy GENOME PROJECT

THE Efficient Dairy GENOME PROJECT

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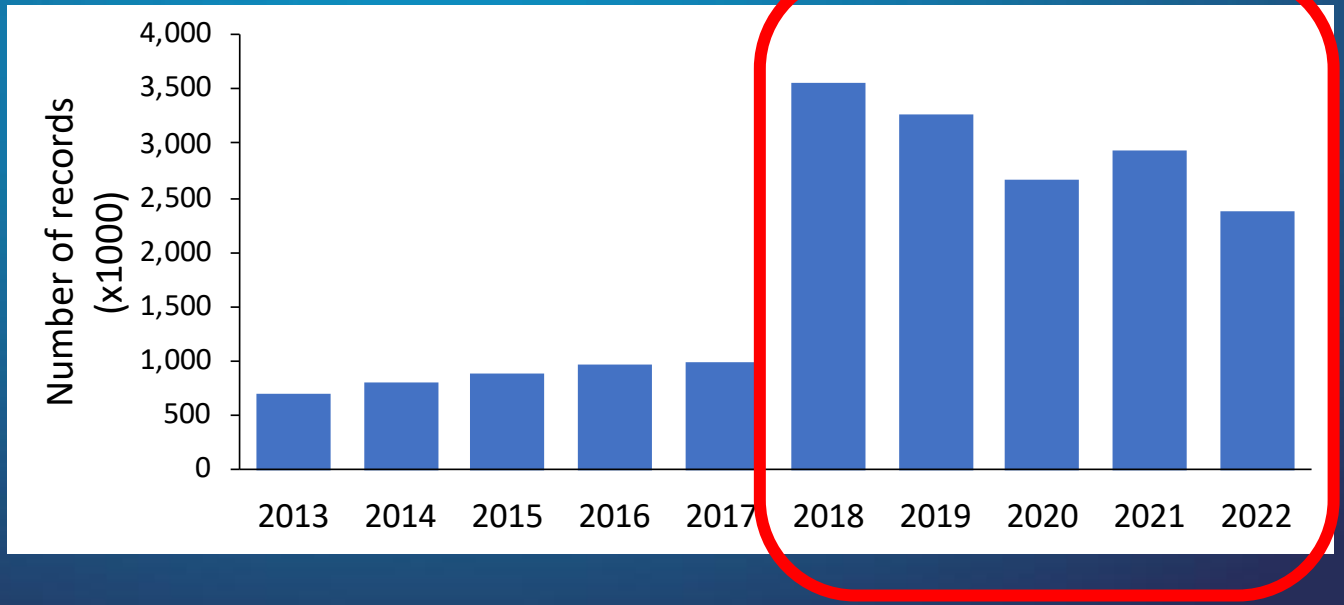
Milk sample
collected on farm

Milk sample
analyzed in lab

MIR data: biological sense, great potential, and availability

More than 13M records from 1.6M cows



PREDICTING CH4 USING MIR DATA

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MIR PREDICTED CH4 - RESULTS

23%
Heritability (mid-high)

70%
Reliability (high)

85% genetic correlation between collected and MIR predicted methane

Unfavorable genetic correlation with fat yield

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METHANE EFFICIENCY

- Genetically independent of production
- Methane emission at the same level of milk, fat, and protein yield
- Cow/Bull genomic values now available

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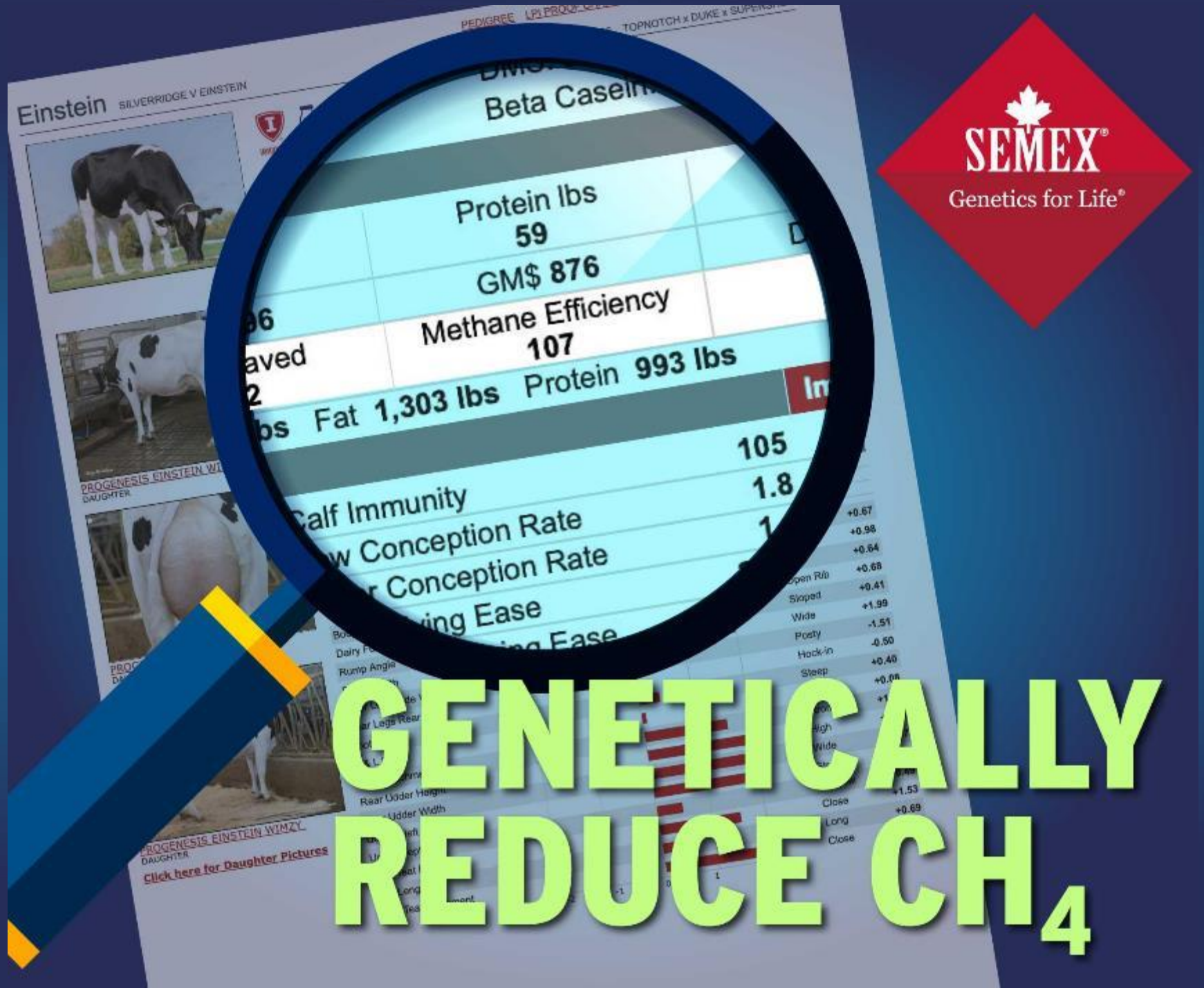
Einstein SILVERRIDGE V EINSTEIN
Protein lbs
59
GM$ 876
Methane Efficiency
107
Fat 1,303 lbs Protein 993 lbs
105
1.8
Calf Immunity
Conception Rate
Conception Rate
PROGENESIS EINSTEIN WIMZY
DAUGHTER
Click here for Daughter Pictures
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GENETICALLY
REDUCE CH_4

High Ranking Sires - April 2023

GENOMAX SIRES

Code	Name	Methane Efficiency
0200HO11831	WESTCOAST CHART	**112**
0200HO11887	DRUMDALE ALLDAY P	**111**
0200HO12213	PROGENESIS PODIUM	**111**
0200HO12377	CLAYNOOK CRACKER	**111**
0200HO12546	PROGENESIS PERKY	**111**
0200HO12681	COOKIECUTTER HISTANDARDS-ET	**111**
0200HO11977	LADYS-MANOR OBSIDIAN-ET	**110**
0200HO12118	PROGENESIS MILLWRIGHT	**110**
0200HO12145	VELTHUIS EVENT	**110**
0200HO12490	PEAK DOTNET-ET	**110**
0200HO12528	LADYS-MANOR OUT-THERE-ET	**110**
0200HO12547	PROGENESIS CRUNCH	**110**
0200HO12722	NORTH-POLLED SONNY-P-RED	**110**
0200HO07956	3STAR OH RANGER RED-ET	**109**
0200HO11862	WESTCOAST LAMBEAU	**109**
0200HO11933	PEAK MOONRISE	**109**
0200HO11983	WESTCOAST ROCKNROLL	**109**
0200HO12014	PROGENESIS PARISMATCH	**109**
0200HO12455	PROGENESIS ESCAPE-P *RC	**109**

PROVEN SIRES

Code	Name	Methane Efficiency
0200HO11457	WALNUTLAWN BRIDGESTONE	**109**
0200HO11385	WESTCOAST RIVER	**107**
0200HO11586	SILVERRIDGE V EINSTEIN	**107**
0200HO11669	PROGENESIS MOLIERE	**107**
0200HO11722	STANTONS COCKPIT	**107**
0200HO10641	WESTCOAST RANDALL	**104**
0200HO10890	LEGEND-MAKER VICTOR	**104**
0200HO11028	SANDY-VALLEY CHALLENGER-ET	**104**
0200HO11458	OCD SHERPA-ET	**104**
0200HO10660	STANTONS ADORABLE	**103**
0200HO10411	CLAYNOOK DEALMAKER	**102**
0200HO10777	WESTCOAST PERSEUS	**102**
0200HO11665	WESTCOAST ALMAMATER	**102**
0200HO07923	WILDER MARK-ET *RC	**101**
0200HO10744	BOLDI V GYMNAST	**101**
0200HO11000	WESTCOAST ALCOVE	**101**
0200HO11412	PROGENESIS DIGITAL	**101**
0200HO10610	WESTCOAST WINDMILL	**100**

Sire Methane Efficiency score of 110 will produce daughters 3% lower Methane Emissions versus average Holstein cows

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20%

Methane Reduction By **2050**

WITH SEMEX

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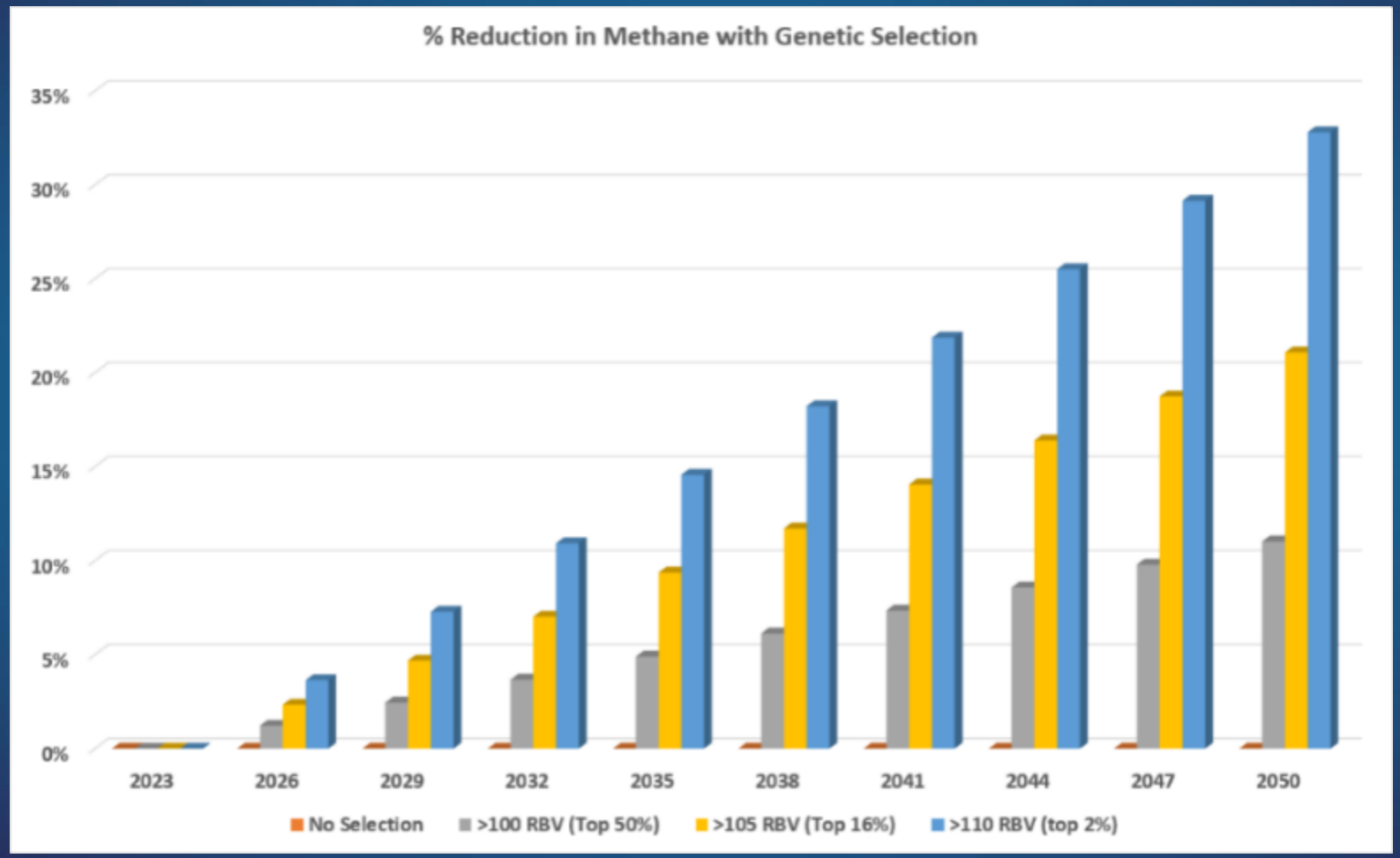
REDUCE METHANE 20-30% BY 2050



IMPACT OF GENETIC SELECTION

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MONITOR YOUR HERD'S METHANE REDUCTION

EXCLUSIVELY THROUGH SEMEX'S ELEVATE®

Elevate®

SEMEX®
Genetics for Life®

Elevate®

Providing genetic methane efficiency evidence shows herd progress and potential incentives.

- Cow and heifer genomic results allow selection and benchmarking of cows via Semex Elevate®
  - *Semex has exclusive international female genomics rights for methane efficiency*
- Semex published methane efficiency genomic index for Holstein bulls in April 2023

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Methane Efficiency Available on Semex Holstein Bulls

- New with April 2023 proofs
- 70-80% Reliable
- Permanent & cumulative
- Independent from other traits
- Methane index available on all Holstein females tested through Elevate
- Depending on selection intensity, herds can reduce emissions 20-30% by 2050

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At Semex we're committed to be Citizens of the Earth.

Genetics for Life is reliant on all of us respecting and caring for the land, shores and all that lives within. As an organization, we must act ethically, socially and morally in ways that ensure our footprint makes for a better world.

20%
Methane Reduction By **2050**

WITH SEMEX

CUT METHANE WITH SEMEX

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