

# CRV launches methane breeding value



concentration, among other gases. Additionally, one farm was equipped with 'greenfeeds'—feed stations fitted with measuring equipment that accurately analyzes the cows' breath. After three years of data collection, 'sniffer data' from nearly 12,000 cows with around 1,400 different sires were recorded. In addition, 'greenfeed data' from nearly 400 cows with 154 different sires were collected. To account for daily fluctuations in methane emissions, the daily measurements per cow were averaged into weekly figures. In total, over 226,000 weekly observations were recorded from the sniffers and nearly 12,000 from the greenfeeds. Both sniffer and greenfeed data are used to estimate breeding values. These values are combined by cooperative CRV into a single methane breeding value, expressed in grams of methane per cow per day.

#### Predictors for increased reliability

"To improve the reliability of the breeding value, we incorporate predictor information into the estimation," explains Niek Meijer, breeding value researcher at cooperative CRV's Animal Evaluation Unit (AEU). Pre-

dictors include traits related to methane emissions, such as breeding values for milk yield and fat yield. Cows with higher breeding values for milk and fat production generally produce more methane. A higher breeding value for feed intake is also associated with greater methane production, as is a higher body weight breeding value. The methane breeding value calculated by cooperative CRV has a heritability of about 35%, making it slightly less heritable than most production traits. "There is sufficient genetic variation between animals, which means we can effectively breed for cows that produce less methane," says Meijer.

#### Higher breeding value, less methane

The methane breeding value is a relative index with an average of 100. Daughters of sires with a breeding value above 100 will emit less methane than average, while daughters of sires with a value below 100 will emit more. The genetic variation among bulls is four points, with each point corresponding to nine grams of methane per cow per day. For example, pairing a bull with a methane breeding

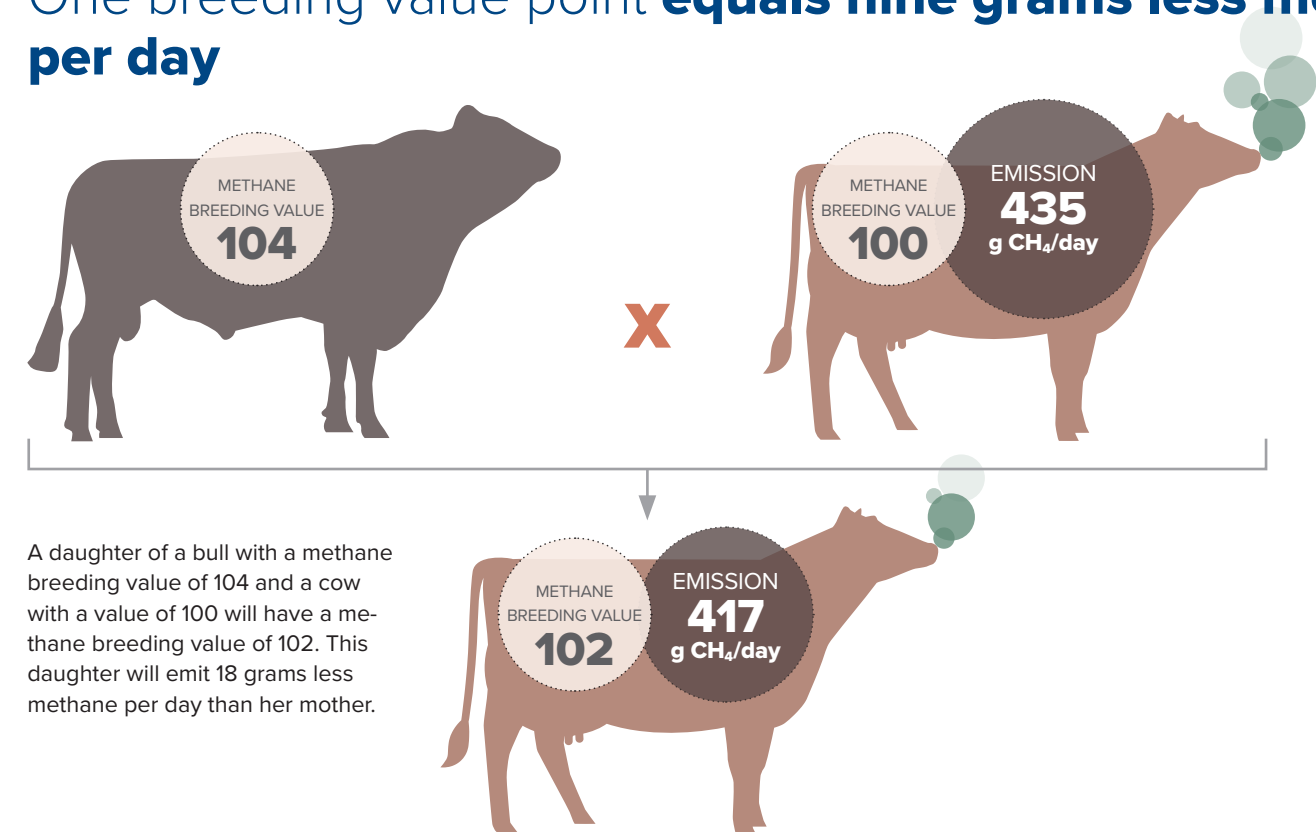
In April, cooperative CRV will introduce a methane breeding value based on measured differences between cows. This new breeding value enables farmers to selectively breed for a herd that emits less methane. In this way, breeding can provide a relatively inexpensive and permanent contribution to reducing the dairy sector's impact on the climate.

The average Holstein cow in the Netherlands and Flanders produces approximately 435 grams of methane per day. This gas is a byproduct of digestion and is primarily released through belching. Methane is recognized as a powerful greenhouse gas, and cattle contribute significantly to global methane production. By reducing methane emissions, the cattle industry can play an essential role in mitigating climate change. The amount of methane a cow produces depends on various factors, one of which is genetic predisposition. This means that selective breeding can help lower methane emissions.

#### Measurements on over 12,000 cows

In 2021, Anouk van Breukelen from the Breeding and Genomics chair group at Wageningen University, in collaboration with CRV and FrieslandCampina, began PhD research into genetic differences in methane emissions. Her research, which she successfully defended last year, laid the foundation for developing methane breeding values. To gain insights into individual cows' methane emissions, 'sniffers' were installed above the feed bins in milking robots on about 100 farms. These sniffers analyze the air exhaled by cows and measure methane

## One breeding value point equals nine grams less methane per day





# Canada calculates methane breeding values from milk recording samples

The Netherlands is not the first country to introduce a methane breeding value. However, the dataset underpinning cooperative CRV's breeding value—containing data from more than 12,000 cows—is the world's largest. In Spain, methane breeding values are based on emissions data from approxi-

mately 3,500 cows. Canada has published methane efficiency breeding values for two years. These values express genetic differences in methane emissions at equal levels of fat and protein production. The Canadian breeding value is based on information derived from milk samples. Calibration lines

were developed using methane measurements and infrared profiles of milk from about 500 cows. These calibration lines allow methane production to be estimated from routine milk recording (MPR) samples, which serve as the basis for the breeding value estimation.

## Niek Meijer, breeding value researcher at CRV: **A heritability of 35 percent makes effective breeding for lower methane emissions possible.”**

value of 104 with a cow scoring 100 results in offspring with a methane breeding value of 102, meaning they will emit 18 grams less methane per day — 417 grams instead of 435 grams (see the illustration).

### **No compromise on health**

The methane breeding value is negatively correlated with breeding values for milk yield, fat yield, protein yield, Inet, body weight, and feed intake. This means heavier cows that consume more feed and produce more milk, fat, and protein tend to emit more methane. A similar relationship exists between methane breeding value and the Dutch NVI index, primarily because production traits weigh heavily in the NVI formula.

However, Meijer emphasizes that breeding for lower methane emissions does not necessarily compromise productivity. “There is a large spread in the data, meaning we can still find bulls with high production breeding values that also score favorably for methane reduction.”

Interestingly, researchers found a positive correlation between the methane breeding value and the breeding value for feed cost savings for maintenance. This suggests that selecting for better feed efficiency naturally aligns with breeding for lower methane emissions. Moreover, no correlation was found between methane breeding value and key health traits such as hoof health, udder health, daughter fertility, and longevity. “This confirms that breeding for lower methane emissions does not negatively impact cow health, fertility, or lifespan,” Meijer explains.

### **Reliability will continue to improve**

At the April index run, cooperative CRV will estimate methane breeding values for bulls with daughters that have recorded methane measurements. These values currently have a reliability ranging from 30% to 83%, depending on the number of daughters with methane data. Additionally, young bulls can receive genomic methane breeding values upon request, with reliability between 25% and 45%. “The collection of emission data will continue,” says Meijer.

“This means that in the coming years, we will gain an even better understanding of genetic differences between cows. We now have a breeding value estimation system in place, and we are ready to improve reliability by processing more data.”

Methane breeding values will not yet be included in the public bull rankings in April but will be published as top lists. Additionally, individual bull methane breeding values will be available via the ‘Search in all sires button’ on CRV websites. For female animals with a known marker profile, genomic methane breeding values will also be estimated in April and will become available in HerdOptimizer later this year for farmers who have their animals genotyped.

## Summary

- Differences in methane emissions between cows are partly determined by genetics.
- From April, cooperative CRV will calculate methane breeding values.
- The methane breeding value is an index with an average of 100 and a genetic standard deviation of 4.
- Every four points in breeding value corresponds to 36 grams of methane per cow per day.
- Heavier cows that consume more feed and produce more milk, fat, and protein generally emit more methane, but there are also bulls with high production breeding values that score well on methane.
- Breeding for better feed efficiency goes hand in hand with breeding for lower methane emissions.
- Breeding for lower methane emissions does not compromise animal health, fertility, or longevity.