

# Ongoing research to investigate the genetic background of nitrogen use efficiency and methane emissions of Swiss dairy cows

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Agroscope, <sup>1</sup>Animal GenoPhenomics, <sup>2</sup>Ruminant Nutrition and Emissions, <sup>3</sup>Methods Development and Analytics, <sup>4</sup>Research Contracts Animals, CH-1725 Posieux; [www.agroscope.ch](http://www.agroscope.ch)

## Background

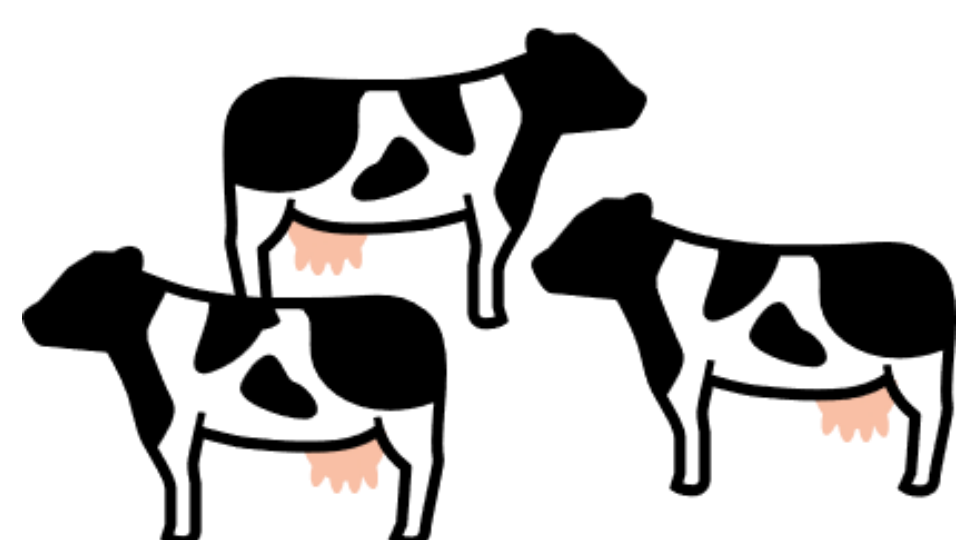
Breeding dairy cows with increased nitrogen use efficiency (NUE) can help **reduce nitrogen emissions from agriculture** in the long term. Individual differences in NUE between cows on the same ration suggest genetic differences. The aim of this study is to determine the **genomic variation in NUE of dairy cows** in relation to methane emissions (CH<sub>4</sub>) and other traits.

## Animals, Material and Methods

### • Duration of experiment:

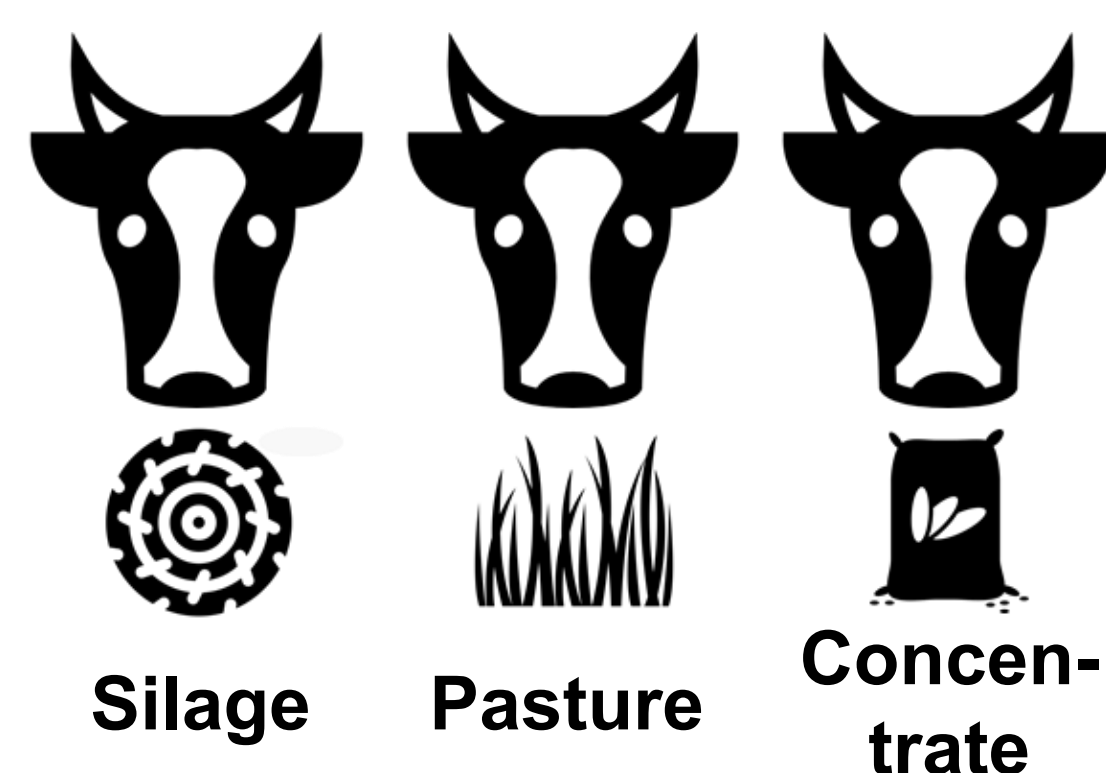
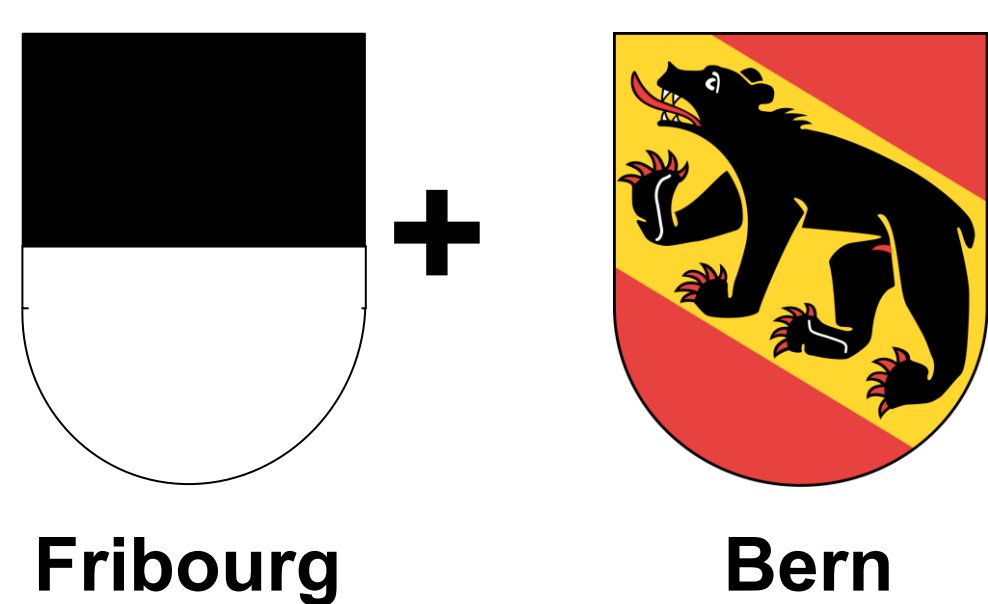


### • Holstein cows

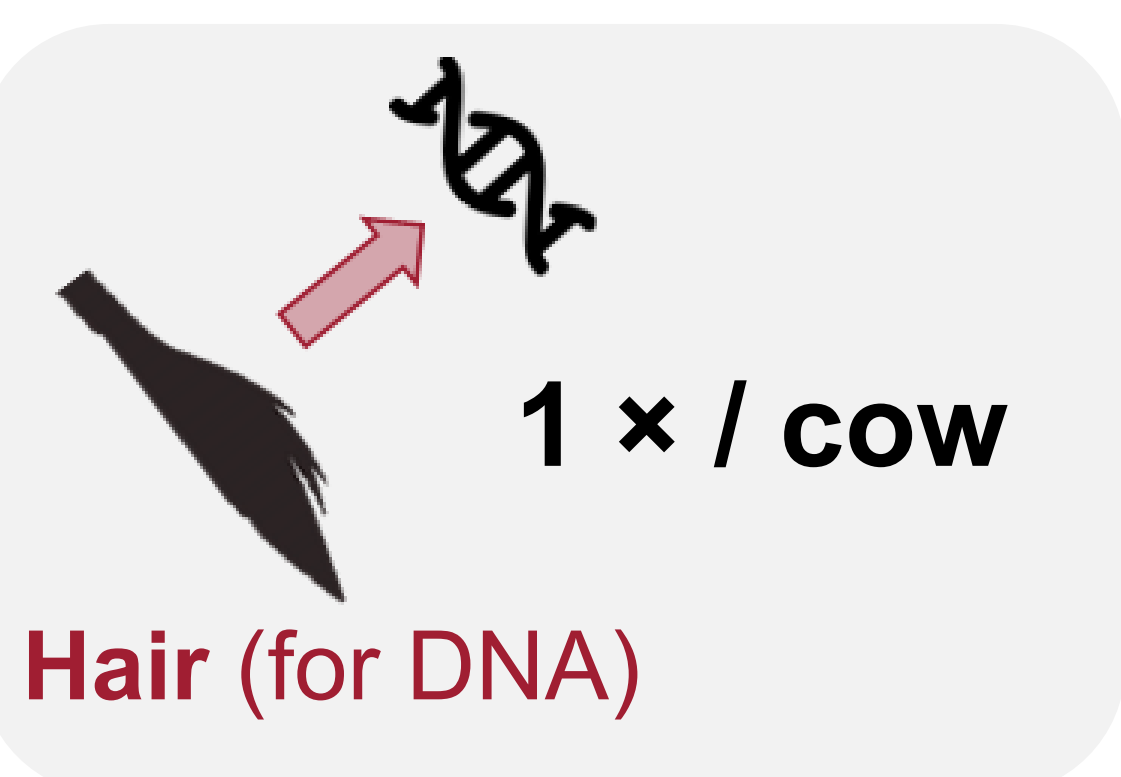
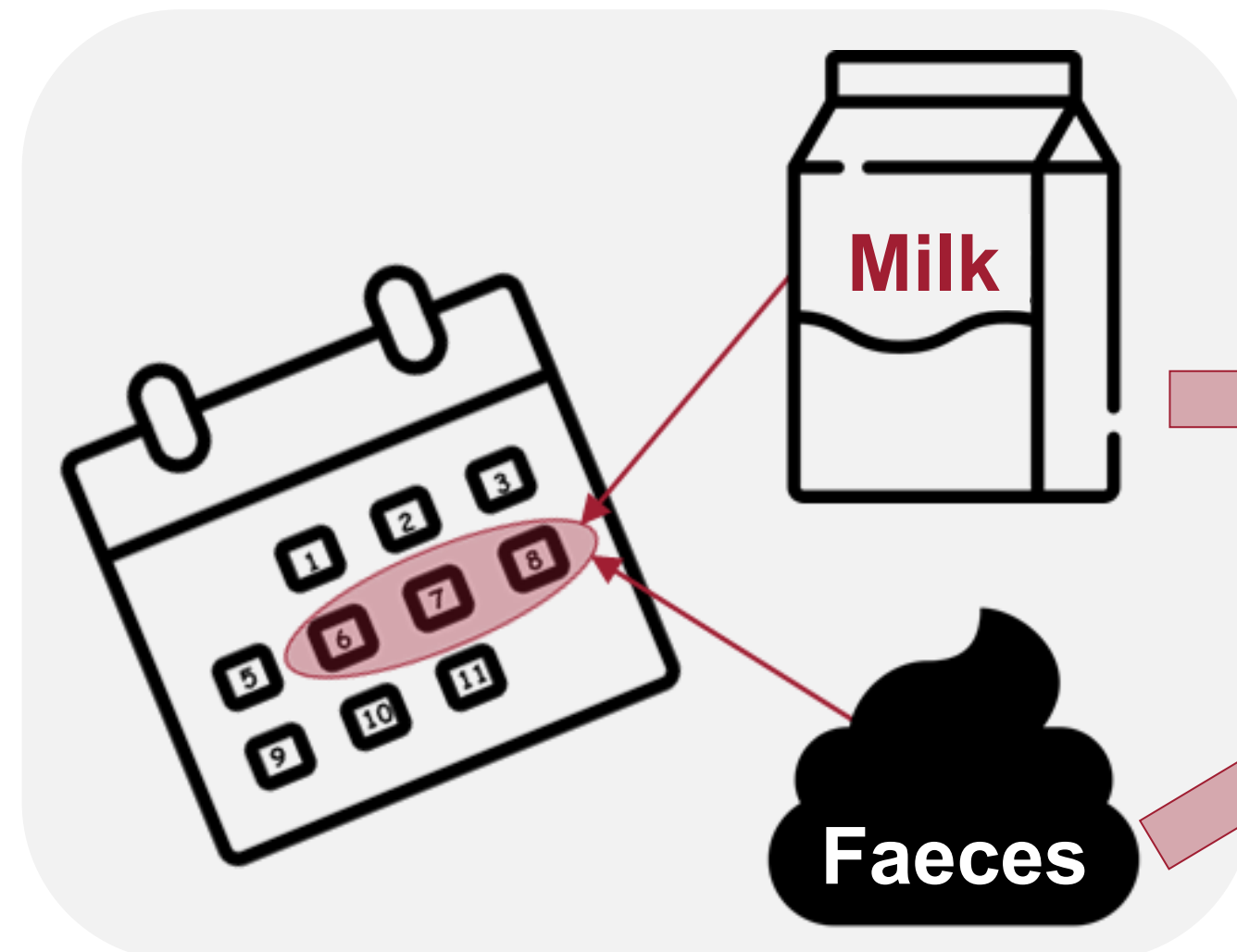
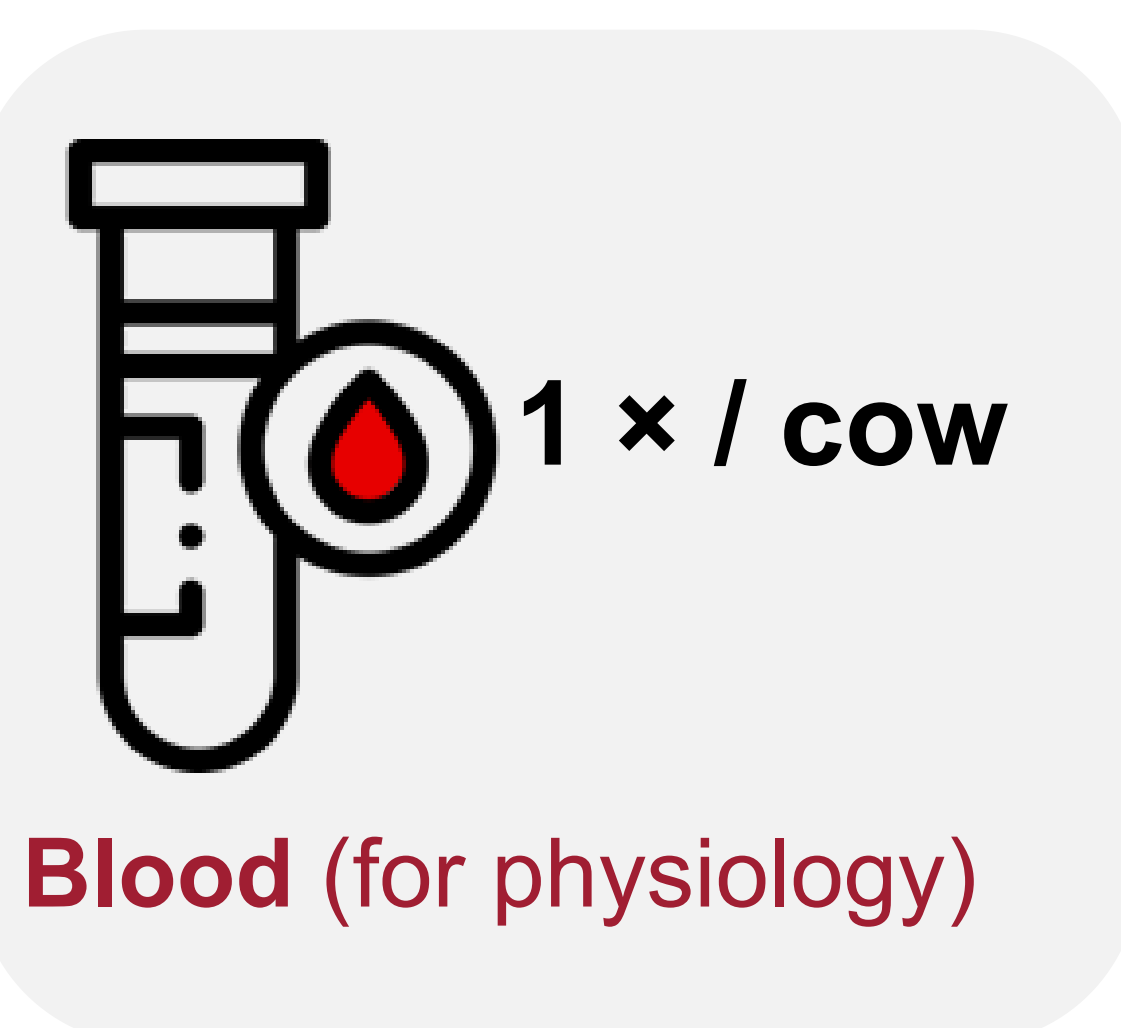


× 1'500 – 2'000  
Lactation day 90 - 250

- Participation of cantonal and private farms
- Ration depending on farm and season



### • 1 measuring period/cow

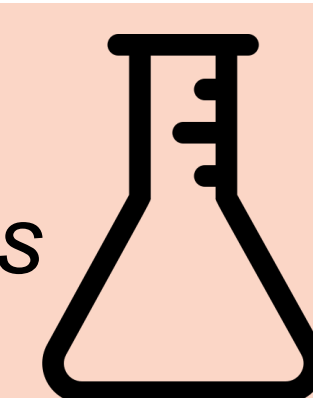


## Phenotypes

Infrared spectroscopy is a **cost-effective alternative to chemical analysis** for the detection of NUE and CH<sub>4</sub> with higher throughput. **Algorithms** that «translate» infrared (IR) spectra of milk or faeces into NUE or CH<sub>4</sub> are developed based on reference data and IR spectra. Existing algorithms will be **further developed** in international collaboration. Once the algorithms have reached a high level of accuracy, **IR spectra will be sufficient for the determination of NUE or CH<sub>4</sub>.**

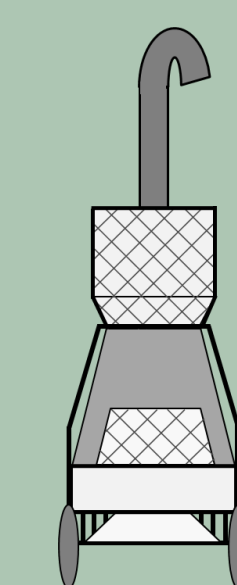
### ★ Reference methods

**Nitrogen use efficiency**  
Weighing feed intake, chem. analysis of milk and feed



**NUE**  
measured

**Methane emissions via GreenFeed®**

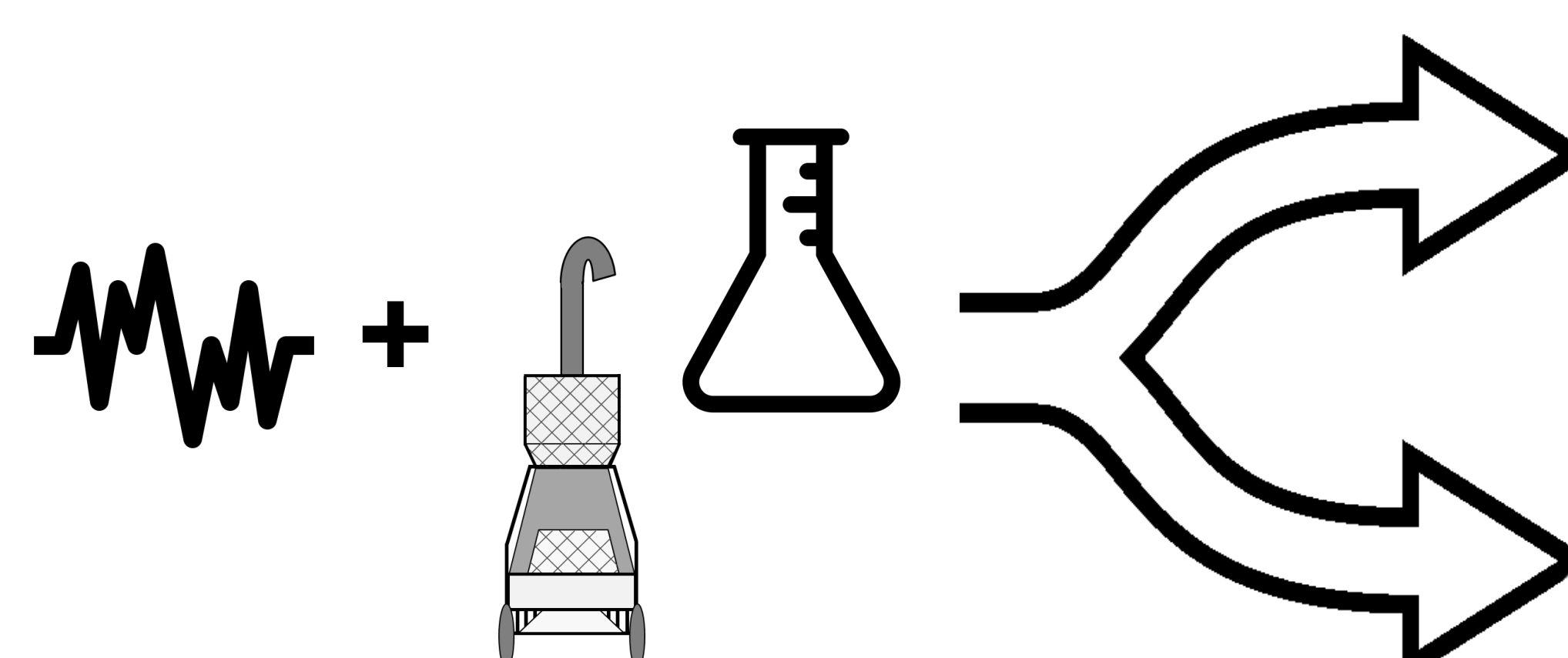


**CH<sub>4</sub>**  
measured

### ★ Infrared spectroscopy



### ★ Algorithms (artificial intelligence)



## Status/situation as of April 1, 2023

- 625 samples (of milk, faeces, hair, blood each)
- 609 different individuals

- 17 farms (Experimental Farm Agroscope Posieux, farm of the Penitentiary Facility of canton Fribourg in Bellechasse, Grangeneuve School Farm, Sorens Organic School Farm and 13 private farms within a radius of about 30 km)