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# Understanding cattle methane and behaviour with statistics and machine learning

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## Why methane matters

**58%** of greenhouse gas emissions from Australian dairy farms came from cattle digestion in 2023 (Dairy Australia)

Methane traps heat in the atmosphere, making it a greenhouse gas. Cattle release it during digestion, losing energy that could support milk production.

## Making sense of sensor data

A logistic mixed model predicts the chance of detecting methane. A lognormal mixed model predicts its level when detected. Cow and day effects account for repeat visits. Random forests check cattle rankings.

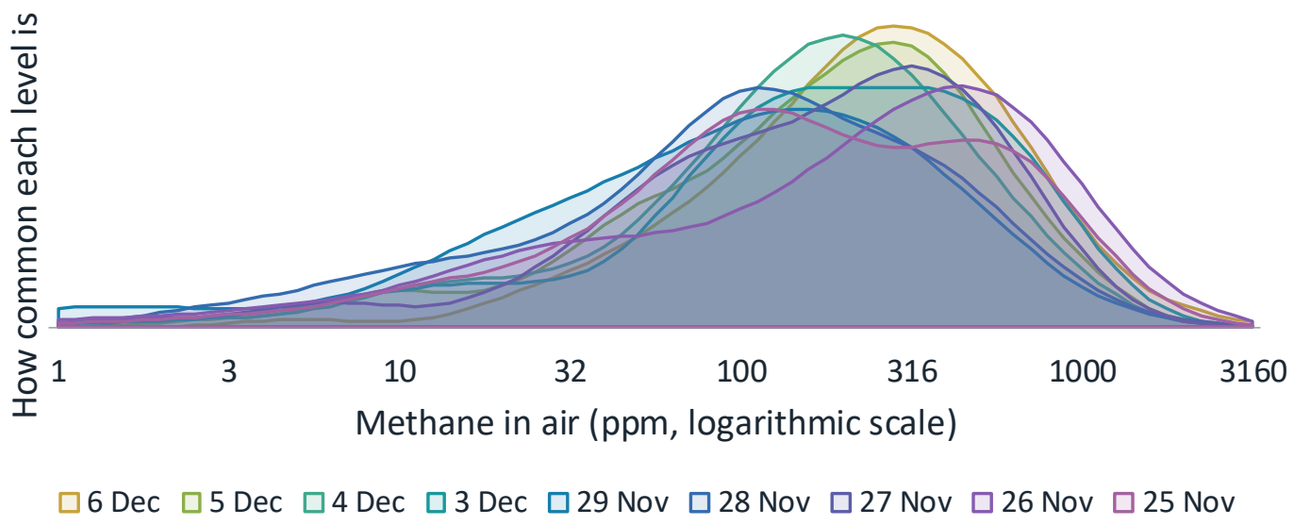
## Supporting farm decisions

Our results can guide feeding trials and show which cattle need more measurements. Work with sensors worn by cattle aims to link feeding behaviour with milk production and animal health.

### Industry collaboration

Data analysis for sensor developers and farm trials.

### Positive methane readings

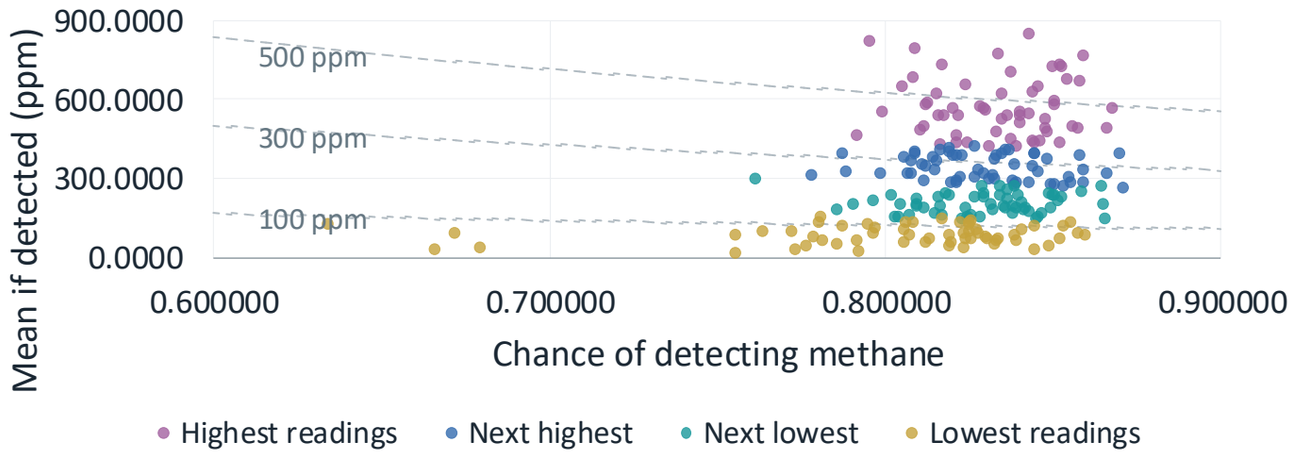



$$\log Y_{ij} = x_{ij}^{\top}\beta + c_i + f_t + \varepsilon_{ij}$$

$$Y_{ij} > 0, \quad \varepsilon_{ij} \sim N(0, \sigma^2), \quad t = d(i, j)$$

Y is a visit's methane reading (ppm) and x its measurement conditions.
c and f are cow and day random effects.

### Comparing 236 cattle




One dot per cow. Colours group cows by estimated mean reading.

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