Comparison of Enteric Methane Repeatability Estimates Using GreenFeed and Agscent Measurement Devices

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Global Methane Genetics initiative

Led by WAGENINGEN UNIVERSITY & RESEARCH

In Partnership with BEZOS EARTH FUND, Global Methane Hub

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Introduction

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Data Collection

- American cows (Eastern Tennessee, USA)
  - 124 commercial cattle
  - Four cohorts measured 2025-2026
  - First calf heifers (May – June), mature females (June – July), mature females (August), and replacement heifers (October – January)
  - 1 Optiweigh
- Australian heifers (Northeast NSW, Australia)
  - Approximately 120 pregnant Angus heifers (late February – May)
  - 2 Optiweighs
- Australian cows (Northeast NSW, Australia)
  - Approximately 120 mature Angus cows (April – May)
  - 2 Optiweighs (later 4)

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Data Analysis

- Records trimmed to:
  - >60 seconds & <3,600 seconds
  - Sensor flowrate >0.80 L/second
  - Methane concentration >5 ppm
  - CO_2 concentration >580 ppm
  - At least 2 methane peak events
- Methane emissions estimate used as trait (g/day)
  - Generated by Agscent
- General additive model smoothed temporal variation
  - Day and hour within day
- Animals with at least 5 spot-samples
- Outliers removed: 3 SD away from within-animal mean
- Mixed model with animal as random effect to calculate repeatability

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Repeatability (n records)

Period	can Cows (n = 20)	Australian Heifers (n = 50)	Australian Cows (n = 22)
Spot-samples	0.07 (200)	0.18 (622)	0.11 (180)
1-day	0.13 (126)	0.22 (347)	0.08 (78)
5-day	0.05 (73)	0.24 (262)	0.23 (61)
7-day	0.09 (66)	0.25 (228)	0.30 (54)
10-day	-	0.29 (206)	0.27 (56)

- GreenFeed repeatability:
  - Confined: 0.14 – 0.61 for spot-sample to 10-day average, respectively[1]
  - Pasture: 0.08 for spot-samples[2] & 0.10 – 0.06 for 1-day to 21-day average, respectively[3]

1. Ryan et al., 2022. J. Anim. Sci.
2. MacNeil & Waterman, 2025. animal.
3. Guarnido-Lopez et al., 2025. J. Anim. Sci.

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Results – Repeatability (n records)

Averaging Period	American Cows (n = 29)
Spot-samples	0.16 (308)
1-day	0.22 (186)
5-day	0.22 (108)
7-day	0.16 (99)
10-day	0.23 (82)

- GreenFeed repeatability:
  - Confined: 0.14 – 0.61 for spot-sample to 10-day average, respectively[1]
  - Pasture: 0.08 for spot-samples[2] & 0.10 – 0.06 for 1-day to 21-day average, respectively[3]

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Take-home Messages

- In pasture measurement introduces additional variation
  - Compounded here by pregnancy status, drought, and supplemental feeding
- Lessons learned with Agscent/Optiweigh
  - Easy to operate
  - Minor issues quickly addressed
  - Simultaneous body weight
  - Plan to reduce number of animals per unit

- Lower heritability can yield greater genetic prediction accuracy given a fixed budget (ex. 2.05 million USD)

Embrace the mess

Technology	h^2	Number of Animals Measured	Accuracy of Genetic Prediction
Gas Flux	0.40	3,453	0.51
Accumulation Chamber	0.20	9,263	0.55
Sniffer	0.15	23,259	0.65
Sniffer	0.07	23,259	0.51

Miller et al., 2026 WCGALP

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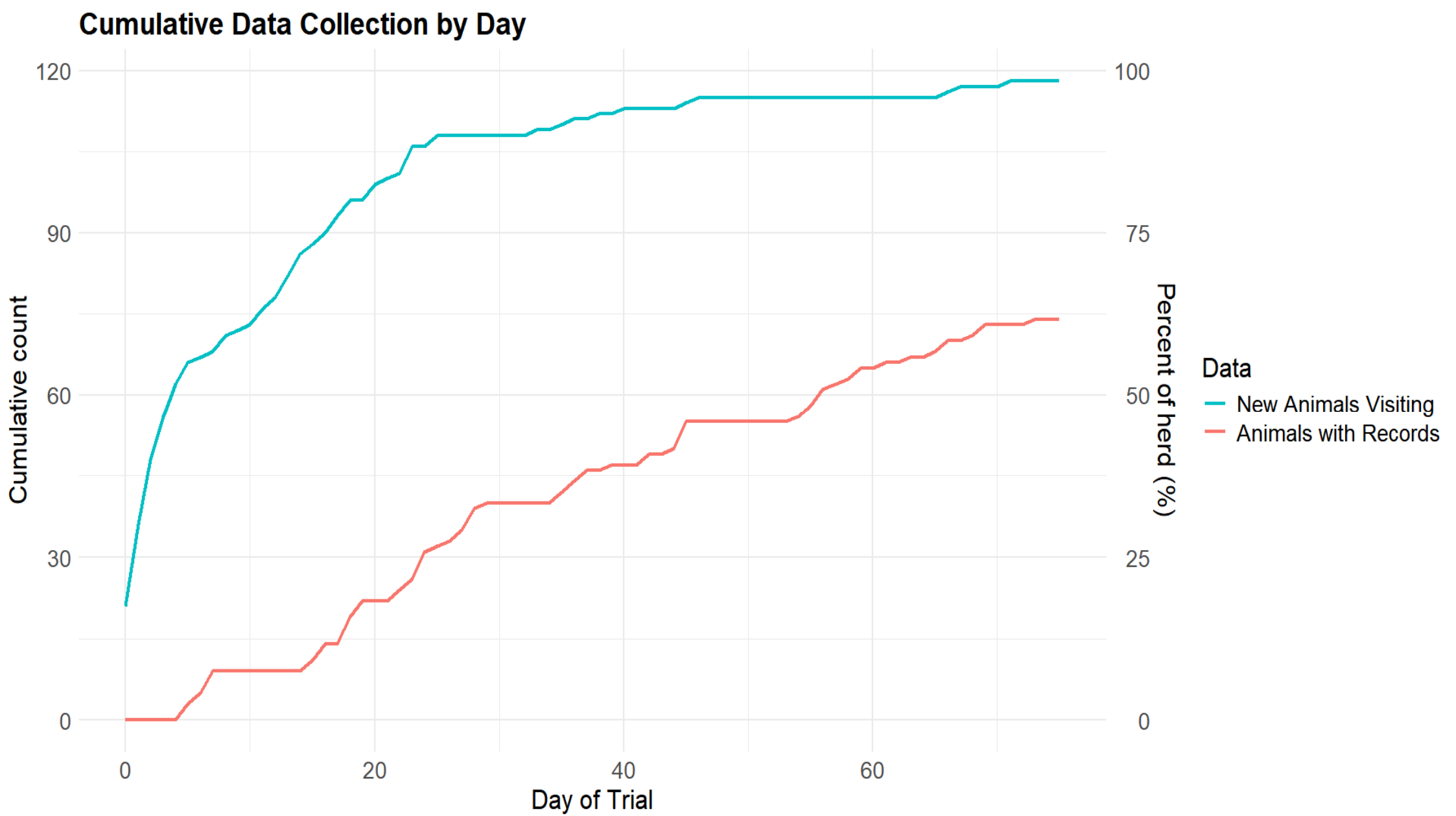
Cumulative Data Collection by Day
120
90
60
30
0
100
75
50
25
0
0
20
40
60
Cumulative count
Percent of herd (%)
Day of Trial
Data
New Animals Visiting
Animals with Records