



Sense

ASGGN & ICAR Feed & Gas workshop

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9th GGAA
2025 · Nairobi, Kenya
5 - 9 October

International Greenhouse
Gas & Animal Agriculture
Conference

Agenda

- Current Technology
- ZELP Sense
- Current Work
- Next Steps

Current Technology

	Accuracy (Individual Cows)	Cost (One-off + Recurrent)	Ease of Use	Grazing Measurements	Behavioural Change	Potential to Scale
Respiratory Chambers	Advantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage
Feeder Spot Samplers	Advantage	Disadvantage	Neutral	Neutral	Neutral	Neutral
SF6 Tracers	Advantage	Disadvantage	Neutral	Advantage	Neutral	Disadvantage
Sniffers	Disadvantage	Neutral	Advantage	Disadvantage	Advantage	Advantage
Laser Methane Detector (LMD)	Disadvantage	Advantage	Advantage	Neutral	Advantage	Neutral

Advantage

Disadvantage

Neutral



- **A highly scalable, wearable device for cattle to measure CH₄ and CO₂ output, and estimate DMI**
- Applicable in housed and/or grazing settings, and across breeds
- Granular emissions monitoring, producing reliable results in short timeframes
- Data viewable via ZELP's mobile-optimised web app
- Little-to-no-training of animals required
- Mass manufacturable & cost-effective - deployable at a fraction of the cost of current alternatives on the market

1

Headgear

- Base attachment for all other components
- Transports signal & fluid
- Positions nosepiece

2

Sampling nosepiece

- Aligns sensors
- Primary filtration
- Gas sampling

3

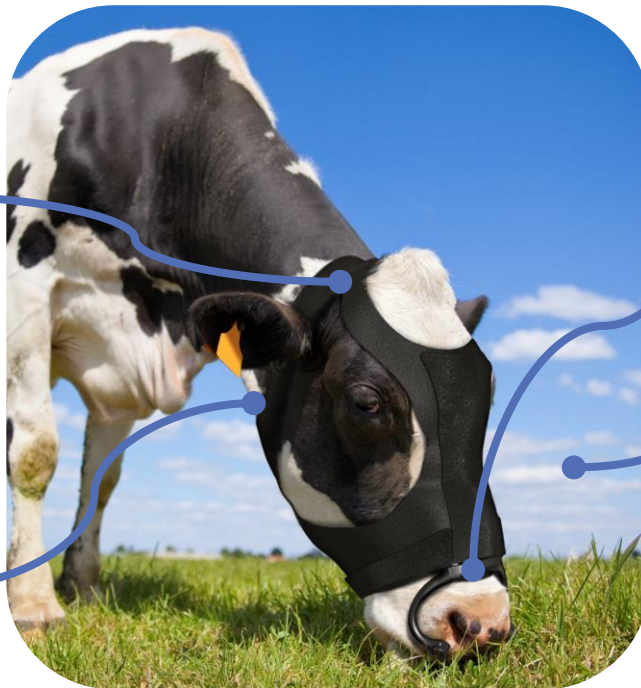
Gas sensing area

- Sensors
- Circuit board & batteries
- Pump & fluidic controls
- Humidity management

4

Processing & delivery

- Pipeline processing
- Delivery via the ZELP App



Breath and Eructations Simulator

Simulates cattle emissions at
realistic and **programmable**:

- Eructations
- Tidal volumes
- Respiration rates
- CH₄ concentrations
- CO₂ concentrations
- Temperature

Critical to sensor selection, assessment of mechanical designs
and development of accurate models



Current Work: Chamber Comparison

Setup:

- Three cows were tested in respiration chambers over a 3-week period, with two separate 3-day testing sessions conducted, separated by a one-week break.

Results:

- Preliminary findings suggest the device accurately reflects respiration chamber data.
- Moderate to strong correlations between device and chamber measurements.

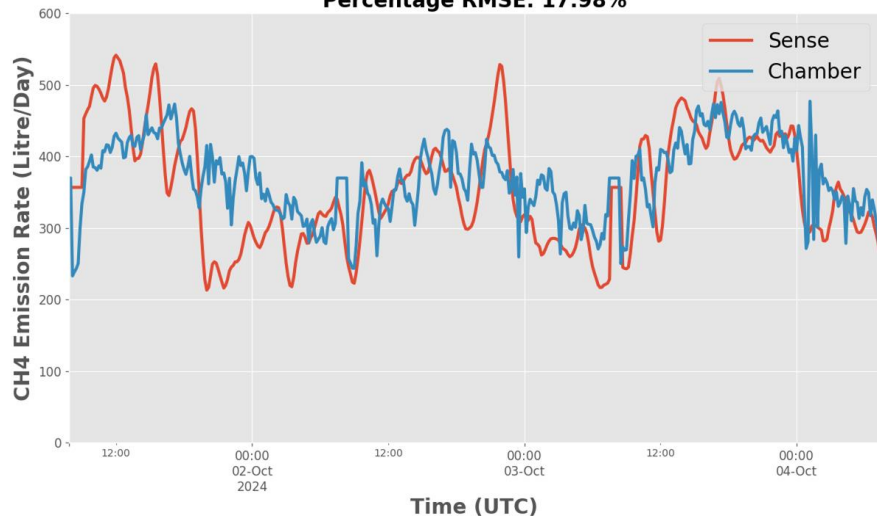
Animal Science Observations:

- Cows adapted well with no signs of distress.
- Normal respiration rates recorded.
- Stable behavior throughout the study.

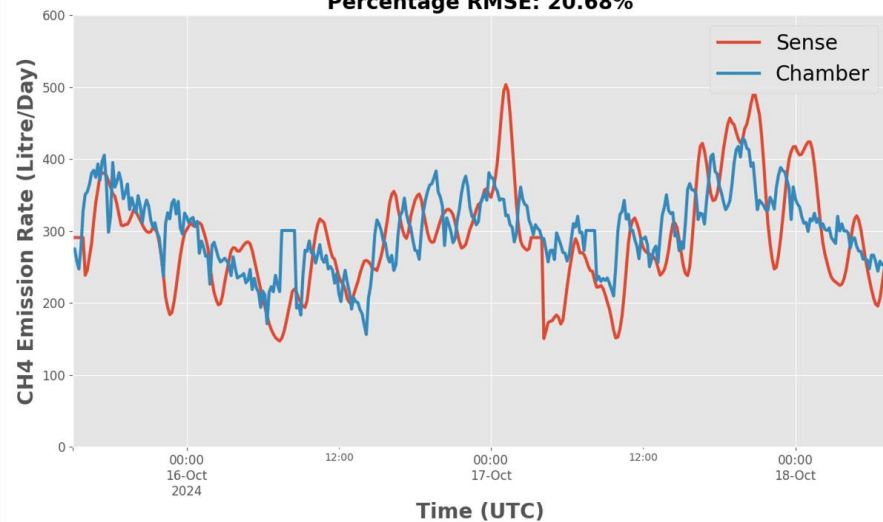


Current Work: CH₄ Results

Comparison of Chamber CH₄ Emission Rate and ZELP Sense Estimation
Correlation: 0.60
Percentage RMSE: 17.98%



Comparison of Chamber CH₄ Emission Rate and ZELP Sense Estimation
Correlation: 0.57
Percentage RMSE: 20.68%

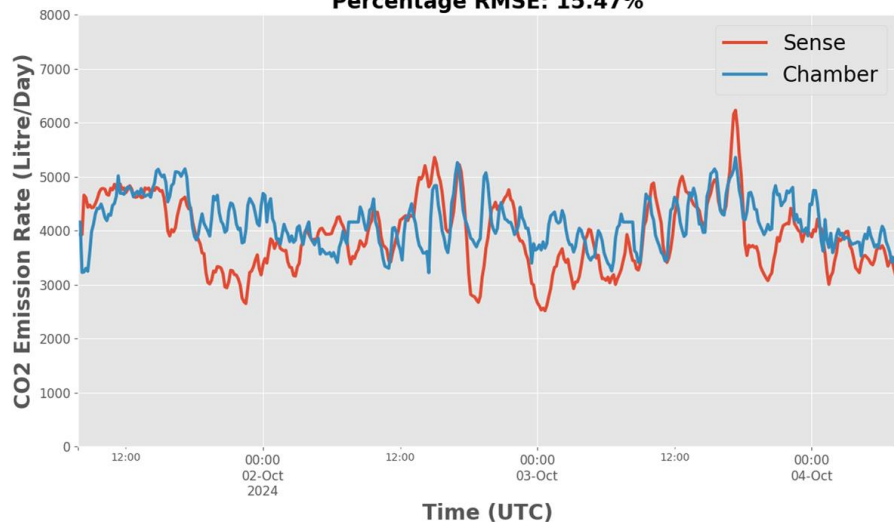


Current Work: CO₂ Results

Comparison of Chamber CO₂ Emission Rate and ZELP Sense Estimation

Correlation: 0.49

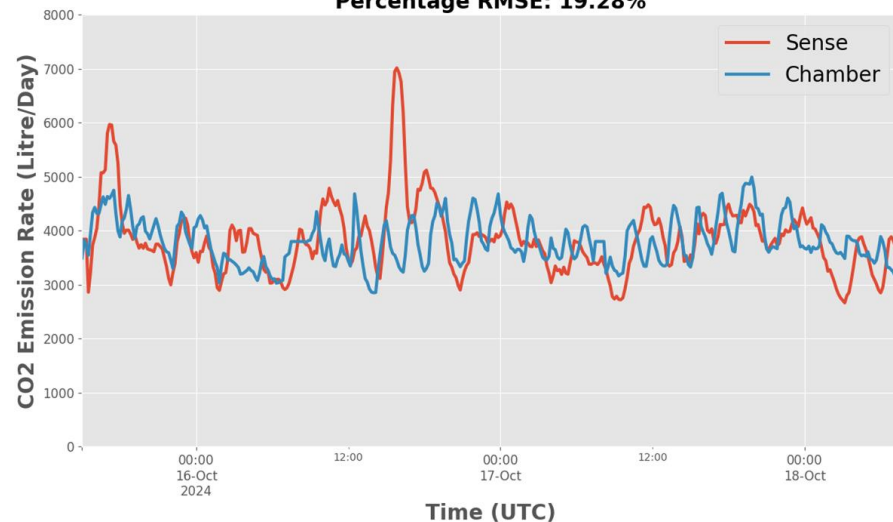
Percentage RMSE: 15.47%



Comparison of Chamber CO₂ Emission Rate and ZELP Sense Estimation

Correlation: 0.25

Percentage RMSE: 19.28%

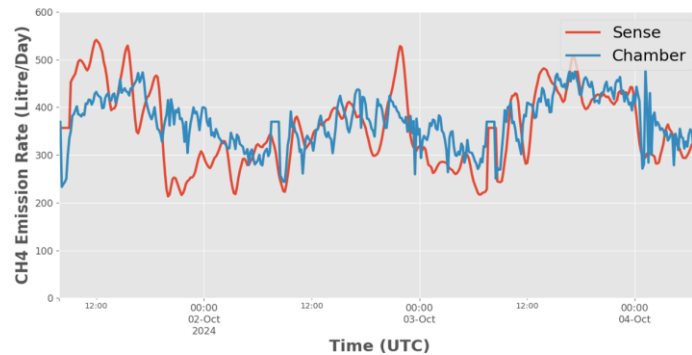


Current Work: Daily Totals

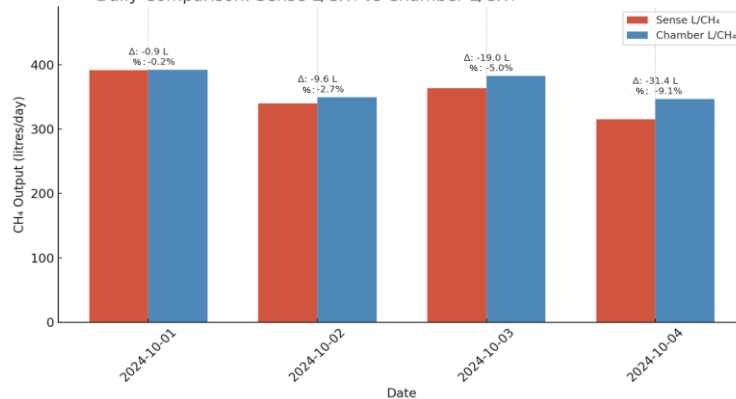


Comparison of Chamber CH₄ Emission Rate and ZELP Sense Estimation

Correlation: 0.60
Percentage RMSE: 17.98%
Percentage Bias: -3.32%



Daily Comparison: Sense L/CH₄ vs Chamber L/CH₄





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When: Completed

What: Comparison vs. chambers

How:

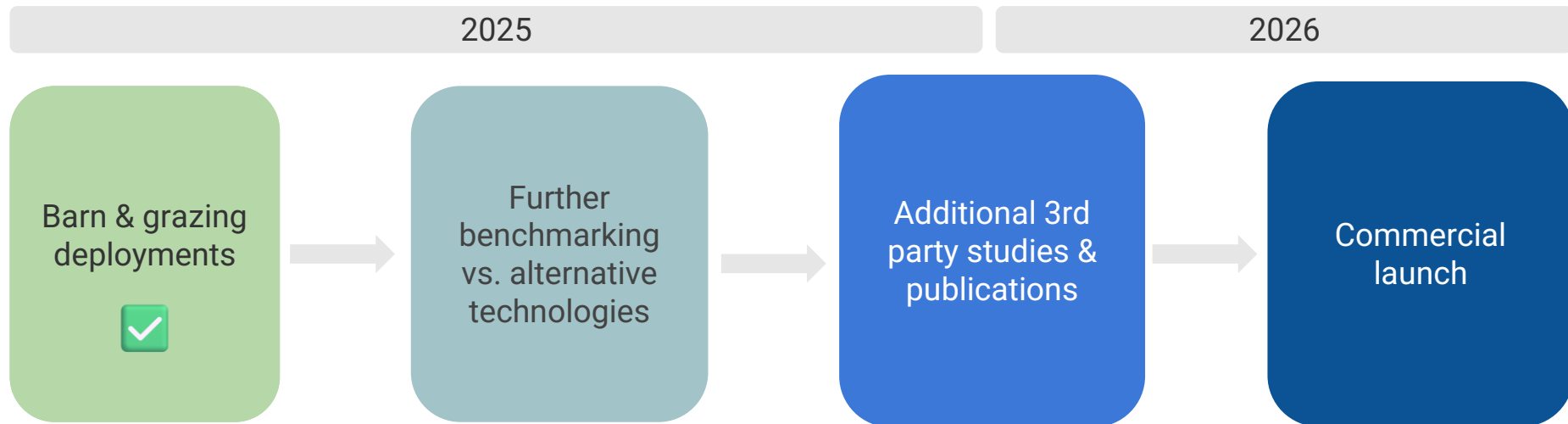
- 4 cows
- 3 days measurement, 4 days restricted feed, 3 days measurement

When: Ongoing

What: Effect on animal behavior, and comparison vs. chambers

How:

- 4 cows
- 2 weeks behavioral observation
- 4 x 4 days measurement, with 10 day rests in between





Questions?
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