

Predicting dry matter intake in sheep using greenhouse gas measurements from portable accumulation chambers

Gareth Difford, G. Steinheim, I. Dønnem, J. Jakobsen, B. A. Åby

EAAP 2024 session 96

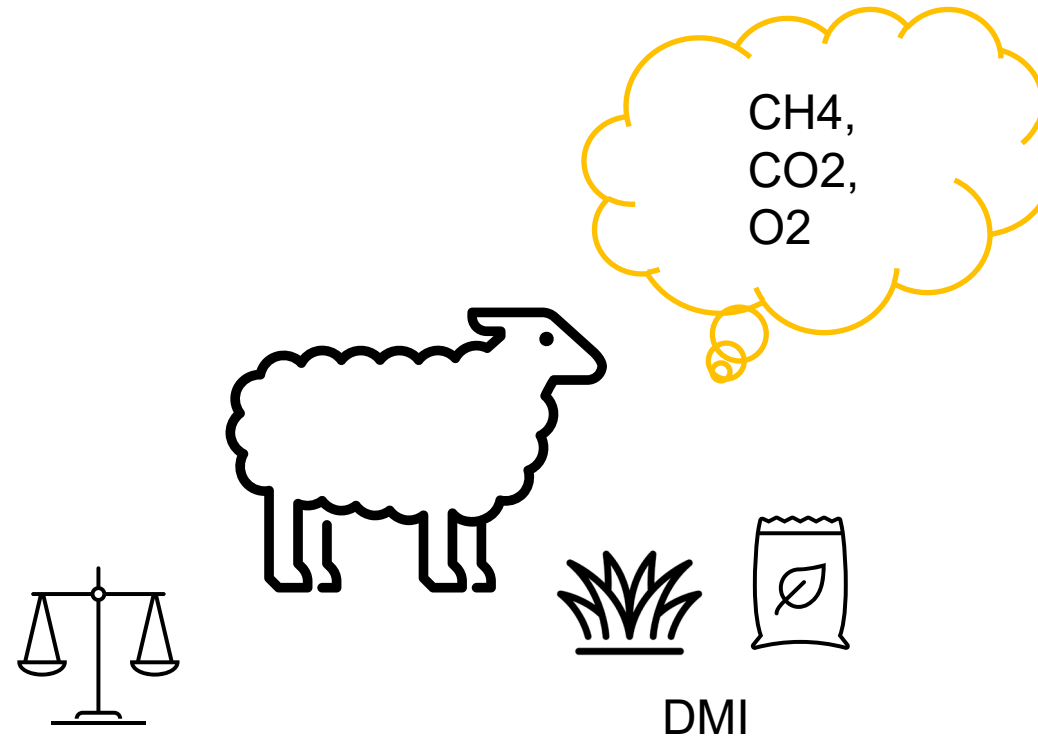
 @DiffordGareth



Acknowledgements



Feed and gas complex in ruminants



When can we record GHG and feed intake?

November – March



Winter feeding

April - May



Spring grazing

June - September



Summer range grazing

September – November

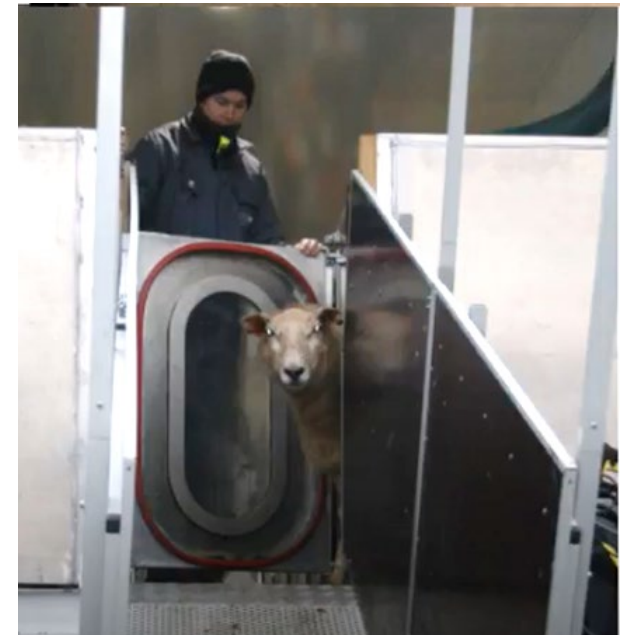


Autumn feeding

Recording dry matter intake – in door



Recording CH₄, CO₂ & O₂ – in & outdoors



Recording CH₄, CO₂ & O₂ with PACS



Objective

- How well can we predict DMI from CH₄, CO₂, O₂ and LW?
- How well can a model trained on silage transfer to grazing?
- How to thoroughly validate?

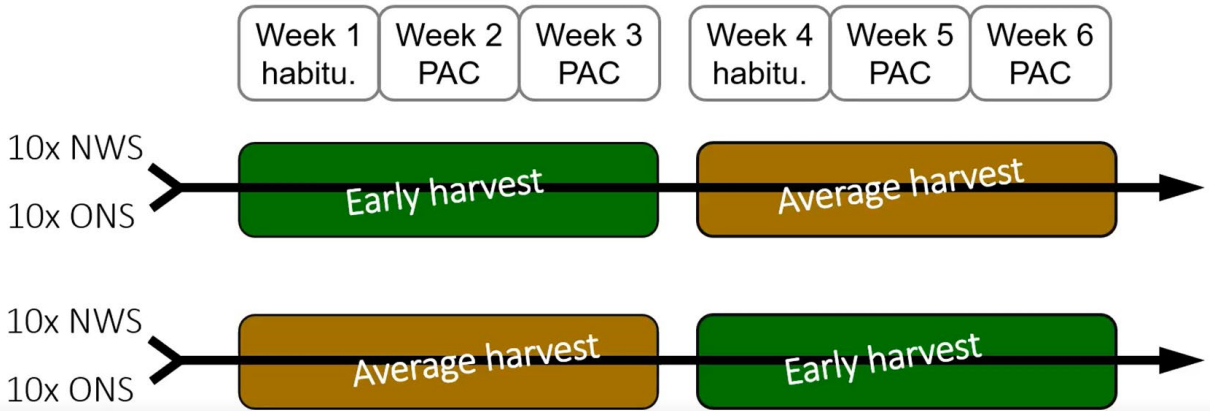
Design & Data – Trial 1 2020



Effects of sheep breed and grass silage quality on voluntary feed intake and enteric methane emissions in adult dry ewes

B.A. Åby^a ✉, I. Dønnem^a, J. Jakobsen^b, G. Steinheim^a

1200 data points
40 ewes
CH₄, CO₂, O₂ & LW



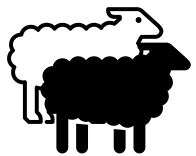
Design & Data – Trial 2 2021



600 data points
6 weeks
CH₄, CO₂, O₂ & LW
29 ewes from trial 1

Training & validating the ANN

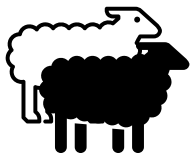
29 ewes



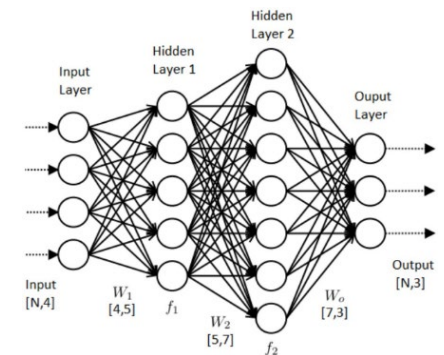
70%

Training

11 ewes

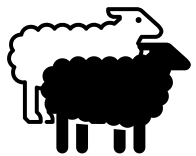


30%



Training & validating the ANN

29 ewes

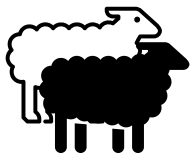


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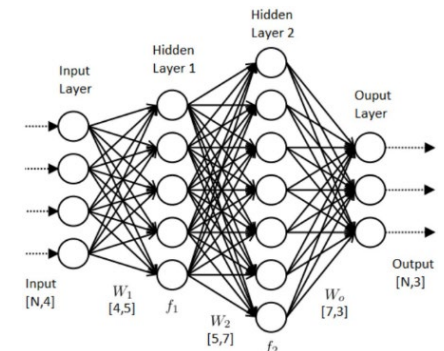
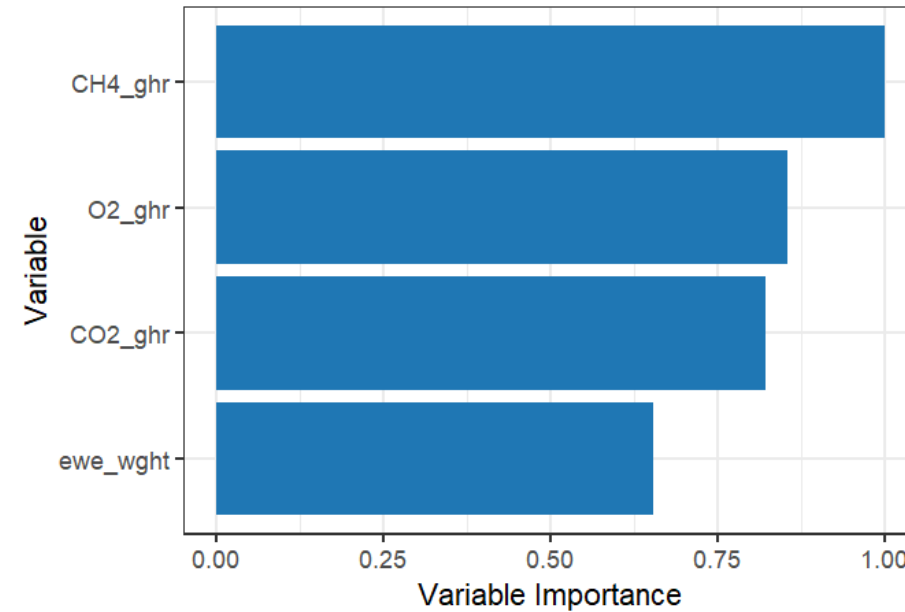
Training

11 ewes

30%

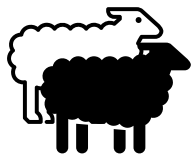


$R^2 = 0.85$
RMSE = 98 g



Training & validating the ANN

29 ewes



70%

Training

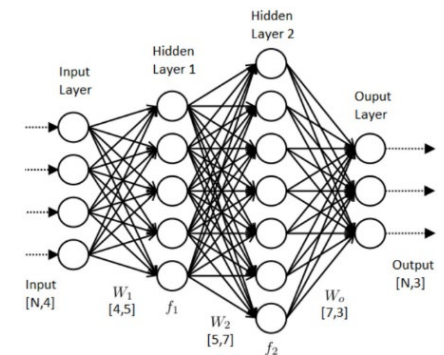
29 ewes

70%

11 ewes

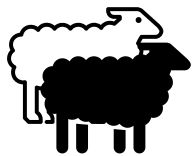
30%

$R^2 = 0.85$
RMSE = 98 g



Training & validating the ANN

29 ewes



70%

Training

29 ewes

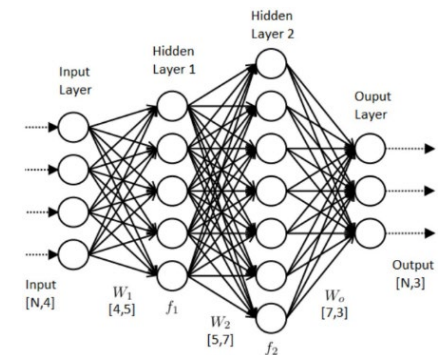
70%

$R^2 = 0.82$
RMSE = 110 g

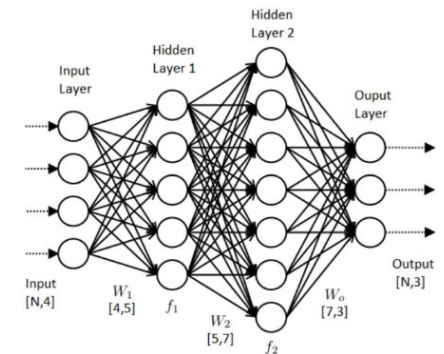
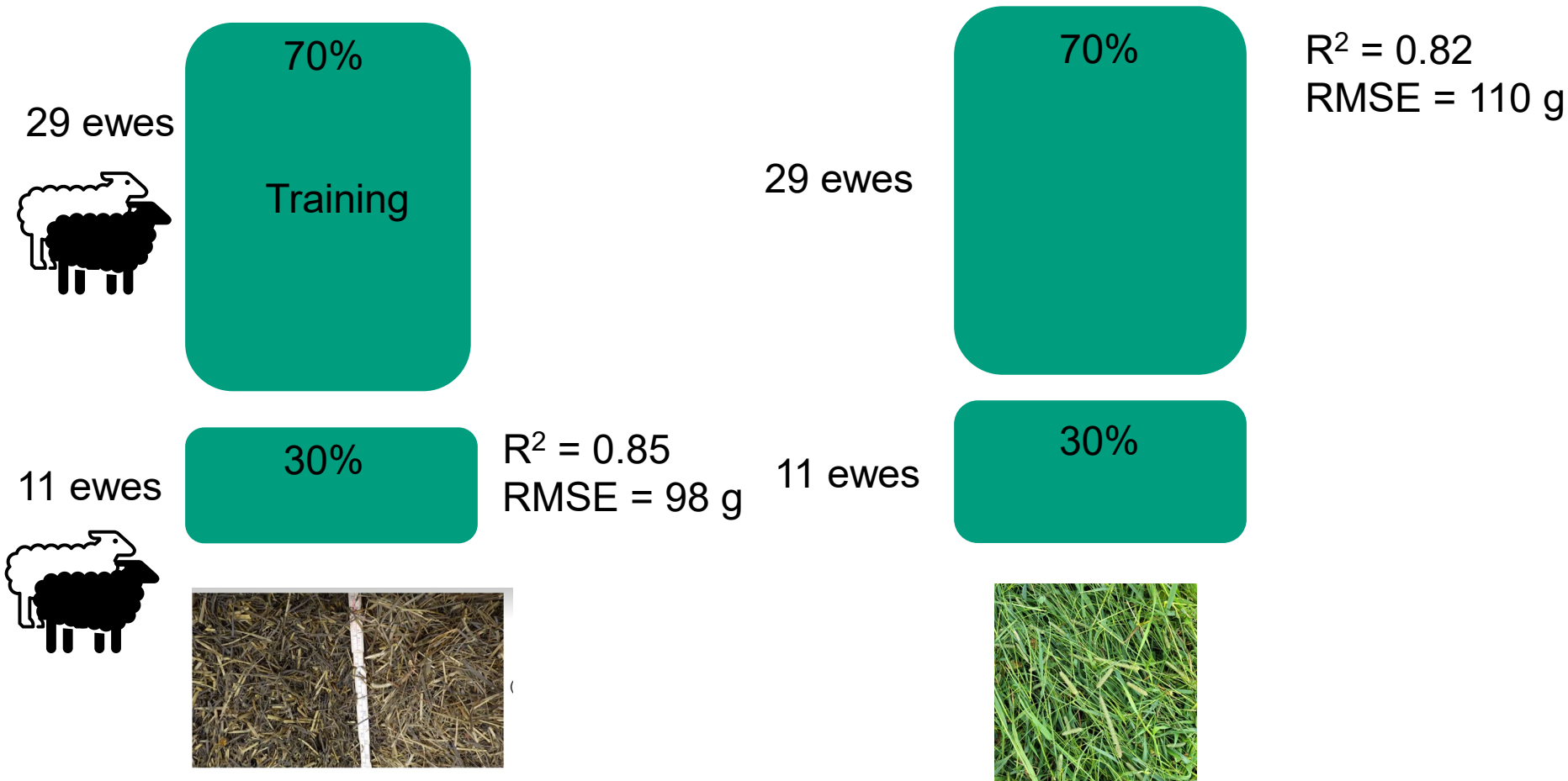
11 ewes

30%

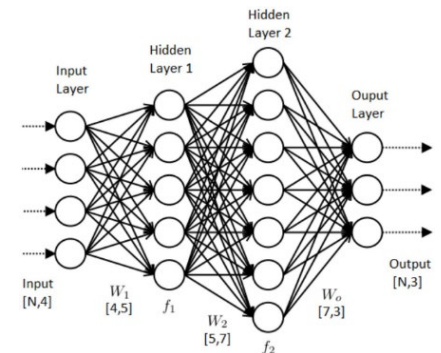
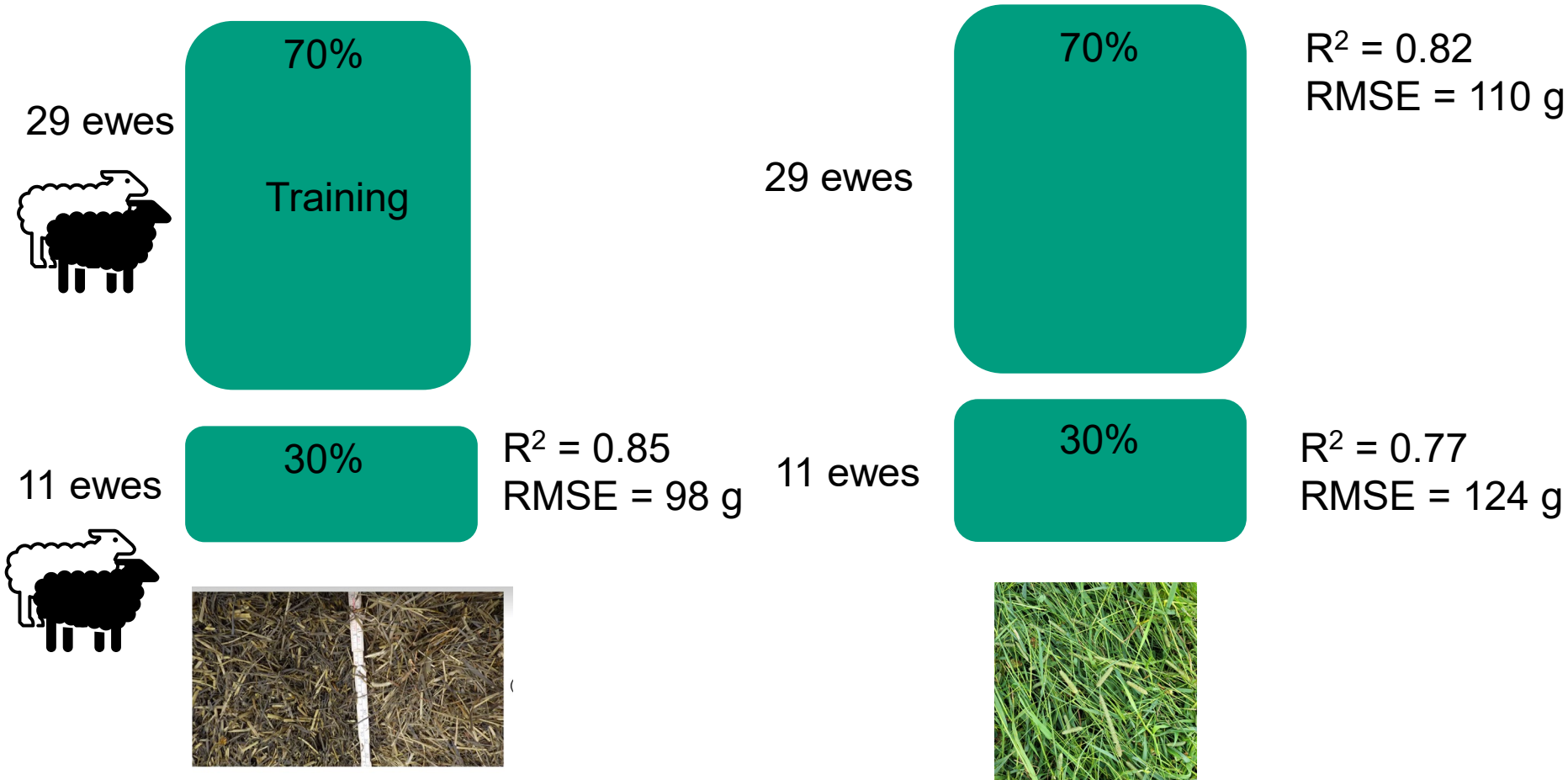
$R^2 = 0.85$
RMSE = 98 g



Training & validating the ANN



Training & validating the ANN



Conclusions

- PAC GHGs & LW are strong predictors of DMI
- ANN on modest data can generalise well across silage and fresh grass
- Predictions in unseen ewes on different feed showed a drop
- Careful validation strategies are needed!



Thank you for listening!

