

***In vitro* gas production from rumen fluid of Angus weaner heifers varying in RFI-feedlot EBVs grazing drought affected pasture**

H. Bansil^A, F.C. Cowley^A, R.S. Hegarty^A, F.A.P. Alvarenga^{B,C} and P.L. Greenwood^{B,C}

^ASchool of Environmental and Rural Science, University of New England, Armidale, NSW 2351, Australia

^BNSW Department of Primary Industries, Livestock Industries Centre, UNE, Armidale, NSW 2351, Australia

^CCSIRO Agriculture and Food, FD McMaster Laboratory Chiswick, Armidale, NSW 2350, Australia

^ACorresponding author: hbansi@myune.edu.au

Residual feed intake (RFI) measurements from which Estimated Breeding Values (EBVs) are determined are generally made in feedlots. This is because measurement of individual feed intake in grazing systems has not been possible in the past, despite grazing systems underpinning most beef production in Australia. The rumen microbiome contributes up to 90% of metabolic needs from ingested feed through impacts on feed fermentation, retention time and digestibility (Mizrahi and Jami, 2018). EBVs for residual feed intake determined in feedlot (RFI-f-EBV) have been shown to be associated with digestive function on feedlot diets (Herd *et al.*, 2019), but it is not known how RFI-f-EBV affects rumen characteristics of young grazing beef cattle. We hypothesized rumen fluid from more efficient cattle would have a greater fermentation capacity.

Six Low-RFI-f-EBV (High feedlot efficiency: mean \pm SEM -0.48 ± 0.05 RFI-f-EBV) and 6 High-RFI-f-EBV (Low feedlot efficiency: 0.75 ± 0.07 RFI-f-EBV) 8-month-old Angus heifers within a group of 40 heifers weaned at 6-months-of-age were studied. The heifers grazed 1.25 ha paddocks comprising drought affected, low quality mixed perennial temperate grasses at 7-day intervals during successive 28-day phases differing in pasture DM availability: Phase 1, $>2,800$ kg DM/ha (7.5% CP and 5.2 MJME/kg DM); Phase 2, $<1,900$ kg DM/ha (5.9% CP and 5.0 MJME/kg DM). Rumen fluid was collected at the end of each 28-day Phase, and *in vitro* gas production measured (Menke *et al.*, 1979) using pasture from paddocks during each Phase as substrate. Total gas, methane and CO₂ production (mL) were measured at incubation times up to 48h. Data were analysed at different incubation times by ANOVA with RFI-f-EBV group (Low or High) and Phase (1 or 2) and their interaction as fixed effects.

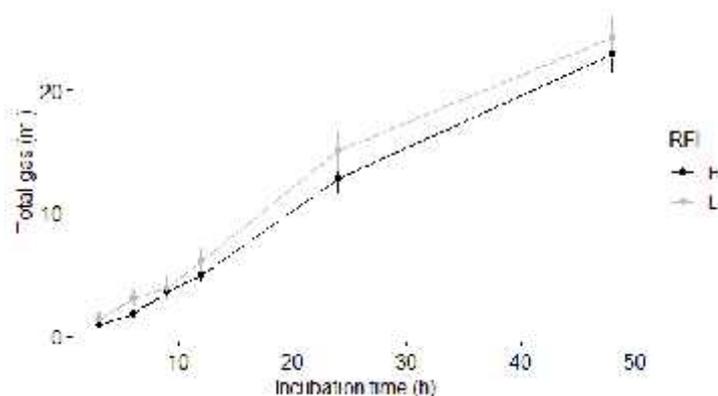


Figure 1. Mean (\pm SEM) total *in vitro* gas production over time as affected by Residual Feed Intake Estimated Breeding Values (RFI: H = High, L = Low).

RFI-f-EBV did not have a significant effect on total gas production at 3, 6, 9, 12, 24 or 48 h incubation ($P = 0.11$) or on methane (17.7 ± 0.76 v 17.6 ± 0.10 mL, $P = 0.50$) or CO₂ (11.7 ± 0.26 v 11.9 ± 0.26 mL, $P = 0.85$) production at 24 h incubation. At 48 h incubation, methane production tended to be greater (5.0 ± 0.59 v 3.7 ± 0.56 mL, $P = 0.07$) for Low-RFI-f-EBV than High-RFI-f-EBV. This tendency for greater methane production/unit digesta from more efficient cattle at 48 h incubation is consistent with the results of Herd *et al.* (2019) and greater digestion in the rumen of more efficient animals, but needs to be married with data on rumen volume to provide a fuller picture of RFI effects on daily methane emission. Further studies should include rumen characteristics between cattle varying in RFI-f-EBVs grazing pastures of differing quality and availability and at different stages of the production cycle. Such research should aim to test the reliability of the results for low and high efficiency cattle observed in the present study using greater numbers of cattle.

References

- Herd RM *et al.* (2019). *Journal of Animal Science*. **97**, 2202-2219.
Menke KH *et al.* (1979). *Journal of Agricultural Science, Cambridge*. **93**, 217-222.
Mizrahi I and Jami E (2018) *Animal*. **12**(s2), s220-s232.

This work was funded by the University of New England, NSW Department of Primary Industries, CSIRO and the MLA Donor Company as part of Project P.PSH.1000 Increasing Profit from Pasture through Increased Feed Efficiency, within the Livestock Productivity Partnership.