Re-defining animal unit equivalence for the northern Australian grazing industries

Stuart McLennan[A], *Ian McLean*[B], *Col Paton*[D]

[A] Department of Agriculture and Fisheries, GPO Box 267, Brisbane Qld 4001,
[B] Bush Agribusiness 120 James Street Toowoomba Qld 4350,
[C] EcoRich Grazing, PO Box 284 Goombungee Qld 4354,
[D]Email: clpaton@bigpond.com

The adult equivalent (AE) system describes and quantifies, in commonly recognised units, the grazing pressure imposed on the pasture by foraging ruminants. The AE concept evolved from a need to assess the overall effect of different classes of animals, separately or in combination, on the pasture they were grazing, with an overriding aim of achieving responsible land management. Multiple uses for the AE concept have been proposed (Scarnecchia 2004). Using a common terminology such as AE allows meaningful comparisons of grazing dynamics within and across properties. In addition, as Scarnecchia and Gaskins (1987) contend, standardising the method of defining the AE is required to improve communication among researchers and grazing land managers.

The AE rank assigned to an animal is commonly determined as the ratio of its energy requirements, for instance metabolisable energy (ME), relative to that of a 'standard animal', where energy requirements are usually determined using feeding standards. In keeping with the approach, various attempts have been made in recent years to define the standard animal and its energy demands, as it relates to northern Australia. In this pursuit, several spreadsheet calculators, e.g., *ME_Required* (CSIRO 2020), which encapsulates the equations from the Australian feeding standards (NRDR 2007), have been set up to easily allow calculations of energy requirements.

Previous research (McLennan 2013), coupled with anecdotal evidence, has suggested that the Australian feeding standards considerably over-estimate the energy requirements, and thus the feed intake, of cattle consuming tropical forages in northern Australia. Following simulations carried out using the Solver function in Microsoft Excel, based on intakes of cattle receiving tropical forage diets, small modifications were made to the equations of the feeding standards to provide better agreement between intakes observed and those predicted using the feeding standards (see McLennan 2013; McLennan *et al*. 2020). One of the changes involved using a constant value for the efficiency of use of ME for maintenance of 0.72 when cattle were gaining 0.2 kg/day or more.

Recently, McLean and Blakeley (2014) had described the standard animal as a 2.25 year-old, 450 kg *Bos taurus* steer consuming a diet of 7.75 MJ/kg DM, walking 7 km/day and maintaining weight. Based on the unmodified equations of NRDR (2007) the ME requirement of this standard animal was 72.6 MJ/day. We have adopted this description of the standard animal but, following the modifications to the feeding standards discussed above, the revised ME requirement is 64.3 MJ/day.

The above described modifications have not been tested with cattle in temperate regions. However, going by the predominance of use of the GrazFeed software program (Freer *et al*. 2012) in southern states of Australia, there may not be a similar need for modification in this temperate region. This raises the dilemma of having different systems for different climatic zones. The recent study (McLennan *et al*. 2020) showed, however, that the AE rank calculated with either the modified or unmodified equations of the feeding standards were similar provided the same equations were used to calculate energy requirements of the animal of interest as were used to define those of the standard animal. These AE ranks can then be applied to calculating carrying capacity or fodder budgets in various ways depending on the level of precision required and the skills of the operator. These include, in order of decreasing sophistication, using a spreadsheet ME requirement calculator to directly estimate feed intake or using tables linking a description of the animal and its production level to an AE rank and then multiplying this rank by an intake constant. Suggested values for the intake constant have been proposed (McLennan *et al*. 2020) that allow for carrying capacity comparisons at a regional, state and national level.

References

Freer M, Moore AD, Donnelly JR (2012) The GRAZPLAN animal biology model for sheep and cattle and the GrazFeed decision support tool.
(CSIRO 2020). GrazPlan supporting programs. https://grazplan.csiro.au/supporting-programs/
McLean I, Blakeley S (2014) Final Report B.NBP.0779. Meat and Livestock Australia Sydney. Aust.
McLennan SR (2013) Final Report B.NBP.0391. Meat and Livestock Australia Sydney. Aust.
McLennan SR, McLean I, Paton C (2020) Final Report B.GBP.0036. Meat and Livestock Australia Sydney. Aust.
NRDR (2007) 'Nutrient requirements of domesticated ruminants.' (CSIRO Publishing: Melbourne, Australia)
Scarnecchia DL (2004) *Journal of Range Management* **57**, 113-116.
Scarnecchia DL, Gaskins CT (1987) *Agricultural Systems* **23**, 19-26.

Special thanks to Meat & Livestock Australia for supporting this work.