

Methane emissions of cattle fed on tropical forage or high grain diets*M Kurihara^{1,2}, T Magner¹, RA Hunter¹, GJ McCrabb¹*¹CSIRO Tropical Agriculture, Tropical Beef Centre, Ibis Avenue, Rockhampton, QLD 4702²National Institute of Animal Industry, Norindanchi, Tsukuba, Ibaraki 305, Japan

Methane is a greenhouse gas produced by cattle during the processes of feed digestion, and is estimated to account for 58 % (1) of methane emissions of all Australian livestock, and 73 % (2) of global livestock methane emissions. In the Australian inventory, predictions of methane emissions of cattle are based on measurements (3) made on British breeds of cattle and sheep fed on temperate forage based diets. The chemical structure of temperate forage species differ greatly to those forage species fed to cattle in the tropics. The objective of this experiment was to determine daily methane production of Brahman cattle fed on three different diets that represent those used under commercial conditions in tropical Australia.

Six Brahman heifers, aged 3.5 years, were used in a latin square experiment conducted over six months. During each period two heifers were fed ad libitum with Angleton grass hay (*Dicanthium aristatum*, 0.4 % N), Rhodes grass hay (*Chloris gayana*, 1.5 % N) or a high grain (feedlot, 2.8 % N) diet. Heifers were fed each diet for four weeks prior to measurements being made. Methane production was measured continuously over 24 hours using a confinement type respiration chamber. The table presents measurements made on the day of the respiration chamber experiment, except for liveweight change which was measured over four weeks.

Diet:	Angleton grass (n=6)	Rhodes grass (n=6)	High grain (Feedlot) (n=6)	Sig.
Liveweight (kg)	359±10	361±10	369±10	ns
Liveweight change (kg/day)	-0.84±0.19a	0.52±0.08b	1.34±0.15c	P<0.01
DMI (kg/day)	3.6±0.4a	6.7±0.3b	7.9±0.6b	P<0.01
Methane production (g/day)	107±9a	240±13b	168±17c	P<0.01
(g/kg DOMI)	75±4a	65±2b	33±3c	P<0.05

DMI = dry matter intake; DOMI = digestible organic matter intake; ns = not significant

These are the first published measurements of methane production for cattle fed tropical forages. Methane production per DOMI was highest for cattle fed Angleton grass and lowest for the feedlot diet. We predicted methane emissions of our cattle using NNGI methodology (1), and found that they were similar to our measurements for Angleton grass and the feedlot diet, but underestimated (~40 %) that for Rhodes grass. We conclude that reliable inventories of methane emissions of livestock in tropical regions of the world, including northern Australia, can only be made when methane emissions of cattle fed a range of tropical forage species are available.

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1. National Greenhouse Gas Inventory Committee. Workbook for Livestock 6.1. Canberra: Department of Environment, Sport and Territories, 1996.
2. US Environmental Protection Agency. International anthropogenic methane emissions: Estimates for 1990. Washington DC: US EPA, 1994.
3. Blaxter KL, Clapperton JL. Prediction of the amount of methane produced by ruminants. Br J Nutr 1965; 19:511-522.