METHANE EMISSIONS AND METABOLIZABLE ENERGY INTAKES OF STEERS GRAZING GRASS/LEGUME PASTURE AND FINISHED IN A FEEDLOT OR AT PASTURE

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Methane is an important greenhouse gas so managing livestock to reduce methane emissions is important to alleviate climate change. In North America, it is common to graze cattle on pasture during the growing phase and to finish them in a feedlot. The GrassGro decision support tool (Moore et al. 1997) has been successfully adapted for use in Canada. It has been validated by comparing predictions with data from a 4-year experiment conducted at Brandon, Manitoba in which steers grazed a lucerne/grass pasture at 2 stocking rates (1.1 and 2.2/ha) either continuously or in a 10-paddock rotation (Popp *et al.* 1997). Observed average daily gain (ADG) (Y kg/d) was compared with predicted ADG by regression. The intercept (-0.066) was not significant (p=0.087) so the line was forced through the origin and was not different from Y=X (t=0.091; P>0.05)

$$Y = 0.995\,X\ (R^2=0.999,\ RSD=0.027,\ P=0.0000)$$

The steers were not finished to meet Canada Grade A when taken off pasture (McCaughey *et al.* 1996) so were fed in a feedlot for 33d to reach 619 kg and Canada A grade at slaughter. GrassGro predicted that the steers would reach 616 kg after 33-d in a feedlot. We then used GrassGro to compare finishing in a feedlot or at pasture with a barley supplement during 1992-1994. The results indicated the steers would reach a mean liveweight of 615±10.7 kg and body condition score (BCS) of 4.6±0.1 (scale 1-5) at the end of the pasture period with an average daily barley intake of 5.25±0.7, 2.25±0.6 and 4.1±1.02 for 1992-1994 respectively. Liveweight and BCS did not differ between years, stocking rate or grazing management treatments. Barley intakes differed between years (P<0.05) but not between management treatments.

We also compared GrassGro predictions for methane emissions/steer (276.8±11.4g/d) with data reported from the field experiment (217.4±43.1g/d; McCaughey *et al.* 1997) and the difference was not significant (P>0.05). GrassGro indicated lower (P=0.02) emissions for steers grazing at 2.2/ha (275.8±11.8 g/d) compared with 1.1/ha (286.1±7.3 g/d) but no difference (P=0.51) for rotation (282.5±10.8 g/d) and continuous (279.5±11.2 g/d) grazing. There was no difference (P=0.65) between stocking rates or grazing management when methane emissions were compared per unit of liveweight gain (LWG). GrassGro indicated that mean total methane emissions/steer when supplemented with barley at pasture were 38.7±7.3 and 54.4±4.0 kg/steer (P=0.0001) for steers grazing pasture without barley supplement and finished in a feedlot. Neither stocking rate nor grazing management influenced total metabolizable energy intake (MEI) or MEI/kg LWG (P>0.05). However, mean MEI/kg LWG of steers finished at pasture with a barley supplement (68.28±6.73 MJ) was less (P<0.001) than that of steers grazing pasture and finished in a feedlot (169.58±8.84 MJ). Similarly, methane emissions/kg LWG were reduced when steers were given a barley supplement at pasture (133.2±22.0 *v* 199.1±20.4 g/kg LWG; P<0.001). We conclude that finishing cattle at pasture with a barley supplement will reduce the total emissions of methane and increase the efficiency of conversion of feed energy to live weight gain when compared with unsupplemented grazing and finishing in a feedlot. Production and environmental advantages were greatest at 2.2 compared to 1.1 steers/ha because more steers were grazed with no change in methane emissions, liveweight gain or barley intake.

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