concentrations at 0.8 M nor M. OM digestibility increased linearly with reducing F:C ratios at both 0.8 M and M, the two relationships had the same slope but had significantly different ($P < 0.05$) intercepts (0.961 and 0.946 for 0.8 M and M respectively). Methane production per kg OM apparently digested decreased with decreasing F:C ratio linearly (no interactions) regardless of level of maintenance, though this was significant ($P < 0.05$) only for 0.8 M. It is concluded that plane of nutrition and F:C ratio can influence apparent OM digestibility and methane production when grass silage is supplemented with FM. Implications are that methane production from FM alone over the inclusion range studied can be estimated from the methane produced from the mixed diets.

82. The use of sheep to predict methane production by cattle fed grass silage-based rations

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Increasing concern over the rôle of greenhouse gases in global warming has led to a renewed interest in models for predicting methane production in ruminants. For economic reasons it would be preferable if such models could be derived from data obtained in smaller ruminants. In the current study four Simmental $\times$ Friesian steers (initial weight 223 kg) and four Suffolk cross wethers (initial weight 80 kg) were used to evaluate the effect of diet on methane production. Barley, maize and sugar-beet pulp based concentrates were included in diets of grass silage at 400 or 600 g/kg dry-matter intake (DMI) and the complete diet was fed at 1 or 1.7 times maintenance in a series of three sequential 2×2 factorial designs. Animals were adapted to the diets for 17 days (cattle) or 21 days (sheep) prior to measuring methane production over 4 days. Methane production by sheep was linearly related to DMI (CH_4 (l/day) = $11.98 + 25.81 \text{ DMI}$; $r^2 = 0.68$). There was no statistically significant improvement in the ability of the model to predict methane excretion when intake was proportioned between silage and concentrate nor when the intake of proximate nutrients was included. Similar results were obtained with cattle; the linear model relating methane to DMI was CH_4 (l/day) = $19 + 36.52 \text{ DMI}$ ($r^2 = 0.96$) with no benefit of including more complex models. When models derived from sheep were used to predict methane output from cattle the fit was generally poor, with the best fit obtained from a quadratic model (CH_4 (l/day) = $14 + 22 \text{ DMI} + 1.7 \text{ DMI}^2$; $r^2 = 0.42$) although this systematically under predicted methane production by cattle. A significant improvement could be achieved by adding a multiplier to the linear model derived in sheep (CH_4 (l/day) = $1.43 (11.98 + 25.81 \text{ DMI})$; $r^2 = 0.96$). In conclusion methane production by cattle could not be described accurately by models derived from sheep, and while a 'cattle' correction factor might improve the fit of such models, such an approach would require validation with data from cattle fed a wider range of intakes than those studied here.

83. Effect of fish meal supplementation on body energy mobilization and milk production of ewes in negative energy balance

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Protein supplementation has a positive effect on milk production, particularly in ewes on negative energy balance. The response has

been associated either to an increase in the rate of fat loss or to an improvement in the energy utilization for milk synthesis. In order to increase the understanding of the mechanism involved, 36 Rasa Aragonesa ewes blocked by body condition score (BCS, overall mean 2.49 (s.e. 0.05) units) after lambing and allocated to two treatments consisting of ammonia-treated barley straw *ad libitum* plus 550 g/day of a supplement made up of barley grain and either 100 (LFM) or 200 g/day (HFM) of fish meal. Initial mean live weight was 43.7 (s.e. 1.32) and 47.6 (s.e. 1.49) kg for LFM and HFM, respectively. After 1 week of adaptation, the straw and concentrate intake were recorded daily and the digestible organic matter intake (DOMI) was determined in digestibility trials. Body weight (BW), BCS and milk production of ewes, and lambs body weight were weekly recorded for 5 weeks. Body fat (BF) and energy (BE) content of ewes were measured at the beginning and the end of the 5-week period by the deuterium oxide method. Similar DOMI was observed in both treatments (44.5 and 44.6 (s.e.d. 1.65) g/kg $\text{M}^{0.75}$ per day for LFM and HFM) and total changes in BW, BCS, BF and BE were slightly but non-significantly higher in HFM than LFM treatment (-0.50 and -0.03 (s.e.d. 0.67) kg, -0.12 and -0.10 (s.e.d. 0.06) units, -2.85 and -2.26 (s.e.d. 0.38) kg, and -101.6 and -80.8 (s.e.d. 15.4) MJ, respectively). Daily milk production and lamb growth rate were significantly higher ($P < 0.001$ and $P < 0.01$) in HFM than LFM (1241 and 915 (s.e.d. 84.6) g/day and 198 and 169 (s.e.d. 11.1) g/day, respectively). The higher mobilization of BF promoted by FM supplementation was not enough to explain the total increase in milk production, suggesting a simultaneous improvement in the efficiency of energy utilization for milk synthesis.

84. Effect of sward height and sheep breed on sward composition during summer grazing period

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With the aim of finding out the effect of sward height (SH) and sheep breed on sward composition a grazing experiment was carried out according to a $2 \times 2 \times 5$ factorial design, defined by: two SH (LSH: < 3.5 cm and HSH: > 6.5 cm), two Spanish breeds of sheep (Churra and Merino) and five sampling periods (every month from June to October). The SH was recorded three times a week and they were adjusted using variable stocking rates. A total of eight plots (0.15 ha per plot) were used and two quadrats (0.5 $\times$ 0.5 m) by plot and period were sampled. The botanical composition on a dry matter (DM) basis was divided in: grasses, legumes and others and proportion of live material and leaves were recorded. The content of crude protein (CP), neutral detergent fibre (NDF) and *in vitro* DM digestibility (IVDMD) were determined. Available DM (kg DM per ha) was 318 (s.e. 38.2) and 943 (s.e. 75.1) for the LSH and HSH, respectively. There were no significant ($P > 0.05$) differences between SH in the proportions of botanical families (grasses, legumes and others), NDF and leaf proportion. A higher value in the LSH was found for the proportion of live material (810 (s.e. 17) v. 730 (s.e. 16) g/kg DM, $P < 0.01$), CP (204 (s.e. 4.7) v. 187 (s.e. 4.8) g/kg DM, $P < 0.001$) and IVDMD (0.71 (s.e. 0.011) v. 0.67 (s.e. 0.010), $P < 0.001$). The plots grazed by Churra breed had a higher proportion of leaves (850 (s.e. 11) v. 800 (s.e. 19) g/kg DM, $P < 0.01$), CP (215 (s.e. 4.6) v. 176 (s.e. 4.8) g/kg DM, $P < 0.001$) and IVDMD (0.70 (s.e. 0.008) v. 0.68 (s.e. 0.010), $P < 0.05$) and a lower value of NDF (500 (s.e. 8.0) v. 550 (s.e. 8.9) g/kg DM, $P < 0.001$). The proportions of live material were not affected by the sheep breed. The proportions of live material, leaves, CP and IVDMD were higher ($P < 0.01$) in the last period considered. The SH and sheep breed can modify the characteristics and nutritive value of sward and this must be taken into account when sheep grazing systems are studied.