A Model to Evaluate Buying and Selling Policies for Growing Lambs on Pasture

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Introduction In pastoral sheep finishing systems, farmers aim to maximize profitability by deciding on when and how many animals to buy and/or sell, while taking into account feed availability and current prices. This paper describes a stochastic lamb growth simulation model with a set of heuristic rules, which has been developed to financially evaluate different management strategies for growing lambs on pasture.

Model inputs Feed supply as pasture dry matter (DM; kg) is described in terms of daily DM growth rates, metabolisable energy concentration in pasture (ME; MJ/kg DM), minimum and maximum pasture DM covers and pasture utilisation (%). The financial parameters used are lamb buying price ($/kg live weight), a selling price ($/kg CW) based on carcass weight (CW) and fatness (GR; mm) and pasture cost (c/kg DM). The stocking rate at the start of the period is also an input parameter. Simulations have been run for a 100 ha farm in New Zealand, starting with 25 kg live weight weaned lambs in January.

Lamb growth The stochasticity in the program is in the form of normally-distributed multiplication factors (1±SD) for: live weight (LW; kg; 1±0.12) at the start, dry matter intake (DMI; kg DM/d; 1±0.01), metabolisable energy for maintenance (MEm; 1±0.0033) and net energy per kg gain (NEg; 1±0.0066). Each of these characteristics is unique for each lamb. The daily growth rate (ADG; g/d) for a lamb is calculated as follows:

$$DMI = C \times 0.04 \times 70 \times (LW/70) \times (1.7 - (LW/70))$$

where 70 kg represents the mature live weight and DMI is reduced by factor C to ensure that pasture cover does not fall below the desired minimal value of 1200 kg DM/ha.

$$ME\ intake\ (MEI) = DMI \times ME \qquad MEm = LW^{0.75} \times [0.39 / (((0.35 \times ME) / 18.4) + 0.503)]$$

$$ME\ for\ growth\ (MEg) = MEI - MEm$$

$$NEg = 2.5 + 0.35 \times LW \qquad ADG = MEg \times ((0.0424 \times ME) + 0.006) / NEg$$

$$CW\ (kg) = -2.04 + 0.473 \times LW; \qquad GR\ (mm) = -10.8 + 1.2 \times CW$$

Random normally-distributed deviations with means of zero are added to the CW (SD=±0.67kg) and GR (SD= ±2.6mm) values (Garrick *et al*., 1986).

Heuristic rules The lambs are sold at weekly intervals, but only when 50 or more have reached 45 kg LW. At the same time as lambs are sold, new lambs may be purchased, with the number bought being calculated as a function of pasture cover and the predicted length of time to grow lambs to 45 kg.

Model outputs The model calculates the predicted farm gross margin for a one-year period (returns from lamb sales minus the costs of lamb purchases and of pasture consumed) and can be used to investigate the effects of different management options on profitability. Results of a sensitivity analysis conducted with this model are presented elsewhere (Morel *et al*., 2005).

References

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