Computer spreadsheets for predicting feed requirements and feed budgeting

I.M. BROOKES[1], S.T. MORRIS[1] and W.J. PARKER[2]
[1]*Animal Science Department, Massey University, Palmerston North*
[2]*Agricultural and Horticultural Systems Management Department, Massey University, Palmerston North*

Keywords: beef cows, dairy cows, ewes, feed budgets, feed requirements, spreadsheets, heifers

Introduction

Planning the use of feed on farms requires the temporal relationship between feed supply and demand to be described by a budgeting process. This can be achieved using spreadsheets, but input data on pasture growth, supplements and animal feed requirements must be provided. Feed requirements can be derived from published tables but interpolation between data points is necessary (Townsley 1986). Computer models can provide estimates of requirements for any specified liveweight and production level. These can then be used as sub-routines to provide inputs to a feed budget (Brookes *et al.* 1991). This paper describes the main features of a number of feed requirement models and their use in feed planning.

Feed requirement models

A series of spreadsheets has been constructed to estimate daily dry matter (DM) requirements for a variety of livestock classes (Table 1). These models are based on published equations for energy use (ARC 1980), and require feed quality to be expressed as metabolisable energy concentrations. If these data are not available, default values for mixed pasture are provided. Output is expressed as daily DM requirements for half-monthly periods throughout the year, as well as annual totals, in either a table or graph format.

Validation of model predictions requires accurate measures of net pasture production and animal intake, both of which are difficult to achieve in the field. Fulkerson *et al.* (1986) showed that ARC equations reliably predict the intake of grazing dairy cows. The DM intake of dairy cows from three grazing trials conducted by the Dairying Research Corporation were closely correlated with predicted estimates from the COWREQTS model (r^2 = 0.91, D. McCall 1993, pers. comm.). Indigestible marker techniques have been used to estimate the DM intake of grazing ewes (Morris 1992). The EWEREQTS model gave similar estimates for ewes in late pregnancy, but appeared to under-estimate intakes in early lactation. Further measurements of individual animal intakes and performance will be obtained in order to validate model outputs.

Table 1 Feed requirement models and input specifications.

Model[a]	Stock Class	Input Data
COWREQTS	Dairy Cow	Breed, Calving Date, Annual Milk Yield, Lactation Length, Condition Score, Feed Quality
BEEFREQT	Beef Cow and Calf	Calving, Mating and Weaning Dates, Cow and Calf Liveweights, Calving %, Feed Quality
EWEREQTS	Ewe and Lamb(s)	Lambing, Weaning and Mating Dates, Ewe and Lamb Liveweights, Wool Production, Lambing %, Feed Quality
HFRREQTS	Pregnant heifers	Birth and Mating Dates, Liveweights, Feed Quality
DRYREDTS	Dry, non-pregnant cattle	Class (Bull, Steer or Heifer), Birth Date, Live weights/ Liveweight gains

[a] All models are structured to a spreadsheet format using Quattro-Pro.

Feed budget models

Two spreadsheets have been constructed for use on dairy (COWPLAN) or sheep and beef cattle farms (EWEPLAN) and differ only in the number of stock classes which can be included. Inputs include: period of the year over which the budget operates; initial pasture cover and target cover at end of the period; effective grazing area; net pasture growth rates, number of animals in each class and daily DM intakes in each half-month. Feed intakes can be derived from the appropriate requirement model and entered either manually or by linking spreadsheets.

Calculated outputs include: total pasture growth and DM intake for each livestock class during the budget period; and the difference between final and target pasture covers. If supplements need to be fed to achieve the target cover, the calculated amounts can be entered into the budget at the appropriate dates.

Use of models in feed planning

The spreadsheets listed in Table 1 have been used extensively for teaching purposes at Massey University and in the evaluation of management strategies including winter milk production (Lynch 1990), once-bred heifer systems (Keeling et al. 1991), and sheep and beef cattle production (Mackay et al. 1991).

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