Using the Grassgro™ Decision Support Tool for Grazing Systems

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Abstract

GrassGro™; is a computer decision support tool designed to assist decision-making in Australian grazing enterprises. Two examples of the use of GrassGro are given: a strategic analysis of a lamb production system and a tactical analysis of beef production to a forward contract.

Key words

GrassGro, decision support, grazing management.

The GrassGro decision support tool (2) has been developed by CSIRO Plant Industry to assist decision-making in the grazing enterprises of temperate southern Australia. The primary intended users for GrassGro are advisors. GrassGro allows users to take advantage of mathematical models of pasture and animal production (1, 2) within a Microsoft Windows™; graphical user interface. GrassGro is capable of analysing the performance of several different grazing enterprises:? wether and ewe flocks, steer and prime lamb finishing, and beef catttle breeding. Analyses with GrassGro take environmental variation into account to calculate production risks of an enterprise. Risks can be expressed in both financial and production terms. The purpose of this paper is to demonstrate the capabilities of GrassGro and its underlying mathematical models by means of some examples. For a further example, see (3).

Examples of the use of GrassGro

The first example concerns a second-cross prime lamb enterprise at Binalong, NSW (34?40'S, 148?38'E).? The management decision to be analysed is the choice of dates for lambing and lamb sales. This decision in- volves a number of interacting factors, all of which are dealt with by GrassGro: conception rates and lamb mortalities, differences in lamb growth rates at different times of the year, and changing prices for the lambs at different turnoff times. GrassGro was set up using the details in Table 1, and a simulation experiment was carried out. Each combination of lambing time and lamb sale date was simulated continuously over the period 1965-1994, and the mean of the annual enterprise gross margin was read from GrassGro's gross margin calculator. The prices used for lambs in each sale month were averages over 1987-95 for principal NSW markets; other costs and prices were the same for all runs.

Table 1. Details of the two production systems

		Binalong ewe system					Wagga Wagga steer system
Soil type:		Duplex: sandy clay loam (300 mm) over clay					Duplex: sandy loam (200 mm) over clay loam
Pasture species:		Cocksfoot, annual grasses, subterranean clover					Annual grasses, subterranean clover
Animal genotype:		Border Leicester x Merino ewes, Dorset rams					Hereford steers
Stocking rate		8 ewes/ha					1.5 steers/ha
Replacements		2nd cross enterprise. Replace through purchase of first cross ewes; cast for age at 5-6 years					Buy on 15 May, at age 6 months and live weight 220 kg
Weaning age:		14 weeks					n/a
Feeding policy:		Barley+lupins to maintain condition score [illegible]					None
Mean lambing dates:		1 Jun	1 Jul	1 Aug	1 Sep		
Lambing percentage:		115%	120%	130%	130%		
Sale date:		15 Oct	15 Nov	15 Dec	15 Jan	15 Feb	15 Nov
Sale price:	<17 kg	140	148	154	164	161	
(¢/kg d.w.)	≥17 kg	138	148	154	175	175	

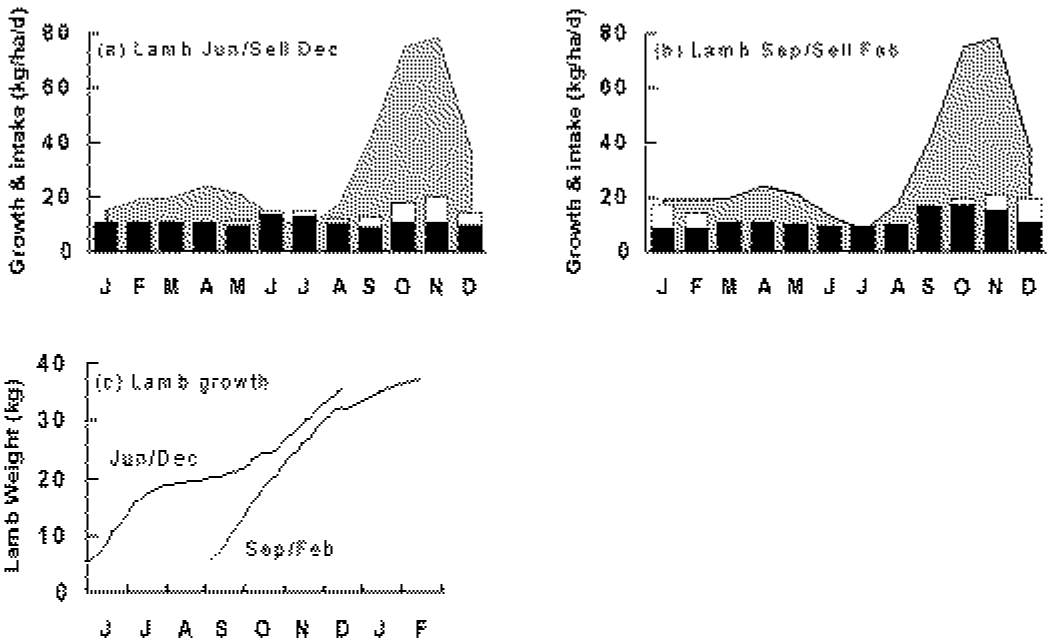

Figure 1

Predictions by GrassGro should always be checked to confirm that they are sensible. Fig. 1 shows the long-run average patterns of pasture growth, intake and lamb growth predicted by the model for two of the simulated systems. It can be seen that lamb growth rates are lower in the earlier-lambing system, because the increased demand for forage by the lactating ewes is not well synchronised with the growth rate of the pasture. Table 2 clearly shows that later-lambing systems yield higher gross margins, with the highest coming from September lambing and January sale. The standard errors of the gross margins (not shown) are reasonably consistent, so production risk is not likely to affect this decision.

Our second example is the case of a steer finishing enterprise near Wagga Wagga (35?10'S, 147?27'E), in a year where the growing season has begun relatively early and there is 600 kg/ha of available green herbage on 15 May. Forward contracts are being offered for grass-fed yearling beef to be sold in the Japanese market; with contract specification of 390-530 kg live weight, delivered in November. The problem is to calculate the probability of achieving the specified sale weight.

Table 2. Simulated gross margins for the Binalong ewe system.

	Lambing date			
Sale date	1 Jun	1 Jul	1 Aug	1 Sep
15 Feb			204	229
15 Jan	186	189	199	233
15 Dec	160	162	190	205
15 Nov	137	135	163	
15 Oct	117	120		

(a) Figures are mean annual gross margins ($/ha) over the period 1965-94.

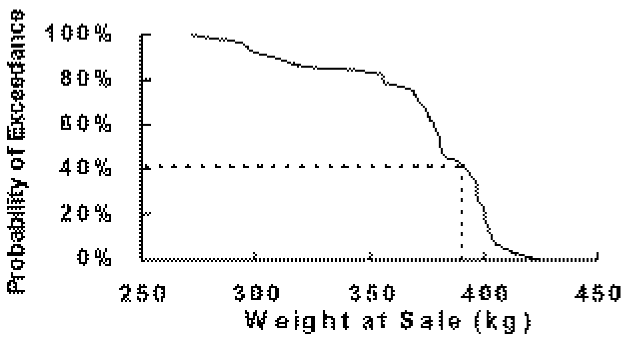

Figure 2

This analysis can be carried out by using the "tactical" simulation facility of GrassGro. In a "tactical" run, a common starting point is used to simulate a few months of production using weather inputs from each of a range of years. This allows the generation of a probability distribution of production levels projected from a single set of initial conditions. Details of the simulated enterprise are given in Table 1; a "tactical" simulation was carried out using May-November weather inputs for the years 1966-1995. It can be seen from Fig. 2 that there is only a 40% chance of the steers reaching the contract weight in this particular case.

Discussion

In both the above examples, a common process was followed: (i) identification of a question, (ii) specification of the physical and biological characteristics of the grazing enterprise, (iii) simulation with GrassGro, (iv) checking the simulated outcomes, and (v) interpretation of results. Because this process requires systems-oriented thinking, and because GrassGro simulations require information from a range of disciplines, training in the use of GrassGro is a vital element of the decision support "package". Training is conducted in small workshops and is problem-oriented. The degree of accuracy required, and so the usefulness of GrassGro, depends on the question at hand. Where the analysis involves comparison of different management options (as in the first example), or where communicating a principle is the advisor's aim, a representative biophysical system may suffice.

References

1. Freer, M., Moore, A.D. and Donnelly, J.R.? 1997.? *Agric. Syst.* **54**, 77-126.

2. Moore, A.D., Donnelly, J.R. and Freer, M.? 1997.? *Agric. Syst.* **55**, 535-582.

3. Simpson, R.J., Clark, S.G., Alcock, D.J., Freer, M., Donnelly, J.R. and Moore, A.D. *Proc. 11th Ann. Conf. Grassl. Soc. NSW*, pp. 57-64.