Alternative feedbase systems for southern Australia dairy farms: 1. Predicted pasture/crop consumption and farm financial performance

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Introduction Traditional perennial ryegrass-based pastures have significant limitations for efficient feeding of dairy cattle in dryland dairy regions of southern Australia. These include strong seasonality of growth, with 50 – 60% of total annual dry matter arriving in spring and little or no growth during summer. There is clear potential for improving total forage production and the seasonality of forage supply in these regions through the use of alternative pastures (Nie *et al.* 2004) and fodder crops. This series of papers applies a modelling approach to investigate the potential improvements in farm productivity and profitability resulting from their use.

Materials and methods Three analytical tools were used 'in series' to simulate non-irrigated, seasonal calving dairy farms 'typical' of the Terang district in southwest Victoria, Australia (38°14'S, 142°54'E). The pasture growth model DairyMod (Johnson *et al*. 2003) was parameterised using appropriate soil physical properties and plant physiology, and used to calculate long-term (1961 – 2000) mean monthly pasture harvest rates. These were then entered into the dairy farm system model UDDER which was parameterised to represent management policies typical of a farm in either the top 40% or top 10% of farms in the region using benchmark data. The farms were 125 ha, calving in autumn, and stocked at 1.8 or 2.25 cows / ha for the respective farms. Predicted total milk production (95,780 or 125,920 kg milksolids respectively) and the inputs required to produce this milk were analysed in 'Red Sky' to estimate the resulting farm operating profit and return on assets. 'Base' models (100% farm area in perennial ryegrass) were compared with: 1) a winter cereal crop grown for silage on 10% of farm area, 2) a summer brassica crop (turnips) grown on 10% of farm area, 3) combination of 2 with annual ryegrass sown on 10% of farm area, 4) combination of 1 and 2 (double cropping) on 15% of farm area, 5) oversowing annual ryegrass into the perennial ryegrass base, 6) combination of 4 and 5, and 7) summer shoulder pasture (tall fescue) sown on 100% of farm area. Harvest rate data were from DairyMod in all cases except for the summer crop where yields were estimated from local survey information. Feeding and other policies were adjusted in UDDER as necessary to efficiently use the additional feed available in each system.

Results Moving from the top 40% farm to the top 10% farm yielded the largest improvements in DM consumption (Table 1), reflecting higher base soil fertility and pasture growth of the latter which was utilised effectively by a higher stocking rate. Alternative feedbase systems resulted in 0.9 – 1.6 t DM/ha extra consumption for both farm types, and improved financial performance. Regression analysis using all simulations predicted that, for each additional tonne of DM consumed / ha, an additional $71 / ha or $102 / ha operating profit is available for the top 40% and top 10% farms respectively. Double cropping and summer shoulder pasture sat above this general relationship (Table 1) due to better seasonal distribution of forage supply.

Table 1 Model predictions for selected feedbase systems for 2 farm types

	DM consumed (t/ha)		Profit ($/ha)		Return on assets	
	Top 40%	*Top 10%*	*Top 40%*	*Top 10%*	*Top 40%*	*Top 10%*
Base ryegrass 10.0	6.7	8.6	750	1314	6.3	10.0
Double crop 11.4	8.0	10.2	930	1500	7.8	11.4
Ryegrass oversowing 10.4	7.7	9.5	836	1380	6.8	10.4
Summer shoulder pasture	7.6	9.6	985	1488	8.2	11.3

Conclusions The models successfully predicted system-level outcomes of changing the feedbase on southern Australian dairy farms. Alternative feedbase systems can improve forage consumption and financial return, but the biggest improvements will come from improved management and utilisation of the base pasture.

References

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