Integrating Dual-Purpose Wheat Crops into Different Sheep Production Systems in Southern Australia: Impacts on Livestock, Economic Returns and Risk

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The XXI International Grassland Congress / VIII International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

Integrating dual-purpose wheat crops into different sheep production systems in southern Australia : impacts on livestock , economic returns and risk

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Key words : mixed farming ,dual-purpose wheat ,simulation ,GRAZPLAN

Introduction Dual-purpose (grain + grazing) cereals have emerged as a potentially profitable new land use in southern Australia . Diverting land to dual-purpose cereal production will result in an increase in forage supply during winter , but may decrease total forage available at other times of year . The usefulness of the winter feed provided by these crops can be expected to depend upon the nature of the livestock enterprise , and hence the kinds and numbers of animals available to consume it . A modelling approach is the only viable way of evaluating the interacting tradeoffs between livestock and cereal production , and the impact of rainfall variability upon the outcomes .

Materials and methods The GRAZPLAN grazing systems models were used to explore the consequences of replacing 20% of permanent pasture with cropping rotations (1/2 year pasture , 1/2 year fallow , 1 year dual-purpose wheat) . The simulations extended a preliminary study (Moore et al . 2004) to a four-way factorial simulation experiment , viz . inclusion of dual-purpose wheat x sheep production system x location x stocking rate . Three sheep production systems were considered : (a) ewes mated in February/March , lambs sold the following January , wheat grazed by pregnant ewes in June ; (b) ewes mated in February/March , lambs carried over the summer , wheat grazed by yearling lambs in June prior to sale ; and (c) ewes mated in November/December , wheat grazed by newly-weaned lambs in July , lambs sold the following January . These systems were studied at 3 locations in south-eastern Australia : Colac (38°20 S , 143°35 E , mean annual rainfall 791 mm) , Canberra (35°19 S , 149°12 E , 630 mm) and Harden (34°32 S , 148°22 E , 629 mm) . Gross margins were calculated based on 2006 prices for grain , meat and wool and adjusted for the capital cost of ewes . Simulations were executed for the years 1972-2005 ; 1972 was omitted from summaries to avoid initialization artefacts .

Results The optimal long-term average gross margin was increased by introducing dual-purpose wheat for all nine combinations of location and livestock production system (Table 1) . Optimal stocking rates (on a whole-farm basis) increased for the February joining/ewes system but decreased for the system where lambs were carried over the summer . The riskiness of the optimal systems increased , but only where the optimal stocking rates were higher ; in these cases most of the extra gross margin could be obtained—with lower year-to-year variability—if the stocking rate per grazed hectare was held constant . The extent to which the predicted increases in gross margins were due to integration of crops and livestock was assessed by comparing expected gross margins of the optimal dual-purpose systems with an area-weighted average of the gross margins for corresponding stand-alone livestock and wheat-growing enterprises . This assessment showed that the crop-livestock integration effect accounted for virtually all of the higher profitability .

Table 1 *Simulated changes in the economically optimal stocking rate , lamb production , expected gross margin and its year-to-year variability resulting from the introduction of a dual-purpose wheat cropping rotation into three sheep production systems at three locations . - W and +W denote the systems with and without dual-purpose wheat ; LW = live weight ; GM = gross margin ; SD = standard deviation .*

Location	Colac			Canberra			Harden		
Start of ewe mating Stock class grazing wheat	Feb ewes	Feb weaners	Nov lambs	Feb ewes	Feb weaners	Nov lambs	Feb ewes	Feb weaners	Nov lambs
Optimal stocking rate - W	10 .5	10 .5	12 .0	8 .0	7 .0	7 .0	6 .0	6 .0	6 .0
(ewes/farm ha) +W	11 .0	9 .5	11 .0	8 .5	6 .5	7 .5	6 .5	5 .5	6 .5
Change in lamb sold (kg LW/farm ha)	+24	-8	-18	+12	-16	+17	+15	-8	+17
Change in GM ($ /farm ha)	+58	+40	+37	+25	+14	+24	+21	+21	+16
Change in SD of GM ($ /farm ha)	+14	+3	-8	+20	-9	+23	+23	+4	+21

Conclusions Introduction of dual-purpose wheat is likely to be a profitable change to enterprise structure across a range of environments , sheep production systems and levels of intensity of management , as long as agronomic management follows current best bet" practices .

Reference

Moore A .D . , Salmon L . , Dove H . , 2004 . The whole-farm impact of including dual-purpose winter wheat and forage brassica crops in a grazing system : a simulation analysis . *Proceedings of the 4th International Crop Science Congress . www . cropscience .org .au .*