

PRISM: APPLYING BIOECONOMIC MODELS TO FARM MANAGEMENT ISSUES

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Farm models need to be easy to use and realistic. MIDAS (Model of an Integrated Dryland Agricultural System) (1) has been widely used in Western Australia, and the Grains Research and Development Corporation has supported the development of MIDAS-like models for southeastern Australia (2). The PRISM (Profit - Resource Integration - Southern MIDAS) project uses a Wimmera Grey Clays model representing farming near Horsham VIC, and a Wagga Red Earth model, based on southern NSW. These simulate and integrate the farming operations that contribute to the production and sale of grain, meat and wool. Detailed information on biological interactions between enterprises, such as between legumes and cereal crops, ensures that the model farms are realistic. This paper examines the role of lupin rotations near Wagga Wagga when lupin grain yields vary.

METHOD

At Wagga Wagga the standard lupin yield in a pasture-pasture-wheat-lupin-wheat rotation is 2.20 t/ha. For this analysis the yield was varied from 1.10 to 2.75 t/ha (transpiration efficiency = 8 to 20 kg/ha/mm), a range encountered in farmer's paddocks (Armstrong, unpublished data). N fixation, input costs (excepting fertiliser), and the weed and disease control benefits of the lupins were not varied. Management of a 1000 ha farm was adjusted at each yield level to maximise operating profit (before tax and debt servicing). Canola and continuous cropping were not considered. Prices were \$210 for wheat, \$200 for lupins, \$180 for barley and \$150 for oats (gross \$/t, 1995/6 forecasts).

RESULTS AND DISCUSSION

Lupins are uneconomic at ≤ 1.5 t/ha/year where rotations such as pasture-pasture-wheat-wheat are superior (Fig. 1). For yields ≥ 2.0 t/ha a 5 year pasture-pasture-wheat-lupin-wheat rotation is optimal, so 20% of the farm is under lupins at any time. Rotations with a higher proportion of lupins (e.g. p-p-l-w-l-w) don't fully capitalise on the benefits of pastures and lupins for wheat, and are uneconomic. PRISM can assess the effects of changes in grain, lamb or wool prices on these results.

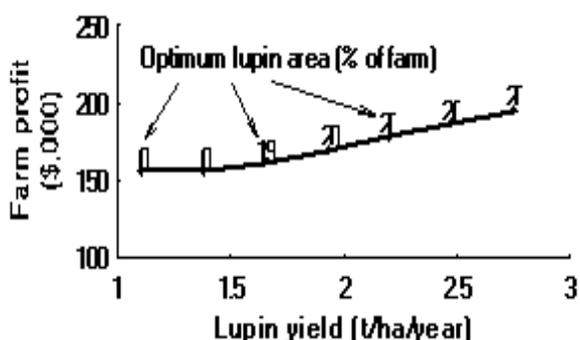


Figure 1. Effect of lupin yield on farm operating profit. The area sown to lupins is also shown.

REFERENCES

1. Morrison, D.A., Kingwell, R.S., Pannell, D.J. and Ewing, M.A. 1986. Agric. Systems 20, 243-268.

2. Robinson, B., Butler, G., and Kearns, B. 1995. Proc. 39th Conf. Aust. Agric. Econ. Soc., Perth, 14-16 February, 1995.