PASTURE STRATEGIES AND FERTILIZER TACTICS IN CEREAL-PASTURE FARMING - REWARDS AND RISKS

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The inclusion of legume dominant pastures in a rotation is usually associated with an accumulation, or at the very least a reduction, in the rate of decomposition of soil organic matter. Aggregate stability and permeability have also been shown to improve, increasing infiltration and reducing run-off and the potential for erosion. The cereal-pasture system allows farmers to have more flexibility in management strategies thereby reducing the risks associated with rainfall variability, grain and stock demand and market price fluctuations. We describe a simulation modelling approach which provides a platform for better decision making in these complex multi-species farming systems.

METHODS

The APSIM modelling shell has been used to construct a composite simulation model of a crop/pasture/soil system. It combines the SOCRATES soil C and N and GRAZPLAN pasture and ruminant biology models with the APSWAT soil water and NWHEAT crop modules from Agricultural Production Systems Research Unit (APSRU). Disease, pests and soil nutrients other than N are not simulated. The soil nutrient module provides a precise representation of crop and animal residue decomposition and N mineralization. Twenty simulation runs were carried out as a preliminary test of the composite model, simulating two annual pasture compositions (pure grass and pure medic) and ten cropping years (1981-90) on a daily basis at Roseworthy Agricultural College. Each run was initialized with identical soil conditions.

RESULTS AND DISCUSSION

About 40-50% of the grass production was utilized by the stock, compared with 15-30% in the medic simulations. Wheat after medic was on average 30% higher than after a grass pasture (Fig. 1.) with significant year-to-year variability in the magnitude of the yield boost. These responses suggest there is sufficient sensitivity in the model to influence the gross margins analysis used to assess the profitability and risk associated with various N and pasture management strategies.

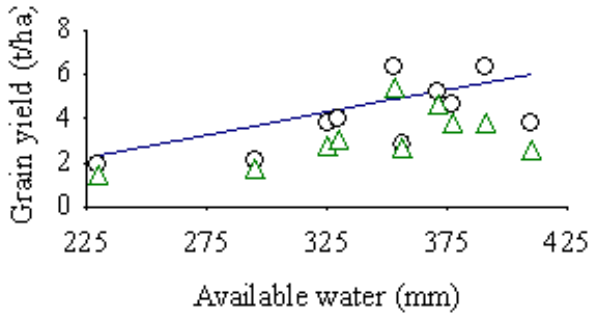

Figure 1. Simulated wheat yields (cv Spear) following pure grass (Δ) and pure medic (O) pastures and estimated potential yield at Roseworthy, South Australia.

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