The effects of high and low rates of reactive phosphate rock or water soluble fertilizers on pastures and net returns from 2nd cross lamb production after 5 years.

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Results from a 40 ha grazing demonstration at Newbridge (near Blayney) which commenced in March 1995 to compare pasture production, livestock performance and the economics of high and low rates of single superphosphate (SSP) and reactive phosphate rock (RPR) were reported previously (Clements *et.al.*,1998). The current paper outlines the production and economic results after five years and provides a benchmark for potential production from modified native pastures. The additional time-frame provides a better guide to the long-term sustainability of the practices carried out.

The pasture is typical of many sown pastures on acidic tableland soils, having reverted to native species (*Austrodanthonia* and *Microlaena*) as the dominant grass species. The soil has a pH($CaCl_2$) of 4.3 to depth and a cation exchange capacity (CEC) of 6.3 m.eq/100g with 18% aluminium. In mid 1994, phosphorus status was low at 4 mg/kg (Bray) and 14 mg/kg (Colwell); sulphur was also deficient.

Methods

The 40 ha was split into 5 treatment paddocks. The control paddock, representing district practice, is stocked at 5 crossbred ewes/ha and receives 125 kg/ha superphosphate applied only one year in three. In adjoining paddocks, equivalent amounts of phosphorus and sulphur were supplied by either single superphosphate (SSP) or reactive phosphate rock (RPR) at high and low rates and spread in November 1994. An initial "capital" application of 420 kg/ha SSP and 300 kg/ha (RPR) was applied to the two high rate paddocks (Gypsum was applied to supply equal quantities of sulphur/ha for a valid comparison with the SSP). Net return data was calculated after deducting all variable costs for the various paddocks including the cost to purchase extra stock. Costs of production ($11.15/ewe) were made up of the following costs:- replacement ewes $5.15; labour/ewe $1; shearing $3.20; and animal health $1.80.

Results and discussion

Table 1 summarises production and financial data averaged over the five years.

The pasture in the control paddock, while botanically stable, remains deficient in legume (5-10%). In contrast, the legume percentage in the other four paddocks ranges from 20-35% depending on the season and grazing pressure. Annual grasses and subterranean clover now make up a significant percentage of the total pasture mass during the winter and spring in all four annually fertilised paddocks. Monitoring of basal cover to determine the persistence of the perennial native grasses has shown no adverse change over the last five years. In the two highest fertiliser rate paddocks, the perennial grass component has actually increased, despite set stocking (necessary to

Table 1 Production and financial data* averaged over the 5 years 1995-1999.

Paddock Treatment	Control	Low SSP	High SSP	Low RPR	High RPR
Stocking Rate (ewes/ha)	5	5.75	7	5.75	7
Fertiliser (kg/ha/annum)	50	140	268	100	192
Wool income ($/ha/annum)	$53.17	$64.80	$78.42	$61.09	$80.41
Lamb income ($/ha/annum)	$127.89	$168.97	$227.54	$167.92	$226.74
Total Income ($/ha/annum)	$181.06	$233.77	$305.96	$229.01	$307.15
Variable Costs ($/ha/annum)	$67.55	$98.42	$135.15	$98.97	$130.46
Net Return ($/ha/annum)	$113.51	$135.35	$170.81	$130.04	$176.69
Extra Net Return per annum		$21.84	$57.30	$16.53	$63.18
Extra Costs (mean 5 years)		$31.42	$62.90	$30.87	$67.60
Return on extra $ invested		69.5%	91%	53.5%	93.5%

* Treatments in this demonstration are unreplicated and the limitations of experimental design preclude unequivocal conclusions. However the relative trends in the financial data averaged above occurred in all five years.

enable collection of meaningful livestock data). We have gradually increased stocking rates to utilise the extra feed grown to avoid clover dominance and ensure persistence of the native grasses. By 1999, stocking rates were 6.75 and 8 ewes/ha respectively on the low and high rate paddocks.

Since 1998, when phosphorus values had risen to 24 mg/kg Bray (15 mg/kg is required for good pasture production) the two high rate paddocks have been fertilised with 2 kg phosphorus per ewe (180 kg/ha SSP or equivalent) attempting to maintain levels above 15. The high SSP is currently 18 mg/kg while the low fertilizer treatments average 11 mg/kg Bray phosphorus. Sulphur is now adequate in all paddocks. Since 1994 there has been no change in soil pH, even in paddocks receiving high rates of phosphorus (over 1.25 t/ha SSP or equivalent).

There are two approaches to building up phosphate levels, the slow regular application which takes some years to achieve higher stocking rates and the "capital" application method. In this demonstration the latter method has indicated superior pasture and livestock production for both fertiliser types. One way to evaluate the economics of the various products and treatments is to consider the % return on extra dollars invested compared with the control as shown in Table 1. The two high rate treatments are indicating over 90% return despite the high fertiliser cost of the "capital" application in the first year and the fact that the highest stocking rates were not achieved until year four. It is worth noting that at stocking rate of 7 ewes/ha, the cost of these high fertiliser rates is only $7.90/ewe/annum.

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