WHITE CLOVER VERSUS NITROGEN FERTILISER 2. SHEEP PRODUCTION

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ABSTRACT
Animal production on pasture systems provided with either fertiliser or biological nitrogen was compared. A grazing experiment was sown at AgResearch Gore (46°07' S; 168°54' E) in October, 1989. Four ryegrass/white clover paddocks were compared to four ryegrass paddocks, with the latter receiving 270 kg nitrogen/ha/year. Each paddock of 0.5 ha was subdivided for rotational grazing at 20 ewes/ha. In comparison to the ryegrass pastures, mixed pastures produced 22% more herbage and were subsequently 22% higher stocked, lamb liveweight gains were 12% higher during lactation and 42% higher after weaning resulting in earlier sale at higher carcass weights. Ewe weight increases were 2.6 kg higher over lactation and wool production per kg body weight was 12% higher on the mixed pastures. Mixed pastures yielded more saleable product per kg of dry matter produced at lower($300/ha) cost than ryegrass pastures.

KEYWORDS
Carcass weight, *Lolium perenne*, liveweight gain, nitrogen, *Trifolium repens*, white clover, wool

INTRODUCTION
New Zealand pasture production systems are low cost systems mainly due to their dependency on white clover (*Trifolium repens* L.) for biological nitrogen fixation. Application of low rates of nitrogen fertilisers can stimulate pasture production with little impact on the white clover contents of those pastures (Eltilib and Ledgard, 1988). High rates of nitrogen fertilisers depresses biological nitrogen fixation and the ratio of clover in pastures (Ledgard et al., 1996). This may impact on volume of saleable animal products and the production costs of those products. White clover is a high quality forage (Ulyatt, 1981), is preferentially grazed by animals (Ridout and Robson, 1991) and has the potential for promoting higher animal growth rates than grasses (Brown, 1990).

An experiment was conducted at AgResearch Gore to quantify and compare ryegrass pastures receiving nitrogen fertiliser with mixed ryegrass/white clover pastures receiving no nitrogen fertilisers in terms of animal production.

MATERIALS AND METHODS
Site preparation and pasture management have been described earlier (Eerens et al., 1997). Eight 0.5 ha treatment paddocks (four mixed ryegrass/white clover and four ryegrass) were each rotationally grazed by 10 ewes (all year round) and 15 lambs (spring and summer) (measured animals), with additional non-measured animals added as required so that herbage allocations for all animals were similar.

Ewes lambed on the trial in September. Lambs were weaned in December re-randomised into flocks and ewes were shorn after weaning. Ewes were then culled, replacement ewes added and flocks re-randomised before ewes returned to the experiment to graze behind lambs from late December until late March (when lambs were sold), after which pastures were grazed by ewes until September.

Lambs were weighed after birth and all animals were weighed mid October and at weaning. After weaning ewes and lambs were weighed every three weeks until lambs reached 40 kg liveweight and were drafted off for slaughter.

Data were analysed based on flock averages of four replications of two treatments. Due to the re-randomisation of ewes at the start of every year, years (4) were considered replications.

RESULTS AND DISCUSSION
Lamb birth weights were not affected by the treatments, with mean birth weights 4.5 and 4.4 kg/head for mixed and ryegrass treatments respectively. Lamb growth rates were significantly higher on mixed than on ryegrass pastures during lactation. Between birth and day 27, growth rates were 276 and 247 g/head/day on mixed and ryegrass grass pastures respectively. Between day 27 and weaning (day 85) the respective growth rates were 223 and 200 g/head/day. Lamb growth rates continued to be higher ($P<0.001$) after weaning on mixed pastures than on ryegrass pastures, 190 vs. 133 g/head/day respectively.

As a result of the higher lamb growth rates, lambs grazing mixed pasture consumed lower total amounts of energy (Brown, 1990), reached target live weights faster and were slaughtered earlier when meat payments were (2 - 4%) higher. This higher per animal production is additional to higher (22%) stocking rates (the result of higher pasture production) on these mixed pastures compared to ryegrass pastures. The total carcass production, which was 38% higher on mixed pastures, was produced at lower cost compared to ryegrass pastures, which were supplied with 270 kg/nitrogen/year at a cost of around $300/ha.

Ewe live weights were around 1 kg higher on mixed than on ryegrass pastures up to the last weighing before lambing. Ewes on ryegrass pastures lost more weight over lambing, which was not reflected in lamb numbers or lamb birth weights, and their weight remained unchanged between tailing and weaning in contrast to the 2.5 kg weight gained between tailing and weaning by ewes on mixed pastures. Higher ewe liveweight gains on mixed than ryegrass pastures over the lactation period made it easier to achieve pre-mating target weights and allowed for greater pasture management flexibility over summer.

An additional advantage was that ewes on mixed pasture had higher fleece weights which was partly the result of higher ewe live weights but also higher wool yields per kg of ewe live weight than on ryegrass pastures (Table 1). Wool growth is influenced by the quality and quantity of feed fed to the animal (Sumner, 1983). With pasture allowance kept similar between treatments, the higher wool growth per kg body weight on mixed compared to ryegrass pastures was most likely the result of higher feed quality (25-35 % white clover in the diet).

CONCLUSION
White clover based pastures yielded 38% more animal carcass and 25% more wool at $300 lower cost than ryegrass pastures supplied with 270 kg nitrogen/ha/year.

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Table 1
Wool g/kg body weight (kg wool/fleece) produced by ewes on mixed ryegrass/white clover and ryegrass pastures over two years (1992 and 1993).

	1992		1993		Mean over two years	
mixed	67.8	(4.63)	75.4	(4.87)	71.6	(4.75)
pure	60.1	(3.77)	66.5	(4.01)	63.3	(3.89)
lsd 5 %	7.58	(0.55)	11.77	(1.06)	5.83	(0.71)