

A comparison of beef production from native and mine rehabilitation sown pastures in the Hunter Valley

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Abstract: *This study compared the growth and value of steers grazing sown tropical grass pastures on rehabilitated mining land with steers grazing adjacent native pastures. Steers grazing on the sown pastures gained more weight, were fatter and worth more money than steers grazing on the native pastures.*

Key words: grazing management, weight gain, fat depth, gross margin, sown pasture, rehabilitated mine land

Introduction

This study was initiated by the Upper Hunter Mining Dialogue (UHMD), which is a group comprising stakeholders from coal mining, agriculture, community and environment groups, local and state government. The UHMD needed to answer questions being raised by the community around the sustainability and profitability of mine land which had been rehabilitated to pastures.

The aim of this study was to provide data on whether mine rehabilitation sown pastures can be as sustainable and productive as native pastures which were typically present before mining began. The study extended from 2014 to 2017. As this study looks at only one of many possible pasture scenarios it is not possible to make broad generalisations.

Methods

Two study sites were identified near Singleton and Muswellbrook where pastures sown to a mix of Rhodes grass (*Chloris gayana* cv. Pioneer), green panic (*Megathyrsus maximus*), lucerne (*Medicago sativa*), kikuyu (*Pennisetum clandestinum*), couch (*Cynodon dactylon*), medic (*Medicago* spp.) and white clover (*Trifolium repens*) were compared with adjacent native pastures. The Singleton site consisted of four 20 ha paddocks, two sown in the 1980s and two native. The Muswellbrook site consisted of six 10 ha paddocks, three sown in the late 1990s and three native.

Two groups of cattle were run at each site: Group 1 from 2014–2016 and then Group 2 from

2016–2017. Initially, (Group 1) 10 Angus steers per pasture type were run at each site giving a stocking rate of 1 steer/3 ha at Muswellbrook and 1 steer/4 ha at Singleton, which was considered conservative. At each site steers from a larger mob were randomly allocated to each treatment. For Group 2, the number of steers was increased to 15 (50% increase) at the Singleton rehabilitation site in an attempt at increasing pasture utilisation. Group 2 cattle at Muswellbrook were set stocked on the full 30 ha area for each pasture type due to problems with fencing and water supply.

Both sites were monitored from 2014 to 2017. Pastures were assessed every six weeks and cattle were weighed every 12 weeks. Grazing management was a simple rotation with cattle moved to a new paddock after weighing. A decision was taken that no supplementary feeding, fertiliser or mineral supplements would be provided during the study. All areas had clumps of established trees which provided shade for stock.

Steers were sold direct to abattoirs or scanned to measure fat cover allowing a reliable estimate of value.

Profitability of an enterprise can be measured in various ways and is influenced by production and cost structures (Anon 2017). This study focused on productivity at each site and gross margin analysis for each pasture type but does not include pasture establishment costs. Weight gains per head and per hectare were used to measure productivity.

Results and Discussion

Steers grazing the rehabilitation pastures gained more weight, were fatter and worth more money than steers grazing native pastures.

Cattle

Group 1 steers on rehabilitation pastures were heavier and fatter at exit than those on native pastures at both sites (Table 1); these differences were greater at Singleton (changes over time can be seen in Fig. 1). Cattle grazing rehabilitation pastures had superior weight gain to those grazing native pastures. Daily weight gain varied from 0.05 to 1.1 kg/head/day for Muswellbrook rehabilitation and -0.16 to 0.99 kg/head/day for Muswellbrook native pasture. Singleton rehabilitation varied from 0.18 to 1.3 kg/head/day and Singleton native 0.12 to 0.84 kg/head/day (Fig. 1). Fat score, which is a measure of stock condition, was recorded at final weighing for all cattle and showed that in each group cattle grazing rehabilitation pastures had better condition than those on the native pastures (Tables 1 and 2).

At Muswellbrook, differences in measured pasture availability were too small to explain the rehabilitation pasture weight gain advantage (Griffiths and Rose 2019). However, there was a notable difference in quality, with native pastures dominated by low quality wiregrass (*Aristida* spp.) and native Parramatta grass (*Sporobolus* spp.) whereas rehabilitation pastures were dominated by better quality Rhodes grass and green panic (Griffiths and Rose 2019).

At Singleton, rehabilitation pastures had much greater measured pasture availability and a

dominance of better quality Rhodes grass with some green panic. Native pastures, however, were dominated by low-quality grasses and this could all help explain the better performance of steers on the rehabilitation pastures. The performance of Group 2 steers (Table 2) and the factors affecting their performance were similar to Group 1. Group 2 steers on the rehabilitation pastures, however, showed greater weight gain per hectare than Group 1 steers (Fig. 1). This was because the rehabilitation pasture stocking rate had been increased by 50% in an attempt to reduce excessive pasture bulk. Although pasture availability had been reduced by the higher stocking rate, it had no detrimental effect on ground cover.

Economics

The main determinants of cattle value are weight, condition (fat score) and market prices. Group 1 cattle were 'finished' and were valued according to the Scone abattoir price grid at the time. Group 2 cattle were in 'store condition' and were valued using Singleton saleyard prices for store cattle at the time of analysis as reported in Table 3. In all cases the average value of cattle grazing the rehabilitation pastures was greater than those grazing the native pastures.

Gross margin (GM) is a standard indicator of enterprise profitability (Anon 2019). Group 1 cattle GM benefited from a rising cattle market at the time, while Group 2 used sale prices from

Table 1. Group 1 steer averages for weight gain per day, weight per head and condition (as measured by P8 fat depth) at exit from native and rehabilitation pastures at Muswellbrook and Singleton.

Site	Grazing days	Daily weight gain (kg/head/day)	Weight at exit (kg/head)	Average P8 fat depth (mm)
Muswellbrook native	557	0.45	537	5.3
Muswellbrook rehab.	557	0.53	586	7.0
Singleton native	553	0.46	611	9.3
Singleton rehab.	553	0.76	764	23.7

Table 2. Group 2 steer averages for weight gain per day, weight per head and condition (as measured by P8 fat depth) at exit from native and rehabilitation pastures at Muswellbrook and Singleton.

Site	Grazing days	Daily weight gain (kg/head/day)	Weight at exit (kg/head)	Average P8 fat depth (mm)
Muswellbrook native	441	0.46	456	3.6
Muswellbrook rehab.	441	0.62	529	6.2
Singleton native	293	0.45	381	2.4
Singleton rehab.	293	0.78	480	4.3

a falling market, which caused the GMs to be less than for Group 1. In all cases the GM for the cattle on rehabilitation pastures was greater than the GM for those on native pastures. Singleton Group 2 GM/ha is notable as it shows the combined effect of greater weight gain and greater stocking rate on the rehabilitation pastures.

Group 1 steers on rehabilitation pasture had a greater dollar value than steers on native pasture at exit from both sites (\$1822 v. \$1506 and \$2017 v. \$1560 per head for Muswellbrook and Singleton respectively). This comparison was based on actual carcase values for the Muswellbrook steers. Singleton steer values were

estimated based on expected dressing percentage from liveweights, P8 fat measurement and the relevant abattoir pricing grid as cattle were not sold till several months after exiting the study. Group 2 steers on rehabilitation pasture also had a greater dollar value than steers grazing native pasture at exit from the study, for both sites (\$1716 v. \$1505 for Muswellbrook and \$1559 v. \$1341 for Singleton; Tables 2 and 3).

For each site, rehabilitation pasture returned greater gross margin per steer, and hectare for both Group 1 and Group 2 steers (Tables 3 and 4). At Muswellbrook the rehabilitation pasture returned 33% higher gross margin for Group 1 and 28% for Group 2. At the Singleton site,

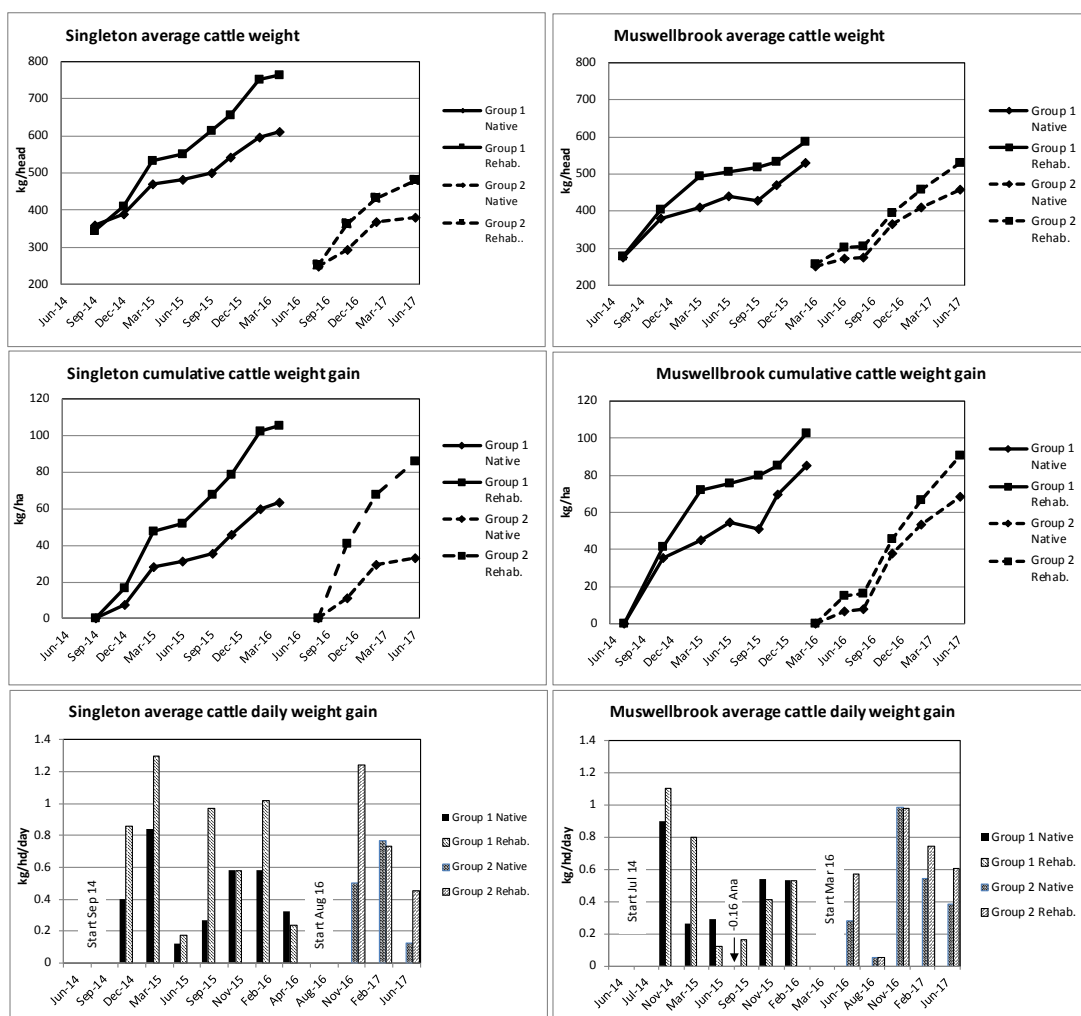


Figure 1. Average cattle weight (kg/head), cumulative weight gain (kg/ha), and daily weight gain (kg/head/day) over each measurement period for two groups of steers on native and rehabilitation pastures at Singleton and Muswellbrook.

Table 3. Purchase and sale prices of Group 1 and Group 2 steers at entry and exit from native and rehabilitation pastures at Muswellbrook and Singleton.

Site	Purchase Group 1 (c/kg LW)	Sale Group 1 (c/kg LW)	Purchase Group 2 (c/kg LW)	Sale Group 2 (c/kg LW)
Muswellbrook native	185	280	340	330
Muswellbrook rehab.	185	311	340	324
Singleton native	205	255	440	352
Singleton rehab.	205	264	440	325

Table 4: Gross margins (\$) for Group 1 and Group 2 steers for native and rehabilitation pastures at Muswellbrook and Singleton.

	Group 1		Group 2	
	Native	Rehab.	Native	Rehab.
<i>Muswellbrook</i>				
Gross Margin	8950	11928	5488	7034
Gross Margin/steer	895	1193	549	703
Gross Margin/ha	298	398	183	234
<i>Singleton</i>				
Gross Margin	7217	12021	1452	5190
Gross Margin/steer	722	1202	145	346
Gross Margin/ha	180	301	36	130

the sown pasture returned 67% and 258% more gross margin for Group 1 and Group 2, respectively. Singleton Group 2 steers on the rehabilitation pasture returned a significantly higher gross margin due to a higher stocking rate as well as weight gain per head: 15 steers on 40 ha as opposed to 10 steers on 40 ha for the native pasture. Gross margins for Group 2 for both sites were lower than Group 1 because prices for restocking cattle in 2016 increased to a greater extent than sale prices, resulting in tighter margins.

Conclusion

This project has provided quantitative data showing that steers grazing sown pastures grew faster, were heavier and worth more money than steers grazing native pastures. Further information is available from the final report for Project C32053 'A study of sustainability and profitability of grazing land in the Upper Hunter NSW' (Griffiths and Rose 2018).

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