Pastures and livestock in the cropping system – benchmarking trends in the wheat-sheep zone of the Central-West NSW and farming zone of North-West NSW

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Abstract. The top 20% of producers in Central West (CW) NSW had a greater percentage of improved pasture than others in their area, which contributed to greater operating return. Pastures were only a small percentage of total land use in North West (NW) NSW since soils were more suited to cropping and livestock enterprises having lower profitability. Lucerne leys were a valuable part of the rotation in CW NSW due to their disease break and nitrogen fixing characteristics. Better returns could be generated from these leys with greater attention to pasture management. Large paddock size and the amount of rainfall needed by black vertosol soils to reach field capacity after drying may reduce the role of lucerne in NW NSW.

Introduction

If you ask commercially orientated farmers what is the most important driver for their business, the answer is almost always profit. That is because today's modern land manager realises that without profit their personal goals and aspirations for their families and farm cannot be achieved.

Farm performance analysis and comparative analysis ("benchmarking") is a tool that an increasing number of farmers are using to assist them to understand the key issues in their businesses. How profitable are they? How does their performance differ from others? What attributes of their business are unique (giving them a competitive advantage or a disadvantage)? What can they do to improve profit? Through benchmarking farmers are getting detailed information on issues such as appropriate enterprise mix, management techniques that lift productivity, and efficiencies in labour and machinery utilisation, all of which improve the farm's financial performance.

This paper concentrates on the integration of pastures and livestock into cropping systems of Central West (CW) NSW (Forbes, Molong and Gulargambone regions) and North West (NW) NSW (Bellata/Moree) and reports overall trends from data collected.

Regional details and land use

CW NSW

This area is a wheat-sheep zone, where the soil types and climate lend themselves to a diverse range of enterprise options. Diversification of enterprises is a key strategy that farmers use to reduce risk. Soils vary greatly across and within the regions, with most farms having a range of soil types. The most common soils are the grey vertosols in the west, which typically hold from 180-220 mm of plant available water (PAW) and the red-brown earths which have 150-180 mm PAW. Soil pH ($CaCl_2$) of the soils ranges from 5.0 on the lighter reds to 8.0 on the grey clays and most soils are responsive to phosphorus and sulphur.

Native pastures contain medic and native perennial grass species, including *Chloris*, *Austrodanthonia*, *Bothriochloa*, and *Paspalidium* species. The most popular improved pasture is lucerne (*Medicago sativa*), which is commonly established under a cover crop and grazed for 3-4 years before returning to crop. Subterranean clover (*Trifolium subterraneum*) is also found in the southern parts of the region.

Over 5 years of benchmarking data have been collected on land use in 3 different regions. For the purpose of benchmarking, improved pastures are considered to be introduced legumes such as subterranean clover and lucerne, as well as grass species such as phalaris (*Phalaris aquatica*) in the higher

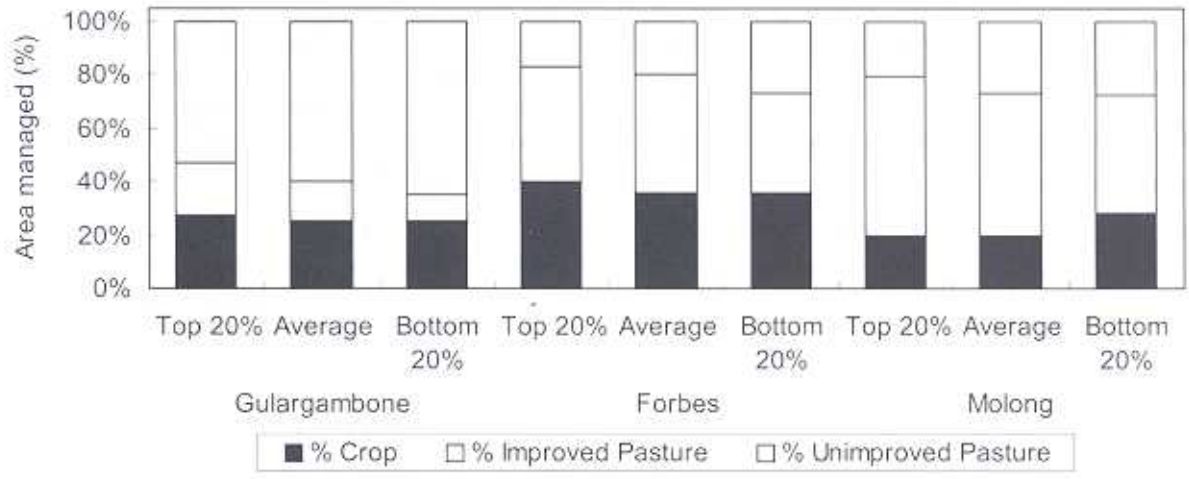


Figure 1. Land use of the top 20%, average and bottom 20% of producers in CW NSW.

rainfall areas. However, in most cases improved pasture refers to lucerne. The data in Figure 1 compare land use between top performing farms, based on percentage return on assets managed (ROAM%), and that of the rest of the participating farms. The figure shows the increasing importance of improved pastures as part of the land use mix towards the south and east of the region. This is because of the higher rainfall that allows a greater quantity of better quality pasture to be grown, increasing stocking rates and therefore returns per hectare.

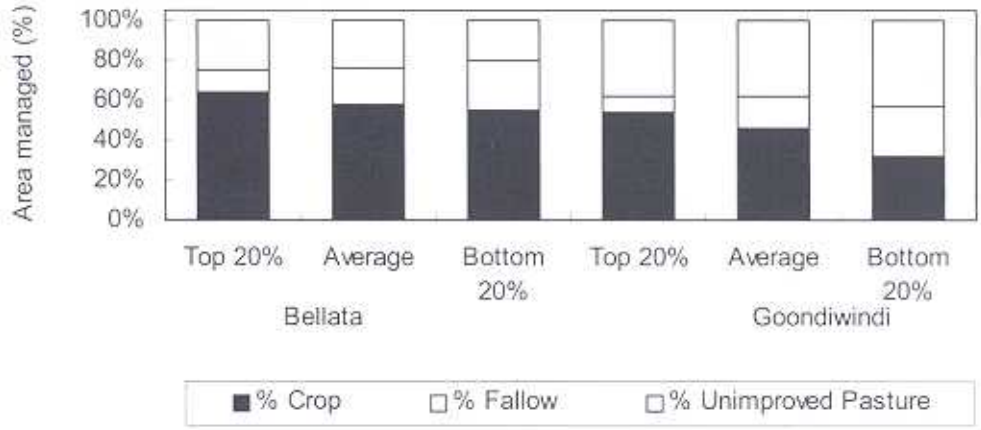
It also highlights that part of the success of top performing farms is that they prefer to rely on either higher cropping intensity and/or increased improved pasture areas to produce their profit advantages. In all areas, the reliance on unimproved pastures (unfertilised pastures dominated by annual and/or native species) is lowest with the top 20% of producers.

NW NSW

A major feature of this region is the deep black and grey vertosols which are renowned for their water holding capacity (180-260mm PAWC) and inherent fertility. Annual medic is common in the region. Improved pastures are not prominent and are largely confined to the eastern part of the region where there are generally greater soil type variations and some of the soils are not suitable for cropping. Improved pastures are mainly lucerne and introduced summer grasses such as Bambatsi panic (*Panicum coloratum* var. *makarikariense*), purple pigeon grass (*Setaria incrassata*) and Rhodes grass (*Chloris gayana*).

The land use patterns in Figure 2 are for the last 3 years and indicate that unimproved pastures represent only a small proportion (20%) of land use at Bellata and Moree and around 40% of the area managed at Goondiwindi. Cropping intensity has been a major determinant of profitability in this region and in many

Figure 2. Land use of the top 20%, average and bottom 20% of producers in NW NSW.



instances, pasture country is land that cannot be farmed for various reasons, rather than a dedicated pasture *per se*.

Profitability and returns for pasture *versus* cropping

Benchmarking provides participants with valuable information on returns per hectare for different enterprises. Gross margin returns include costs for labour and machinery to ensure that both time and machinery investment are accounted for when comparing the performance of one enterprise against another.

Table 1 summarises average measured enterprise gross margins over a number of years for different CW NSW localities. Data are gross margins per hectare and highlight the degree that top performers significantly outperform their peers. Average returns from wheat are higher than the alternative livestock enterprises, but these crops are generally grown on the best land, which would also support improved pastures. The Forbes and Molong data demonstrate that unless farming areas are available in sufficient scale and farmers do the job extremely well (i.e. are in the top 20% of croppers) they are just as well off running stock, given the higher stocking rates that can be supported. However, if cropping was not part of their business, they would also incur further costs of pasture establishment, as many of the improved pastures are currently established under cover crops.

In the Molong area, which is predominantly more grazing orientated, the level of improved pasture (60%) is a very important determinant of overall farm profitability. Top performing producers had higher levels of improved pasture, ran marginally higher stocking rates, and had higher ROAM% (Table 2). This was mainly linked to better animal performance as a result of improved pastures.

Integration of pastures into the cropping system in NW NSW is limited due to the large disparity between grazing returns (predominately beef) and crop returns (Table 3). It is only where soil types do not lend themselves to high yields that grazing returns can compete since the cropping soils can hold larger amounts of PAW, allowing for profitable crop growth. Currently, there are no perennial pasture varieties available that can achieve a comparable result for

Table 1. Enterprise gross margin comparisons ($/ha) of the top 20%, average and bottom 20% of producers at Gulargambone (7 years data), Forbes (7 years data) and Molong (3 years data) in CW NSW

	Gulargambone			Forbes			Molong		
	Top 20%	Average	Bottom 20%	Top 20%	Average	Bottom 20%	Top 20%	Average	Bottom 20%
Merino breeding	33.27	13.58	-2.99	120.82	46.69	0.60	229.50	77.61	-11.76
Prime lamb	71.90	41.33	11.07	175.97	81.74	24.26	166.64	85.38	-23.45
Beef breeding	34.49	13.90	-10.31	57.46	17.54	-31.53	137.05	30.35	-64.82
Beef trading	59.03	35.38	15.32	-	-	-	-	-	-
Wheat	234.73	121.55	3.07	206.01	74.45	-51.11	273.18	90.29	-78.91

Table 2. Improved pasture (% of area managed), stocking rate (DSE/ha) and operating return on assets managed (%) of the top 20%, average and bottom 20% of producers in 3 districts of CW NSW

	Improved Pasture (%)			Stocking Rate (DSE/ha)			Operating Return (%)		
	Top 20%	Average	Bottom 20%	Top 20%	Average	Bottom 20%	Top 20%	Average	Bottom 20%
Gulargambone	20	15	10	3.6	3.3	3.4	9.2	3.0	-2.7
Forbes	43	45	37	5.0	5.2	5.4	9.2	3.4	-1.7
Molong	60	54	46	10.8	8.9	9.7	4.3	0.2	-5.7

Table 3. Gross margin comparisons ($/ha) of the top 20%, average and bottom 20% of producers at Bellata (3 years data) and Goondiwindi (2 years data) in NW NSW

	Bellata			Goondiwindi		
	Top 20%	Average	Bottom 20%	Top 20%	Average	Bottom 20%
Beef breeding	88.07	39.85	10.88	65.27	33.73	9.30
Beef trading	-	-	-	83.27	49.92	36.06
Sorghum	298.44	144.33	-31.15	265.48	80.30	-109.41
Wheat	344.45	147.71	-73.68	411.32	184.24	-46.32

stock. Additionally, stock tend to have a negative impact on soil structure on these soils, further hindering a suitable crop-stock system.

Lucerne and wheat in CW NSW

Farmers have found that lucerne is the most versatile of the improved pastures, particularly where it is integrated into a cropping system. The benefits of a lucerne ley include:

1. Significant accumulation of nitrogen (N) over the ley, which is subsequently used in following crops. The N response is apparent in wheat crops up to 3 years after the ley.
2. Large reduction in weed seed bank through grazing pressure, reducing the requirement for expensive in-crop weed control.
3. An important disease break for *Fusarium* crown rot which has an inoculum survival period of >2 years and impacts significantly on crop yield.

The combination of these benefits means that in a farming rotation, growers are able to significantly increase yields and returns in comparison to farmers growing continuous wheat. This is particularly important in the lower rainfall areas where alternative crops such as canola are either not able to be grown or carry a higher risk of failure. The financial benefits of lucerne in the rotation in the Gulargambone region are summarised in Table 4.

Table 4. The financial benefits of lucerne in the rotation with wheat in the Gulargambone region (1997-1999)

	Top 20%	Average	Bottom 20%
Yield (t/ha)	3.4	2.6	1.7
Costs/ha ($/ha)	178.79	183.75	206.38
Gross Margin ($/ha)	346.44	210.81	57.84
% Previous crop - lucerne	42	29	17
% Previous crop - wheat	23	47	62

Table 4 indicates that wheat profitability is greatly increased by the use of lucerne in a rotation. Typically the ley is 3-5 years, with longer leys generally having a greater invasion of grass weeds and reduced N storage. Top performers who consistently have a higher percentage of their wheat crop following lucerne were able to produce yields double those of the bottom group of farmers. This bottom group consistently have a high percentage of their wheat area following a wheat crop.

Whilst the benefits of integrating lucerne into the wheat growing system were well demonstrated, the expected grazing benefits were not being captured by producers. Stocking rates do not vary significantly between top performers and their peers despite their greater reliance on improved pasture (Table 2). This in part was due to the large paddocks, which do not lend themselves to the grazing management necessary to get efficient utilisation from the lucerne without temporary subdivision.

A rotational grazing system that allows significant defoliation, followed by regrowth and replacement of root reserves is essential to maximise productivity of lucerne. Conversely, leaf drop and apical dominance, which reduces foliage growth, are common occurrences in the region, suggesting that producers who are using lucerne in their rotations could substantially increase their returns through improved grazing management.

Limitations to pastures and grazing in NW NSW

A major limitation to the adoption of this rotational system in NW NSW is larger paddocks. Furthermore, on the deep vertosol soils, a long moisture recharge period is needed due to lucerne's ability to extract moisture from the profile. Data from the Jimbour Plain show that the soil profile was still not fully recharged up to 11 months after spraying out lucerne (J. Whish and N. Dalgleish pers. comm.). This has important implications for the northern cropping belt, where significant amounts of stored moisture from summer dominant rainfall are required for winter cropping.

Conclusions

Top performing farms generate higher levels of profitability by consistently producing enterprise gross margins double that of their peers. Their focus on productivity is supported by a higher reliance on improved pastures in the Central West and a higher cropping intensity in the North West. On heavier soils and lower rainfall environments crop returns exceed those achieved by grazing. The role of pastures and their integration with cropping is more crucial in the Central West where livestock returns compete with average cropping returns. In the Central West, lucerne has been shown to be a valuable addition to the farm program providing substantial crop yield benefits and improved returns.