

A survey of the current and future use of lucerne, chicory and perennial grasses in pasture-crop rotations in southern New South Wales

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Abstract

The paper summarises the results of an extensive survey conducted in 2009 in the mixed farming zone of southern New South Wales (NSW) to determine the use of perennial pasture species in pasture-crop rotations. A total of 95 responses were received. Respondents were mainly farmers who attended workshops and farmer meetings organised by farming system groups and district agronomists. Comparisons of pre-drought, current and future land allocation and management were made. Averaged over the whole region at any one time about 52% of the land managed by respondents was under crop, 29% under pastures containing perennials, and 19% under annual pastures. Lucerne (*Medicago sativa*) was the most widely grown perennial species being sown on 84% of properties, followed by phalaris (*Phalaris aquatica*) (48%), native perennial grasses (31%) and chicory (*Cichorium intybus*) (26%). Cover-cropping was the most common method of establishing pastures with 83% of farmers utilising this technique. The prolonged drought does not appear to have influenced the proportion of crop and pasture sown or future land allocation intentions. However, the drought had served to justify the continued role of livestock enterprises in the system due to their stabilising effect on farm income based on interviews with farmers. The results from this survey will be used to identify issues restraining the greater use and adoption of perennials in farming systems.

Key Words

Mixed farming system, cover-cropping, ground cover, grazing, livestock.

Introduction

Perennial pasture species have been shown to provide feed for livestock over a longer period and utilise rainfall more effectively compared with annual pastures (Dear et al. 2008). They also convey a number of important natural resource management benefits such as minimizing the risk of dryland salinity by reducing deep drainage (Cocks 2001), and alleviate the rate of soil acidification by reducing nitrate leaching (Scott et al. 2000). Some species such as perennial grasses also increase ground cover leading to reduced soil erosion.

In the mixed farming zone of southern New South Wales (NSW), farmers typically use a phased farming system that includes a combination of cropping and livestock activities. The length of the pasture and crop phases varies, but typically each phase is about 4-6 years in duration. This combination of livestock and crops conveys a number of advantages including income diversification, minimisation of risk from variation in climate and commodity prices as well as production advantages including weed control, restoration of soil fertility and improvement in soil structure.

A survey of farmers was undertaken to benchmark the current use of perennials as part of the rotation in southern NSW and determine farmer attitudes to perennial pasture species. The questionnaire consisted of a number of questions to find out a) the ratio of crop and pasture on farms; b) the proportion of farm sown to perennial pasture species; c) perennial species they are sowing; d) farmer perspectives on

advantages and disadvantages of growing perennials; and e) factors restricting greater use of perennials in pasture-crop rotations.

Materials and Methods

The survey targeted farmers in the mixed farming zone of southern NSW. Rainfall ranges from around 650 mm in the higher elevation and undulating slopes to the east of the region, declining to around 400 mm in the Riverina Plains to the west of the region. Soil varied from non-arable Tenosols (often shallow or rocky, and steeply sloping), to grey Vertosols (sodic grey clays, heavy textured cracking soils), light red Kandosols (acidic gradational soils), and red Chromosols (duplex soils, generally not strongly acidic). The region is suited to a wide range of winter crops including wheat (*Triticum aestivum*), oats (*Avena sativa*), barley (*Hordeum vulgare*), triticale (*Triticale* spp) and canola (*Brassica napus*). Pulses such as field peas (*Pisum sativum*), lupins (*Lupinus* spp) and vetches (*Vicia* spp) can also be grown but low economic returns restrict their wider use. The pastures sown as part of the pasture phase are typically based on the annual legume subterranean clover (*Trifolium subterraneum*). Lucerne (*Medicago sativa*) is the dominant perennial pasture species grown throughout the region. Other perennial pasture species potentially adapted to parts of the region include chicory (*Cichorium intybus*) and perennial grasses such as phalaris (*Phalaris aquatica*), tall fescue (*Festuca arundinacea* syn. *Lolium arundinaceum*) and cocksfoot (*Dactylis glomerata*).

There is a diverse range of livestock activities within the region based on sheep and cattle. Typically sheep enterprises are self-replacing Merino flocks. With the continued trend of lower wool prices coupled with the increase in both mutton and lamb prices there has been a gradual shift into prime lamb production. Cattle are more commonly run in the southern area of the region. The majority of production is aimed at yearling production for the feedlots or supermarket trade.



Fig. 1 Target zone in southern NSW

Farmers surveyed were mostly members of farmer groups, such as Landcare or Farming Systems Groups. They regularly attend meetings and workshops and are interested in increasing the sustainability and productivity of the farm enterprise and could be regarded as more progressive. Farmers were given a standard questionnaire to complete in a group setting. The identity of farmers was not recorded but the geographic location of their properties was identified to enable differences in responses with rainfall and region to be extracted. Where participants were asked to rank in order of importance a series of answers to a particular question, answers were given a score based on the response. The highest rank received the greatest score and the lowest rank the least. Respondent scores were summed to give an overall ranking for each answer to the question. Results are presented for the whole region and broken down into the eastern and western components of the region. The eastern region included 44 farms located predominantly around the towns of Cootamundra, Burrumbuttock, Brocklesby, and East and West Hume. The western region had 51 farms located around the towns of Arianh Park, Temora, Junee and Henty (Fig. 1).

Results and discussion

Pasture and crop ratio

Based on responses over the whole region, 52% of land was under crop at any one time, 29% contained perennial pasture and 19% annual pastures. This represents a relatively high use of perennials in current systems across the region (Table 1). The proportion of land under crop was higher in the western region (60%) and lower in the eastern region (45%). The area under crop increased by 5% to 60% whereas area under pastures reduced by 4% as a result of drought in the western region, but both areas of crop and pasture in the eastern region remained unchanged due to drought. In the future, farmers across the region indicated that they are likely to decrease the area of annual pasture and increase the use of perennial species by about 7%. The area under crop is likely to decline by about 3% with no real difference observed between farmers in the east and west of the region.

Table 1. Percentage of farms sown to crop, perennial pasture (PP) and annual pasture (AP) pre-drought, currently and planned for the future

	Whole region			Eastern zone			Western zone		
	Pre-drought	Current	Future	Pre-drought	Current	Future	Pre-drought	Current	Future
Crop	50%	52%	49%	45%	45%	42%	55%	60%	56%
PP	31%	29%	36%	38%	38%	44%	25%	21%	29%
AP	19%	19%	14%	18%	17%	14%	20%	20%	14%

Farms in the region continue to allocate approximately half their farm area to pastures despite the apparent greater potential returns from cropping. Reasons given for maintaining a significant livestock enterprise were reliability of income and cash flow from stock which balances the higher input costs and greater seasonal risk associated with cropping. There was no trend to increasing the area sown to crop in the future. Only a small proportion of farms (8-9%) are intensively cropped with little or no pasture, most farms maintaining a balanced livestock-crop enterprise mix. Farmers in the drier western zone are more likely to have a higher proportion of crop than in the eastern zone. However, if the recent fall in grain price continues as a result of increased production world-wide, farmers indicated that a shift to a more balanced livestock-crop enterprise could be possible.

Cover-cropping

Over the whole region 83% of farmers used cover-cropping (undersowing) at some time to establish pastures. Cover-cropping was more common in the western region with 93% of farmers using it at some time for pasture establishment compared to only 73% of farmers in the eastern zone. In the western zone approximately 2/3 of farmers either mostly or always used cover-cropping to sow perennial pastures compared to 43% of farmers in the east. Although the effect of drought on future pasture sowing techniques was not asked, recent interviews with farmers suggest the use of cover-cropping is declining with the drier weather resulting in an increase in direct sowing without a cover crop.

Cover-cropping has clearly been the dominant method of pasture establishment. It is seen as an effective way of reducing the cost of pasture establishment by avoiding additional cultivation and sowing costs. The success of this technique however is much lower under moisture stress conditions and although not asked as part of the survey farmers are reporting a high failure rate in lower rainfall years (Peoples et al. 2010). As a result many farmers report moving away from cover-cropping to direct pasture sowings in the year after crop. There was a lot of interest from farmers in obtaining better information on the

effectiveness of cover-cropping under moisture limiting conditions in terms of the effect on pasture establishment and long term pasture productivity.

Percentage of perennial pastures

Averaged over the whole region lucerne was the most common perennial species being grown on 84% of all farms (Table 2). The actual area of lucerne on farms was similar across the region from east to west. The next most common perennial species after lucerne was phalaris with an average of 48% of farms reporting growing phalaris. A higher proportion of farms in the eastern zone (64%) grew phalaris than in the western zone (35%). Native grass pastures represented the third most common perennial across the whole region with it being reported on 31% of farms. The percentage varied slightly with the eastern zone having 35% compared to 29% in the west. Chicory was sown on 26% of farms across the whole region which was similar to native grasses with 31%. The proportion of farms having chicory was twice as high in the eastern zone (36%) compared to the west (18%).

Lucerne is clearly the most widely grown perennial species with a high level of adoption. Lucerne is less dominant in the eastern zone where soil is more acidic and a greater range of perennial options such as phalaris and chicory are available. The eastern zone is also more undulating and in some areas less suitable for rotational grazing which lucerne prefers to.

Table 2. Percentage of farms reporting particular percentage of nominated species on their property as a percentage of perennial pasture area in the whole region.

Species	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	80-90%	90-100%	Total farms%
Lucerne	7%	4%	4%	5%	16%	4%	7%	8%	4%	23%	84%
Phalaris	7%	6%	6%	3%	5%	3%	4%	4%	4%	4%	48%
Native grasses	12%	7%	4%	2%	2%	1%	0%	2%	0%	0%	31%
Chicory	4%	7%	2%	0%	11%	0%	0%	0%	0%	2%	26%
Perennial ryegrass	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Tall fescue	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%	2%

Reasons for sowing perennial pastures

Respondents were asked to rank the reasons for sowing perennial pastures. Results showed that increased stocking rate was ranked number one by 48 respondents. It also had the highest total score of 448 across all 6 rankings and the highest combined score of 401 for the top 3 ranks (Table 3). It is interesting that increased stocking rates was the main reason for sowing perennial pastures even though stocking rates have been steadily declining over last few years as a result of the drought. The 'increased turnoff weights' was ranked first by only 16 respondents yet 33 respondents ranked it second and 19

respondents ranked it third. This gave a combined score for the top 3 ranks of 337 and a total combined score across the six ranks of 397. The 'reduced need for supplementary feeding' was ranked first by 26 respondents yet its total combined score for all 6 ranks was 405 and only 351 for the combined top 3 ranks (Table 3). While it is arguable as to which is ranked second or third, in reality 'increased turn off weights' and 'reduced supplementary feeding' are linked objectives as there are tradeoffs depending on when lambing occurs. Lambing early in the year results in increased supplementary feeding of ewes but higher turn off weights of progeny, while lambing later results in reduced supplementary feeding of ewes but lower turn off weights. Extending the growing window at both ends of the growing season benefits both.

Table 3. Ranking of reasons why respondents grow perennial pastures

Number of respondents and weighted score	Rank1	Rank 2	Rank 3	Total	Overall rank
Increased stocking rate	48	13	12	448	1
Increased livestock turnoff weight	16	33	19	397	3
Reduced need for supplementary feed	26	19	25	405	2
N fixation	9	12	17	307	4
NRM issues	11	10	9	285	5

Perennial pastures are seen by farmers as conveying significant benefits to livestock in terms of increasing stocking rates, higher growth rates and reduced need for supplementary feeding. This suggests that the feed supply curve from perennials is better matched to animal livestock requirements than annual pasture production. Nitrogen fixation and natural resource management scored 307 and 285, respectively. While they are lower than production type priority, they are still important priorities for farmers.

Respondents were asked to identify positive experiences they have had with their two main perennial pasture species. The main advantages of lucerne reported were providing feed when nothing else grows (73 respondents out of 95), production of feed following summer rain (71), and surviving the drought well (54). The result for chicory were less clear, however 16 of the 95 respondents felt that it provides feed when nothing else grows and responds well to summer rain. Phalaris scored well in environmental aspects with 41 of the 95 respondents identifying it provides improved year round ground cover and improves soil organic matter. It also survived the drought well.

The two main negative experiences for lucerne were that it is costly to sow (51 of 95 respondents in the whole region) and is difficult to kill prior to the cropping phase (34). Nineteen respondents felt it reduced yields in the following crop. Eleven and 10 respondents felt lucerne and phalaris were hard to establish, respectively. There were no major negative experiences with chicory other than its poor survival and costly to sow. Twenty-five of 95 respondents felt that phalaris was costly to sow and 14 respondents felt it did not survive the drought well.

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