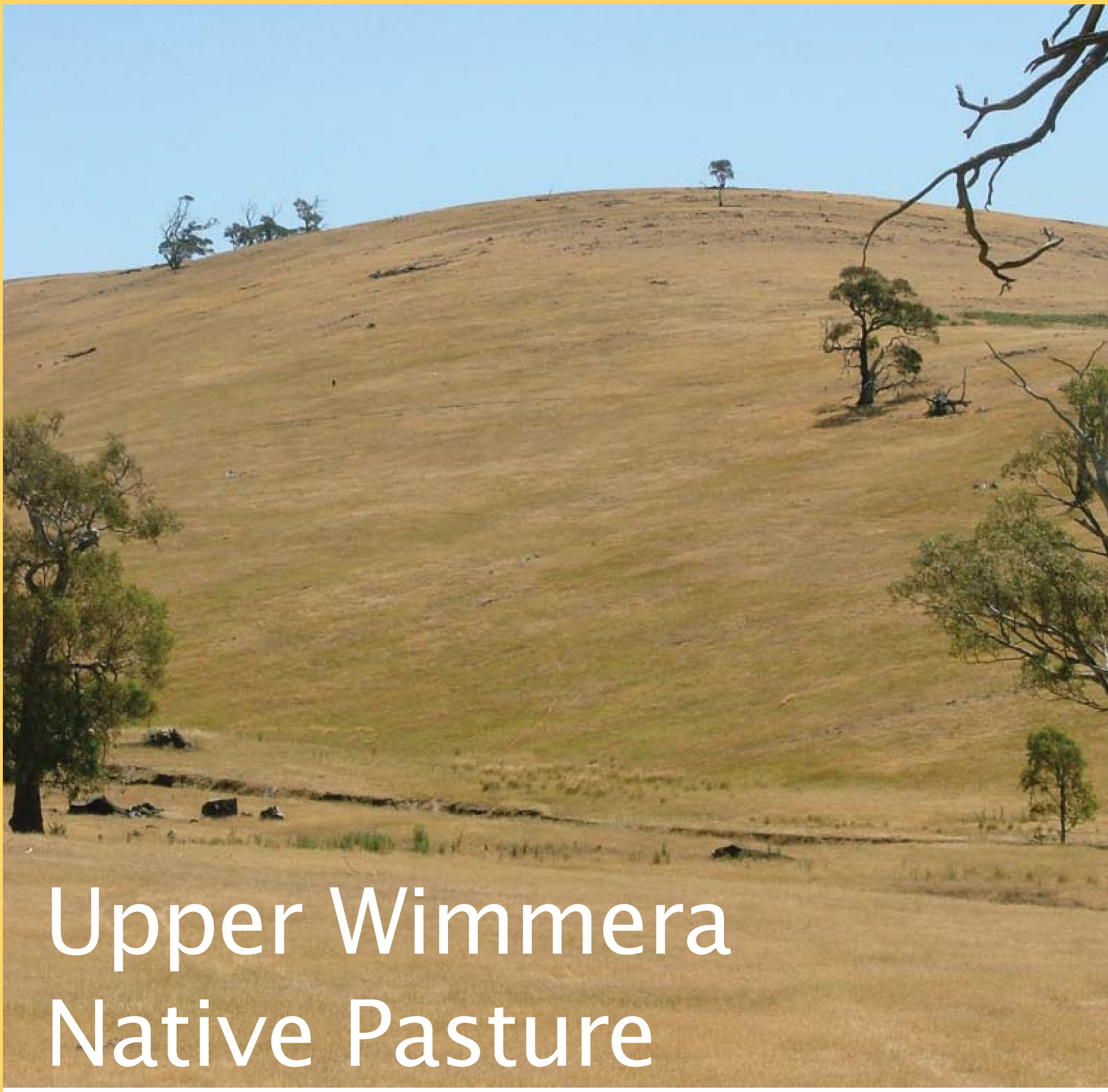
DEPARTMENT OF
PRIMARY INDUSTRIES



Upper Wimmera Native Pasture

Benchmark Survey 2006

Victoria
The Place To Be

action
Salinity & Water
AUSTRALIA

Wimmera
Catchment
Management
Authority

This project is supported by the Australian Government's National Action Plan for salinity and water quality through the Wimmera Catchment Management Authority.

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Acknowledgements

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Introduction

Management options for salinity control fall into three main categories – biological, engineering and living with salt. Biological control options focus on the use of perennial systems, including trees, shrubs, perennial pastures – based on either introduced or native species, saltbush and salt-tolerant perennial species.

In the interests of sustainable land management and productivity, the Wimmera Regional Catchment Strategy (1997) suggested a need for research on land management that might strengthen native grass pasture on steep hill country and thus help reduce recharge and the spread of dryland salinity.

Similarly, the Wimmera Regional Salinity Action Plan 2005-2010 (WRSAP) claimed that native grass pasture would benefit recharge control, particularly in the Upper Wimmera Catchment which, they considered, retained substantial areas of such pasture, mostly on non-arable terrain.

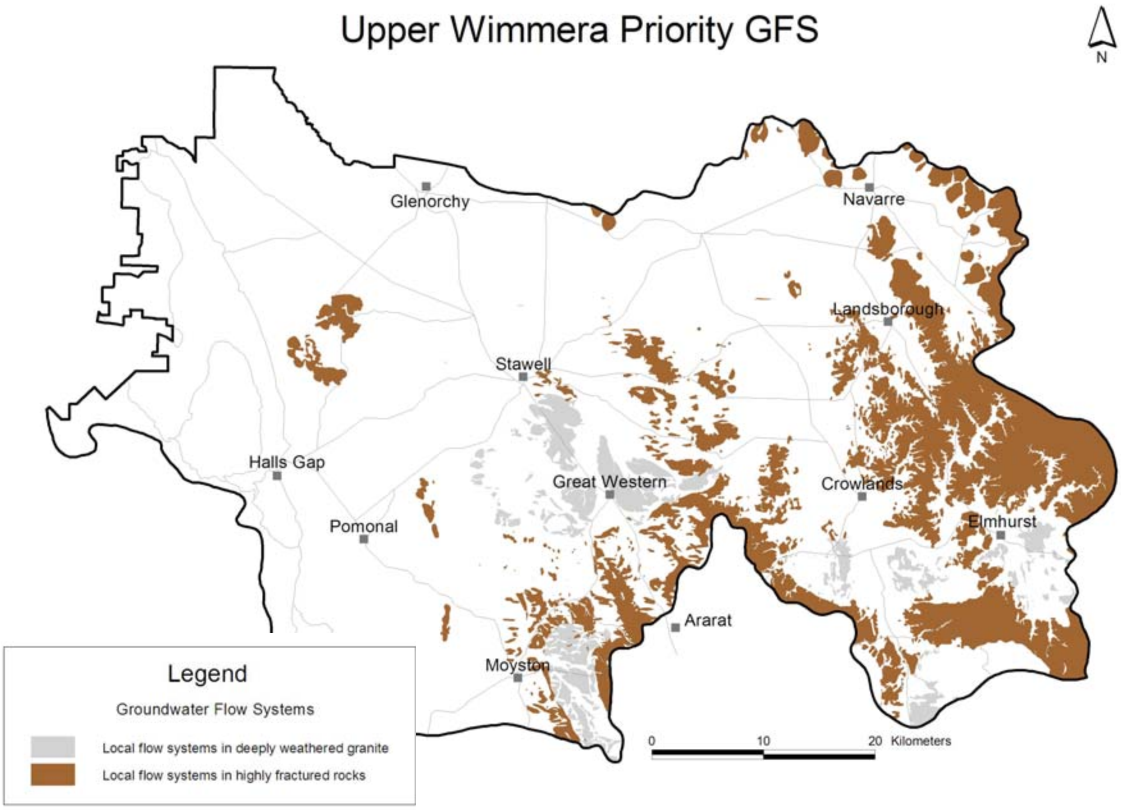
The WRSAP was prioritised on the basis of groundwater flow systems (GFS) and recommended that research be conducted that might help farmers to improve their management of native grass pasture in the following GFS (refer Map 1):

1. Local flow systems in high-relief weathered granites (HRG).
2. Local flow systems in low-relief deeply weathered granites (LRG).
3. Local flow systems in highly fractured rock (LFR).

The WRSAP allocated priority for research and development to HRG and priority for implementation to LRG and LFR.

The Federal National Action Plan for salinity and water quality (NAP) through the Wimmera Catchment Management Authority (WCMA) provided funds for the Department of Primary Industries (DPI) to undertake, a project addressing the above WRSAP priorities within the Upper catchment of the Wimmera River. Funds were directed to the implementation priority areas, that is native grass pasture in the local flow systems in low-relief deeply weathered granites and in highly fractured rock (Map 1).

Map 1: Upper Wimmera priority Groundwater Flow Systems



Map 1 shows the priority GFS for native pasture in the Upper Wimmera Catchment. The total area of these GFS is 64,477 hectares (ha), occupying 18 per cent of the Upper Wimmera Catchment. 20,528 ha of this priority area is public land with a further 2,758 ha under tree cover on freehold. The remaining cleared area of freehold in the priority GFS is 41,191 ha.

In the landscape the priority GFS generally constitutes steep hill country or granitic terrain. The most common use of the land is for grazing.

Rainfall across the upper catchment of the Wimmera generally increases with movement south e.g. Navarre has an average annual rainfall (AAR) of 500mm while Eversley is 600mm. Higher AAR is associated with the Pyrenees ranges and the Grampians.

The soils and landform of the area was mapped by White *et al*. (1985) at 1:100,000. A Land Resource Assessment project by Robinson *et al* (2006) also mapped soil and landform at 1:100,000 consistently across the entire Wimmera Region.

The common definition of native pasture is 'any pasture in which native grasses are the main perennial species' (Crosthwaite and Malcolm, 2001). It can be applied to situations where native grasses are the dominant species but also where they are sub-dominant or even infrequent, as long as they are the main *perennial* species. This definition is used by the EverGraze program for native pasture (M. Mitchell, 2006 pers. com.). Many pastures are dominated by annual species however, so a more objective definition is required. It remains difficult to ascertain the real "area" of native grass pasture, although such information is basic to consideration of research and conservation.

The Australian Bureau of Statistics used to collect such acreage detail for "native pasture" via their rural census. In 1967 for example, they gave the area of native pasture in Victoria, inclusive of crown land leased for grazing, as 4.5 million ha. In the central highlands region, which includes our survey area, it represented 34 per cent of the total area of pasture (Powell 1970). In 2002 the Bureau ceased collection of such information as the identification of native pasture by producers returning the Census forms generated strong criticism. Reviewers concluded that it was too inaccurate to be of any use; many Census fillers used the category to allocate grazing land dominated by naturalised weedy grasses, rather than native species.

Collecting on-ground data about the area and botany of native pasture is an especially important task prior to implementing the WRSAP recommendation to improve the management of native grass pasture. This report, the **Upper Wimmera Native Pasture Benchmark Survey,** provides some benchmark data about native grasses in pasture within the priority areas, specifically their location and general composition but also their history and management.

An important part of improving the management of native grass pasture is developing an understanding of the characteristics, needs, existing practices and barriers to change, of the current managers and landholders. As we rely on managers and landholders to implement change, we have attempted to gain an understanding of their knowledge, motives and goals.

The data collected was then used to recommend practices and changes to management that will be necessary if salinity control in the Upper Wimmera is to improve.

Objective

The long-term objective of the DPI Upper Wimmera Priorities Project, native pasture subproject is to *maintain and increase the native perennial grass component of unimproved pasture* in the priority groundwater flow systems (GFS) in the Upper Wimmera, in order to improve recharge control. This is expected to be achieved by improved management of pasture.

In this phase, a new subproject for the Wimmera Regional Catchment Investment Plan, the following tasks were accomplished for this report:

1. Field data was collected to quantify and locate the native grass component of unimproved pasture in the low-relief granites (LRG) and local fractured rock (LFR) groundwater flow systems (GFS) of the Upper Wimmera Catchment (refer to the Wimmera Regional Salinity Action Plan).
2. Landowners were interviewed to obtain information about the current management of native pasture in these GFS and to assess their relevant needs and characteristics that may impact on the long term objective. Landowners were also tested re their skill in identifying grass species.
3. The above findings and the management of native pasture was discussed in the context of practices considered beneficial to recharge control and animal production.
4. Based on the results of the field survey and interviews, directions for a future native pasture program in the Wimmera, to improve management of native grass pasture, were presented. The initial findings were presented to graziers who provided access to paddocks for survey and/or interviews at a meeting in late 2007. Their responses were incorporated into this report.

Methods

Botanical composition of pasture

Following trials conducted elsewhere in Victoria (Wilson *et al*, 2004), remote sensing of pasture was assessed for its ability to identify the presence of native grasses. Available Landsat imagery was compared to known native grassland sites and Landsat mapping of the remaining southern half of the catchment was undertaken.

Previous field survey of the upper Wimmera (H Malloy, DPI Vic., unpublished data) was investigated, as was the biodiversity map of the Pyrenees Shire (Jaschenko N. and Brown-Kenyon K. 1999). The location of known native pasture sites was compared to GFS maps to determine their location in respect to priority areas. Ratepayer information provided by the three local shires (Pyrenees, Northern Grampians and Ararat) was then used to identify relevant landholders whose total holdings exceeded 50 ha: a 'reasonable scale' of production was considered necessary to implement recommended practices. Each landholder was contacted by mail and advised of the mapping component of the project and contacted by telephone to clarify which areas of their land had been grazed with little improvement or were likely to have native species present. Sites for subsequent survey were selected on the basis that lesser disturbance would increase the probability that native species would persist. Only sites that were grazed were included on the assumption that alteration of grazing regimes may represent the most practical means to increase the native species content of pasture. Only sites that had approximately 10 per cent or more native grasses present (based on quadrat data) were surveyed.

Once survey sites were selected and access approved, contour and GFS maps, aerial photos and cadastral data were prepared for each and a date scheduled for survey that fell within the period of grass head emergence/maturity.

Once on site, field identification of map-indicated GFS was confirmed. Sampling locations were then chosen from representative landforms and aspects in the paddock. A total of 78 sampling sites were surveyed in November-December 2005 and an additional 51 in October-November 2006.

At each location aspect and landform was recorded and a transect of 100m, traversed. The latitude and longitude coordinates at the start and end points of the traverse were recorded by GPS. At five metre (m) intervals the vegetative ground cover or lack of was recorded. Plants present were identified at least to Genus status. Species information was collated and summarised by categories (perennial grass, annual grass, introduced dicotyledons/clover/broadleaf weeds, non grass natives (eg.haloragis, lissanthe, vittadenia, ptilotus, lomandra, juncus), moss/lichen, onion grass, bare soil, litter, rock).

Associated with each transect, a quadrat (0.1 m^2) was placed on a site considered representative of the vegetation along the transect. The proportion of ground within the quadrat that was covered by the various categories of species that we observed was estimated and recorded.

Sample sites were classified into one of four categories using quadrat data and depending on the percentage of ground cover observed as perennial grass (in all cases predominantly native grasses). viz high (>60%), moderate (60-30%), low (30-10%) or very low (<10%). Aspect severity was determined from site orientation and was classified as hard (sites facing N to W inclusive), mid (sites between N and E, or S and W) or soft (sites facing S to E inclusive).

Statistical Analysis

Ten of 144 transects in the data set had two quadrats measured. The transect was the experimental unit used in these statistical analyses and the two quadrats are samples of the one experimental unit. Where possible (the quadrats have the same value for nominal or ordinal data) only one quadrat per transect was used in the analysis. Ordinal data such as the frequency categories for native grasses at a site were analysed in Generalised Linear Models with multinomial errors. Where cell sizes were too small or this model did not fit, non-parametric Exact Tests for ordered multinomials were used. Non-parametric tests were conducted using StatXact, Cytel Studio, Version 8.0.0. Other analyses were completed using GenStat Release 10.1. Lawes Agricultural Trust (Rothamsted Experimental Station).

Associations were tested for statistical significance at the five per cent probability level (P=0.05). The associations tested were (NS = not significant):

Grazing management vs. years of ownership (NS)
Aspect severity vs. native grass frequency
Wimmera soil group vs. native grass frequency (NS)
Average annual rainfall vs. native grass frequency. (NS)
Average annual rainfall vs. presence or absence of *Microleana*. (NS)
Aspect and average annual rainfall vs. the presence of *Microleana*. (NS)
Altitude vs. native grass frequency (NS)

Table 1: Associations tested for significance

	Age	Education	Off farm income
Time of last application of superphosphate	NS	S	NS
Source of pasture advice	NS	S	S
Goals over next 10 yrs	significant	S	NS
Succession planning	NS	S	NS
Change to enterprises	NS	S	S
Change to unimproved pasture	significant	NS	NS
Extra skills or support to change grazing management	NS	NS	NS
Education	significant		
Grazing management	significant	NS	NS

Many of the associations tested were not significant at the five per cent level. Those that were significant are described under results.

Landholder interviews

To understand the factors that may have influenced native pasture and their current management, individual interviews with 35 landholders were conducted. The questionnaire (Appendix 1) was completed during these interviews. Paddocks of each of these landholders had been surveyed for native grass frequency. Generally the relevant land managers were interviewed rather than landholders who were generally absent from the surveyed site and did not live in the region. In a few instances where some questions were not answered, the actual sample number is indicated with the results.

Interviewees were also asked to identify grass species from a folder of pressed, mature specimens of locally occurring introduced and native grass species.

The questionnaire drew on previous studies undertaken in north-east Victoria and New South Wales (Millar and Curtis 1995; Garden *et al*. 2001) and discussions with those involved with a landholder survey in the NSW Southern Tablelands

The initial grouping of questions for the interviews was developed by applying 'Bennett's Hierarchy' (ref - http://citnews.unl.edu/TOP/english/overviewf.html, June 2008) to the issue of native pasture management for recharge control. Bennett's hierarchy is an example of program logic that helps conceptualise programs/projects and aids our understanding of how activities lead to outcomes – it helps to articulate cause-and-effect relationships between program activities, outputs, intermediate outcomes and ultimate outcomes. Program logic can be used to plan research and evaluations. Bennett's hierarchy is a generic program logic model for agricultural extension that uses seven steps to describe how extension programs are thought to bring about change. A strength of this model is its focus on the people we expect to change as a result of an intervention – farmers in the case of most agricultural extension programs.

Because our research was concerned with farmers and their grazing management practices and because extension programs have been used as one form of intervention to effect voluntary change with them (i.e.: to create a shift towards more desirable management practices), this study used Bennett's hierarchy to structure the interview of farmers by collecting information at each level of the hierarchy. The research should not only provide a useful benchmark, but highlight where changes are most required.

Communication

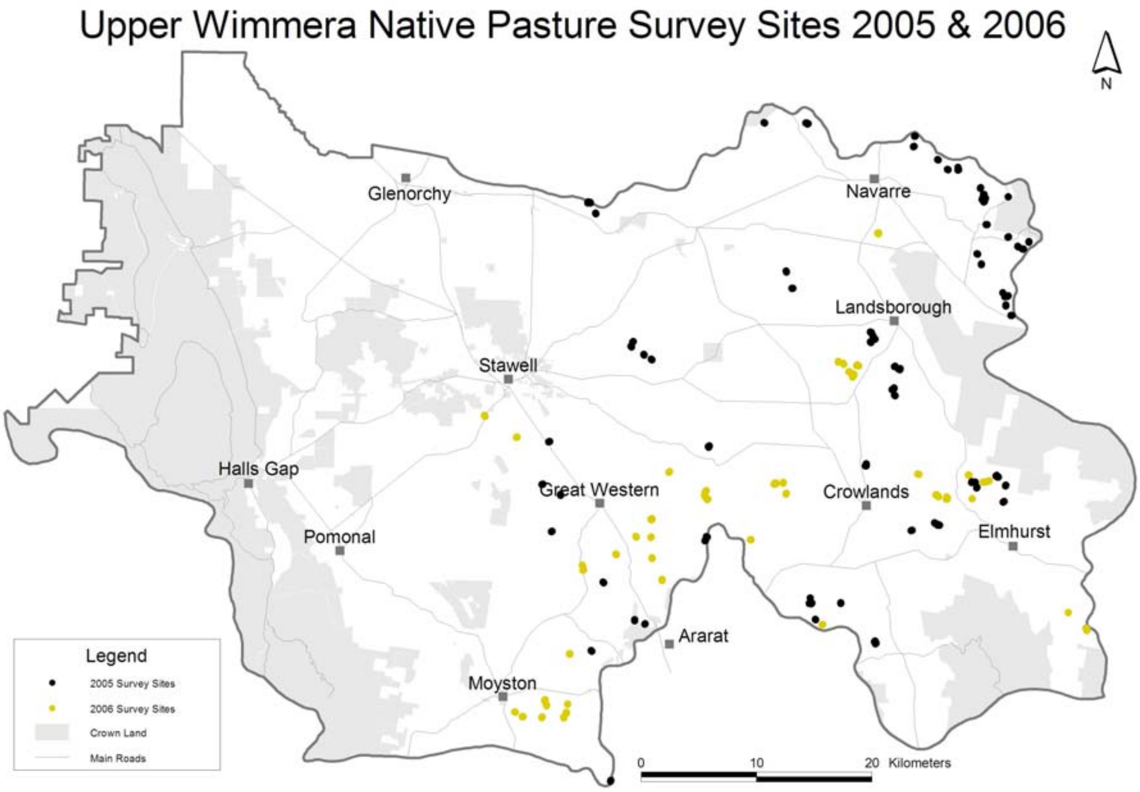
To involve landholders in the survey, in November 2005 each landholder within the mapped high-priority GFS areas was sent a letter to advise them of the project, the likely start dates for the paddock surveys and to encourage them to ring the project officer involved. Telephone contact was made with landholders where likely paddocks were targeted for survey. A further letter was sent to all targeted landholders in April / May 2005 advising them of the project's progress and providing another opportunity for involvement in further surveys in 2006. Many articles were written for local media, including the *Wimmera Farming and Landcare Newsletter* and the *local DPI Update Newsletter*, which were sent to a large number of Upper Wimmera landholders. Presentations on the project were given to Great Western, Elmhurst and Moyston Landcare groups (LCG), and five grass identification walks were conducted at locations within the Upper Wimmera catchment. A workshop for landholders involved in the project was held in September 2007. The survey results were presented and participants' feedback was collected.

Results

Mapping native pasture

A total of 129 sites were examined - 78 in December 2005 and 51 in October / November 2006. The growing season in 2006 finished quite early.

Figure 1: Paddock survey locations in the Upper Wimmera



Satellite imagery was examined for its usefulness in aiding location of native grass pasture. Although useful, if combined with landholder information about the level of disturbance of the paddock, on its own its reliability for predicting native grass presence and abundance appeared low, although no methodical assessment of the accuracy of landsat data was made. Detail of the Elmhurst area showing where landsat imagery indicated the presence of native grass and the actual results at three sample quadrats that were in that area are illustrated in Map 2. Where the presence of native grass was indicated both a high and low frequency of native grass were found. Where the presence was not indicated a moderate frequency of native grass was found.

Map 2: Landsat imagery of the Elmhurst area and actual sample site.

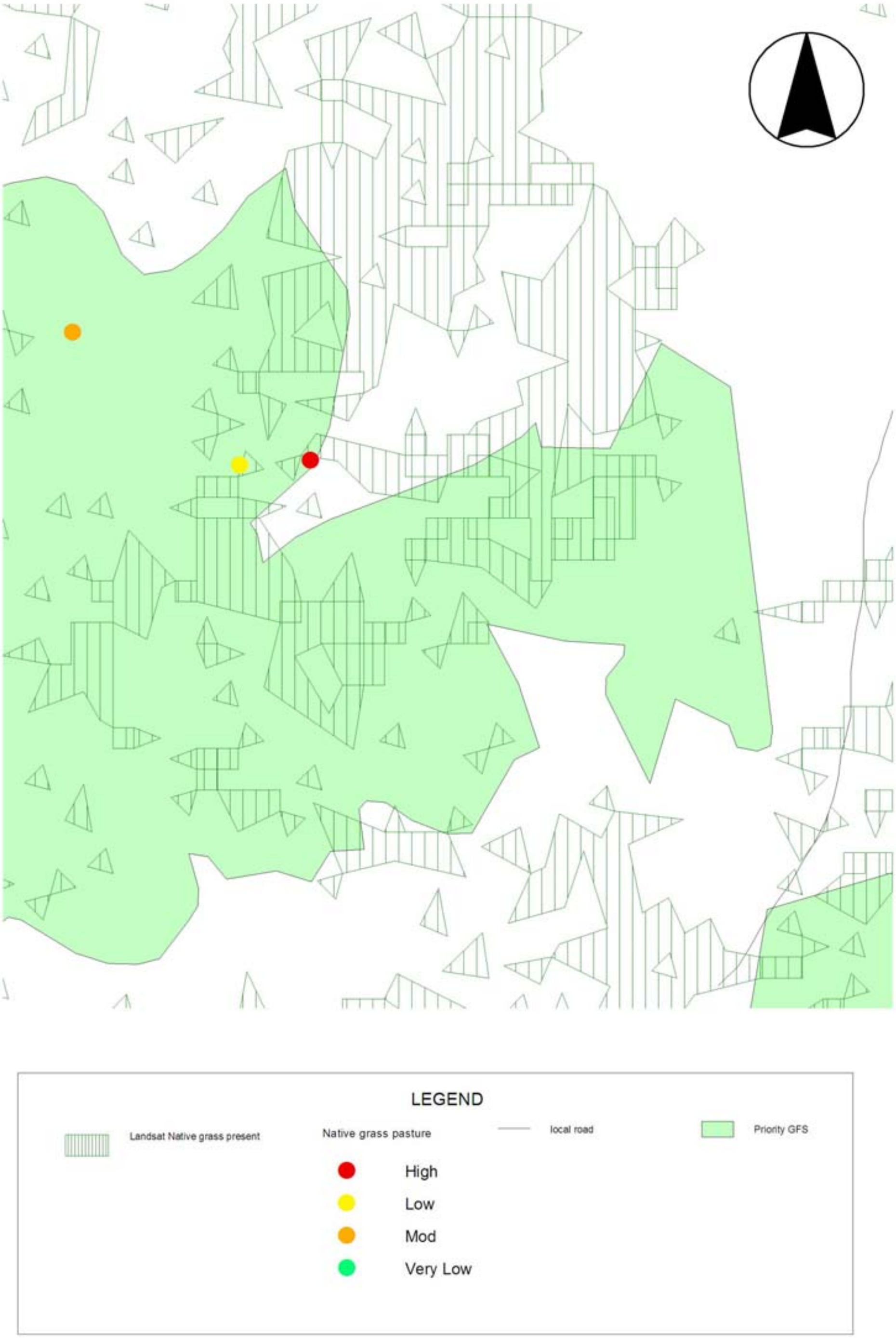


Table 2 has been generated from quadrat data collected at sample sites. The proportion of sites recording the presence of a particular species or genera gives an indication of its distribution across the upper Wimmera catchment. All native grasses found were perennial.

Table 2: Proportion of sites where particular species were recorded in the grazed pastures examined in the upper[1] Wimmera River catchment in 2005 or 2006.

Species **Common name**	**Genus**	**% of sites where present December 2005**	**% of sites where present Oct-Nov 2006**
No. of sites examined		**77**	**54**
Native Grasses			
Wallaby grasses	*Austrodanthonia* spp.	97.5	94
Spear grasses (including A. scabra)	*Austrostipa spp*	47.5	48
non grass natives	*haloragis, lissanthe, vittadenia, ptilotus, lomandra, juncus*	44	20
Weeping grass	*Microleana stipoides*	43.7	30
Kangaroo grass	*Themeda triandra*	42.5	20
Rough spear grass	*Austrostipa scabra*	39	4
Common wheatgrass	*Elymus scaber*	35	8
Tussock grass	*Poa labillardierei*	6	10
Fern	*Cheilanthes*	6	6
Plume grass	*Dichelachne*	2	0
Blown grass	*Lachnogrostis*	2	0
Wiregrass	*Aristida*	2	1
Red anther wallaby	*Joycea*	1	0
Lovegrasses	*Eragrostis spp.*	1	2
Five awn grass	*Pentapogon*	1	0
Introduced species			
Annual grasses	*Hordeum,, Vulpia, Bromus, Lolium,*	95	90
Broadleaf		57.5	72
Onion grass	*Romulea rosea*	45	80
Perennial grasses	*Holcus, phalaris*	42.5	24
Clovers	*Trifolium* spp.	5	8

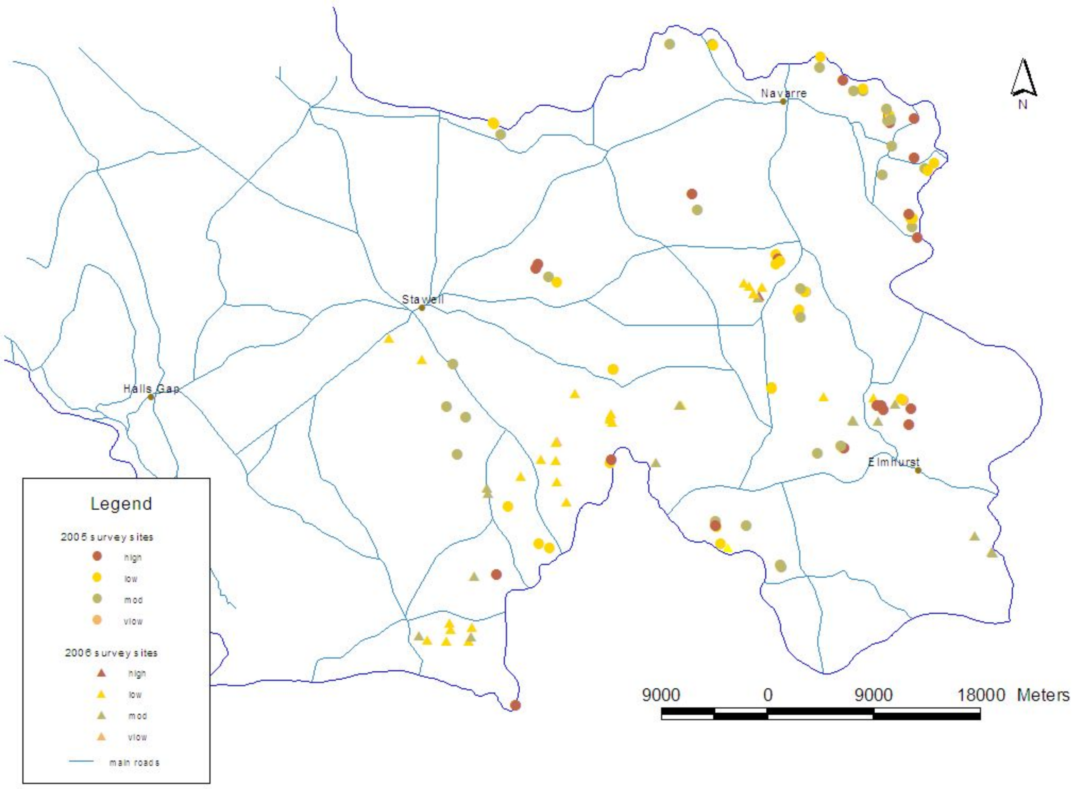
([1] sample sites in local fractured rock and low-relief granite groundwater flow systems)

Table 3: Proportion of sites where the frequency of native grasses (all perennial) were recorded as high, moderate, low or very low

Perennial grass %	**% of sites 2005**	**% of sites 2006**
High = >60	32	2
Moderate = >30-60	26	36
Low = 10-30	40	60
Very low = <10	2	2

The classification of sites for the relative frequency of native grasses is shown on the map of site locality (Map 3).

Map 3: Upper Wimmera survey sites and their native grass frequency



Aspect

Compared with sites having a soft aspect, there were more sites having a hard aspect (refer to Table 4) with a low frequency of native grasses (58 per cent compared to 32 per cent). These hard aspects also had a high proportion of soil crusting.

Hard aspect sites only had a high native grass frequency if grazing practice involved summer-autumn spelling and rotational grazing during winter-spring. Where other forms of grazing management were employed, they had a moderate to low native grass frequency on hard aspects.

Soft aspect sites with a high native grass frequency were often associated with summer-autumn spelling and rotational grazing in other seasons or continuous grazing at a low rate of stocking.

Table 4: Number of sites with various levels of native grass frequency by "hard, mid and soft aspects, 2005.

Aspect[1]	Number of sites with native grass frequency				**Total no. of sites**
	High[2] >60%	**Moderate** 30-60%	**Low** 10-30%	**Very low** <10%	
Hard	4	6	8		18
Mid	5	9	9		23
Soft	15	13	11	1	40
Total					81[3]

1. *Aspect: hard = N to W inclusive; mid = N to E, W to S; soft = S to E.*
2. *Perennial pasture (98% native): high = >60%; moderate = >30-60%; low =10-30%; very low = <10%.*
3. *3 sites had >1 quadrat*

Figure 2: Aspect severity and native grass frequency, 2005

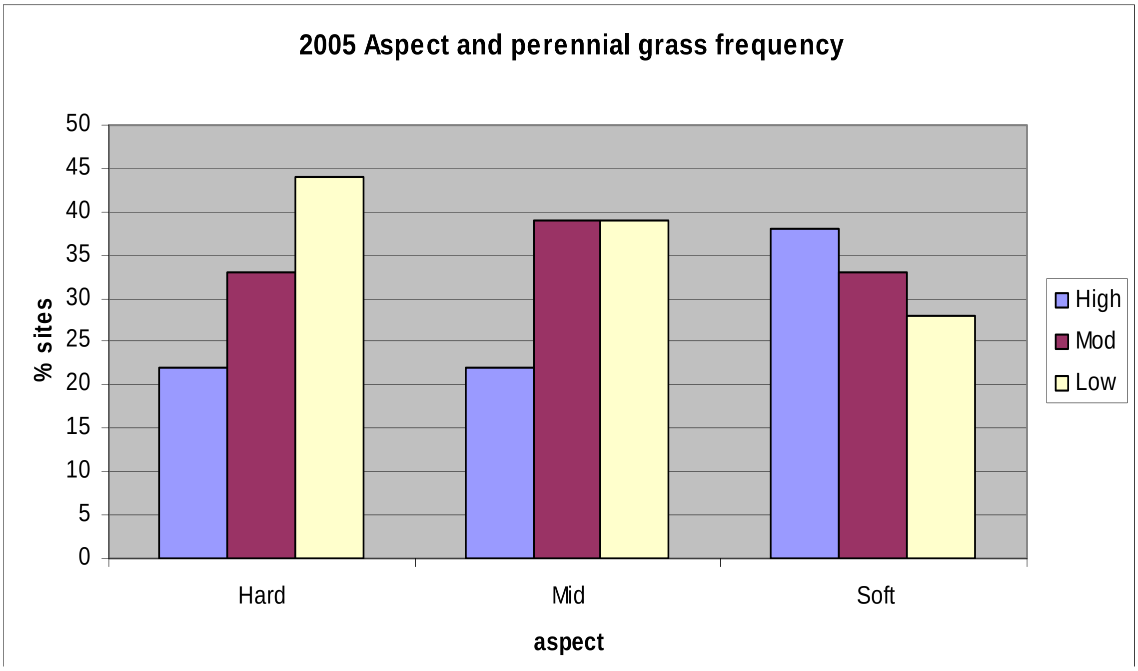
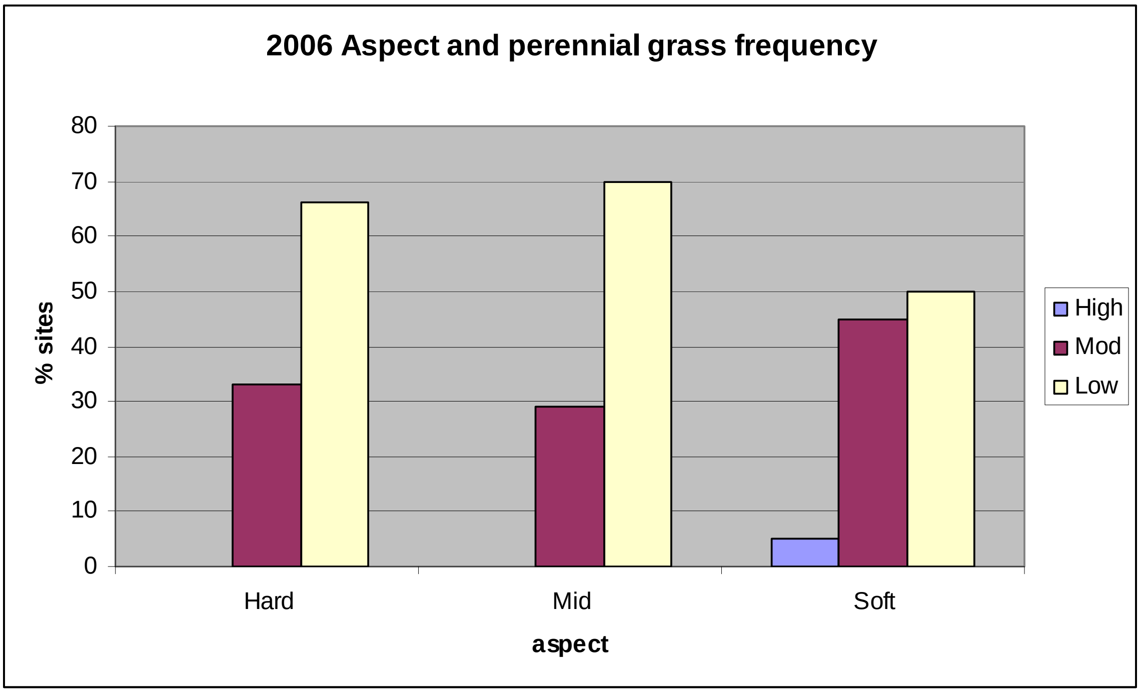


Table 5: Number of sites with various levels of native grass frequency by "hard, mid and soft aspects, 2006.

Aspect[1]	Number of sites by category of native grass frequency				**Total no. of sites**
	High[2]	**Moderate**	**Low**	**Very low**	
Hard		5	10		15
Mid		5	12		17
Soft	1	9	10	1	21
Total					53[3]

1. Aspect: hard = N to W, mid = N to E, W to S; soft = S to E.
2. Perennial pasture (98% native): high = >60%; moderate = >30-60%; low =10-30%; very low = <10%.
3. 2 sites had >1 quadrat

Figure 3: Aspect severity and native grass frequency, 2006



There was no significant (P = 0.13) association between aspect severity and native grass frequency across all sites. However, when aspect severity was reduced to more specific orientation, for the N and NE–facing sites, a significantly (p = 0.005) greater proportion contained a low frequency of native grasses, than the other aspects combined (Table 6).

Table 6: Distribution of sites (2005 & 2006) by frequency of native grass and the aspect orientation of the slope at the survey site

Aspect	Frequency of native grass		
	Low	Mid	High
N	5	1	0
NE	15	6	2
E	5	4	3
SE	7	12	7
S	11	6	6
SW	8	8	2
W	4	4	2
NW	7	6	2

Other factors

Only one respondent (n=35) had had a soil test carried out on sample paddocks in the past five years. Soil was not sampled for analysis as part of our examination although soil nutrient status is recognised as having a major influence on pasture ecology. The Wimmera soil group (N. Robinson 2006) for each of the survey sites was recorded. No significant association was found between Wimmera soil group and the frequency of native grass ($p = 0.21$).

The actual rainfall at sites over the last 10 years was not recorded, but for the range of average annual rainfall applicable to the surveyed sites (described above), we found no evidence of its significance on the frequency native grass in pasture ($p = 0.120$). It is worth noting that the area had experienced at least six years of below average annual rainfall and that the 2006 growing season was considerably shorter than that of 2005. In 2006 we found that only two per cent of the sites we surveyed were in the 'high' category for native grass frequency; for 2005 the corresponding figure was 32 per cent. (Table 3).

The unimproved pastures that were targeted for examination were generally located on poorer land classes with constraints such as steep slope, rock outcrop and/or soils with low pH, poor water holding capacity or low fertility. The proportion of steep hill country (>20% slope) on the farms that were surveyed ranged from little on the granite country up to 67 per cent of the total farm (n=23).

Current management

The current practices of pasture management in the high priority GFS are influenced by the broader context of the Upper Wimmera community. Current practices are influenced by social, economic and environmental factors, as well as historic management practices. Information about some of these factors was collected as part of the landholder interviews and the section following reflects their observations and generalisations (n=35) related to the priority areas of the Upper Wimmera. Those interviewed held land in the priority areas of the catchment of the Upper Wimmera. The area west of Stawell, near the Grampians, was not included in the survey area.

Perceived farming trends

The trend in farm size over the preceding decade saw commercial primary producers maintaining/increasing farm size. This trend was observed in the localities of Elmhurst, Great Western, Glynwylln, Crowlands, Stawell, Landsborough and Navarre. As older farmers retired, their land was usually bought by other farmers. In the Moyston area, where farm size was relatively small, viz. <400 ha, extra off-farm income was helping to sustain the property.

Increasing hobby farm/small lot development was observed at Stawell, Concongella and Armstrong. In the Navarre district it was clear that this trend involved a dichotomy: hill country was sold as separate allotments, mostly to absentees; the flatter country was absorbed by existing farms. In Landsborough the number of commercial farms halved. Considerable small lot subdivision in some hill country had occurred in previous decades (e.g. Navarre and Landsborough).

The major change in land use that local residents described for the past 10 years was a decrease in traditional enterprise of wool production. Other changes included:

1. Increasing revegetation on farm land;
2. Increasing crop production from arable land (e.g. Glynwylln, Warrak, Great Western, Stawell, Navarre, Rocky Point and Crowlands) and, generally, an increase in prime lamb and cattle numbers. Increased hay making was noted in better seasons. Increasing interest in perennial pasture establishment, including lucerne;
3. A large increase in the area of vines (e.g. Landsborough and Elmhurst). Smaller areas of alternative enterprises, including vines, olives, horses, boer goats, Christmas trees and lavender had occurred in the Landsborough, Armstrong, Stawell, Great Western and Navarre localities;
4. Increased planting of blue gum (e.g. Elmhurst/Warrak). This locality is on the extreme limit of viable hauling distance.; and
5. Increased areas of ungrazed land and rural lifestyle lots were observed at Armstrong, Landsborough and Navarre.

Compared to the years prior to the last decade, the characteristics of landholders were perceived to have changed as follows:

1. Increasing numbers of absentee landholders were associated with the smaller blocks noted at Great Western, Landsborough, Navarre and Warrak;
2. Increasing numbers of rural residential landholders were noted in the localities of Armstrong, Black Range, Elmhurst, Great Western, Landsborough, Navarre and Stawell;
3. Increasing numbers of resident landholders had off-farm income, especially in the Armstrong, Crowlands and Stawell localities;
4. Farmer age was increasing and farmer numbers decreasing at Bulgana, Crowlands, Great Western and Stawell; and
5. The proportion of land under corporate ownership increased in Elmhurst and Landsborough associated with blue gum plantation and vines; at Great Western it was associated with horse and vine enterprises.

Past management of native grass pasture

Landholders were asked to comment on changes they had observed in the native pasture paddocks over time and 35 supplied information. Past management practices were highly variable and difficult to analyse. Some of their observations about their paddocks are summarised below.

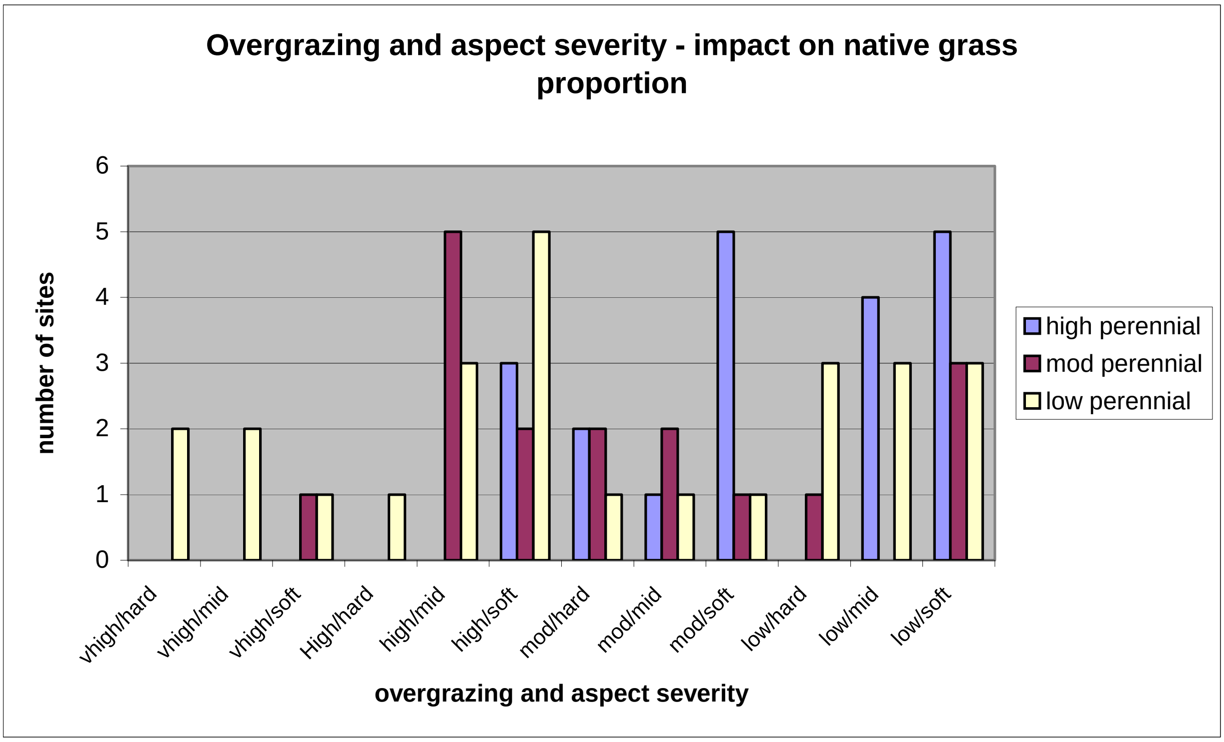
Most areas had had no superphosphate application or very little in the past 10 years. Before the 1980s, superphosphate application was more common, with higher clover content as a result. Generally, clover content had declined over recent times.

Other changes that respondents noted included an increase in kangaroo grass or increasing regeneration of trees and wattles. On other sites, some respondents described an increase in the presence of onion grass which they thought was possibly associated with dry conditions. In one case, waterholes had silted up in drainage lines.

Rabbit control through the "Rabbit Busters Program" in the late 1990s had greatly increased the herbage mass, ground cover and presence of orchids. Increasing tree cover was seen to have provided greater protection and explained the steady increase in kangaroo numbers. Some respondents remarked that the weed horehound (*Marrubium vulgare*) had increased with decreasing rabbits. Land class fencing of hills had helped control weeds associated with stock camps and helped maintain ground cover.

Where stocking rates had changed, they were generally reduced, with seasonal de-stocking occurring more often. However, stocking rates had increased, where more intensive management had been applied or inputs increased. Where grazing management had altered, there had been a shift from continuous to rotational grazing, with a resulting increase in the cover and density of native grass. The overgrazing classification of sites as derived from the amount of bare soil, rock and bryophyte/moss-lichen crust cover, when considered together with site severity, indicated a marked impact on native grass content of pasture (Figure 4).

Figure 4: Number of sites with a high, moderate or low frequency of native grass for various classifications of overgrazing and aspect severity.



Overgrazing class includes rock/bare soil/bryophyte-moss and lichen: very high >60%; high = 60-30%; mod = 30-10%; low <10%.
Aspect severity: hard = N and W; mid =NE, SE, NW, SW; soft=S and E.
Native grass frequency: high = >60%; moderate = >30-60%; low =10-30%; very low = <10%).

Native grass frequencies were not high where there was very high overgrazing on any aspect, nor were frequency high where there was overgrazing on aspects of hard or mid severity. Soft aspects were more forgiving of overgrazing.

Enterprises

Wool production was the major enterprise for 97 per cent of respondents. Prime lambs, cropping and hay production provided a secondary enterprise for many. There was limited cattle, goat and egg production. Merinos predominantly, with some first-cross sheep, were the main stock run on the surveyed native grass pastures. Shearing was evenly spread across the year; lambing predominantly took place over autumn (46%) and winter (37%).

Pasture management

Most respondents (32/35) felt their unimproved pasture paddocks that contained some native grass were less productive than those sown to introduced pasture species when considered in terms of carrying capacity. Respondents considered that native grass pasture was 30–70 per cent less productive than a phalaris pasture. However, three respondents thought that their $/ha returns were higher on native paddocks due to minimal inputs and/or better quality wool. Two others thought that the native pasture provided useful feed during the summer-autumn period and reduced seasonal variation in productivity across the farm.

Rates of stocking rates were commonly quoted at 0.6–2.5 dry sheep equivalents (dse)/ha, with a few at 3–6 dse/ha. There appeared to be some lack of consistency in the factors that different farmers used to convert other animals into dry sheep equivalents. Their estimates of carrying capacity may therefore be compromised. Respondents were also concerned with the impact of fluctuating numbers of wildlife on carrying capacity, particularly the grazing pressure exerted by wallabies and kangaroos.

Native pasture was considered worthwhile because of its low requirement for inputs, their contribution in the off season, the fineness of wool produced and the limited options for establishing introduced perennial species – especially on land of low arability.

I. Grazing management of native grass pasture

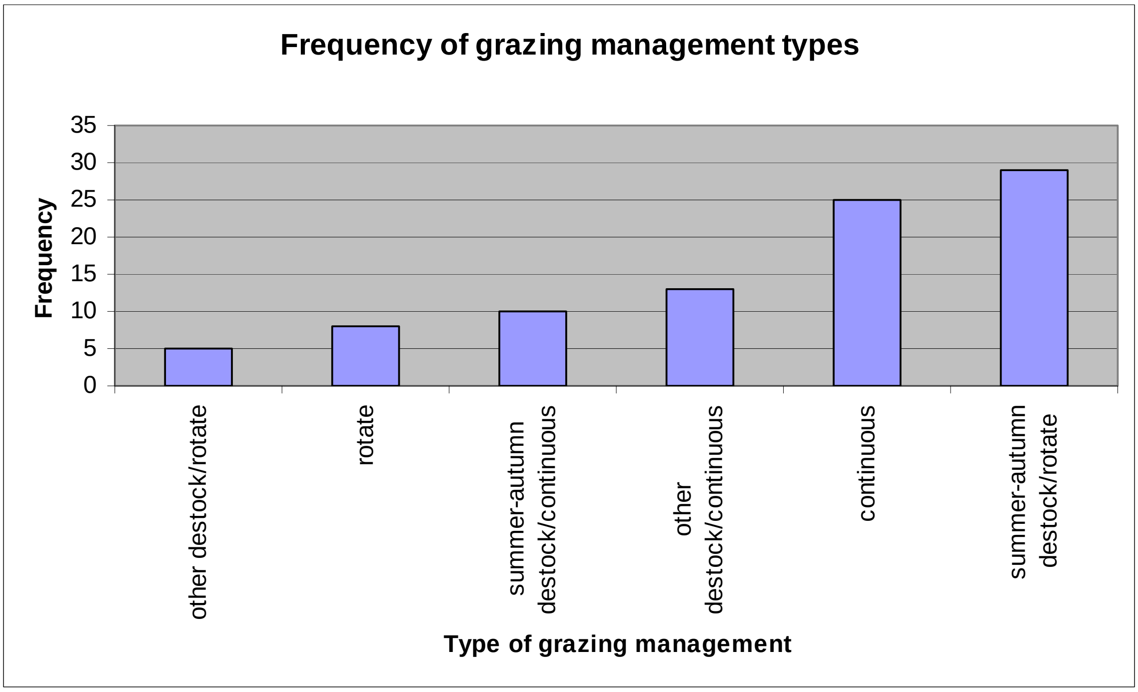
The current grazing practice employed for the surveyed paddocks was described in terms of the destocking period, if any, and the form of grazing for the remainder of the year. In Table 7, for example, 'autumn-spring destock/continuous' describes a regime where stock are removed from the pasture over autumn through to spring and then it is continuously grazed for the summer period. In this instance, the native pasture provides some feed over the summer months, when other pastures have stopped growing.

Table 7: Number of sites using specified grazing managements on native grass pasture (n=35)

Grazing management	**Frequency 2005**	**Frequency 2006**	**Sum.**	**Aut**	**Win**	**Spr**
Summer-aut destock/rotational (SR)	20	9				
Continuous grazing (C)	18	7				
Summer-aut destock/continuous (SC)	7	1				
Summer-winter destock/continuous 6 wk (SC)	2					
Rotationally grazed (R) includes:	6	1				
Summer winter destock/spring & autumn (R)		1				
Other destock/continuous (OC) includes	9	4				
Spring destock/continuous (OC)	3	2				
Aut-spring destock/continuous (OC)	3					
Winter-spring destock/continuous(OC)	1					
Early spring-aut destock/continuous (OC)		1				
Aug-Mar destock/autumn continuous (OC)	2					
Autumn destock/continuous (OC)		1				
Other destock/rotational (OR)	3	2				
*Winter-spring destock/*rotational *(OR)*	2					
*Summer destock/*rotational *(OR)*	1					
*Aug destock/*rotational *(OR)*		2				
Total number of paddocks	65	25				

KEY: white = destocked/ungrazed, grey = rotationally grazed, black = continuously grazed

Figure 5: Frequency of simplified grazing management types at 2005 & 2006 sampled sites.



From Figure 5 destocking over the summer-autumn period was widely practised (41%), and is most prevalent in steep hill country. Continuous grazing for all or part of the year was also a common (42%) grazing practice on the target (native grass) paddocks.

Other grazing patterns included a period of destocking in differing seasons, for example, autumn-spring, early spring only, spring-summer, summer and winter, winter-spring. The winter-spring destock was based on providing feed during the traditional feed gap of summer-autumn and spelling 'better' paddocks.

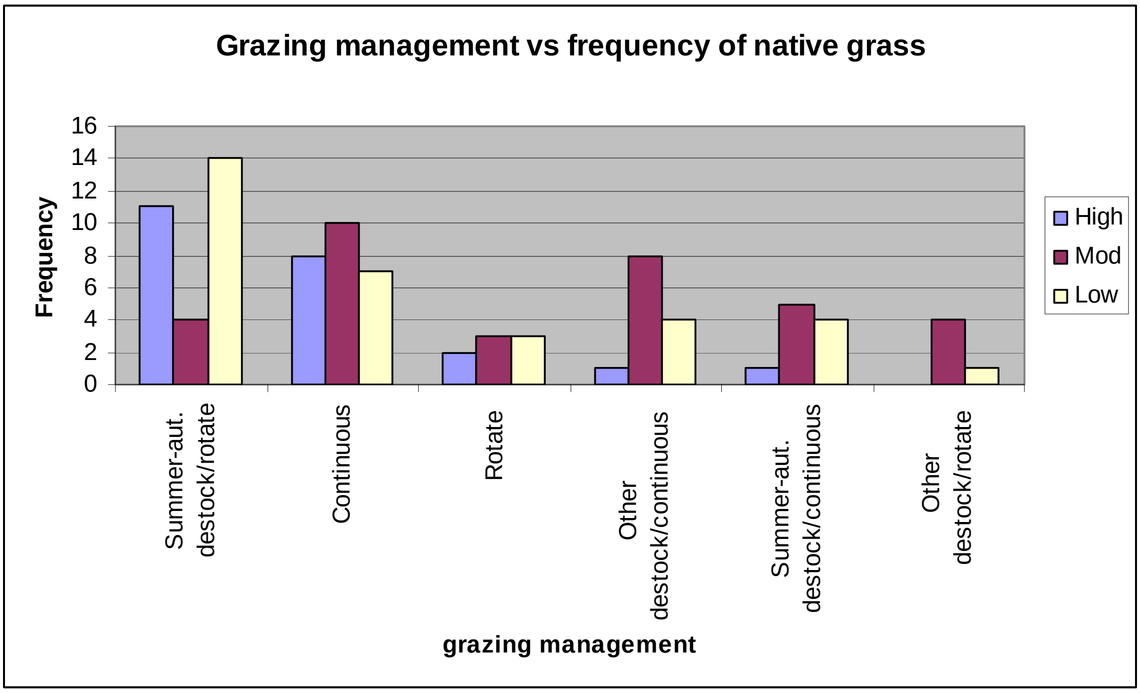
Table 8: Frequency of native grass in the pasture by grazing management, 2005+2006 (n=35).

	Frequency of native grass		
Grazing management	**High[1]**	**Moderate**	**Low**
Summer-aut. destock/rotational (SR)	11	4	14
Continuous (C)	8	10	7
Other destock/continuous (OC)	1	8	4
Spring destock/continuous		*4*	*1*
Autumn & spring destock/continuous		*1*	*2*
Winter-spring destock/continuous		*1*	
Early spring-aut. destock/continuous		*1*	
Aug-Mar destock/autumn	*1*		*1*
Autumn destock/continuous		*1*	
Summer-aut. destock/continuous (SC)	1	5	4
Summer-autumn destock/set	*1*	*5*	*2*
Summ.-wint. destock/continuous 6 wk			*2*
Rotate (R)	2	3	3
Rotate	*2*	*2*	*3*
Summ.-wint.destock/spring & autumn		*1*	
Other destock/rotate (OR)		4	1
Winter-spring destock/rotational		*1*	*1*
Summer destock/rotational		*1*	
August destock/rotational		*2*	
Total number of paddocks	23	34	33

1 = Perennial pasture (98% native): high = >60%; mod = >30-60%; low = 10-30%; very low = <10%.

Of the two most common grazing management practices, continuous grazing was more often (72%) associated with a high or moderate native grass frequency than SR (50%). (Table 9).

Figure 6: Number of sites with a high/moderate/low frequency of native grass for various grazing practices.



For analysis the grazing management categories have too few in the sample number to be confident about impact.

II. Management by pasture type

Survey responses (n=28) to the question "is the grazing pattern different for different pasture types?', covered a wide range of ways that grazing was different. Of the nine responses that said the pasture type did not influence the grazing management they used, two clarified this by saying it was the paddock (land class) that determined how they grazed. Comparing respondents' grazing management of native pasture with that of other pasture types, 21 out of 35 did have different grazing management.

Five respondents continuously grazed their sown, introduced pasture. Two mentioned that native, unimproved pasture was used to rest the 'better' paddocks.

III. Subdivisional fencing

Fencing layout can make a substantial difference to the ease of grazing management and, therefore, effective pasture utilisation. Twenty-nine respondents (n=34) took land class into account, at least in some areas of their farms, e.g. hills and gullies, when fencing. Generally, hill country has been fenced separately. Flatter country was usually fenced into smaller paddocks. Fifteen respondents mentioned having a whole farm plan. Where there were no substantial issues, such as the existence of gullies, salt or remnant vegetation, then Crown Allotments tended to be the basis for fencing.

Twenty-eight respondents had erected new fencing over the past 10 years, most of which was Landcare related, for example, fencing off swamps, gullies, tree plantations, hills, land class, waterways and remnant protection. Increasing the number of lower paddocks used for improved grazing options was also mentioned. Three respondents had replaced existing or boundary fencing only. One respondent had done no new fencing in last 10 years because he had implemented his whole farm plan prior to this.

IV. Drought and seasonal feed gaps (n=34)

The major grazing strategies during drought included reducing stock numbers, bulking up mobs to minimise paddocks required, shifting stock from hill paddocks to better / flatter land or smaller paddocks, agisting to minimise impact, or shifting to paddocks with water supplies. Supplementary feeding was expected. Ten respondents said they would use a stock containment area (SCA) or small holding paddock for feeding. Two respondents raised animal health and wool contamination concerns with SCAs. Twelve respondents specifically mentioned the need to protect ground cover, better pastures and poorer country as a factor that had influenced their management practice.

The usual period identified as a feed gap was from summer to after the autumn break. The strategies for dealing with this included supplementary feeding, grazing stubbles, growing summer fodder crops or lucerne, selling lambs before summer or running lower stocking rates. No specific mention was made of perennial pastures, except the use of lucerne to reduce the feed gap period.

V. Weeds

The main weed problems identified are listed below. Control options were often limited by steep terrain and access, so control was time consuming and labour intensive.

Table 9: Main weeds and control used (n=35).

Weeds	**Control**
Broadleaves – capeweed, corkscrew/*Erodium*, sorrel	Grazing, MCPA (selective herbicide)
Onion 'grass'	Spray on flatter land
Serrated tussock	Spraying
St Johns wort	Spot spray, strategic grazing
Saffron thistle , scotch and variegated thistle, sweet briar, bracken,	Dig out thistles
Horehound	Spray, graze with goats
Patterson's curse	Spray where can reach

VI. Fertiliser

Superphosphate application has not been a priority for the surveyed paddocks. In the past 10 years the number of paddocks receiving superphosphate was much lower than those where none was applied (Figure 7).

Figure 7: Time since last application of superphosphate (n=35).

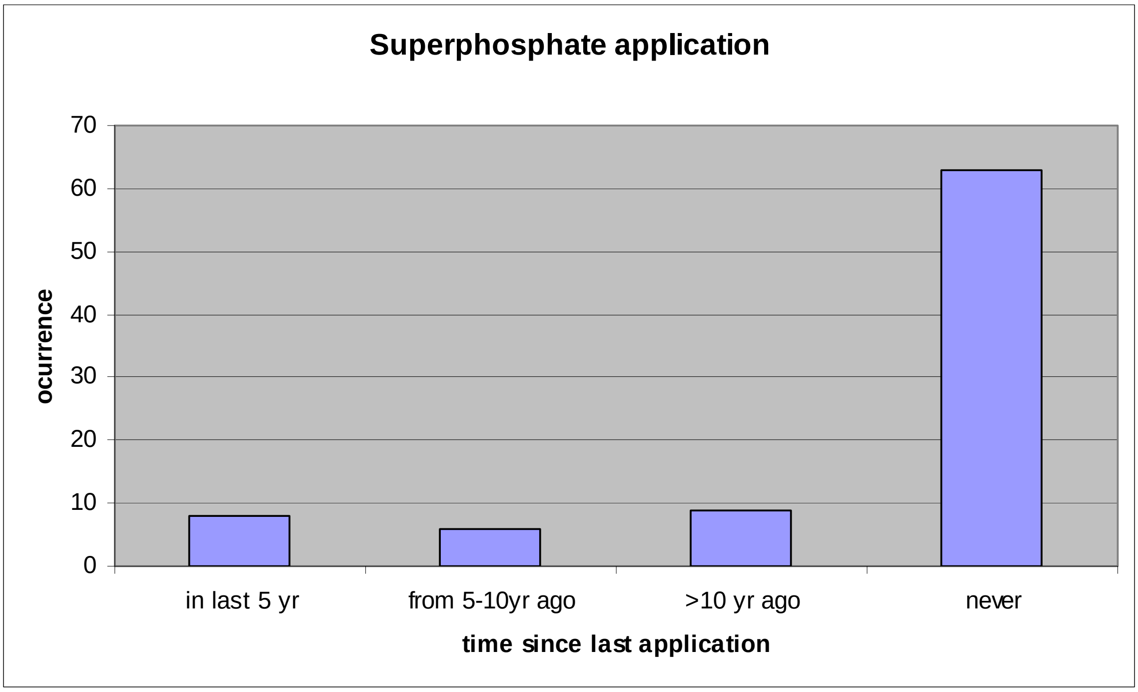
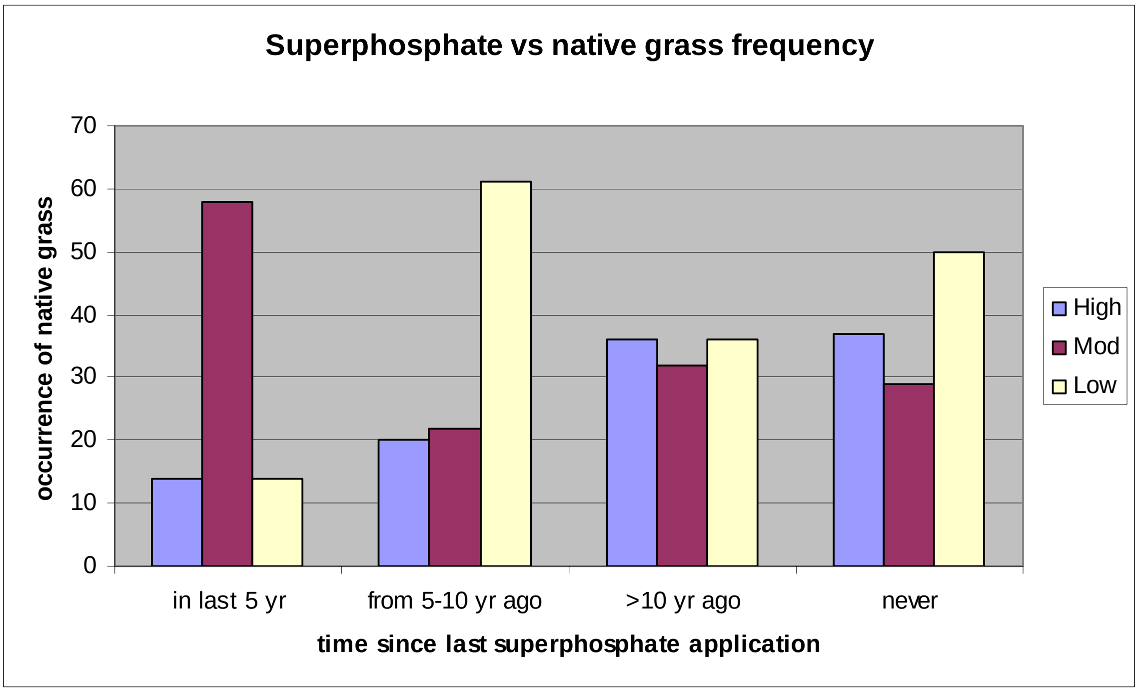


Figure 8: Time since last superphosphate application and native grass frequency



VII. Rabbits and kangaroos (n=34)

The main areas where kangaroo numbers were an issue were hills, creek frontage, land bordering forest or public land, or anywhere with remnant vegetation. A general observation made by respondents was that kangaroo numbers had increased over recent decades and producers farming near blue gum plantations believed that the plantations provided shelter for bigger mobs of wildlife.

Rabbits were generally felt to be under control, but tunnel-eroded areas, frontage, steeper hills, rail reserves and granite outcrops were identified as problem areas. Anywhere with harbour, such as stumps, spiny rush, remnant vegetation or revegetation areas, could be a problem.

Landholder needs and characteristics

To better understand the motivations and decision making of landholders, it is useful to have information about their individual needs and characteristics. Before management practices can change, landholders must first develop the appropriate knowledge, skills, aspirations and attitudes.

To determine landholders' characteristics, data was collected about their residential location, farm size, the number of separate blocks that made up their total holding, length of ownership, age, education, off-farm income, source of pasture advice, recognition of and attitude to native grasses, attitude to government grant assistance, knowledge of grazing systems, grazing management skills, aspirations for their farm, for their unimproved paddocks and the constraints to their aspirations.

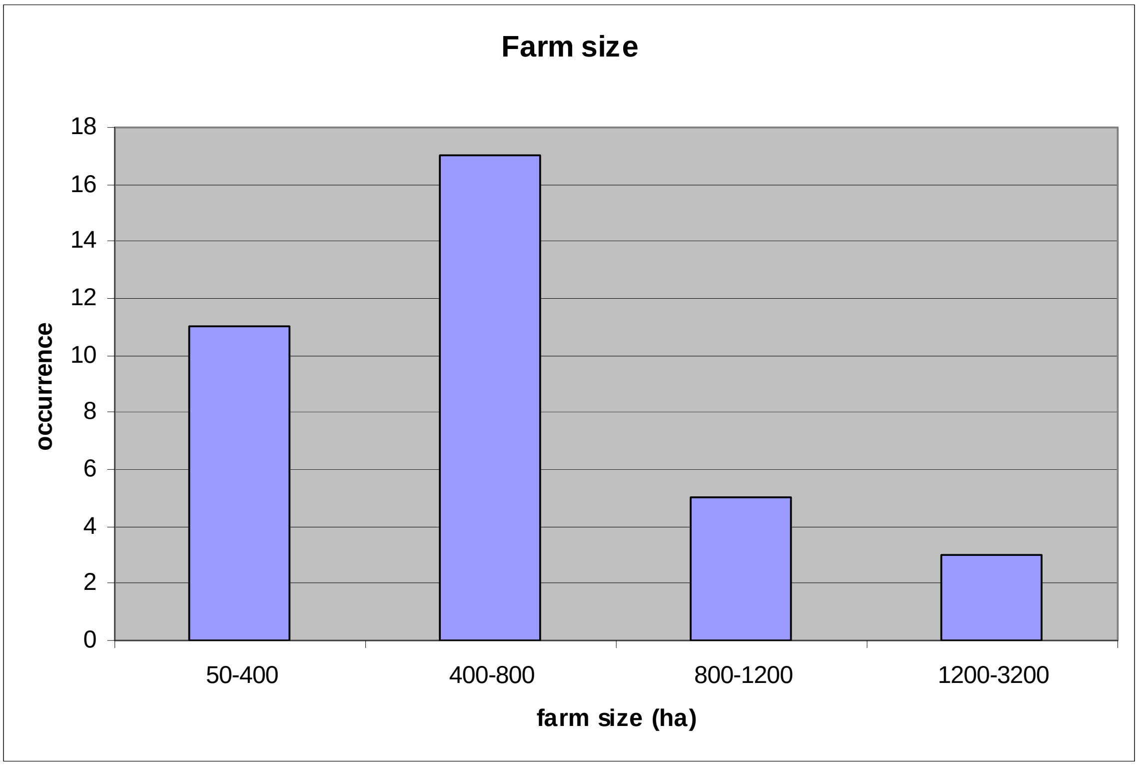
Landholders were asked specifically to identify their perceived needs if grazing management was to change, as well as their responses to a range of activities designed to meet their needs.

Residence, farm size, number of blocks, length of ownership (n=35)

Fifty per cent of respondents were resident on their land and another 48 per cent resided locally and visited frequently. The frequency of visits ranged from daily to monthly, depending on stock requirements. Only one respondent was absentee but usually spent a few days each week at the property.

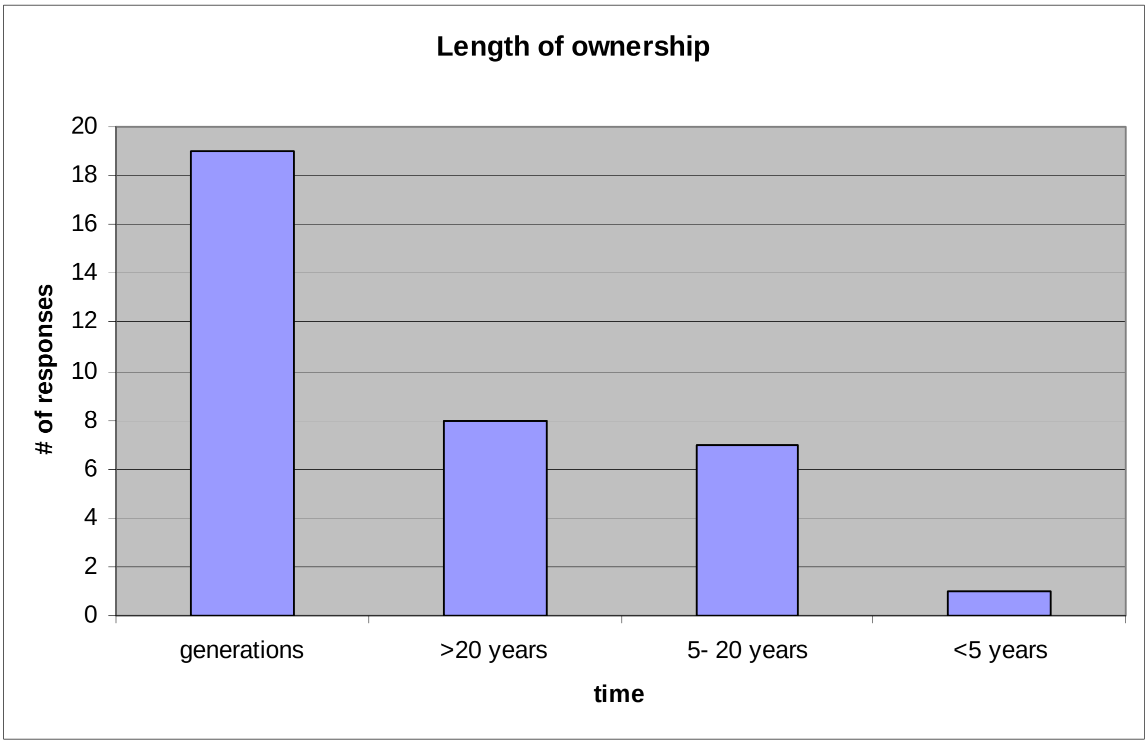
The average farm size was 663ha. This figure needs to be qualified, however, with reference to the methodology used for sampling sites. Landholders owning land less than 50ha were excluded from the survey.

Figure 9: Number of farms within each of four farm size categories



The average number of blocks run was 2.6. A total of 68 per cent of those interviewed had holdings in either one or two separate blocks. The remaining 32 per cent had holdings made up of three to eight blocks. There appeared to be a greater proportion of multiple block ownership around the Barkly- Navarre area.

Figure 10: Length of land ownership (n=35)



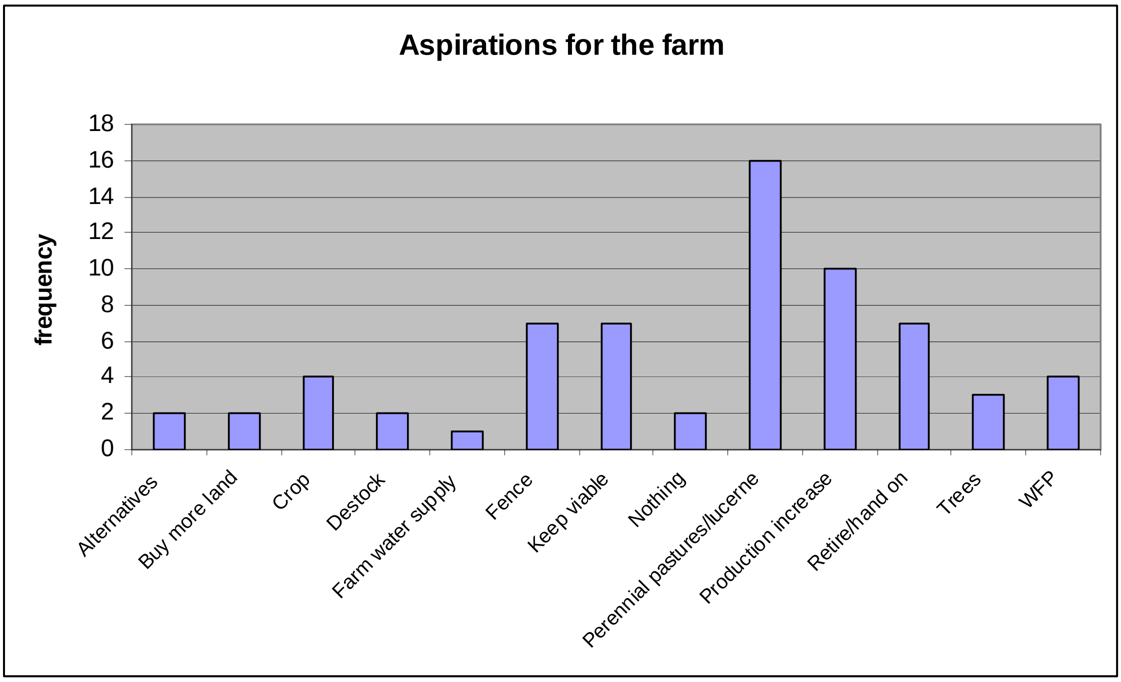
Aspirations

Eleven out of 32 respondents had identified a successor to the farm. A total of 21 out of 32 had not decided who would inherit the farm and two of these respondents had young children. There was no data for three out of 35 of the surveyed landholders.

Figure 11 (n= 34) shows the range of responses when respondents were asked their goals for their farms over the next 10 years. There was often more than one response. The most cited response was 'increasing production coupled with perennial pasture'. 'Keeping viable' was a common response, usually combined with a comment as to how that might be achieved, for example, 'increased pasture production'.

Some of the comments from respondents included "hand it on to son in a good state"; "keep on farming, shift up onto the land into a smaller house. Maintaining my income and lifestyle"; "run a sustainable business that supports the family without going off-farm for income"; and, "grow sheep that cut 8kg fleeces". Two respondents had no plans for the next 10 years. Four were planning to retire.

Figure 11: Aspirations for the farm



Many respondents (n=33) wanted more, but smaller, paddocks; the size depending on mob size and type of country (bigger paddocks on hills). A size of 25–28 ha was often suggested, while others suggested 16 ha on better country and 40 ha on hills. Most respondents preferred to have at least three paddock/mob.

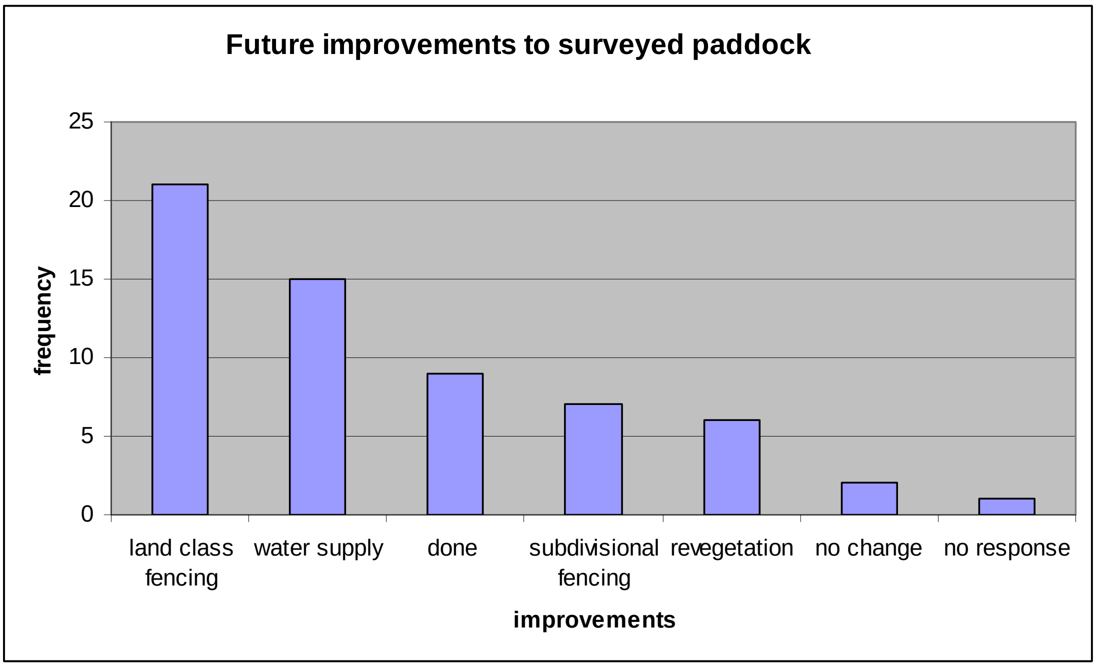
Landholders (n=34) were asked if they were considering enterprises other than those they currently operated. The most popular option for changing enterprises was to alter animal production including calf rearing, fat lambs, meat sheep, broad wool or getting out of goats, The next most popular option was "not to change",

Table 10: Choice of future new or additional enterprise

Enterprise change	**# responses**
Animal production changes	15
No change to existing	11
Fodder crops, hay	5
Alternate – wind, viticulture, organic	4
Expand current enterprise	2

Fifty-seven per cent of respondents (n=35) indicated land class considerations would influence subdivisional fencing of the surveyed paddocks. Twenty-six per cent had already implemented sub-divisional fencing, most based on land classing. Forty-three per cent of responses mentioned water supply as a critical part of subdivision (see figure 12).

Figure 12: Choice of future improvements to surveyed paddock

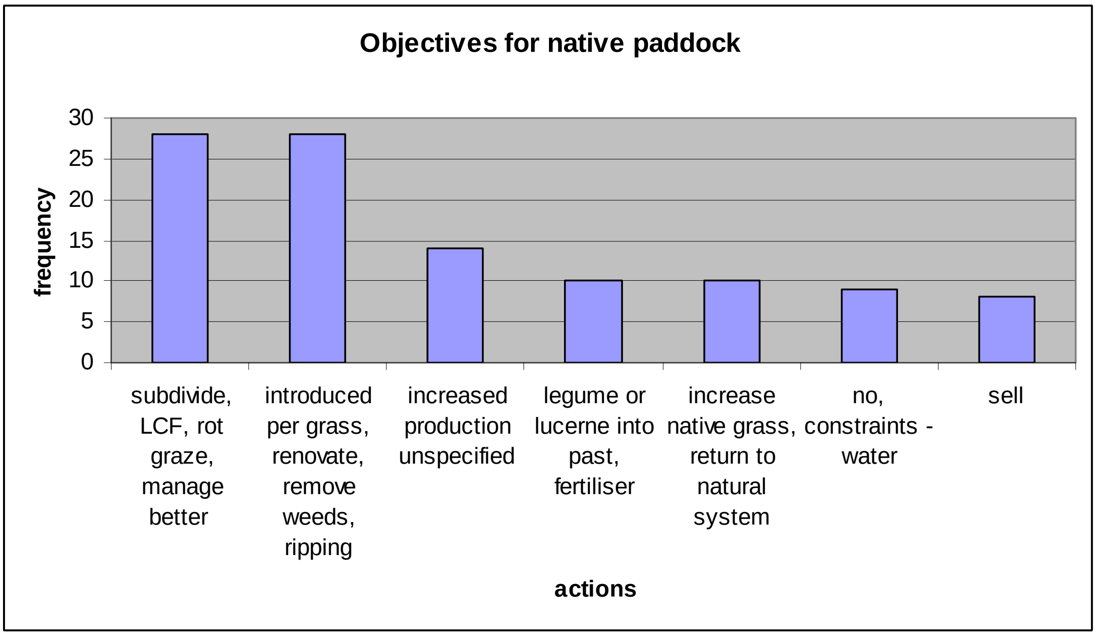


Thirty respondents (n=32) had specific objectives they would like to implement on their unimproved pasture, while two indicated no change. In both cases of no change, stock water availability was cited as the constraint to change.

Equally popular objectives for unimproved pastures were to better manage the existing pasture with grazing and subdivision or to establish introduced perennial grasses and reduce weeds (see figure 13).

Some respondents were less specific about how they would achieve their objectives, for example, 'increase production', and 'return to natural system'.

Figure 13: Objectives for surveyed paddocks



Age associations

Figure 14: Age distribution of respondents (n=34)

a. Age versus goals over the next 10 years

There were some significant associations between 10 Year goals and age class of respondent (Table 11). When comparing fencing, whole farm planning and perennial pasture/lucerne with handing on/selling up, older farmers were found to be more likely to be planning for this event up ($p < 0.01$).

Table 11: Frequency distribution for the categories of 10 year goals and age class

10 Year goals\Age class	< 40	40 - <50	> 50
Fencing, Whole farm planning	3	2	1
Increased production	9	0	3
Perennial Pasture/lucerne	0	2	1
Hand on, sell up	0	5	9
Trees, alternate income	0	0	1
Mixed	5	18	20

b. Age versus succession planning

Tests of association between successor determined and age class were done with the >50 years groups combined. Increasing age was not significantly ($p = 0.22$) associated with whether a successor had been determined. Farmers <40 years had the highest percentage for successor determined. (Table 12).

Table 12: Frequency distribution for the categories of successor and age class

Successor\Age Class	<40	40 - 49	50 - 70	>70
No	5	20	16	4
Yes	12	7	14	1

c. Age versus change to unimproved pasture

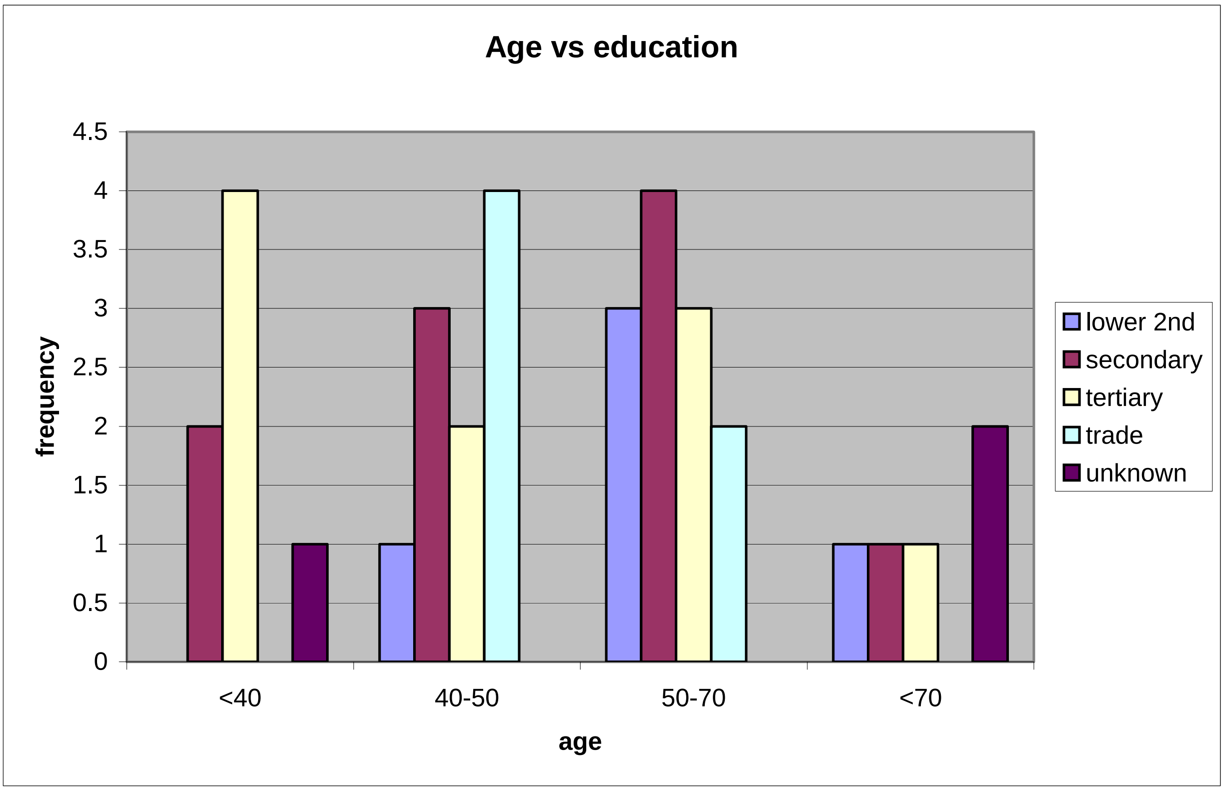
The cell sizes in the frequency distribution for the categories of changes to pasture and age class were generally too small for much inference (Table 13). The proportion of producers that were proposing to make changes to pasture, as opposed to those who were doing nothing or selling, was significantly increasing with age ($p = 0.006$).

Table 13: Frequency distribution for the categories of changes to pastures and age class

Changes to Pasture\Age Class	<40	40 - 49	50 - 70	>70
Natives	1	0	1	1
Perennials	6	2	4	3
Legumes	0	0	0	1
Mixed	3	14	22	0
Increase production	0	4	0	0
Nothing	7	2	0	0
Sell	0	5	3	0

d. Age versus education

Figure 15: Age and education (n=34)



There was a significant ($p < 0.001$) association between age and education, as might be expected. The <50s had proportionately more with higher secondary and tertiary education (Table 14).

Table 14: Frequency distribution for the categories of age class and education class

Age\Education	< 2nd	2nd	3ry	Trade
<40		3	13	
<50	2	17	7	8
50 - 70	9	8	9	3
>70	1	3	1	

e. Age versus grazing management

For the analysis, ages >50 and other destock/rotational + rotationally grazed and other destock/continuous + continuous grazing were combined. There was a significant association between age and grazing management type ($p = 0.03$) (Table 15). The most obvious difference was that producers aged 50-70 years were more likely to have employed proportionately more continuous grazing than the younger aged producers.

Table 15: Frequency distribution for the categories of age class and grazing management type

Age\GMT	OR	OC	R	C	SR	SC
<40		3	1	2	9	3
<50	2	2	5	7	12	5
>50	2	4	2	13	8	2
>70	1	1		3		

Education associations

a. Education versus superphosphate use

The association between the most recent application of superphosphate and education is shown in Table 16.

Table 16: Frequency distribution for 2 categories of P history and education category

Superphosphate last used\Education	< 2nd	2nd	3ry	Trade
≤ 10 years	5	3	5	0
>10 years or none	7	28	24	11

The distributions are significantly (p = 0.03) different; there was less recent superphosphate use amongst secondary and tertiary educated farmers.

b. Education versus source of pasture advice

There was a significant (p = 0.001) association between source of pasture advice and education category. Proportionately more tertiary and trades-educated farmers did not use DPI for pasture advice (Table 17).

Table 17: Frequency distribution for pasture advice and education category

Pasture Advice\Education	< 2nd	2nd	3ry	Trade
DPI alone or mixed	8	20	6	2
Non DPI	4	11	20	9

Table 18: Respondents' source of pasture advice (n=34)

Source of advice	**# of times mentioned**
Agribusiness – Agronomist/newsletters	16
Other farmer	14
DPI agronomist	9
Field days	5
Seed company info	4
Media – *Weekly Times*	4
Agricultural journals	3
Grasslands Society	2
Holmes and Sackett (a Vet consultant firm)	2
Landcare notes	2
Internet	2
Aboriginal management	1
Grazing management courses e.g. MLA Prograze, consultants	2
McKinnon group (a Vet consultant)	1
DPI SW farm monitor group	1

Most producers sought advice on pasture from more than one source (Table 18).

c. Education versus goals over next 10 years

The association between 10 year goals and education category is shown in Table 19.

Table 19: Frequency distribution for the categories of 10 year goals and education category

10 Year goals\Education	< 2nd	2nd	3ry	Trade
Fencing, WFP	0	1	3	2
Increased production	0	0	9	2
Per. pastures, lucerne	1	0	0	2
Hand on, sell up	8	6	1	0
Trees, alternate income	0	1	0	0
Mixed	3	23	17	3

Significantly ($p = 0.02$) more tertiary educated farmers included increasing production in their plans (Table 20).

Table 20: Frequency distribution for 2 categories of 10 year goals and education category

10 Year goals\Education	Tertiary	Other
Increasing production	18	17
Other	12	37

d. Education versus succession planning

There was a significant association between successor determined and education category ($p < 0.001$) (Table 21).

Table 21: Frequency distribution for the categories of successor and education category

Successor\Education	< 2nd	2nd	3ry	Trade
No	4	24	11	5
Yes	8	2	19	6

Proportionately more of tertiary educated farmers had determined a successor.

e. Education versus change to enterprise

Higher secondary and tertiary educated farmers more often envisioned an enterprise change than did the other groups ($p = 0.003$) (Table 22).

Table 22: Frequency distribution for enterprise change and education category

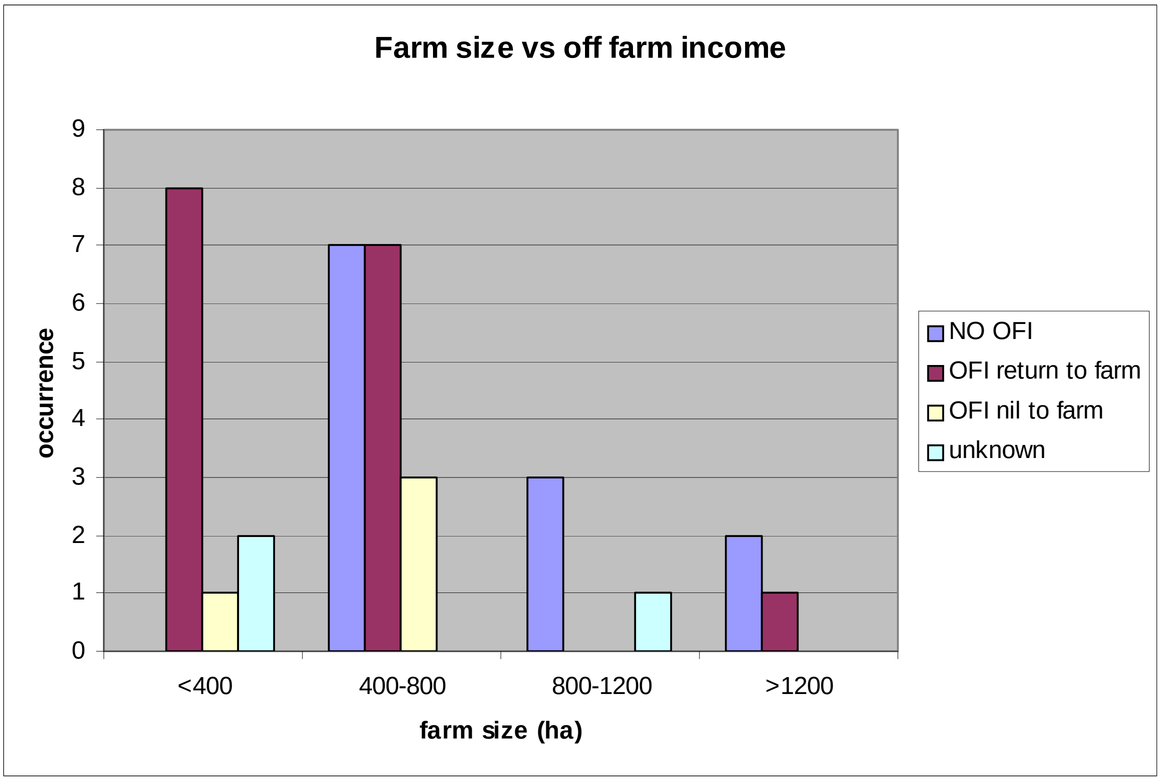
Enterprise changes\Education	< 2nd	2nd	3ry	Trade
Animals	3	17	8	1
Fodder			1	3
Alternative		8	2	
Expand existing			7	
Mixed	1		5	1
No change	8	5	7	6

Tertiary educated farmers were more likely to choose an enterprise other than animal production ($p = 0.03$).

Off farm income associations

Sixty-two per cent of respondents reported having off farm income.

Figure 16: Off-farm income versus property size (n=32)



a. OFI versus source of pasture advice

There was a significant interaction between OFI and whether farmers used DPI pasture advice (p = 0.01). Landholders who do not access their pasture advice from DPI were more likely to have OFI (Table 23).

Table 23: Frequency distribution for pasture advice and OFI

Pasture Advice\OFI	None	Not to farm	To farm
DPI alone or mixed	4	6	7
Non DPI	21	3	21

b. OFI versus change to enterprise

Proportionately more farmers with OFI planned an enterprise change (p < 0.001) (Table 24).

Table 24: Frequency distribution for enterprise change and OFI

Enterprise changes\OFI	Not to farm	None	To farm
Animals	1	14	18
Fodder			4
Alternative	7		3
Expand existing		4	3
Mixed	1		6
No change	1	20	1

Proportionately fewer farmers with OFI proposed a change to an animal enterprise (p = 0.020, than did farmers with no OFI.

Constraints

Table 25: Major constraints to reaching objectives (n=31)

Constraint	**# responses**
Cost	18
Time	8
Knowledge	5
Intergenerational	3
Age	3
Kangaroos	2
Climate change	2
Technical practicality	1
Attitude of manager	1
Skills	1
Machinery	1
OH&S	1

Table 25 shows respondents' indications of the most limiting factors that prevented them from reaching their objectives for the farm. Cost and time were the most frequent constraints identified.

Constraints for particular individuals included the availability of appropriate machinery, skills and attitude of manager.

Respondent knowledge of native grasses

The native grasses that respondents most commonly mentioned as occurring locally were kangaroo grass (87%) and wallaby grass (66%). Less commonly mentioned were spear grass (19%), weeping grass (22%) and *Poa* (9%) (Table 26).

Mention was also made of species that are not grasses (matrush – *Lomandra*), or not local (red grass – *Bothriochloa*), or unclear (tussock grass, *Pucinellia*). Other introduced species that were mentioned included silver grass (*Vulpia* spp.), shivery grasses (*Briza* spp.), sweet vernal grass (*Anthoxanthum odoratum*), and barley grass (*Hordeum leporinum*).

Although these species names were mentioned, this did not mean that respondents could identify that species from the specimen.

Table 26: Familiarity with native grass names

Species	Number of times mentioned %
Kangaroo	87
Wallaby	66
Weeping	22
Spear	19
Poa	9
Other	Tussock (2), *Vulpia* / silver, shiver, sweet vernal, barley, *Pucinellia*, red grass, matrush

Table 27: Respondent identification of local grasses

Grass species	Correct (/33)	Incorrect (/33)	No response (/33)	Incorrect /no response (/33)	Incorrectly identified as	ID Native
*Cynosurus**	0	2	31	33	wallaby, barley	4*
Bent grass*	0	8	25	33	fog, feather, spear, feathertop, silver, wild oat	7*
Common wheatgrass	0	5	28	33	spear, wallaby, wire, weeping	6
Wallaby[1] grass	0	5	28	33	rye 3, canary, silver	4
Weeping	2	16	15	31	wild oat, spear 8, silver, rye, wallaby 2, kangaroo	6
Wallaby grass	2	6	25	31	brome3, spear, rye, barley	3
Bromus catharticus	3	11	19	30	rye 4, barley 4, silver 2, oatgrass, wallaby	7*
Austrostipa mollusc	4	5	24	29	wallaby, fog, brome, tall wheatgrass	7
Vulpia spp.*	6	0	27	27		3*
Yorkshire Fog grass*	6	6	21	27	canary, cocksfoot 5	2*
Wallaby grass	7	3	23	26	kangaroo, brome 2	8
Austrostipa scabra	8	2	23	25	needle grass, poa	9
Kangaroo grass	23	0	10	10		4
*Phalaris*aquatica*	25	1	7	8	brome	0
Wild oats*	28	1	4	5	spear	1*

** = introduced*

1 = 3 wallaby grass specimens were used at different levels of maturity.

Each respondent's response to the sample was recorded as correct, incorrect or no response. Respondents were also asked if the species was native or introduced.

From Table 27, the most widely recognised species were kangaroo grass (23/33), phalaris (25/33) and wild oats (28/33). Generally, there was poor identification of most species (75 per cent of responses were either incorrect or did not know) and poor knowledge of which were native and which were introduced species. Some introduced grasses, for example, bent grass, silver grass and brome grass, were mistakenly called native. Many native species were mistakenly identified as introduced species. Some species, for example, spear and wallaby were recognised as natives but could not be named. Twenty-four per cent of respondents failed to identify phalaris.

Respondent knowledge of grazing system terminology

From Table 28 respondents had less understanding of the term 'cell grazing' compared to crash or rotational grazing. Sixty-seven per cent of respondents considered they employed some form of rotational grazing.

Table 28: Respondents' knowledge and use of grazing system terms (n=34)

	Understood term	**Mis-understood term**	**Did not explain term**	**Used system**	**Comment**
Rotational grazing	33	0	1	23	Range of understanding about intensity of grazing and triggers for shifting. Two paddock shifts were considered rotational. Shifts based on stock needs or maintaining cover. Few mentioned pasture recovery needs. Most understood that resting of pasture was required. Involves more work.
Cell grazing	22	5	7	0	Associated with dairy / prime lambs, wagon wheels. More paddocks and water points. Shift stock often. "Club like Amway". Too much work, fencing, stock movement more suited to high rainfall / fertility areas. Kangaroos. Some confusion with strip grazing.
Crash grazing	29	0	5	19	Generally associated with spray grazing, prep for sowing crop or new pasture.

Respondent attitude to native grass pasture (n=35)

Respondents were asked if they saw advantages to having native grass pasture. Generally, more than one reason was given. The most frequent responses related to the pre-existence of native pasture, that no sowing was required and its adaptability to harsh environmental conditions. Asked to identify the disadvantages of having native pastures, respondents gave less reasons, with lower productivity the most common response (20 out of 35). Other perceived disadvantages, such as lower ground cover, susceptibility to overgrazing and slower growing, may be responses to grazing management and rate of stocking rather than inherent problems with the native pastures. Two respondents mentioned that, although production was low, it was probably all that could be expected from hard hill sites. Nine respondents saw no disadvantages and said that native pastures were fine for difficult hill country.

Table 29: Perceived advantages of native grass pasture

Category	Includes	frequency
Adapted	Naturally occurring Drought resistant Persistent Acid tolerant	22
Best option	Useful pasture spp In hills, most productive option	16
Summer response	Responds to summer rain	11
Low input	Animal husbandry, no fertiliser, easy management	7
Ground cover	In summer, roots of perennials protect soil from erosion	5
Kangaroo grass	Green in summer, responds to rain, sheep happy to eat with nutrient block	4
Animal health	Sheep no drenching, no scouring	3
No advantages		3
Biodiversity value	Indigenous, natural ecosystem	2

Table 30: Perceived disadvantages of native pastures

Category	Includes	Frequency
Less productive	Not suitable for finishing off stock Tussock grass has no value for feed	20
No disadvantages	Fine for the difficult country	9
Seed contamination of wool	*Stipa* and weeping grass seed	8
Not enough ground cover	Not dense enough Broad leaf weeds can get in	3
Lower palatability	Kangaroo grass	2
Susceptible to overgrazing		2
Slower growing	Longer to regenerate	1

Respondents attitude to accessing government assistance to better manage native pasture (n=32)

Respondents unanimously indicated that they were not concerned about where assistance came from, whether government or non-government organisations. Some mentioned that their response would depend on the conditions attached, not the source of grant. Some mentioned the objectivity of government assistance compared to business assistance /advice.

Respondent skill in pasture and stock assessment

Table 31: Respondents' skills re pasture and stock assessment

Specific Skill	Has skill	Uses skill	Other	No use	Comment
Dry Matter (DM) assessment of pasture (n=34)	9	4	22	0	Most use feed height, bare ground, sheep behaviour, stock condition. Also spp mix, density, health. Five respondents learnt skill in Prograz course.
Feed budgeting (n=33)	17	12		18	
Fat scoring (manual assessment using standard scoring) (n=34)	18	10	17	0	Most use visual assessment, using stance, feeding and travel behaviour, back width, hollows. Assess when handling or at shearing. Fat scoring helpful when in full fleece.

The skills of assessing pasture dry matter, fat scoring stock and feed budgeting are developed through the Prograze program. The benefits of using a standard system of indicators include the advantage of common understanding when talking with others.

Where respondents had not developed formal skills, other indicators were used to assess pasture and stock condition. Unlike the formal methods, however, these indicators do not allow standard communication of results, for example, describing a pasture as 1500kg / ha or a sheep as fat score 3.

In some instances, some of the indicators used, for example, tails for condition scoring, are not reliable, or are not replicable between operators.

Respondents that regularly produced fodder on farm for the feed gap usually based quantities on previous years' usage. However, where additional feed was being bought in, for example during drought, feed budgeting was usually done to ensure value for money.

Landholder needs

Table 32: Respondents' needs as required in order to alter their grazing management

Topic	Info. needs (n=30)	Skills to develop (n=31)
Fertiliser / soil tests	4	2
Chemicals / spraying	2	
Objective / check	1	
Prograze skills Feed budgeting/DM assessment	2	6
Native grass management, grass ID	4	5
Time requirements to rot graze	2	
Cost of rotational grazing	5	
Pasture management – generally	3	4
Rotational grazing	6	3
Record keeping, computer packs		2
No needs identified	17	15

In Table 32, 13 out of 30 graziers identified specific information, and 16 out of 31 specific skills, to help them change their grazing management to improve pastures. Some gave more than one response. In addition, specific support (n=17) mentioned a graziers' pasture focus group to build confidence in using pasture tools, to share useful information and access technical research. Other forms of support proposed were having available contractors for those without the appropriate machinery, grants for subdivisional fencing, labour support, DPI and agribusiness agronomists for pasture advice, and activities on weekends for those who have off-farm income.

Table 33 shows the results of respondents (n=33) asked to score a list of activities. Scores were based on the perceived usefulness of the activity to the respondent. Activities were then ranked based on how frequently they received the top two most useful scores.

Table 33: Respondent scoring of proposed extension activities for managing native pasture

Activity	% high scoring*	Ranking
Incentives / grants for fencing, water supply, weed control	75	1 most useful
Demonstration paddocks	66.6	2
Grass identification workshop	62.5	3
Visits to others' farms	58.3	4
Prograze (pasture management course)	41.6	5
Farmer focus groups	41.6	5
Assistance with individual grazing plans	25	6
Rotational grazing field days	29.1	7

Discussion

Mapping native pasture

According to the definition of native pasture 'any pasture in which native grasses are the main perennial species' (Crosthwaite and Malcolm, 2001) our findings clearly establish that native pastures persist throughout the Upper Wimmera. Our survey, it must be emphasised, was not a random survey and so cannot indicate the area of native pasture in the catchment. Rather, it was an attempt to describe their botany and investigate natural and management factors that are associated with their presence and dominance. Their persistence appeared to be influenced by the degree of disturbance and the form of management (J Dorrough, 2005 pers. comm.). On non-arable hill country, little mechanical disturbance had occurred and, for most sites, little or no superphosphate had been applied.

From Table 2, the dominant native species were the wallaby grasses (*Austrodanthonia* spp.) which were present on 97 per cent of sites surveyed in 2005 and 94 per cent of sites surveyed in 2006. Other regularly occurring natives were weeping grass, kangaroo grass and spear grasses and, to a lesser extent, common wheat grass. Other species were present at a low frequency. The common high presence of native grass in surveyed paddocks is important. As most of these sites are difficult, expensive and risky for sowing introduced perennials, the capability of the native perennial species to persist under grazing permits the undertaking of a sustainable wool/meat enterprise

Introduced species occurred at all sites. Virtually all sites had naturalised annual grasses, while broadleaf weeds, onion grass and naturalised perennial grasses (generally lesser productive species, for example, Yorkshire fog grass) occurred on about half the sites surveyed in 2005. On sites surveyed in 2006, there appeared to be a similar distribution of native grasses, but a greater distribution of onion grass and broadleaf weeds.

Table 3 shows that in 2005 the majority of sites had >30% native grass cover while in 2006 these sites had a majority of sites with <30% perennial cover. Map 3 shows the distribution of sampling sites and the associated perennial pasture rating.

There was no significant effect of altitude or soil group on native grass frequency. Undoubtedly, soil characteristics such as fertility and depth/texture/ability to retain moisture, have important effects on plant growth and pasture composition but our survey did not measure such details.

Aspect

Aspect is a reasonable indicator of likely soil depth and soil moisture content. Hard aspects are those between north and west that receive longer and more intense sunlight. When combined with slope, ready drainage and rapid surface runoff, this reduces the capacity of the skeletal/shallow soils at these sites to hold water. Such 'hard' environments are difficult for vegetation to establish and persist in. Our results obtained in 2005 supported this expectation (Figure 2) and showed that as aspect increases in harshness there was a decline in the presence of native grasses. As aspect softened the frequency of native grass increased. Sites with a N or NE aspect had a greater proportion with a low frequency of native grass than did the other aspects combined ($P = 0.005$). However, for the sites surveyed in 2006, after the drought, aspect did not have any significant effects. Some sites with a high frequency of native grass were recorded on hard aspects and some with a low frequency were recorded on soft aspects.

Rainfall
Factors other than aspect influenced pasture composition, as in 2006 all aspects had a high percentage of sites with low frequency of native grass (Figure 3). Water availability is a critical factor for plant survival and botanical composition in this environment (Clark *et al.* 2003). In the 2006 growing season rainfall was well below that of 2005 and it is probable that aspect would have less of an impact where water availability has already severely limited plant survival. This may account for the lesser impact of aspect on the native grass frequency recorded in 2006. For all sites there was no significant (p = 0.120) association between average annual rainfall and the frequency of native grass in the pasture. However soil moisture can influence the species mix at a site. In Victoria, weeping grass is naturally distributed on light to medium textured soils within the >630 mm average rainfall zone (Drake and Harrison 1932), or in locations where soil moisture is higher, for example, southern aspects or protected gullies. No significant association was found between the proportion of weeping grass and average annual rainfall over the range encountered. Nor was there any significant association between aspect, rainfall and weeping grass presence. Species presence may better be predicted by soil moisture during the growing season, and soil nutrients; this data was not collected. However controlled studies by Hill *et al*. (2004) showed that unlike wallaby grass (*Austrodanthonia richardsonii*), weeping grass has a high requirement for phosphorus to achieve its potential.

Pasture management

Socio-economic factors influence the behaviour of landholders including how native pasture will be managed. Economic factors, such as low commodity prices, reduced profit margins or off-farm income will influence decisions such as willingness to invest in further subdivisional fencing or providing stock watering in hill country. Changes in management practices rely on the decision of the individual, and this is influenced by many factors – economic, environmental and social.

In this research, the management environment in the Upper Wimmera catchment around Stawell was described from responses to the interviews, particularly the questions relating to farm size, land use and type of landholder and the changing trends over the past decade. Other factors which influence management but relate more personally to landholders are described below (refer *Landholder needs and characteristics*).

One of the criteria for selecting survey sites was that they were grazed. This survey did not collect absolute figures on changing land use in the priority areas but simply landholder observations of local land use changes.

Trends in farm size reflected the increasing cost price squeeze; primary producers were maintaining or increasing their acreage. Where possible, less productive land was sold for other uses and more productive land acquired. Where farms were sold (usually where there was no family successor), they were commonly sub-divided for sale as hobby farms or rural lifestyle blocks (where they were close to towns) or sold to augment nearby farms.

Change of land use from pasture into, for example, vine, olive, blue gum plantations, revegetation (using government grants via Landcare), and vacant (ungrazed) land was apparent. Increasingly sheep production was moving away from wool and into prime lamb production, reflecting the increased pressure to get higher productivity from remaining farmland.

Curtis & Byron (2002) reported survey respondents expected mix of land use/enterprises in 2005 as a percentage of farms with that landuse. For the upper Wimmera catchment (northern footslopes n=65) the land use mix was 75 per cent of farms with pasture, 52 per cent cropping, 80 per cent wool, 42 per cent sheep meat, 23 per cent cattle, three per cent grapes, five per cent other horticulture, 14 per cent farm forestry and 55 per cent landcare tree plantings.

Compared to actual land use/enterprise mix in 2002, expectations for 2005 saw a slight reduction in the percentage of farms with enterprises of pasture, cropping, wool, meat and cattle with alternatives slightly increasing.

Corporate land ownership was associated with vine and plantation development. Barr (2005) described the catchment of the Upper Wimmera as part of a rural transitional landscape, such as often develop between rural amenity and agricultural production landscapes whose boundaries are of course somewhat fluid reflecting economic and social factors. The decline of the wool industry and a growing interest in the hill landscapes of the Grampians and Pyrenees ranges of the Great Divide have considerably altered land use, farm size and land ownership over the previous decade.

Historically, management practice has been characterised by limited investment with no or low fertiliser and limited focus on grazing management. Past overstocking partly caused by vermin and wildlife has left a lasting legacy of low level ground cover and perennials, particularly on harder, more fragile aspects. Poor ground cover management led to serious gully erosion and caused many farmers to alter their practices. Changes included land class fencing on hills, concerted rabbit control in the late 1990s (through the *Rabbit Buster Program*), reduced stocking rates and changes to grazing management - from continuous grazing to deferred or rotational grazing.

Pasture production and rate of stocking

There is a general perception that native pastures have low productivity. It is not obvious that landholders understand that increases in perennial grass density are possible with altered grazing management, but some certainly appreciate that as a low input system, native pasture can facilitate a profitable enterprise. Relatively little investment has been made to increase the productivity of these pastures because they usually occur on the least productive land classes and are last in line for investment. Only 3/35 respondents had done soil tests in the surveyed paddock and this usually coincided with areas they intended to sow.

Relevant grazing research in South Australia (French 1985) and Victoria (Reed *et al.* 1987) indicate that for 500-600 mm annual rainfall it is possible to realise a carrying capacity of 10-15 dse/ha. The conservative stocking rates we observed (<5 dse / ha) probably relate to a number of factors. The lower rates may be a result of low pasture productivity and consequently limited conservation of fodder to sustain nutrition in winter, stock management issues (availability of stock watering points, animal health and flock size) and attitude to risk – viz. unpredictable seasons/markets.

Low stocking rates (<5 dse / ha) were found on all the survey sites except one, where a paddock that had a high frequency of native grass, was grazed in rotation with a number of other paddocks, so spelling time/deferment period was relatively long. The frequency of native grass in the pasture was not correlated with rate of stocking.

Grazing management

Sanford *et al*. (2003), reporting on research from a nationwide set of sites, found that two management factors consistently increased the perennial grass proportion of pasture. These were grazing management and ameliorating soil pH (by raising it). At low to medium stocking rates (3–18 dse/ha), they found that rotational grazing would maintain the highest perennial grass content. Less acid soils supported a higher proportion of perennial grass, particularly where the acid-intolerant phalaris was the main species.

There is evidence that the main introduced perennial grasses vary significantly in their tolerance of strongly acid/high exchangeable aluminium soils (Myers *et al*. 1987). Some native grasses are tolerant of acid soil conditions. (Mitchell 2006).

Of the varied grazing management practices reported by respondents, the one most closely approximating late start deferred grazing in Nie's work (Nie et al 2008) was the summer-autumn destock/rotation. Over the 2005 and 2006 seasons, 32 per cent (29/90) of the surveyed sites were characterised by this strategy. The next most common form of grazing management was continuous grazing and then other destock/continuous grazing (Figure 5).

The widespread practice of destocking over the summer-autumn period (43 per cent of sites) was most prevalent on steep hill country, reflecting respondents' concerns about maintaining groundcover in order to prevent soil erosion and the difficulty of providing stock water in hill paddocks over summer.

Sargeant (2007) found that her respondents in the NE of Victoria were not implementing late start deferred grazing but the majority of hill farmers used some form of strategic grazing or summer destocking on their hills. Another common practice was the use of unimproved paddocks to rest/spell 'better' paddocks.

Summer-autumn destock/rotate management was associated with a high native grass frequency on 48% of sites and a low frequency on 43 per cent of sites (Figure 6). This confusing result could perhaps be partly due to variation in the commencement of destocking. Analysis showed that this form of management resulted in a moderate native grass frequency significantly less times than did other managements of grazing (Table 8).

If grazing management is directed more at increasing perenniality by considering plant phenology and critical yields of pasture, then we may realise the increase in native grass frequency that recent research has shown can be so obtained (Nie *et al.* 2007). That work has emphasised that, provided there is approximately at least five to 10 per cent of the desirable native perennial grasses present in the pasture, they can be increased over time by grazing heavily in mid to late spring - before seed heads of the weedy annual grasses mature - and then spelling from grazing over summer - to increase the amount of seed set by the native grasses.

However, as the particular native grass component observed within each grazing management had a low level of certainty; factors other than grazing management may have been influential e.g. growing season rainfall and past history/initial density.

The details of grazing management must be considered carefully. Although summer-autumn destocking would appear to be a strategy that should encourage the seeding of native grasses (and therefore an increase in their frequency in the pasture), we found that the date of destocking was often based upon consideration of the amount of feed remaining. Thus it was not infrequent for grazing to continue past the time that was optimal for allowing perennial grasses to set seed. Consequently seed production and the subsequent recruitment of native grass seedlings was compromised. Common practice in the surveyed area therefore, differed from the 'late start deferred grazing' regime employed in the Ararat Hills research (Nie *et al*. 2008).

Moving stock around paddocks was considered rotational grazing (Table 28). Respondents' records however, did not clearly indicate the spelling period of the rotation. Often the rotation was between two or three paddocks, or maybe only one shift per year. Decisions to move stock were based on feed availability in target and other paddocks, stock condition, stock health, ground cover, weed seed set, timing of stock operations and summer fuel (fire hazard) levels. We gained the distinct impression that stock condition was an over-riding factor.
The pasture condition of the currently stocked paddock was often not given due consideration as the prevalence of weeds including annual grasses might testify.

Overall, despite our attempts to fit individual farm practices into the various categories of grazing management, the grazing regimes were not strictly as defined and varied considerably within categories. Thus our efforts to detect significant associations with the native grass frequency were somewhat compromised and we do not put great emphasis on this information.

The presence of native grasses in the upper Wimmera appear to be associated with low inputs, large paddock size, less accessible parts of the landscape, low fertiliser use, continuous grazing and low availability of stock water. Although, on hill country, destocking over summer-autumn for soil conservation/water access reasons, is prevalent.

As a generalisation, grazing decision-making by graziers shows little focus on the requirements to maintain or improve native pasture condition. Only two of the 35 landowners that we interviewed specifically mentioned that their management was aimed at allowing native grasses to seed over the summer. No responses in respect to the decisions for moving stock included perennial plant phenology. A limited understanding of the requirements needed for perennial grass species to persist, coupled with generally poor identification skills for pasture grasses (Table 27), suggests that some graziers lack an appreciation of the skills required to manage native pasture. Graziers generally felt they did not need to improve their skills (Table 32). By contrast, for management of lucerne, graziers displayed a clear understanding that spelling/rotational grazing was essential to maintain lucerne plants.

Kangaroos were cited as a problem for many graziers, especially when close to remnant vegetation, revegetation or forests. Rabbits, kangaroos and wallabies can apply considerable pressure to pastures and dramatically reduce the effectiveness of rotational grazing. They continue to graze at times when stock are excluded, not allowing plants recovery time. The grazing pressure exerted by uncontrolled vertebrates cannot be over emphasised. In a field experiment conducted within the survey area, Morgan and Quigley (1992) estimated that the grazing pressure that they applied to spring pasture was equivalent to that of three-four dse/ha.

The worst case scenario was on a steep hill paddock near Landsborough with a hard aspect. This site had a land class fence but gates were not closed to rest the hill. Continuous grazing had resulted in an extremely high proportion of bare soil and a low frequency of native grass cover on the hills. High surface runoff following rain had caused sheet and rill erosion over the hill and initiated gully erosion near the break of slope. Clearly, this is unsustainable management and pasture production appeared to have been severely reduced. The hill now requires immediate destocking and erosion control work.

The best case scenario was observed on hill country at Elmhurst on hard aspects where destocking took place over summer to autumn and rotational grazing (with at least three other paddocks) was practiced for the remainder of the year. With low to moderate rates of stocking (low = <2; mod = 5 dse / ha), a high native grass frequency had been maintained. Decisions on when to move stock within the rotation were based on maintaining a minimum pasture cover of 800 kg of dry matter /ha.

Caution is desirable in drawing conclusions about grazing strategies. For *Themeda-Austrodanthonia* pastures, Garden, Lodge, Friend, Dowling and Orchard (2000) found spring destocking allowed *Themeda* to increase as did the exotic Yorkshire fog grass (*Holcus lanatus*). Destocking strategies may result in variable outcomes depending on e.g. the exotic species present and Garden *et al*. (2000) noted that autumn destocking could reduce annuals such as silver grass (*Vulpia* spp.) but again it increased the Yorkshire fog grass.
From a comparison of sheep grazing strategies conducted on a hill site within our region, the most appropriate for increasing the density of native grass was to destock over the late spring to late autumn period. This practice halved the density of clover plants compared with a continuous grazing strategy; no agricultural production results were reported (Nie *et al*. 2005). Similar species change was recorded on the Monaro Tablelands in south east NSW by Dorrough *et al.* (2004). Tasmanian studies also indicate that invasion by exotic species in native grassland is most likely where grazing is continuous and/or where the rate of stocking is relatively high (Leonard and Kirkpatrick 2004).

Management by pasture type/Land class

It was clear that respondents with lucerne pasture understood the need for it to be spelled regularly. It was not clear that respondents understood the need for regular spelling of perennial grass pastures. Rather than managing the pasture type, landholders considered stock condition as a priority and on hill country, the land class and applied grazing management that would minimise the risks associated with the soil erosion. For pasture, land class is an important determinant of both botanical composition and grazing strategies (e.g. Sargeant 2007). On most of the paddocks surveyed, hill country had been land class-fenced to aid management. This is consistent with previous findings from the upper catchment of the Wimmera River reported by Cowan and Linehan (2007). Less than a third of those surveyed had subdivided their flatter land to increase the number of paddocks and improve grazing options. This had usually been carried out in combination with a whole farm plan and other Landcare works. Accessing stock water and the cost of fencing were described as the major impediments to subdividing hill country. Eighty-two per cent of the interviewed landowners took land class into account with their location of subdivisional fencing - at least on parts of the farms where critical issues were causing concern and forty-two per cent had drawn up whole farm plans.

Drought and seasonal feed gaps

Only 28 per cent of respondents indicated that they would use a stock containment area under drought conditions. Although other strategies were mentioned, there was no identification of a clear pasture/animal condition trigger for when they would be applied e.g. ground cover below 70 per cent. To avoid deleterious effects of drought, the timeliness for when destocking occurs is critical to maintain both cover and the survival of perennial plants. As discussed above, current management, as described by landowners, was not fine-tuned to these parameters.

The key feed gap was over the summer and up until after the autumn break which coincides with when many of the respondents are destocking their hill native grass paddocks (41 per cent). The integrated management and use of native grass pasture over the whole farm to reduce the feed gap was not well developed. Late start deferred grazing requires the pasture to be destocked over the summer-autumn period to increase perennial density. However, once the density of perennials has increased than these pastures can be rotationally grazed over this period.

Weeds

Control of weed problems such as St Johns wort, thistles, horehound, Patterson's curse (Table 9) on non-arable areas is difficult because of limited ability to mechanically spray with ground equipment. The daunting labour that would be needed for manual control is usually quite out of the question. Grazing management can be a useful tool for control of some weeds, e.g. St Johns wort, if it can be integrated with other goals. The increasing prominence of onion grass (*Romulea rosea*) and introduced annual grasses (e.g. *Poa annua, Hordeum leporinum, Vulpia* spp.) is of concern to landowners, as these both reduce productivity, limit recruitment of perennial grasses and so far show limited success using grazing for control.

Fertiliser

Early research by Donald and Williams (1954) noted that, where sustained use of superphosphate had occurred, the native perennial grasses disappeared. The relationship between superphosphate application and species of native grass, however, was not explored. Mitchell (2006) indicates that there are varying responses to fertility between species/genera. Research at DPI Hamilton has shown that onion grass can be eliminated when pasture is sown down and given adequate superphosphate (Cayley *et al* 1998). Our survey found that most of the native grass pasture had not had superphosphate applied (Figure 7) and that there was no significant association between the date of last superphosphate application and the frequency of native grass present (Figure 8). The species most tolerant of low Phosphorous and Nitrogen are wallaby grass (*Austrodanthonia richardsonii*) and Yorkshire foggrass (*Holcus lanatus*) (Hill *et al* 2004).

Most research on fertiliser use for native grass has employed just one form of grazing management (i.e. continuous grazing), with the result that the associated increase in rate of stocking was confounded with the effect of fertiliser. Michalk et al. 2003 reported that a combination of tactical grazing with fertiliser use could increase the growth of perennial grass – compared with continuous grazing and fertiliser treatment. Respondents indicated that costs preclude the use of fertiliser on most hill paddocks.

As part of increasing the productivity of native pastures, Simpson and Langford (1996) recommend increasing the legume component to around 20per cent. In their case such topdressing gave a considerable increased productivity while topdressing native grass pasture that did not contain a legume resulted in only small gains in livestock performance and a decrease in profit. The profitability of topdressing on hill native pastures has not been determined. In the survey area where many hill country soils are derived from Ordovician sediments, clover growth – the invaluable source of organically produced nitrogen - is however, severely limited until nutrient deficiencies are corrected. Initially molybdenum deficiency was naturally widespread here and it requires reapplication approximately every 10 years (Newman 1970).

Landholder needs and characteristics

The needs and characteristics of landowners in the Upper Wimmera catchment were gauged by respondents' answers to questions and on statistical analysis of associations between data sets (refer Appendix 2 for survey format). The landowners were nearly all (34 out of 35) resident on the farm or live locally and visit frequently. Where absentee owners ran stock via employing local managers or where they leased out the land, then the land managers themselves were interviewed (6 out of 35). The grazier survey revealed that the average farm size was around 660 ha (Figure 9), with ~70% held as either 1 or 2 separate blocks. The remainder had more than two separate blocks. Generally, the size of the holdings was sufficient to allow for some flexibility in grazing management and provided options for reducing paddock size to implement simple rotational grazing systems. In the wider Wimmera region, Curtis (2002) found the average farm size of respondents to be 900 ha and that property size had little impact on the adoption of current recommended practices - but it naturally impacted on farm profits and financial viability.

In 77 per cent of cases land has been owned for >20 years by the landholder or their family (Figure 10). Low numbers of landowners without such family connections were entering the priority area.

Age
More than half the respondents were 50 years or older (Figure 14).

Age influenced:

1. goals set for the coming decade: Older respondents were more likely to be planning to hand on the farm or sell compared to goals related to WFP and pasture improvement (table 11)
2. grazing management: Older respondents (>50 years of age) were more likely to use a form of continuous grazing on native grass pasture. Curtis (2002) found no relationship between age and adoption of recommended practices but his work did not include questions about grazing management (table 15)
3. proposals to change unimproved pasture – in contrast to doing nothing or selling off the land. A higher proportion of older respondents proposed changes. This would appear contrary to the trend seen in the 10 year goals set (point 1). The survey question related to specific goals for unimproved pasture and addressed the actions they would like to take. It did not necessarily represent a commitment (Table 13).

Age had no significant association with
1. how long since they had applied superphosphate to their unimproved pasture, or where they sought information on pastures. Most producers sought advice on pastures from more than one source;
2. whether a successor had been determined although respondents under 40 years were the most likely to have determined a successor (Table 12); or
3. identifying if extra skills or support were required to alter grazing management.

There appears to be an opportunity to target older farmers to add perceived value to their farm by implementing changes that will allow altered management prior to property sale/transfer, (Table 11).

Education

Higher education was associated with:
1. younger graziers (Table 14);
2. less recent application of superphosphate (secondary and tertiary) (Table 16);
3. including increased productivity in their goals (tertiary) (Table 20);
4. changing their enterprises rather than not changing (secondary and tertiary) (table 22);
5. choosing a wide 'industry' enterprise change rather than a change of animal production enterprise (tertiary) (table 22);
6. determining a successor (tertiary) (table 21); and
7. not using DPI for pasture advice (tertiary and Trades) (table 17)

Education level had no significant association with:
1. identifying extra skills or support to alter grazing management;
2. planning changes to unimproved pasture; or
3. grazing management used on native pasture

Higher education level did not mean graziers placed more value on native grass pasture. Graziers believed that the introduced pasture species were more productive and wanted them on their non-arable land. However, they were aware of the increased risk of trying to establish them in challenging terrain, so they generally did not develop these areas. There is an opportunity to target younger or more educated graziers using productivity and financial information and by working more closely with agribusiness to achieve commitment to change.

Off farm income (OFI)

Sixty-two per cent of respondents reported having off-farm income. This is similar to the findings that Curtis (2002) reported for Wimmera Region. Off-farm income was an important contributor to farm operation in properties under 800ha, although in the top of this range, viz. 400-800 ha, more were solely reliant on the farm for income (Figure 16).

OFI was associated with:
1. choosing enterprise change over no change (Table 24);
2. not choosing a change related to animal enterprise (Table 24); and/or
3. accessing some or all of their pasture advice from DPI (Table 23)

OFI did not influence

1. when superphosphate was last used ;
2. 10 year goals;
3. determining a successor;
4. plans to improve unimproved pasture;
5. identifying extra skills or support to alter grazing management; and
6. grazing management system

Having OFI did not necessarily assure landowners would commit to change. Rather, graziers with OFI were more inclined to adopt change providing they could see sound evidence of improved productivity and economic benefit.

Table 34: Landowners' age, education and off-farm income characteristics and the significance of each of these on aspects of farm management

Farm management practice	Age	Education	OFI
Date when last used superphosphate	NS	Yes	NS
Where sourcing pasture advice	NS	Yes	Yes
Setting of 10 year goals	Yes	Yes	Yes
Determining a successor	NS	Yes	NS
Grazing management system	Yes	NS	NS
Improvement of unimproved pasture	Yes	NS	NS
Identification of extra skills required to implement change	NS	NS	NS
Support needed to change practices	NS	NS	

NS = no significant association ($P>0.05$)
Yes = a significant association ($P<0.05$)

Constraints - Financial

The major constraint respondents identified as limiting their reaching objectives for the farm was finances; with time the next most mentioned constraint (Table 25). This is not surprising as grazing commodity prices, particularly wool, have been low and dry seasonal conditions have limited recent production. The corresponding need for off-farm income limits time availability.

Curtis (2002) also identified economic issues as the major constraint to adoption of current recommended practice. Current recommended practice covered 10 different practices including tree planting, waterway fencing, sowing perennial pastures, soil testing, minimum tillage and weed and pest control. Figure 16 shows economic influence but recognised social and environmental factors as also important in adoption.
Interestingly Curtis found on-property profitability was only linked to the adoption of one current recommended practice (minimum tillage practices).

Shortage of finance also accords with the high level of interest in the possibility of a grant to support improvements (Table 33). From a list of options, respondents identified incentives or grants as the most helpful activity to assist them to manage native pasture. This was followed in decreasing order by demonstration paddocks, grass identification workshops, visits to other farms and a farmer focus group on perennial pasture.

The Wimmera CMA has provided grants for hill landclass fencing to allow better management of hill country. Both adoption and implementation of hill landclass fencing in the upper Wimmera was found to be high by Cowan and Linehan (2007). The demand for these grants had virtually disappeared by 2007, indicating either high levels of implementation or other barriers to adoption. Stock water supply to hill paddocks was identified as a constraint to further hill landclass fencing. Curtis (2002) made it clear from respondents' interest in grant types, that constraints other than financial capacity limit the adoption of current recommended practice.

Knowledge

Sargeant (2007) identified barriers to the adoption of rotational grazing that included labour, soil type, ease of stock movement, number of mobs, stock water supply and animal health issues. The perception that she gained was that landowners considered the benefits of rotational grazing did not justify their costs e.g. labour and infrastructure, particularly on hill country.

At the forum we attended with upper Wimmera graziers, participants identified the following constraints to the adoption of rotational grazing: watering points; topographic fencing difficulties; aspect differences; consistent paddock size; set-up costs; mob management; new skills; kangaroos; multi separate farming blocks and climate variation. Property management planning (previously called whole farm planning) can be a useful tool to alleviate some of these constraints.

Only 16 per cent of 31 respondents identified knowledge as a constraint to reaching their objectives. Also, from Table 32, 57 per cent and 48 per cent of respondents felt that they had no need of further information or skills respectively, in order to change grazing management. The remaining respondents found it difficult to identify what additional support or information they may need to change grazing management. Most considered they had the necessary skills and knowledge for pasture management and that nothing more was needed for native grass pastures, apart from replacing them with more productive introduced species (Figure 13). The objective to place introduced perennials into these challenging landscapes is balanced by a practical understanding of the high risk of failure.

Thus it appears that resources such as increased information and skill development are unnecessary. However many respondents who said they had no such needs qualified their response by declaring they had no intention to change their current grazing management. It can be difficult to identify the need for relevant knowledge ahead of implementing change. For example landholder identification skills of local grass species was poor as 75 per cent of responses were marked unknown or incorrect (Table 27). Only six per cent identified a need for improved skills in grass identification which is a basic requirement for the sustainable management of pasture.

Curtis (2002) found that a majority of respondents indicated they had sufficient knowledge to manage ground cover and minimise soil erosion.

Without monitoring actual management it cannot be verified that perceived management levels are adequate to prevent soil erosion. Knowledge aside, the recent dust storms and sheet erosion seen on local hills suggests management is not maintaining groundcover in all areas of the upper Wimmera catchment. As a group, respondents' grass identification skills and knowledge of which species were native, introduced or weed was poor. Twenty-four per cent of respondents did not identify phalaris correctly (Table 27). As the predominant perennial pasture species of choice in the area, it is worrying that some graziers, who rely on pasture for their livelihood, cannot identify this common species. Garden, Dowling, Eddy and Nicol (2000) mention similarly poor recognition skills – although he found that the identification of undesirable species was usually good. In districts where there was a greater abundance of native pasture, for example the Monaro district of NSW, recognition and knowledge about their management was better. Changes to grazing management practices in the future will require improved knowledge regarding plant identification and development.

Overall, most respondents saw benefits of native grass pasture, including its present existence, low inputs, capacity for growth in hard country and that it could be reasonable sheep feed (Table 33). The major disadvantage of native grass pasture was low productivity and susceptibility to overgrazing (Table 29). Again, these perceptions are as expected from other work where the value of native grasses was related to their performance under drought conditions and the low level of inputs required to sustain growth (Virgona pers. comm. 2008). Realistic expectations of the productivity of perennial pasture (both native and introduced) from poorer land classes needs to be addressed in any future extension activities related to pasture management.

There was a fair understanding by respondents of the terms used in describing grazing system (Table 28), but limited understanding of the details of its application, particularly with intensive rotational grazing/cell grazing. One respondent likened landholders using cell grazing as subscribing to a *club like Amway, with the whole emphasis on the grazing system and not enough on the bottom line*. Another respondent commented that cell grazing was *too much work, too much fencing and supplying stock water was a problem*.

Greater exposure to applied rotational grazing might be beneficial to Upper Wimmera graziers. Some respondents' simplistic view of rotational grazing - *grazing with spelling* - suggests that they would learn much from visiting dairy farmers who are practising tactical grazing based on plant phenology as well as stock needs.

Less than half of the respondents had received formal training in pasture management skills e.g. prograze, such as dry matter assessment, feed budgeting and fat scoring, and even less used the skills in their pasture management (Table 31). Drought conditions usually provided an incentive to use feed budgeting, but otherwise pasture management was based on previous experience. Examples of the benefits of regularly applying Prograze skills were given, for example, using fat scoring to evaluate stock condition under full fleece and ease of communication by using commonly understood terminology. Understanding the benefits of acquiring and using Prograze skills may convince more graziers to adopt them.

The most popular goals for respondents' farms included increasing the area of perennial pasture, increasing production, further fencing (decreasing paddock size and increasing the number of paddocks) and increasing the area under crop (Figure 11). Improved management of perennial pasture will assist with the first two goals and may be achieved with further appropriate subdivisional fencing. Increasing the area under crop needs to be clearly tied to land capability or soil degradation is a likely result. Property management planning is a valuable tool assisting landholders to better understand land capability and appropriately allocating land use to land capability. It is also critical in appropriately locating pasture types to land class.

In the case of unimproved pastures, most respondents wanted to establish introduced perennial grasses and reduce weeds (Figure 12). There was less interest in increasing the component of native grasses in these paddocks. Species such as cocksfoot (*Dactylis glomerata*, ssp *hispanica*) and grazing brome grass (*Bromus stamineus*) which are adapted to poor soil and low rainfall have been quite productive in local field trials (Reed *et al.* 2008; Nie *et al.* 2008; Harris *et al*. 2008).

Establishing introduced perennial pastures on hill country although possible with aerial application, has major risk and economic constraints. Native grasses persist in these limiting environments, whereas most introduced perennial grasses struggle.

Where the economic establishment of persistent introduced perennial species is not available, an alternative option is to increase native grass frequency in hill country to address graziers' desire for greater animal productivity and the need to reduce recharge. Comparative studies monitoring the persistence and production of sown perennial pasture on non arable hills and native grass pastures would clarify the return on investment. This would be a logical follow-up to species evaluations recently carried out by the CRC Salinity in the Ararat Hills (Nie et al. 2008).

Commitment

A total of 38 per cent of farming families had identified a successor to the farm. Successor's in-waiting should be targeted in future extension programs concerning changes to the farm management practices. Curtis noted high rates of adoption of current recommended practice where they related to maintaining or improving productivity. Any messages about altered grazing management clearly need to show a link to maintaining or improving productivity, or more importantly, profitability.

The wire and water grants delivered by the "Stipa" program in the central west catchment of NSW have seen a slow but steady uptake in support of changed grazing systems to promote native grasses and improve ground cover (X White, 2008 pers. comm.). The grants which help offset the costs of necessary subdivisional fencing and stock watering have allowed graziers to set up the infrastructure to implement rotational grazing and in the process learn how to fine tune their pasture and stock assessment skills and thus improve management and outcomes. A minimum standard for grant eligibility is the mandatory attendance at grazing management workshops before funding is approved. Ongoing monitoring by the grazier, that records key pasture parameters, is a condition of the grants. A key factor in graziers adopting the grants is the support of a project officer assisting them to design their grazing system. In this way the workshops, grazing plan, technical support and financial grants for infrastructure, facilitate skill development and build confidence.

Moll (2007) used a mix of technical skills, farm economics, pasture agronomy and ecology, to help landholders make decisions regarding parts of the property to prioritise for management change. The feedback survey indicated landholders would have liked more time to explore and discuss recommended management options and explore different management options with the technical advisors. This technical support assists the landholder in making decisions about management options.

Conclusions

The first task of the project was to locate and describe the native grass component of unimproved pasture in the low relief granites and local fractured rock groundwater flow systems of the Upper Catchment of the Wimmera River. Significant frequencies of native grass remain in the areas considered a high priority for salinity control. Their perenniality provides benefits for recharge control. Native pasture remains in varying conditions on sites with minimal disturbance (both mechanical and chemical, for example, superphosphate application) and where grazing management with spelling and/or lower stocking rates is employed. Aspect has significant impact on the proportion of perennials found at a site. Harder (N- and W-facing) aspects have less perennial species.

The dominant native grass genera present was wallaby grass (*Austrodanthonia spp.*) which occurred on 97 per cent of sites surveyed in 2005 and 94 per cent of sites surveyed in 2006. Other regularly occurring native grasses belonged to the *Microleana, Themeda* and *Austrostipa* genera. To a lesser extent, some *Elymus* was noted but other native species were only found at a low frequency. Introduced species occurred on all sites.

The high frequency of native grasses in surveyed paddocks is significant as most of these sites are unsuitable for sowing introduced perennials. In many cases, the only perennial species found on steep hills were native grasses and they represented 98 per cent of all the perennials species observed.

This study provides useful benchmark data from which to develop future directions and actions for improving native pasture management in the catchment of the Upper Wimmera. As the coordinates were recorded, it now provides a lasting resource for facilitating the monitoring of change over time.

The second task of the project was to determine current management of native pasture in priority areas for salinity control. As a generalisation, there is little focus by graziers in their grazing decision making on the requirements to maintain or improve native pasture frequency. Limited knowledge of the requirements of perennial grass species, limited grass identification skills and challenging site conditions restrict graziers' ability to actively improve pasture condition. Native pastures are usually found on the poorer land classes of farms and therefore attract little, if any, investment in tighter times of drought or low commodity prices.

Historically, management practices have resulted in degradation of the hills. More recently, graziers have improved management practices to increase ground cover with land class fencing on hills, concerted rabbit control, particularly through the Rabbit Buster program, reduced stocking rates and deferred grazing regimes. Destocking hill country over summer-autumn is widely practised (45 per cent of respondents), to maintain ground cover using any available vegetation. With hill land class fencing in place, the practice of destocking is driven also by the difficulty of providing stock water in hill country over the summer.

Land use changes have been dramatic in some areas, shifting from grazing to vines, olives, tree plantations and vacant land. These land use changes alter the available options for increasing perenniality.

Appropriate management practice, as discerned by some current research on grazing, appears to be the use of a late-start deferred grazing to increase the perennial component combine with ongoing rotational grazing, based on pasture indicators as well as stock requirements. Late start deferred grazing involves heavy stocking rates when annual plants are going to head and removal of grazing to allow perennial grasses to go to seed. Eighty-three per cent of the pasture surveyed in 2005 had >20% native grasses. A frequency of 10-20 per cent native grass is regarded as adequate start point for improving their density via grazing management.

The landholders' needs and characteristics were determined from structured interviews with representative graziers from across the priority areas. Primary producers were maintaining or increasing their land holdings. The average farm size was approximately 640 ha. Most had owned their land for >20 years.
The average age of surveyed farmers was over 50 years. Off-farm income was an important contributor to farm operations where properties were under 800 ha, and so severely limited the time available for farming activities.

There appeared to be an opportunity for targeting older farmers to change management, in the lead-up time of property transfer. At this time they are more likely to consider changes that will increase the farm's capital value.

There is an opportunity to target younger or more educated graziers, using production and economic information and by working more closely with agribusiness to achieve commitment to change.

Future directions for a native pasture program in the Wimmera

A practical option for improving management of native grass pasture to help control salinity is to increase the perennial grass component of pasture. This may best be achieved by changing current grazing management practices in high priority areas and adopting late-start deferred grazing over summer-autumn, with rotational grazing for the remainder of the year. If required, heavy grazing in early spring for annual grass control can also be included as this provides good control of annual weeds and, over time, will increase perennial grasses (Nie et al 2005).

The planning tool, 'Bennett's hierarchy' can be used to describe and logically organise future actions and the anticipated intermediate outcomes required to achieve the objective. It explains the logic that links activities to outcomes and describes the resources required and the wider outcomes sought. In addition to including proposed actions, this model also includes proposed monitoring/evaluation activities to measure the success of any interventions / activities (Table 32). The first column specifies the seven steps of the hierarchy, from outcomes to resources required (i.e. the generic theory of action provided by Bennett). Column two describes what we would hope to see at each level of this model if the proposed resources and activities (see the 'Activities' level) were implemented with the appropriate target audience (i.e. graziers. See the 'Next users' level). In other words, column two describes what success would look like at each step of the hierarchy, or, what activities and results we think are required to affect desired change at each successive level of the model. Thinking about how we might monitor and evaluate the success of our planned activities (and the extent to which anticipated changes/outcomes occurred as a result of these activities), column three identifies the activities needed to determine the degree of success at each level.

Activities have been roughly ordered to reflect that some need to occur before others. Activities that will change attitudes and aspirations are important to motivate the next users to increase their relevant knowledge and skills. Therefore they should come earlier in the program. For success, activities that are directed at assisting landholders to implement change (e.g. grants or market based instruments) also require a commitment to change that is influenced by attitude.

Some Victorian catchments (e.g. North Central and Goulburn-Broken) have assisted landholders with subdivisional fencing to specifically improve management of native grass pasture through the "GreenGraze" pilot project that was conducted in 2006/2007. The tender arrangements included a specific grazing management plan to improve pasture condition and improve native vegetation management on the farm (including understorey diversity and natural regeneration). The ongoing dry conditions were suggested as contributing to participants risk aversion and structuring their bids to cover most if not all capital costs. The need for ongoing monitoring of the effect of altered grazing management on both environmental and economic parameters was highlighted.

The Biodiversity program of the Central West CMA in NSW includes grazing management incentive grants to improve native grassland. The grants are available to facilitate fencing, install watering points and access management training. They also fund the "WeaLth" project which was delivered through the Stipa Native Grasses Association Inc., provided incentives for installing subdivisional fencing and watering points. The focus is more on production with improved ground cover and increased perenniality. Variables identified by Curtis (2002) that were found to be significantly linked to the adoption of CRP have been included. These were:

- Involvement in property planning;
- Involvement in government funded programs; and
- Greater knowledge about the extent and management of land degradation issues.

Seasonal variability is considered of major importance to landholders implementing changes. The uncertainty and high risk associated with agricultural enterprises is a major disincentive to invest in change. Without confidence that the altered management will result in the sought after goal, landholders will not commit to the change. Even if they have the necessary knowledge, skills, attitude and aspirations to change, without confidence, they will not change their practices to those that have been recommended. Moll (2007) found that seasonal conditions (i.e. drought) were a major reason for non-participation in the "Green Graze" pilot project. In planning future actions we need to consider seasonal variability. It can reduce the effectiveness for planned actions to deliver desired outcomes.

Table 35: Theory of action: connection of proposed actions to intended outcomes

Level of logic	What success looks like	Actions to measure success, i.e. to evaluate the extent to which future actions have lead to desired change
Outcomes Social Environmental Economic change	Increased proportion of perennial grass in priority recharge areas of the Upper Wimmera catchment will reduce recharge.	In order to measure success at this level some further work is required to monitor change, based on foundational activities (see activities level): 1. Biannually analyse results from long-term monitoring sites. Evaluate impact. 2. Explore the impact of changing demographic and land use on total area used for grazing. Are alternative perennial systems more appropriate to achieve recharge control?
Practice change	Increased use of late-start deferred grazing management on pastures in priority recharge areas to increase perennial grass density.	Conduct a phone survey of representative graziers every two years on their grazing management in priority areas. (tie to long term monitoring sites above)
Knowledge, aspirations, skills and attitude	High grazier knowledge of native grasses. High understanding of matching pasture type to land capability. Realistic aspirations for the application of introduced pasture species and their expected productivity from poorer land classes. High grazier skill in grass identification, plant development needs, pasture monitoring and rotational grazing skills. Positive attitude to the contribution of perennials (including native) pastures to overall farm outputs. Positive attitude to improving pasture management, Aspire to improve management and increase perennials.	Assessment of skill and knowledge development built into training activities. Conduct a biannual phone survey after activities have been conducted of participants and non-participants to assess attitudes and aspirations.
Reactions	Respond to activities with thoughtful and constructive comment for practical improvement.	Evaluate next user involvement and reactions to activities.
Next users	Graziers in the Upper Wimmera (particularly on priority recharge areas). Identified successors PPS and other grazier groups Agribusiness agronomists	To keep actions relevant to graziers, monitor trends in next users, number, age, OFI, education etc. (i.e. demographic data relating to particular attributes)
Activities	Actions required to achieve success at higher levels: Aspiration/attitude level	Foundational activities required to establish an appropriate baseline to measure the extent to which 'practice

Level of logic	What success looks like	Actions to measure success, i.e. to evaluate the extent to which future actions have lead to desired change
	1. Initiate trial of introduced perennials versus native pasture on poor class land under CRP and set stocking, focusing on the economics/profitability. Including enterprise GM $/ha compared to overall farm productivity. 2. Promote value of native pasture as appropriate perennials for production within farm pasture system, using key speakers at annual pasture seminar. Knowledge/skills level 3. Run soils workshops that include assessing soil nutrients and physical characteristics, land capability, pasture selection and interpreting soil/plant analysis results. 4. Combine native pasture management with introduced perennial pasture extension. Focus on integrated pasture management across the whole farm for long term profitability outcome. Build into property management planning. 5. include 'whole of farm' water supply component into property management planning. 6. Present relevant research including Ararat Hills, EverGraze and cocksfoot trials. 7. Set up small demonstrations of recommended grazing practice that foster native grasses – monitor, collate, analyse and disseminate results. 8. Link with national "EverGraze" project by providing a support site. 9. Grass identification sessions (practical and technical) at Landcare group level. 10. Pasture monitoring (Prograze) sessions to improve skills in identifying plant growth stages, dry matter (DM), ground cover and plant density assessment. 11. Tour farms with CRP on native pastures and farms with rotational grazing systems 12. Subsidised landholder attendance at Stipa and Grassland Society conferences held in Victoria. Next users level 13. Define market, target message e.g. older graziers before transfer; financials to more educated. 14. Run pilot of funding assistance for subdivisional fencing and water supply for high priority sites specifically for improved native pasture management. Grant conditional on implementing a specific grazing management plan to improve	change' and 'SEEC' outcomes were achieved (i.e. as a result of implementing future actions with graziers): 1. Do literature review on WUE (water use efficiency) of perennial pastures under different grazing regimes in priority landscapes. 2. Analyse results from Johan Noguiera's PhD studies of soil moisture monitoring at Landsborough NP site. Can it provide benchmark data for future research at 3? 3. Research native pasture WUE under different grazing management in upper catchment. 4. Set up long-term monitoring sites to monitor perennial pasture proportions.

Level of logic	What success looks like	Actions to measure success, i.e. to evaluate the extent to which future actions have lead to desired change
	pasture condition at each site. 15. Support opportunities for graziers to share knowledge and skills, proactively include next generation. 16. Do regular updates to PPS on native pasture project. 17. access Ararat Prison Landmate labour to implement fencing and water supply grants.	
Resources	people time funding existing relationships (Requisite resources need to be determined in a detailed program-planning phase)	

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Appendix 1 - Survey format

A survey of grazed pastures on high priority GFS in the Upper Wimmera Catchment VIC

Q1

Landholder		ID #	
Address		Interview date	
Phone			
Email			
Property location		CFA ref	
Easting/Northing			

Q2 Is your property your permanent residential address
If NO how often do you visit

Target Paddock Info
Q3 Name:
Map of property, showing location of surveyed paddock and transects - see attached map

Area	Altitude
Aspect	Rainfall
Slope	Soil type

Do you have any soil tests for the surveyed paddock?

Q4a What is your 'normal' annual grazing pattern in the surveyed paddock

	# of sheep											
	Jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec
Dates on												
Dates off												

Q4b

Stock type	Grazing duration	Grazing intensity	Rest duration	Rules used to move animals

Q5 How does pasture production in the surveyed paddock compare with other pasture types on the farm?
Stock type (condition) - Meat or wool prod/head, \$/head, \$/ha, DSE/ha, \$/dse
Q6 What weeds do you have in the surveyed paddock? How do you manage those weeds?

Q7 If the surveyed paddock was subdivided, how would you subdivide it and how would you water it?

Q8 History of the target paddock

Year	Stock type	Stocking rate	Grazing management	Fertiliser	Other(lime, ripping, burning)
2005					
2004					
2003					
2002					
2001					
2000					
1999					
1998					
1997					
1996					
1995					
Prior to 1995					

What changes in the surveyed paddock have you noticed over time? Eg. spp, weed, bare ground.

General farm info

Q9 How many years have you owned this land? How many years farming this land?

Multiple blocks? Total Size of property?

Q10

main enterprise	secondary enterprise
livestock type, # mob sizes lambing dates shearing dates marketing strat	livestock type, # mob sizes lambing dates weaning shearing dates marketing strategy

Q11 land types and what proportion of total eg.20%hills

Land type	% of total farm area

Draw location of unimproved pasture on farm (not disturbed by herbicide, cultivation or direct drilling).

Q12 Pasture types and proportion –are they related to land type?

Pasture type	%	Carrying capacity (dse/ha)

Q13 Is the grazing pattern different for different pasture types?

pasture TYPE	# & type of stock ON												Rules used to move animals How do you decide stock ON/OFF
	Jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	

Q14 Can you do DM assessment? Kg/ha? Do you use them on your paddocks when planning your grazing. If not how do you decide?

Q15 Can you do feed budgeting? Do you use it?

Q16 Can you do fat scoring on your stock? Do you use it to assess your stock condition?

Q17 Would you graze the property differently in drought?

Q18 When are you likely to have feed gaps and what do you do with stock?

Q19 What is your subdivisional fencing arrangement based on? (eg. WFP, CAs, historic)

Q20 Have you put in new fences or altered fences over the last 10 years? Why?

Q21 What is your ideal # of paddocks?

Q22 Where are your problem areas for rabbits? For roos? How do you manage them?

Goals

Q23 Age education

Q24 Over the next 10 years: what are your objectives for the farm?

Q25 Do you have off farm income?
If you have off farm income, is it used for funding farm activities?

Q26 Have you identified a successor?

Q27 What would you like to change with your farm enterprises? why?

Q28 Do you have specific objectives for your unimproved pastures?

Q29 What do you see as the major constraints to you reaching your objectives for the farm? Eg. others interests, $, knowledge, skills, health and fitness

Objective	Constraint

General Qs

Q30 Do you know the names of any native grasses that grow locally?
Can you name any grasses in this book? Are they native?

1	2	3
4	5	6
7	8	9
10	11	12
13	14	15

Q31 What advantages do these native grasses have? Do they have any disadvantages?

Q32

Grazing system	What does it mean to you?
rotation grazing	
Cell grazing	
crash grazing	

Do you use any of these grazing systems on your farm? Why? Not?
Q33 Where do you mostly source your pastures advice?

Q34 If you could get financial assistance to help you with managing your native pastures would it matter to you if it came from government or NGO?

Q35 What changes have you seen over last 10 years, in the local area (particularly hills) in
farm size,
land use,
type of landowner?

Needs
Q36 If you were to change your grazing systems:
What information do you need?

Q37 What skills do you need to develop or practice?

Q38 What support do you need from others? (DPI, landcare group, farmer focus group, neighbours)

Q39 In managing your native pasture paddocks: how useful to you would the following be: (give each rating out of 5. 1=least useful, 5=most useful)

- ❑ Grass ID (native and introduced) workshops
- ❑ Farmer focus groups- to ID issues, try solutions
- ❑ Demo paddocks
- ❑ Rotational Grazing field days
- ❑ Visits to other farms to see what others are doing
- ❑ Incentives for subdivisional fencing, water, weed control, training
- ❑ PROGRAZ course or 1 day sessions
- ❑ help to develop individual rotational grazing plan
- ❑ Other suggestions