A BASELINE OF ADOPTION OF PASTURE MANAGEMENT PRACTICES - WIMMERA REGION

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CENTRE FOR LAND PROTECTION RESEARCH

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Contributors:
Komala Karunaratne - CLPR Bendigo
Neil Barr - CLPR Bendigo

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Abbreviations

ABS	Australian Bureau of Statistics
LMU	Land Management Units

SUMMARY

The aim of this report is to document baseline information about the state of adoption of pasture establishment and management practices in the Wimmera Region of Victoria and to evaluate the tools for continued monitoring of the adoption of these practices.

Based upon the available data, the progress towards adoption of pasture management practices in the Wimmera Region can be summarised as follows:

- The ABS farm census is the only available comprehensive measure of the rate of perennial pasture establishment in the Wimmera Region. The ABS farm survey for 1993/94 shows a rate of all perennial pasture sowing in the catchment of 1.1 percent per annum, with 0.8 percent to phalaris based pastures and 0.3 percent to lucerne. An increase is shown in both these measures in the 1995/96 season, in which there was a total resown rate of 2.6 percent.

- There is no available independent study that can be used to calibrate the ABS pasture sowing data. It would be necessary to obtain more information on pasture resowing and improved pasture management practices in the region through farm surveys.

- Previous farm censuses did not differentiate annual from perennial pasture. However, it can be deduced from these that the rate of pasture sowing peaked in 1986/87 during a short period of high wool prices, fell in the latter part of the 1980s, and appears to have continued to fall since.

- This low rate of perennial pasture sowing is unlikely to bring about a significant increase in the area of active perennial pasture in the catchment. At this rate it is unlikely to maintain existing perennial pasture area as there is evidence that the lack of maintenance of perennial pasture is likely to reduce the persistence of pastures. The ABS and Condon *et al*. (1995) study revealed a low adoption of improved pasture management systems such as top dressing and rotational grazing management strategies in the region.

- The ABS farm survey in 1994/95 revealed a rate of pasture top dressing of 14 percent. This almost doubled by 1997. There is no other data available in the region which can be used to calibrate the ABS fertiliser data. However, comparisons between ABS data and data from farm surveys in other regions have shown that ABS fertiliser question provides a reliable measure of the maintenance of improved perennial pastures.

- There is no ABS data that can be used to monitor the use of grazing rotation practices. The Condon *et al*. (1995) study reveals that set stocking is the predominant method of grazing management in the region and highlights the low adoption of rotational grazing.

- Financial constraints due to low returns from wool production, lack of understanding about the benefits of perennial pastures, and lack of experience with establishment and management of these pastures were the main limitations to increasing pasture areas.

- Condon *et al*. (1995) grouped farmers according to their commitment to pasture renovation.

  Committed: This group of farmers have a high percentage of their farm sown to perennial pastures and are adopting the total package of improved pasture management practices on their perennial pastures. This group consists of one-fifth of the population and is driven by an interest in production and profit.

Partial Adopters: This was the largest group identified, with 40 percent of the population. This group have a smaller proportion of their farm sown to perennial pastures and see the cost of inputs as the main barrier to pasture improvement. They pay high attention to improved grazing management practices such as increasing stocking rates and top dressing resown pastures.

Comfortable: This group of older farmers (looking towards retirement), were winding down their level of interest in agriculture and had no intention of investing in significant projects. They were longing to live an easier life on the land without going into extra risk, and were happy with the income from the farm and other sources for the foreseeable future. They claim a significant area of perennial pastures on their farm, but were not interested in resowing, top dressing or changing from set stocking to rotational grazing even if the risk of these practices were minimised.

Sceptics: This group of graziers viewed phalaris as an unpalatable weed that can be toxic to stock. It is unlikely that they will ever sow phalaris on their farms. This group comprised 27 percent of the population.

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A BASELINE OF ADOPTION OF PASTURE MANAGEMENT PRACTICES - WIMMERA REGION

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KOMALA KARUNARATNE & NEIL BARR

Centre for Land Protection Research, Department of Natural Resources & Environment, Cnr Midland Highway & Taylor St, Epsom. Vic. 3551.

1 THE WIMMERA REGION

1.1 Sustainability in the Wimmera Region

The Wimmera Region comprises the Wimmera River catchment and covers an area of about 3 million hectares. The region ranges from the mountainous Grampians area in the south to the northern sand plains of the Mallee district.

The Wimmera has a semi-arid climate with a high rainfall variation and a small temperature variation across the catchment. Rainfall varies from 700-1000 mm/yr in the south of the catchment to a low of 300 mm/yr on the northern plains. About 2 million hectares in the catchment is used as farmland while the remaining area is national park, state forest and public reserves. About 44 percent of the farmland is sown to improved pastures and another 30 percent is sown to crop. In 1990/91, the catchment had a gross value of agricultural production of $350 million (Wimmera Regional Catchment Strategy 1997).

Soil erosion, soil structure decline and dryland salinity are the major land degradation problems in the Wimmera Region. The cropland production losses due to soil losses and structure decline in 1988/89 in the Wimmera catchment were estimated to be $8 million. About 17 000 ha of the catchment area is currently salt affected and loss of production due to this is estimated to be around $230 000 per year. About 60 000 ha of land on sandier soils in the northern part of the catchment is at risk of wind erosion (Wimmera Catchment: Draft Salinity Management Plan 1992; Wimmera Regional Catchment Strategy 1997).

The predominant land management units in the region are the Wimmera and Mallee Plains, the Riverine Plains and the Lowan Dunefields (Figure 1). There are two major types of Wimmera cropping soils: the friable brown or grey clays and the red duplex soils. The two soil forms require different management. The clays are naturally well structured and less prone to soil erosion than the cropping soils of the Mallee or North Central Victoria. They are moderately prone to soil structural damage (OCE 1991). The stability of these soils has encouraged little attention to the impact of cropping on these soils until recently. The attention has focused upon the impact of loss of organic matter. The clay soils of the Mallee are judged to be at only moderate risk of rising watertables (Kent 1987; Wimmera Catchment: Draft Salinity Management Plan 1992).

The red duplex soils are hard setting and have historically proved difficult to manage (Barr & Cary 1992; OCE 1991). These soils are generally rated as being at high risk of soil structural decline and water erosion (Wimmera Regional Landcare Plan 1993). They are also more prone to watertable recharge due to the use of long fallow.

Establishment and improved management of perennial pastures, strategic tree planting, and fencing, and revegetation of affected areas, along with a series of other sustainable soil management techniques, are promoted in the area as solutions to these problems.

The benefits of sowing perennial pastures in overcoming soil degradation lies within their potential to reduce recharge by extracting water from a greater volume of soil than annual pastures, using their deep root system. Perennial pastures also have the capacity to trap leached nitrates, reducing the rate of soil acidification by 50 kg lime/ha/year compared to annuals (Ridley *et al*. 1990). However, appropriate pasture management practices such as use of fertiliser, pest and disease control methods, and more importantly, grazing management systems largely affect the maximum water use by perennial pastures.

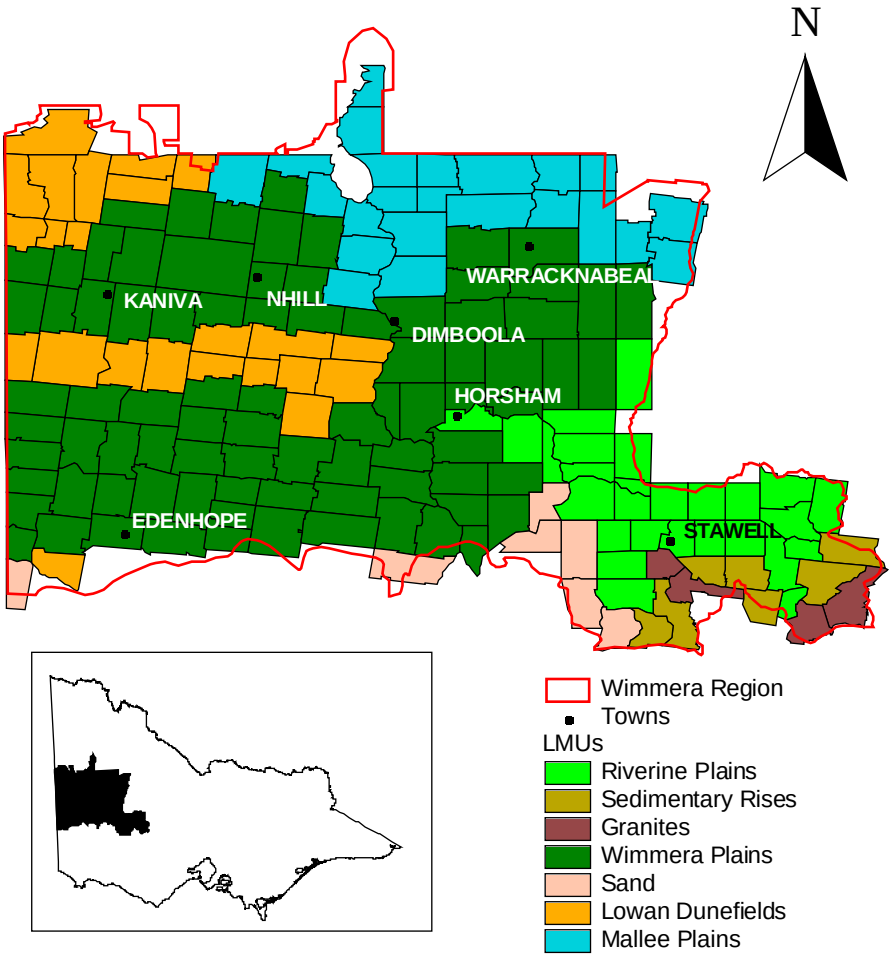


Figure 1 Land management units in the Wimmera Region

1.2 Indicator practices

The following practices have been selected as indicators of the extent of adoption of sustainable pasture management practices in grazing industry in the Wimmera Region.

- Perennial pasture sowing rate

  The Wimmera Salinity Management Plan (1992) recommends sowing perennial pastures on high priority land management units as a salinity control measure in the region. The plan sets 15 year target areas of perennial pastures to be achieved on different land management units, with an average annual total of 18 000 ha in the Wimmera catchment. Given that perennial pastures need to be maintained by a resowing program, a measure of the rate of resowing is used as an acceptable proxy for the area of perennial pasture.

- Top dressing of perennial pastures

  Annual top dressing of newly sown pastures is an important factor in maintaining a dense, vigorous pasture in order to have an impact on reducing the watertable, and also to gain high productivity through increased gross margins. Unfertilised pastures will decline to annual pastures and eventually to an annual and native pasture mix.

- Stock management methods used: rotational grazing systems

  Heavy grazing needs to be introduced through increased stocking rates to utilise newly sown pastures in order to achieve maximum profitability. Such a method is often the best way to deal with any weeds to ensure optimum pasture growth. From the salinity control point of view it is also necessary to introduce rotational grazing systems which enable the pastures to increase leaf area, plant growth and root development in order to maximise the water use of perennial pastures.

2 DATA SOURCES AVAILABLE

2.1 Australian Bureau of Statistics

The Australian Bureau of Statistics (ABS) farm census is distributed annually to all Australian farming businesses which meet a minimum gross income criterion. There is a legislative requirement that all farm business operators complete and return the farm census. In the last decade the ABS farm census has intermittently included questions covering use of fallow, grain legumes, soil ameliorants, fertiliser use and pastures. In recent years questions have covered the total area and resown area of perennial pastures and lucerne pasture. Data from the ABS farm census is normally available only in aggregated form at state or local government area. As part of this project, data was purchased disaggregated at parish levels. As parishes are significantly smaller than local government areas, the ABS data was reaggregated according to catchment and soil type boundaries.

2.2 Qualitative study of pasture improvement (Condon *et al.* 1995)

A study of farmer attitudes, perceptions and motivations to the establishment and management of perennial pastures was carried out in three locations across Victoria in order to determine the barriers to adoption of perennial pastures. The Wimmera was selected as one of the locations. This was the initial stage of a project funded by the National Landcare Program, aimed at increasing farmer awareness and understanding of the technology associated with perennial pasture establishment and management. In-depth interviews using a semi-structured questionnaire were conducted with 15 farmers in the Wimmera Region.

3 MEASURING PERENNIAL PASTURE ESTABLISHMENT AND MANAGEMENT

3.1 Pasture resown rates

3.1.1 Australian Bureau of Statistics

The questions on the ABS census from 1984 to 1990 asked farmers for total pasture areas and areas sown or resown with pastures during the census year. This pasture resown area could be used to compare the pasture resown rates. However, these questions do not distinguish between perennial and annual pastures. However, local knowledge suggests that the absolute rate of pasture resowing may be a reasonable indicator of the adoption of perennial pastures.

The pasture questions from 1991 to 1993 included only the total pasture area, and did not ask for the pasture resown area, making the information useless for measuring the adoption rates. Research in NSW and Victoria shows there is tremendous variation in the quality of pastures described as 'perennial' by farmers.

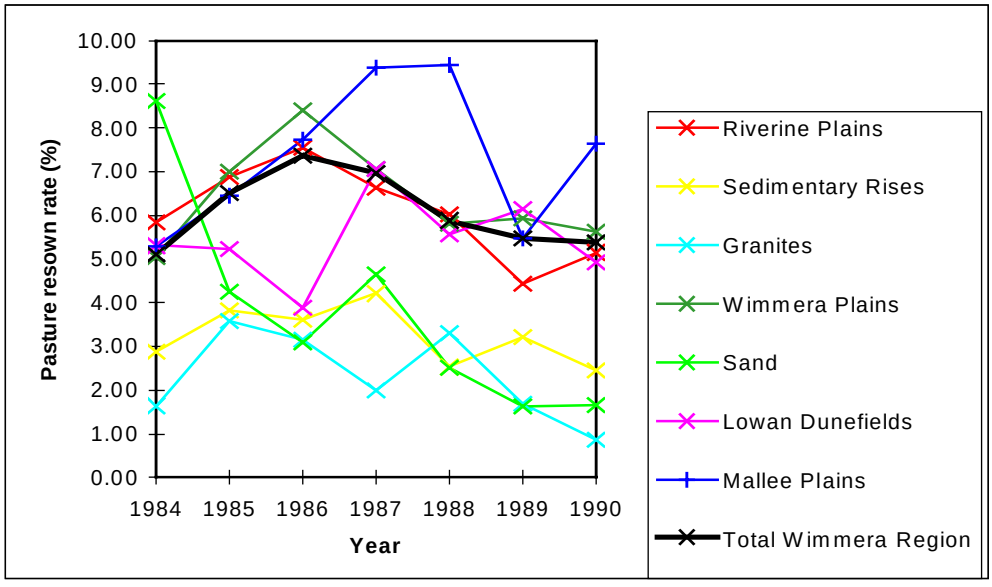
The questions included in the 1993/94 census provide the most valuable information on perennial pasture resown rates. This census separates the total area of pasture and the area of pasture resown during that year, allowing for the calculation of the pasture resown rate. A major advantage of this set of questions is that it separates lucerne, other perennial pastures and annual pastures in pasture mixtures.

The question in the 1994/95 census only asked for area of pastures sown or resown during that year and did not include the total pasture area. This difference between the two sets of questions during 1993/94 and 1994/95 has led to unreliable responses to the 1994/95 question with many farmers filling the total area of pasture rather than sown area. Hence, these results are not included in this report.

A pasture question similar to 1993/94 format was repeated in 1995/96 and 1996/97 censuses and can be used as a measure of change in lucerne and perennial pasture adoption rates.

The pasture questions on censuses in different years are shown in Appendix 1. The inconsistency of pasture questions in the ABS census data during the last decade limits their role in determining a trend in perennial pasture and lucerne adoption rates.

Total pasture resown rates from 1984 to 1990 on different land management units (LMUs) are shown in Figure 2. Figures for the total region show a relationship between wool prices and pasture resowing rates. With high wool prices in the mid 1980s there was an increase in resown rates followed by a slump in the latter part of the 1980s associated with low wool prices. This increasing trend in the mid 1980s is clearly shown on the Riverine Plains, Sedimentary Rises, Wimmera and Mallee Plains LMUs. The Granites LMU covered very small proportions of the region's area and had the lowest resown rates, while the more dominant LMUs had higher resown rates. As mentioned earlier, this measure does not distinguish between perennial and annual pastures resown, but is still an indicator of resowing rate changes for perennial pasture.



Source: Australian Bureau of Statistics (1984-1990)

Figure 2 Total pasture resown rate on different land management units in the Wimmera Region (1984-1990).

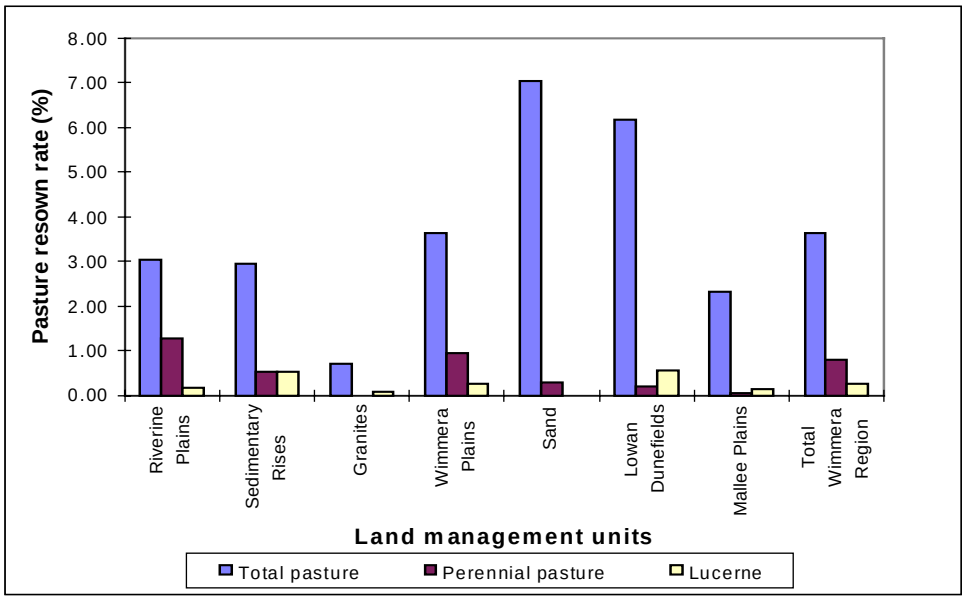
The 1993/94 ABS farm census data shows that 20 percent of the existing pasture in the Wimmera Region was described as perennial pastures while another 5.6 percent was under lucerne pastures. However, field surveys suggest the quality of much of this existing perennial pasture may be low (Quigley & Morgan 1990).

For 1993/94, lucerne resown rates were calculated considering pure lucerne resown during the season, together with mixture of lucerne and other pasture species, as a percent of total pasture area. Similarly the perennial pasture resown rates included a category with a mixture of perennial grasses and legumes, excluding lucerne. Only 0.8 percent of total pasture area in the region was sown or resown with perennial pastures during the 1993/94 season, while another 0.25 percent was resown to lucerne. The Riverine Plains and Wimmera Plains LMUs dominated in perennial pasture resown rates, reaching 1.3 and 0.94 percent of the total pasture areas, while the Lowan Dunefields and Sedimentary Rises LMUs had the highest lucerne resown rates (Figure 3). However, the Wimmera Plains had the highest resown areas for both lucerne and perennial pastures (Table 1). Perennial pasture and lucerne pasture resown rates in 1993/94 in the Wimmera Region are mapped in Figure 4.

Table 1 Pasture resown areas (ha) in the Wimmera Region according to LMUs (1993/94)

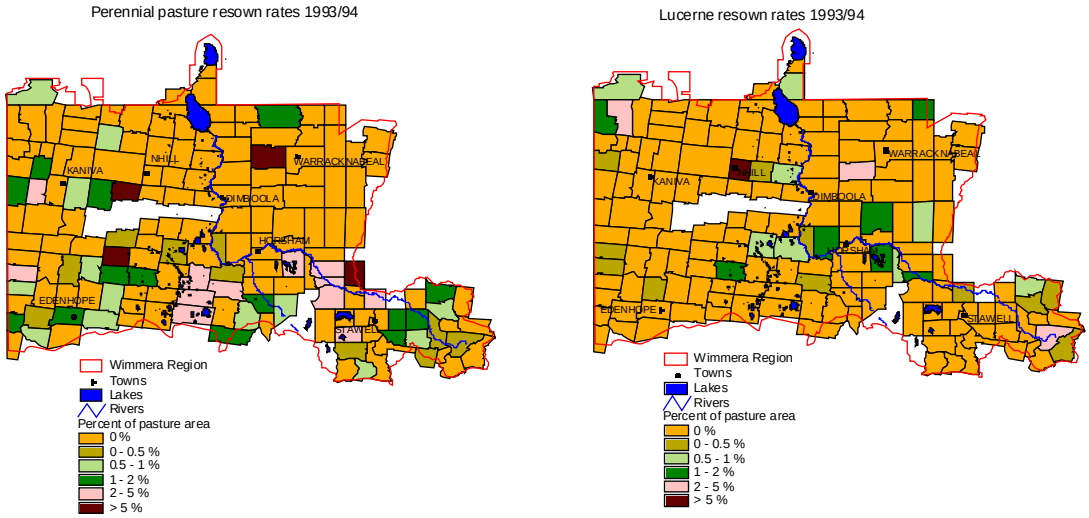
LMU	Lucerne	Perennial pasture	Total pasture area
Riverine Plains	210	1507	119190
Sedimentary Rises	256	263	49572
Granites	10	0	13185
Wimmera Plains	1217	4802	512626
Sand	0	28	9637
Lowan Dunefields	459	174	84796
Mallee Plains	92	45	74188
Wimmera Region Total	2244	6819	863194

Source: Australian Bureau of Statistics (1993/94)



Source: Australian Bureau of Statistics (1993/94)

Figure 3 Pasture resown rate in the Wimmera Region (1993/94)



Source: Australian Bureau of Statistics (1993/94)

Figure 4 Pasture resown rates in the Wimmera Region (1993/94)

The total pasture area reported, as well as the total perennial pasture area reported, declined during the two years from 1994 to 1996. However, there was a 7 percent increase in the area of existing pasture reported as perennial pastures. The total lucerne area declined by more than half in 1996 while the area of lucerne sown or resown during 1996 was almost double that in 1994 (Table 2). There is an increase in both lucerne and perennial pasture resown rates, with 0.7 percent and 2 percent of total pasture area in the region being sown or resown with lucerne and perennial pastures respectively (Table 2).

The increasing trend in perennial pasture resown rates was consistent in all land management units with the Wimmera Plains having the highest resown area, followed by the Riverine Plains LMU. The Mallee and Wimmera Plains, Dunefields and Riverine Plains LMUs dominated in lucerne resown rates (Table 3 & Figure 5). Perennial pasture and lucerne pasture resown rates in the Wimmera Region in 1995/96 are mapped in Figure 6.

Table 2 Pasture resown areas in the Wimmera Region (1993/94-1996/97)

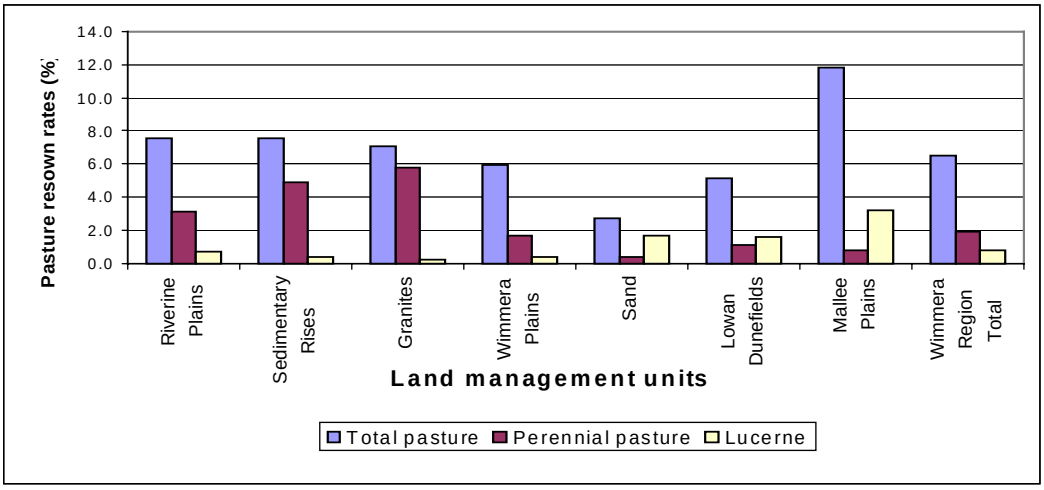
Measure	1993/94	1995/96	1996/97
Total pasture area (ha)	863193	548156	586703
Total pasture resown area (ha)	31363	35622	47146
Total perennial pasture area (ha)	172919	152600	176918
Total lucerne area (ha)	48059	21589	20747
Perennial pasture resown area (ha)	6820	10608	13823
Lucerne resown area (ha)	2244	4072	4100
Percent of perennial pasture (%)	20.0	27.8	30.0
Percent of lucerne pasture (%)	5.6	3.9	3.5
Perennial pasture resown rate (%)	0.8	1.9	2.4
Lucerne resown rate (%)	0.3	0.7	0.7

Source: Australian Bureau of Statistics (1993/94-996/97)

Table 3 Pasture resown area (ha) in the Wimmera Region according to LMUs (1995/96-1996/97).

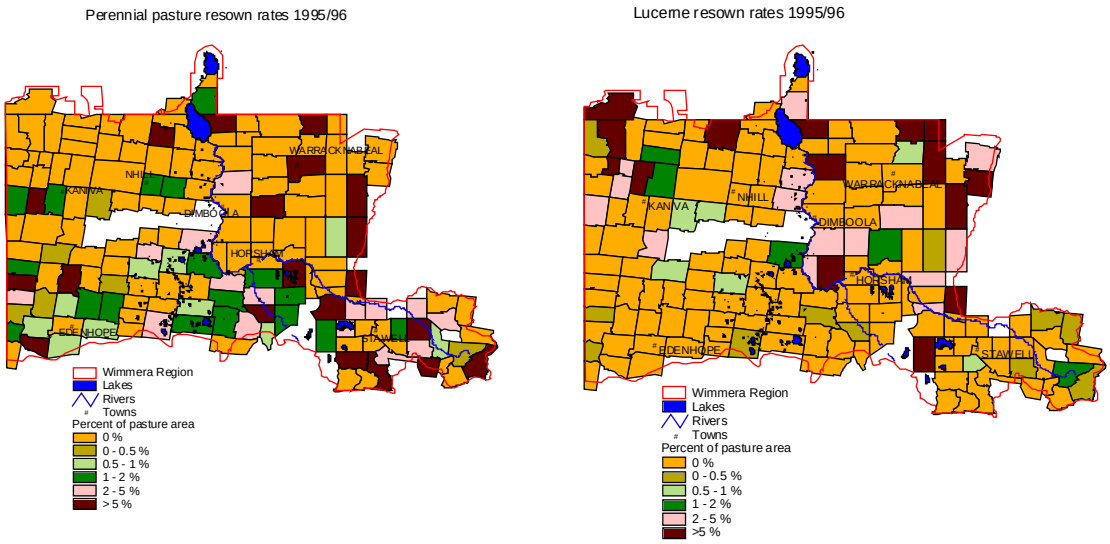
LMU	1995/96			1996/97		
	Lucerne	Perennial pasture	Total pasture area	Lucerne	Perennial pasture	Total pasture area
Riverine Plains	547	2558	82150	571	2360	88592
Sedimentary Rises	78	1108	22793	73	674	27164
Granites	22	505	8696	8	372	9777
Wimmera Plains	1370	5540	338398	1537	8796	362764
Sand	95	20	5836	38	20	8550
Lowan Dunefields	856	608	55365	700	1003	64216
Mallee Plains	1104	269	34918	1173	598	25640
Total Wimmera Region	4072	10608	548156	4100	13823	586703

Source: Australian Bureau of Statistics (1995/96, 1996/97)



Source: Australian Bureau of Statistics (1995/96)

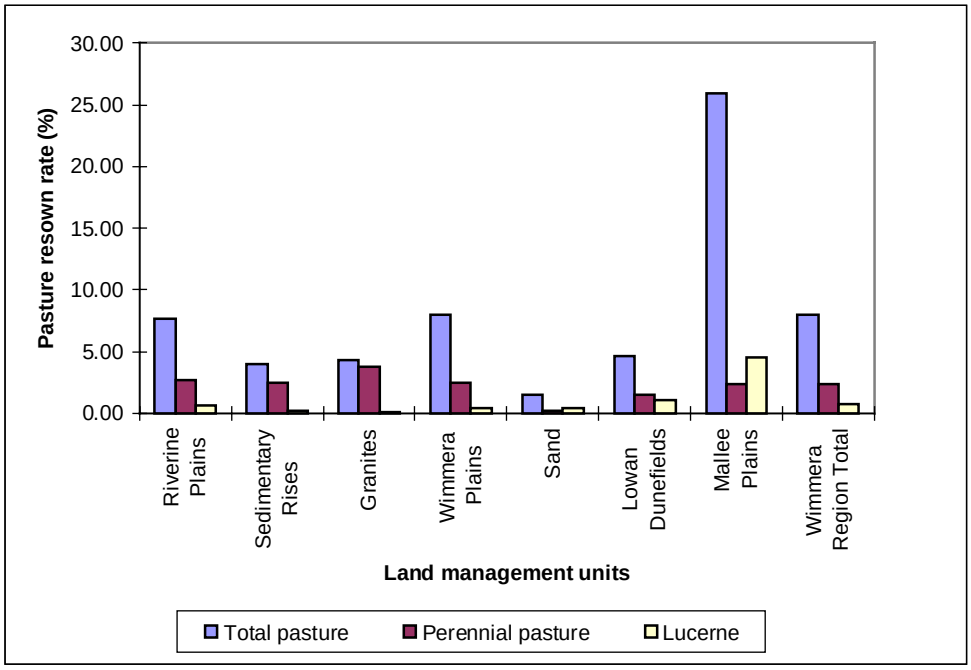
Figure 5 Pasture resown rates in the Wimmera Region (1995/96)



Source: Australian Bureau of Statistics (1995/96)

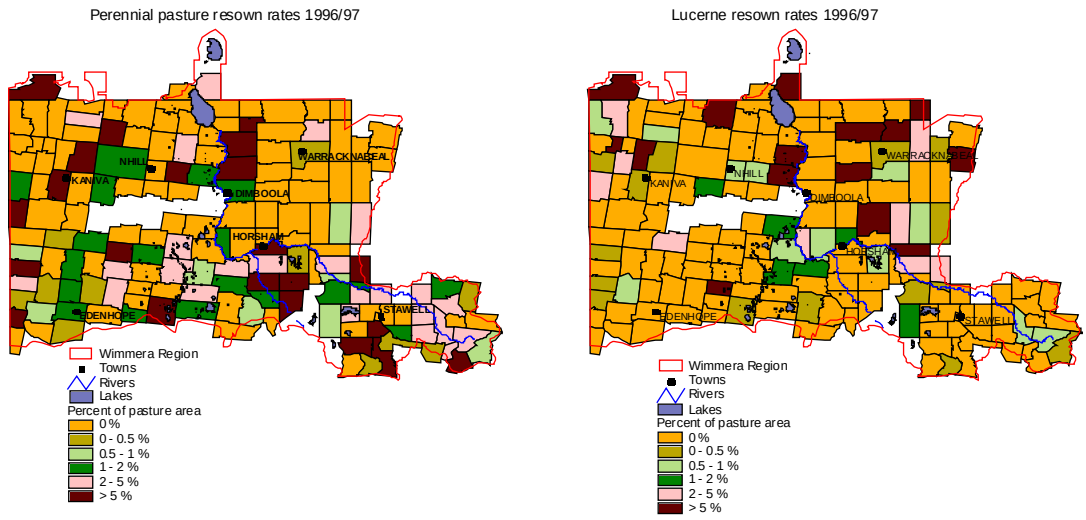
Figure 6 Pasture resown rate in the Wimmera Region (1995/96)

Measures for perennial pastures increased again during the 1996/97 season while total lucerne area and resown areas remained almost unchanged. The increases in perennial resown areas were mainly evident in the Wimmera and Mallee Plains and Dunefields Lmus (Table 3 and Figure 7). Perennial pasture and lucerne resown rates in 1996/97 in the Wimmera Region are mapped in Figure 8.



Source: Australian Bureau of Statistics (1996/97)

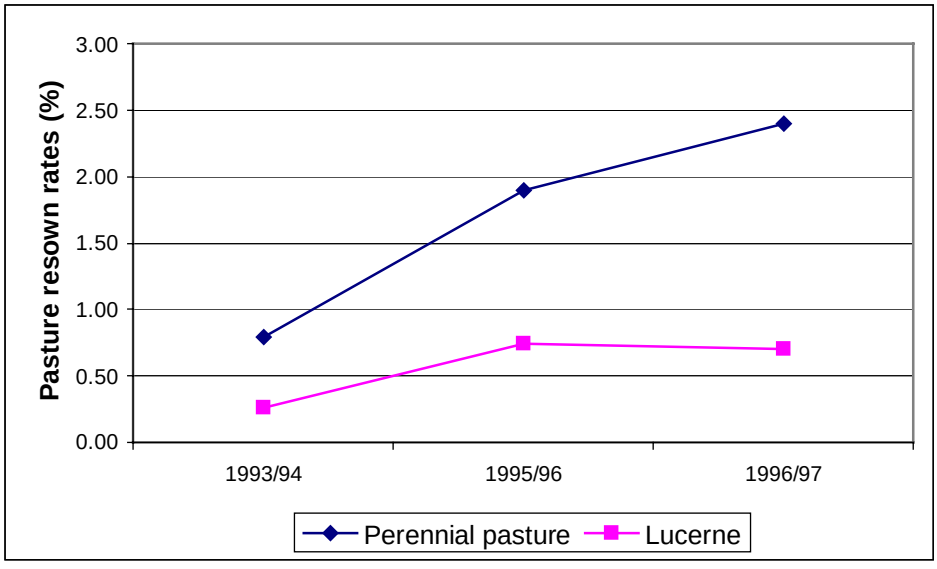
Figure 7 Pasture resown rates in the Wimmera Region (1996/97)



Source: Australian Bureau of Statistics (1996/97)

Figure 8 Perennial pasture resown rate in the Wimmera Region (1996/97)

Figure 9 shows the overall trends in pasture resowing rates in the Wimmera Region from 1993/94 to 1996/97. Perennial pasture resown rates have shown a significant shift over the period of four years while lucerne resown rates were almost static in 1997, following an increase during 1996.



Source: Australian Bureau of Statistics (1993/94-1996/97)

Figure 9 Trends in pasture resown rates in the Wimmera Region (1993/94-1996/97)

3.1.2 Qualitative study of pasture improvement (Condon *et al.* 1995)

This study was more of a qualitative nature and did not ask for resown areas. Most farmers interviewed were motivated to sow perennial pastures as part of their farm program. Thirteen percent had their intended pasture resown areas documented in their wholefarm plans About 80 percent of the interviewed farmers were not satisfied with the current state of their pastures for a range of reasons.

3.2 Fertiliser applications on pasture

Fertiliser rates and frequencies of applications play an important role in maintaining a stable perennial pasture growth free of weeds and inferior grasses. Poorly managed perennial pastures will have no greater impact on watertable control than annual pastures. Hence, application of fertiliser on pastures is used as a proxy for measuring the level of pasture management undertaken by farmers in the region.

3.2.1 Australian Bureau of Statistics

In the 1987/88 agricultural census farmers were asked the areas of pure lucerne, other pastures and crops fertilised, and the type and quantity of fertiliser applied. The 1988/89 and 1989/90 censuses collected the same information for total pasture areas but did not separate pure lucerne from other pastures. A similar set of questions were asked again in 1994/95 season. The 1995/96 and 1996/97 census questions asked for the total pasture areas top-dressed or fertilised and did not collect information on types of fertilisers used. These sets of questions are shown in Appendix 2.

Thirty-one percent of the pasture area was fertilised by 34 percent of farmers in 1987/88. Both the area fertilised and the number of farmers using fertiliser increased during 1989 and 1990 (Table 4). There was a huge drop in fertiliser usage during the five years from 1990 to 1995. Both the area fertilised and the number of farmers using fertiliser decreased, with only 20 percent of farmers using fertiliser on 14 percent of the pasture area. This is clearly related to the prolonged period of poor wool prices. The percentage of pasture area fertilised again doubled during 1995/96 with more farmers using fertiliser on larger areas. There was no further significant increase in use of fertiliser reported in 1996/97 season (Table 4).

Table 4 Measure of fertiliser application on pastures in the Wimmera Region (1988-1996)

Measure	1987/88	1988/89	1989/90	1994/95	1995/96	1996/97
Pasture area fertilised, as a proportion of total farm area (%)	15.9	18.7	19.1	6.9	8.2	9.0
Proportion of pasture area fertilised (%)	30.6	34	35.8	13.6	25.6	26.5
Farmers using fertiliser on pastures (%)	34.0	38.3	41.3	19.6	22.2	22.7
Lucerne area fertilised (%)	41.5	*	*	*	*	*
Farmers using fertiliser on lucerne (%)	62.0	*	*	*	*	*

Source: Australian Bureau of Statistics (1987/88-1996/97)
*Information for lucerne was not collected during these seasons

The rate of application of superphosphate (kilograms per hectare) over the pasture area fertilised and the entire pasture area is shown in Table 5. A drop in fertiliser rates per pasture area fertilised was shown during 1989, followed by a slight increase in 1990 and 1995 (Table 5). The increase in 1990 was mainly on the Sedimentary Rises and Mallee Plains LMUs while the Riverine Plains and Sedimentary Rises LMUs had high rates in 1995 (Table 6).

Table 5 Rate of application of superphosphate (kg/ha)

Measure	1988	1989	1990	1995
Rate per area fertilised	102	98	100	107
Rate per entire pasture area	31	33	36	15
Rate on lucerne pastures	168	*	*	*

Source: Australian Bureau of Statistics (1988-1995)
*Information for lucerne was not collected during these seasons

Table 6 Rate of application of superphosphate on different LMUs (kg/ha)

	1988		1989	1990	1995
LMU	Perennial pastures	Lucerne	Perennial pastures		
Riverine Plains	106	302	111	104	141
Sedimentary Rises	126	54	107	123	142
Granites	113	316	102	105	93
Wimmera Plains	101	207	92	98	99
Sand	110	_	106	60	112
Lowan Dunefields	83	0	108	94	80
Mallee Plains	90	100	73	128	79

Source: Australian Bureau of Statistics (1988-1995)

3.2.2 Qualitative study of pasture improvement (Condon *et al.* 1995)

Sixty percent of farmers in the region top-dressed their pastures, however, the majority admitted that they had neglected their pastures and had not treated the pastures with fertiliser regularly. All farmers were concerned about the cost of superphosphate compared to the expected returns from its application.

3.3 Grazing management on pasture

3.3.1 Qualitative study of pasture improvement (Condon *et al.* 1995)

Most farmers practiced set stocking, while only 20 percent rotationally grazed their stocks. Few farmers who set stocked their normal pastures rotationally grazed their lucerne paddocks. Only 20 percent of farmers recognised the importance of grazing management in long-term persistence of pastures.

4 UNDERSTANDING LOW RATES OF ADOPTION

In promoting the adoption of perennial pastures and improved pasture management practices it is important to understand the factors influencing and/or limiting the use of these practices. The Condon *et al.* study on pasture improvement practices has identified some of these factors in the Wimmera Region. The following section discusses these factors.

4.1 Qualitative study of pasture improvement (Condon *et al.* 1995)

Most farmers were motivated to sow perennial pastures as a part of their farm program. However, lower returns from wool production was a major limitation to increasing pasture production for over 80 percent of farmers interviewed. Lack of experience and confidence with lucerne and other perennial pasture establishment and management, and a lack of understanding of their benefits, were the other major constraints reported to increasing pasture areas. The effect of seasonal variation on establishment was also considered as important. Financial, labour and time limitations, and a lack of advice regarding input use and management, were also of concern to most farmers.

This study grouped graziers with regard to their commitments to pasture establishment and management. Twenty percent of farmers had a positive attitude and a motivation towards pasture resowing and management. They were grouped as *Committed Graziers*. They saw perennial pastures as a vital component of the whole farm program and have a high percentage of their farm sown to these pastures. They were involved in a yearly pasture resowing plan with regular top dressing and rotational grazing or strategic grazing. Loss of production from the new pasture paddocks during the establishment phase was the main obstacle mentioned in the yearly resowing of pastures. In his study of grazing adoption processes, O'Keefe (1993) identifies this group of graziers as having a decision process led by the awareness of a farm innovation. For these farmers awareness leads to attitude change which then leads to behaviour change.

Partial Adopters used parts of the pasture package. This was the largest group, consisting of 40 percent of graziers. The proportion of their land resown to pasture was smaller than that of the former group. Resowing was not included in a yearly program and was dependent on the cost of inputs. This group considered perennial pasture as high quality feed and understood the possibility of increasing stocking rates. They paid greater attention to improved grazing management practices than those with a smaller proportion of perennial pastures. They all practiced strategies such as spring lambing, increasing stocking rates and top dressing resown pastures to achieve higher productivity. However, concerns about the problems in increasing stocking rates may discourage these farmers from resowing new pasture areas.

The Comfortable were identified as a group of older farmers looking towards retirement, who were winding down their level of interest in agriculture and had no intention of investing in significant projects. They were longing to live an easier life on the land without going into extra risk, and were happy with the income from farm and other sources for the foreseeable future. They claim a significant area of perennial pastures on their farm, but were not interested in resowing, top dressing or changing from set stocking to rotational grazing even if the risk of these practices are minimised.

The last group *(Sceptics)* believes perennial pastures are of no value in their farm and view phalaris as an unpalatable weed which can be toxic to stock. It is unlikely that these farmers will ever sow improved perennial pastures on their farms. These perceptions of phalaris are thought to be related to their unwillingness to use appropriate grazing strategies and heavy stocking rates. This group comprises 27 percent of the interviewees.

5 RECOMMENDATIONS

The aim of this report is to provide baseline information and establish trends in adoption of pasture management practices in the Wimmera Region. The information in this report is based on ABS census data and provides reasonable trends in adoption of these practices in the region. Accurate long-term measures of the area of phalaris pastures sown in the region will need to be obtained by continued use of the ABS farm census. One of the limitations to using ABS data in determining the adoption trends is the changing format of the question each year. The consistency of the format of questions is important in providing reliable information to measure trends in adoption rates. The adoption rates estimated from 1993/94 ABS data provides a reasonably reliable baseline and can be used to monitor future adoption of these practices. A question similar to 1993/94 format was repeated in 1995/96 and provides suitable continuity in data. Hence, the same format can be used in future to estimate the adoption of perennial pastures.

The 1994/95 fertiliser question provides data to measure the use of selected fertilisers on established pastures. This question appears to provide an accurate measure of pasture maintenance by top dressing. This does not include information on other maintenance practices important in pasture management, particularly rotational grazing. The 1995/96 ABS census included a question on maintenance and management of established pastures and can be used in future to monitor the adoption of pasture management practices. This does not include information on rotational grazing. To determine the adoption of improved grazing management techniques, it will be necessary to collect more data on grazing management practices.

The format of this question is as follows:

ABS Pasture maintenance question in 1995/96

Maintenance and management of established pastures between 1 April 1995 and 31 March 1996

Area of established pasture over which the following maintenance or management operations were carried out:

Hectares

Top dressing of fertiliser ……..

Weed control or spraying ……...

Pest and disease control or spraying ……..

Slashing or burning (other than prior to sowing the paddock)……..

6 REFERENCES AND DATA SOURCES

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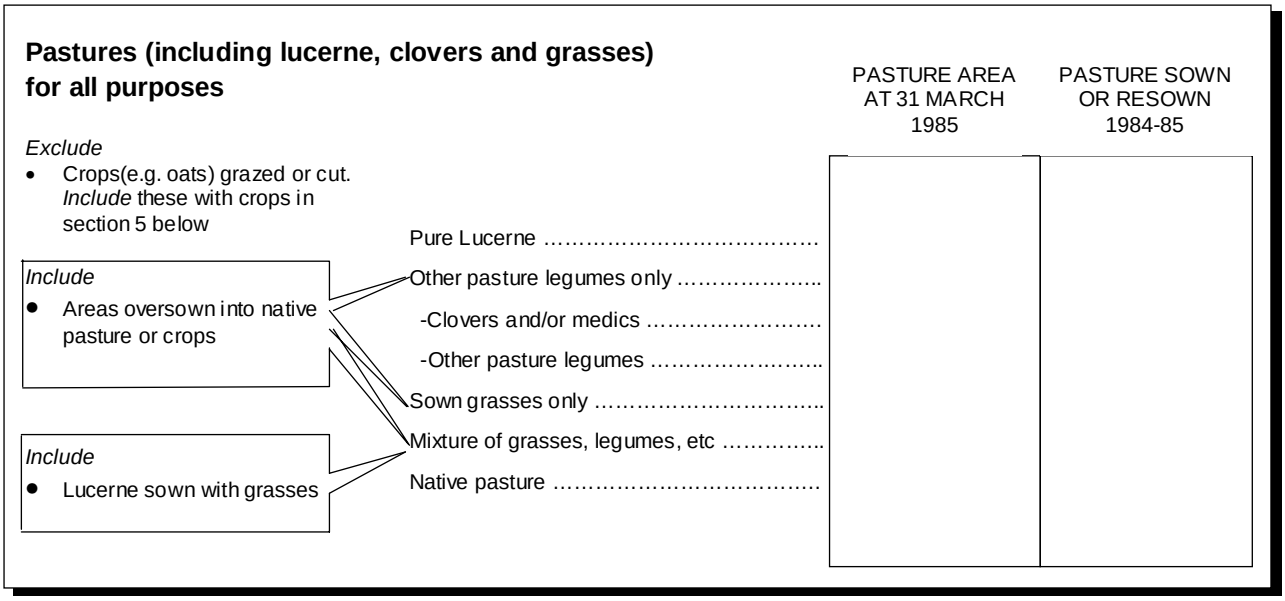
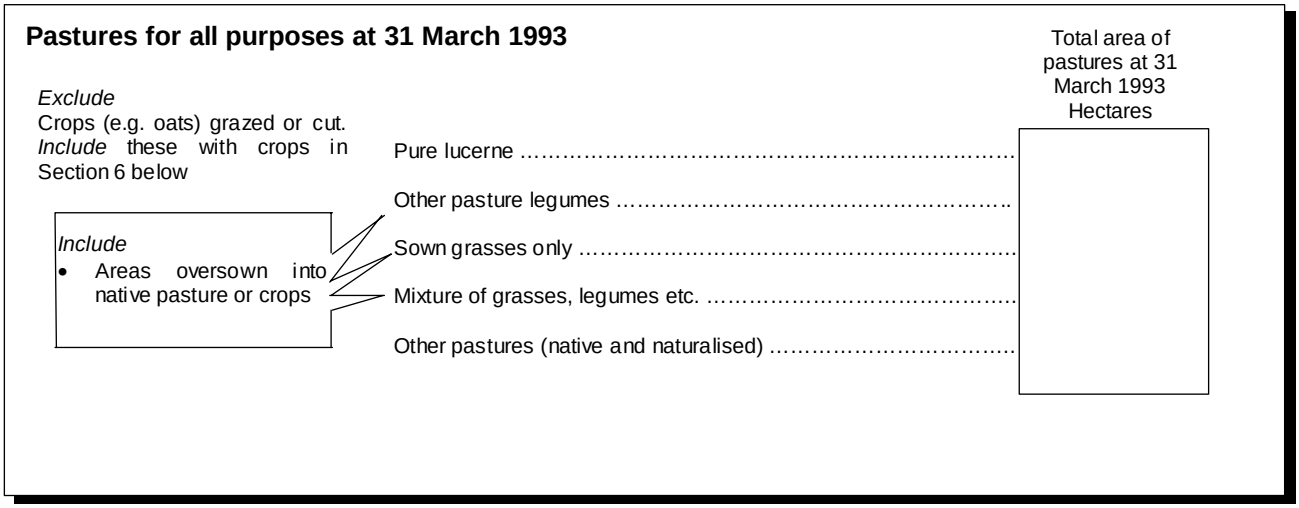
7 APPENDICES AUSTRALIAN BUREAU OF STATISTICS FARM CENSUS QUESTIONS

Appendix 1 ABS pasture questions

ABS pasture question 1984-1990



ABS pasture question from 1991-1993



ABS pasture question 1993/94

Pastures for all purposes at 31 March 1994

Exclude

- Crops (e.g. oats) grazed or cut. Include these with crops in Part 1c below

Include

- Areas oversown into native pasture or crops

Perennial grasses include phalaris, cocksfoot and perennial ryegrass

	Total area of pasture at 31 March 1994 Hectares	Pasture sown or resown during year ended 31 March 1994 Hectares
Pure lucerne		
Other pasture legumes		
Sown grasses only		
Mixture of lucerne and other pasture species.....		
Mixture of perennial grasses and legumes excluding lucerne		
Mixture of annual grasses and legumes excluding lucerne		
Other pastures (native and naturalised)		

ABS pasture question 1994/95-1996/97

Pastures sown or resown for all purposes during year ended 31 March 1997

Include

- Areas oversown into native pasture or crops

Perennial grasses include phalaris, cocksfoot and perennial ryegrass.

Legumes include clovers, medics and vetch.

Annual grasses include Wimmera rye grass.

	Total area of pasture at 31 March 1997 Hectares	Pasture sown or resown during year ended 31 March 1997 Hectares
• **Sowings including lucerne:**		
Pure lucerne		
Mixture of lucerne and other pasture species		
• **Sowings excluding lucerne:**		
Pasture legumes only		
Mixture of perennial grasses and legumes		
Mixture of annual grasses and legumes		
Sown grasses only		

Appendix 2 ABS fertiliser questions

ABS fertiliser question in 1987/88

Artificial fertiliser used (whether applied by you, by contractors, or others)
Season 1987-88

Exclude lime, gypsum and dolomite

Enter double and triple strength superphosphate as single strength equivalent,

Pastures and Crops Fertilised	Area Fertilised	**Quantity and Type of Fertiliser Used**				
		Super-phosphate (including super with trace elements)	Straight nitrogenous types (e.g. urea, sulphate of ammonia)	Straight Potash	Mixtures of super, and potash	Other artificial fertilisers including complex mixtures and mixtures containing nitrogen
	Hectares	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Pure lucerne						
Other pastures (sown or native)						
Wheat						
Oats						
Barley						
Field peas						
Other cereals						
Oilseeds						
Vegetables for human consumption						
Fruit (including nuts)						
Grape vines						
Other (please specify)						

ABS fertiliser question in 1988/89 and 1989/90

Artificial fertiliser used (whether applied by you, by contractors, or others) Season 1988-89

Exclude lime, gypsum and dolomite

Enter double and triple strength superphosphate as single strength equivalent,

Pastures and Crops Fertilised	Area Fertilised	Quantity and Type of Fertiliser Used				
		Super-phosphate (including super with trace elements)	Straight nitrogenous types (eg. urea, sulphate of ammonia)	Straight Potash	Mixtures of super, and potash	Other artificial fertilisers including complex mixtures and mixtures containing nitrogen
	Hectares	Tonnes	Tonnes	Tonnes	Tonnes	Tonnes
Pastures sown or native						
Wheat						
All other crops						

ABS fertiliser question in 1994/95

Use of selected fertilisers on established pastures (whether applied by you, by contractors or by others) - Season 1994-95

Exclude

- Pastures sown during the 1994-95 season

Note

- Use total fertiliser weight not weight of active constituents.

Include

- Double and triple super-phosphate, MAP or DAP

	Hectares	Tonnes
Area of existing pasture top-dressed with fertilisers specified below		
Single superphosphate used for top dressing existing pastures		
High analysis fertilisers used for top dressing existing pastures		
Super-potash blends used for top dressing existing pastures		