A BASELINE OF ADOPTION OF PASTURE MANAGEMENT PRACTICES - MALLEE REGION

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Abbreviations

ABS Australian Bureau of Statistics

SUMMARY

The aim of this report is to document baseline information about the state of adoption of pasture establishment and management practices in the Mallee 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 Mallee 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 Mallee Region. The ABS farm survey for 1993/94 shows a rate of all perennial pasture sowing in the catchment of 0.7 percent per annum, with half to phalaris based pastures and half to lucerne. These measures significantly increased in 1996/97.

- There is no available independent study which 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 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 promote a significant increase in the area of active perennial pasture in the catchment. At this rate it is unlikely to maintain the area of existing perennial pasture, as there is evidence that the lack of maintenance of perennial pasture is likely to reduce their persistence. ABS census data revealed a low adoption of improved pasture management systems such as top dressing.

- The ABS farm survey in 1994/95 shows the rate of pasture top dressing to be as low as 1 percent. This measure had slightly increased by 1997 with 4 percent of the pasture area being fertilised by 3 percent of farmers. 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 or other data which can be used to monitor the use of grazing rotation practices. Further information is needed to comment on pasture management practices adopted on resown perennial pastures in the region.

CONTENTS

List of Figures

List of Tables

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1 THE MALLEE REGION

1.1 Sustainability in the Mallee Region

The Mallee is a semi-arid area of 4.3 million hectares, almost one-fifth of the area of Victoria (Figure 1). The average annual rainfall varies from about 400 mm in the south to less than 250 mm in the north-west. About 60 percent of the yearly average rainfall occurs between May and Oct. Since the 1950s the fallow/wheat/pasture rotation has been the basis of Mallee farming. This system was designed to maximise storage of the infrequent rainfall, the premise being that by preventing grass growth during a fallow season, any rainfall would be stored in the soil profile, allowing the following year's crop to utilise two season's rainfall. The proof of this system lay in the clear yield superiority of crops grown after a fallow. However, the long fallow system of production is now believed responsible for two major threats to the sustainability of Mallee farming: wind erosion and soil salinity.

The major land degradation forms in the region are dryland salinity, wind erosion, and the loss of organic matter and nutrients from soils. More than 330 000 ha of land area is at risk of salinisation within 50 years (Mallee Dryland Draft Salinity Management Plan 1993). Practices such as overcultivation, long fallow, excessive grazing and replacement of woodlands and native perennial grasslands with introduced annual pasture species have largely contributed to these problems. The only solution to these problems would seem to lie in longer or better quality pasture phases during the cropping rotation.

Establishment and improved management of perennial pastures, strategic tree planting, and fencing and revegetation of affected areas, along with a series of other cropping practices, are promoted in the area as solutions to these problems (Mallee Regional Landcare Plan 1993; Mallee Regional Catchment Strategy 1997).

The benefits of sowing perennial pastures in overcoming soil degradation lies with the 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 fertilisers, pest and disease control methods, and more importantly, grazing management systems, largely affect the maximum water use by perennial pastures.

1.2 Indicator practices

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

- Perennial pasture sowing rate

  The Mallee Dryland Salinity Management Plan (1993) recommends sowing perennial pastures and lucerne pastures as a salinity control measure in the region. The plan sets an annual target of 5676 ha of perennial pastures to be established in the region.

- Top dressing of perennial pastures

  Annual top dressing of newly sown pastures is an important factor in maintaining a dense, vigorous pasture. This will have an impact on reducing the watertable and improved 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

  Higher stocking rates and rotational grazing systems are required to utilise newly sown pastures in order to achieve greater profitability. Such a method is often the best way to deal with any weeds and ensure optimum pasture growth. From the salinity control point of view it is also necessary to introduce rotational grazing systems, which will enable pastures to increase leaf area, plant growth and root development and thus maximise the water use.

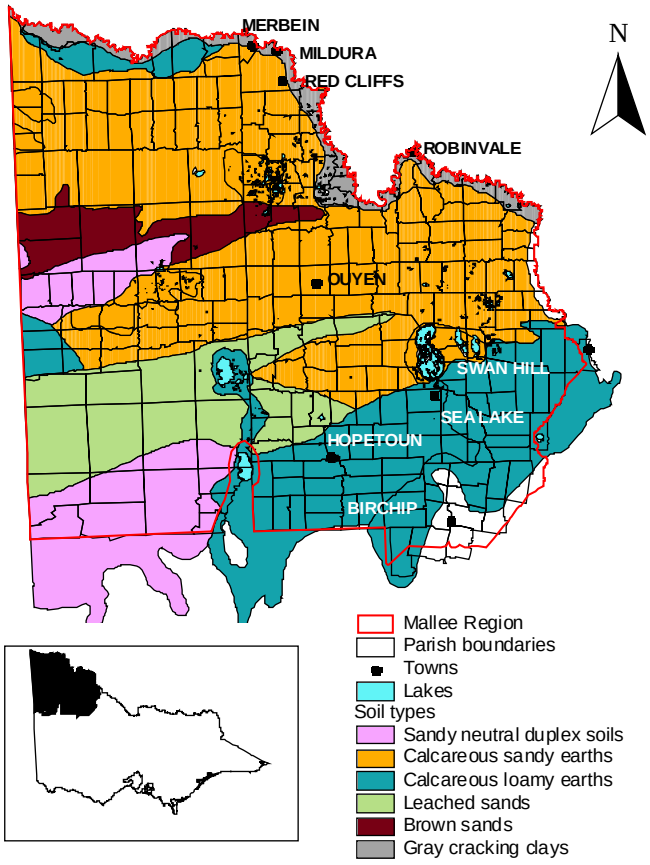


Figure 1 Soil types in the Mallee Region

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 area of resown perennial pastures, as well as 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 is purchased disaggregated at parish levels. As parishes are significantly smaller than local government areas, ABS data is reaggregated according to catchment and soil type boundaries.

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. The pasture resown data could be used to compare pasture resown rates. 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 measuring 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 data useless for measuring 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 separates the total area of pasture and the pasture resown during that year, allowing the calculation of the pasture resown rate. A major advantage of this set of questions is that it separates lucerne, other perennial pasture and annual pastures in pasture mixtures.

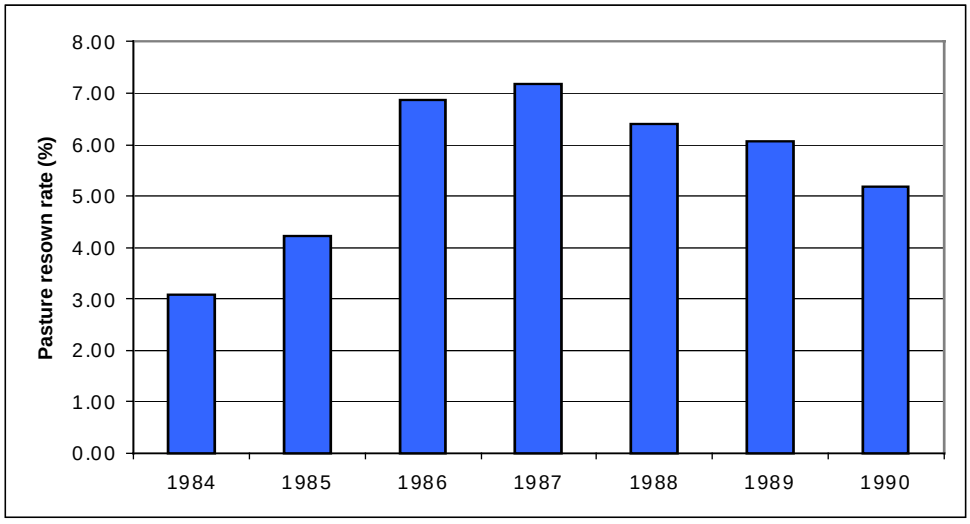
The questions in the 1994/95 census only asked for the pastures sown or resown during the census year and did not include the total pasture area. This difference between the two sets of questions during 1993/94 and 1994/95 has led to unreliable responses to 1994/95 question, with many farmers filling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

A pasture question similar to the 1993/94 format was repeated in the 1995/96 and 1996/97 censuses and could 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. This inconsistency of pasture questions in ABS censuses 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 in the region 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 drop in the latter part of the 1980s associated with low wool prices. The highest resown rate of 7.2 percent occurred in 1987. As mentioned earlier, this measure does not distinguish between resown perennial and annual pastures, but is still an adequate indicator of resowing rate changes for perennial pasture.

The 1993/94 ABS farm census data shows that only 8 percent of the existing pasture in the Mallee Region was described as perennial pastures, while another 7 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 percentage of total pasture area. Similarly the perennial pasture resown rates included the category with a mixture of perennial grasses and legumes, excluding lucerne. Of the total pasture area in the region 0.35 percent was sown or resown with perennial pastures during the 1993/94 season, while another 0.34 percent was resown to lucerne (Table 1). Perennial pasture and lucerne pasture resown rates in 1993/94 in the Mallee Region are mapped in Figure 3.



Source: Australian Bureau of Statistics (1984-1990)

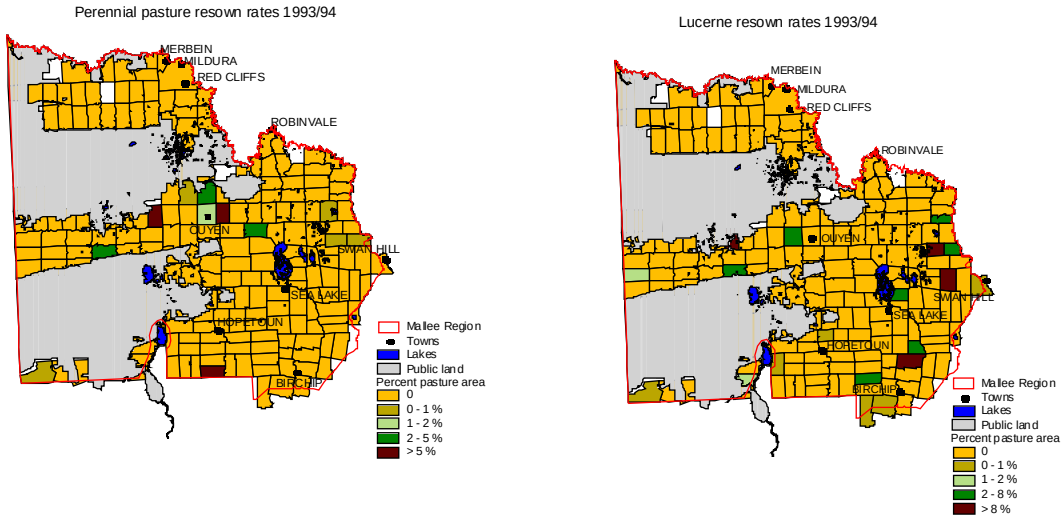
Figure 2 Total pasture resown rate in the Mallee Region (1984-1990)

It should be noted that the increase in the percentage of perennial pasture area in the 1995/96 season is a result of the huge reduction in total pasture area reported during this year and not due to an increase in total perennial pasture area. Both perennial pasture and lucerne areas have significantly dropped during these two years. However, more farmers have sown or resown these pastures on larger areas, resulting in higher resown rates compared to the 1994 figures (Table 1). These measures have further dropped during 1996/97. However, larger areas were resown to lucerne compared to the previous year. Perennial pasture and lucerne pasture resown rates in 1995/96 and 1996/97 in the Mallee Region are mapped in Figures 4 and 5 respectively.

Table 1 Pasture resown areas in the Mallee Region (1993/94-1996/97).

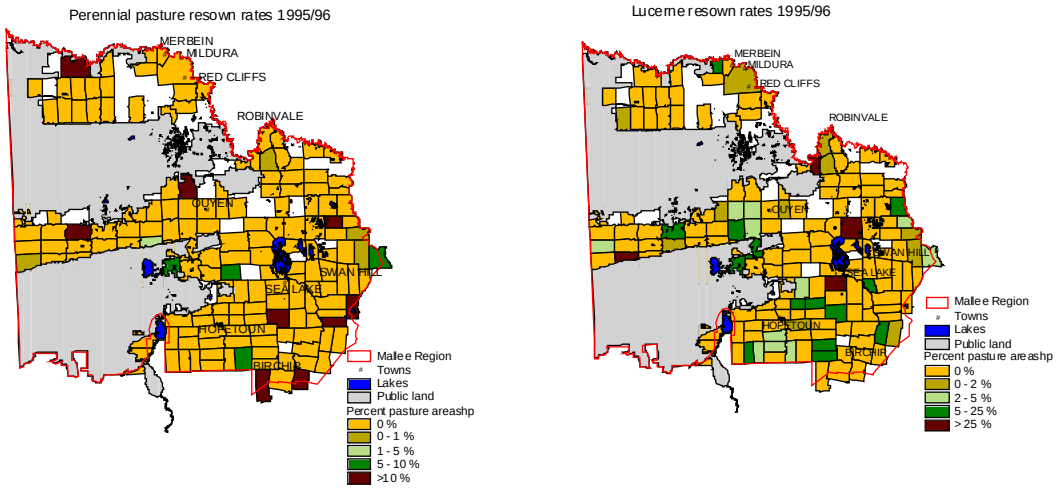
Measure	1993/94	1995/96	1996/97
Total pasture area (ha)	928930	345776	412567
Total pasture resown area (ha)	23812	30549	39884
Total perennial pasture area (ha)	73692	55917	49936
Total lucerne area (ha)	63879	17068	20854
Perennial pasture resown area (ha)	3271	5072	3557
Lucerne resown area (ha)	3163	6382	6609
Percent of perennial pastures (%)	7.9	16.2	12.1
Percent of lucerne (%)	6.9	4.9	5.1
Total pasture resown rate (%)	2.56	8.8	9.7
Lucerne resown rate (%)	0.34	1.9	1.6
Perennial pasture resown rate (%)	0.35	1.2	0.86

Source: Australian Bureau of Statistics (1994-1997)



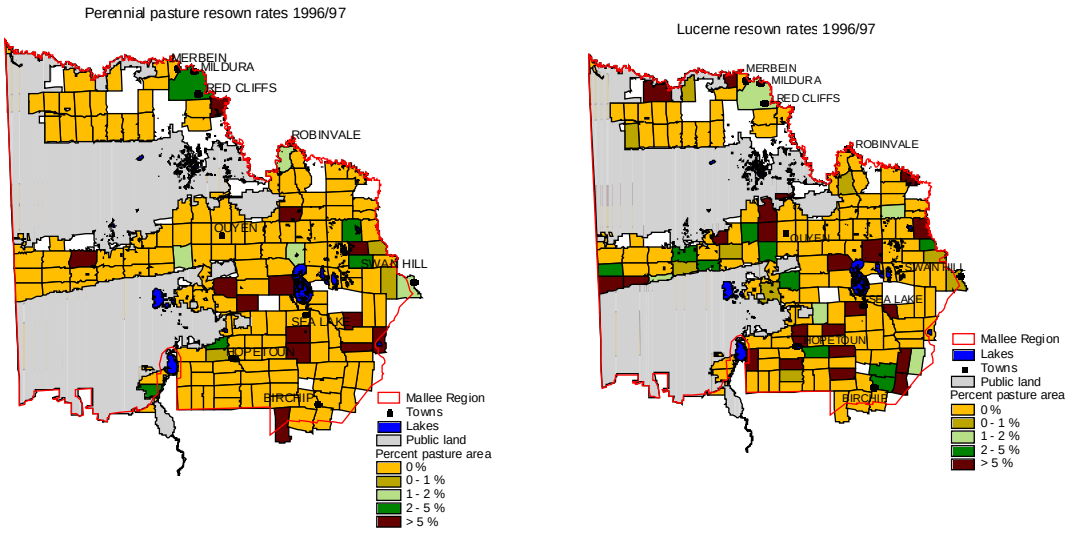
Source: Australian Bureau of Statistics (1993/94)

Figure 3 Pasture resown rates in the Mallee Region (1993/94)



Source: Australian Bureau of Statistics (1995/96)

Figure 4 Pasture resown rates in the Mallee Region (1995/96)



Source: Australian Bureau of Statistics (1996/97)

Figure 5 Perennial pasture resown rate in the Mallee Region (1996/97)

3.2 Fertiliser applications on pasture

Fertiliser rates and frequency 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 will 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, as well as the type and quantity of fertiliser applied. The 1988/89 and 1989/90 questions 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 the 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.

Only a very small proportion of the pasture area was fertilised by 3 percent of pasture growers during 1988. Both the number of farmers using fertiliser and the area of pasture fertilised increased during the next two years (Table 2). There was a large 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 3 percent of farmers using fertiliser on 1 percent of the pasture area. The reduction in use of fertiliser is clearly related to the prolonged period of low wool prices. The pasture area fertilised improved slightly over the next two years while the percentage of farmers reporting fertiliser usage remained unchanged in 1996/97 (Table 2).

Table 2 Measure of fertiliser application on pastures in the Mallee Region (1988-1997)

Measure	1987/88	1988/89	1989/90	1994/95	1995/96	1996/97
Pasture area fertilised, as a proportion of total farm area (%)	0.9	1.3	1.7	0.5	0.6	0.7
Proportion of pasture area fertilised (%)	2.1	3.1	3.7	1.2	4.0	3.8
Percentage of farmers using fertiliser on pastures (%)	3.1	5.2	5.4	2.7	3.1	3.0
Percentage of lucerne area fertilised (%)	40.8	*	*	*	*	*
Percentage of farmers using fertiliser on lucerne (%)	33.6	*	*	*	*	*

Source: Australian Bureau of Statistics (1988-1997)
* Information for lucerne was not collected during these seasons

The rate of application of superphosphate as kilograms per hectare over the pasture area fertilised and the entire pasture area is shown in Table 3. The rate of superphosphate per area fertilised increased in 1989 followed by a drop in 1990 (Table 3). Only a few farmers used fertiliser on a very small area of pasture in 1995, resulting in apparent high rates of application of superphosphate. The number of farmers using superphosphate decreased by half during the five years from 1990 to 1995.

Table 3 Rate of application of superphosphate (kg/ha)

Measure	1988	1989	1990	1995
Rate per area fertilised	81.4	93.3	80.8	122.8
Rate per entire pasture area	1.7	2.8	3.0	1.5
Rate on lucerne pastures	208.0	*	*	*

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

4 RECOMMENDATIONS

The aim of this report is to provide baseline information and establish trends in adoption of pasture management practices in the Mallee 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 measurement of the area of phalaris pastures sown in the region will be 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 getting reliable information to measure trends in adoption rates. The adoption rates estimated from the 1993/94 ABS data provides a reasonably reliable baseline and can be used to monitor future adoption of these practices. A question similar to the 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 be an acceptably accurate measure of pasture maintenance by top dressing although it does not provide 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 data, however, 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)……..

5 REFERENCES AND DATA SOURCES

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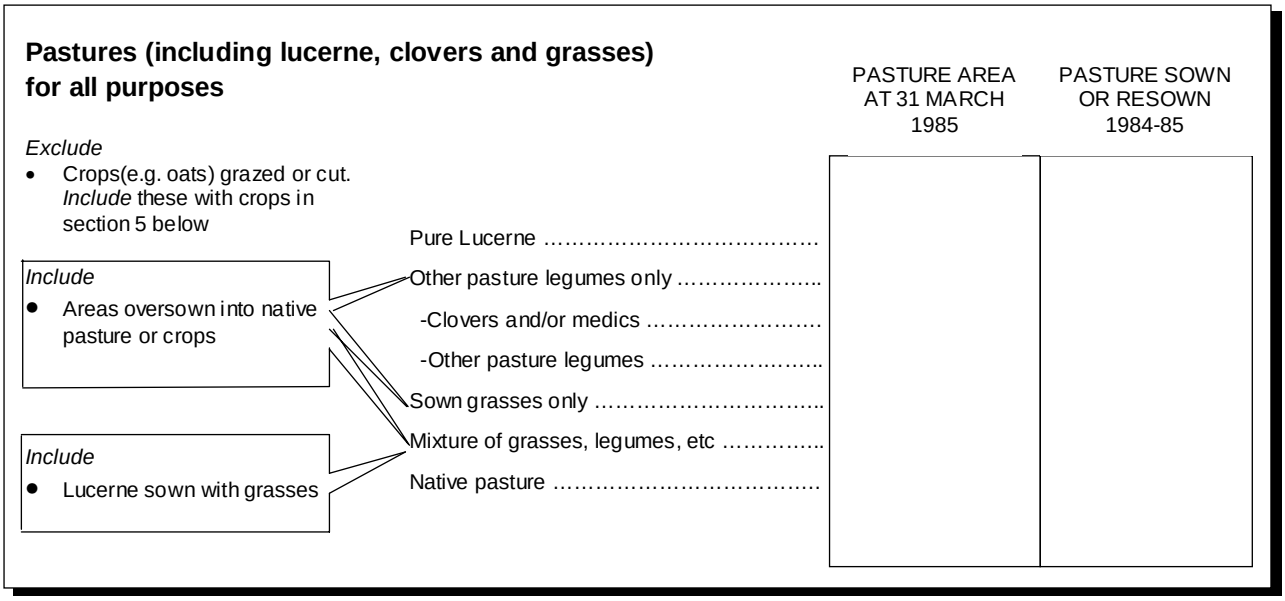
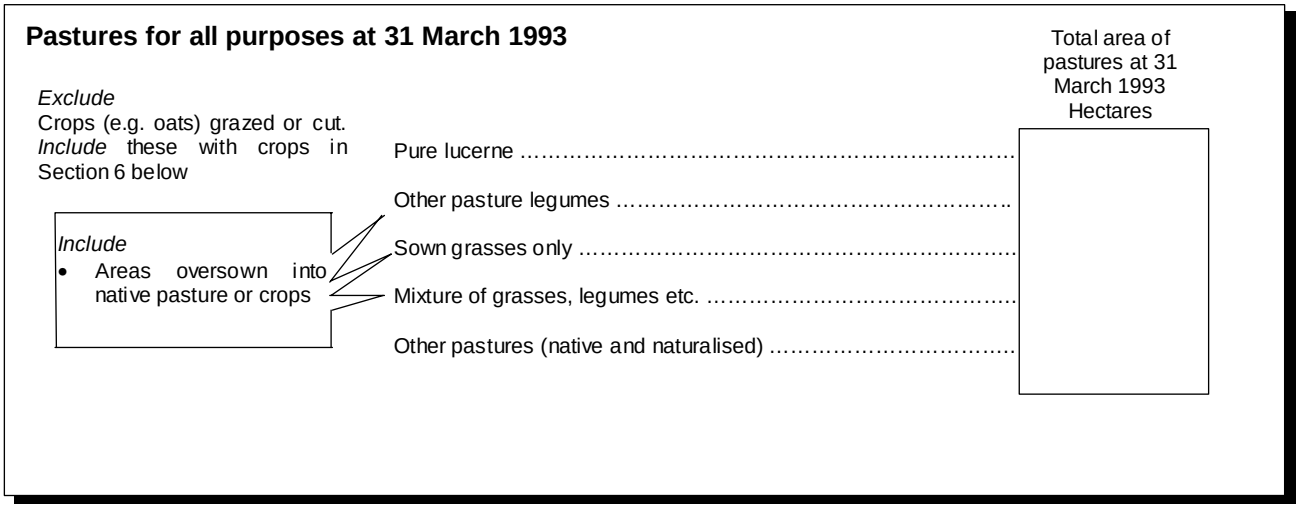
6 APPENDICES AUSTRALIAN BUREAU OF STATISTICS FARM CENSUS QUESTIONS

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

Area of existing pasture top-dressed with fertilisers specified below .....

Tonnes

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 .....