INTEGRATED PARASITE MANAGEMENT IN SHEEP PROJECT

BENCHMARK SURVEY

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iPM-sheep integrated parasite management

another australian wool innovation limited

The researchers of the Integrated Parasite Management in Sheep Project provided technical input into the content of the survey and data analysis, and provided the twelve point summary on the next page.

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SUMMARY OF THE BENCHMARK SURVEY FINDINGS

1. Flock composition leans very heavily towards ewes reflecting an increased emphasis towards sheep meat production. On average, ewes made up 50% of flocks, and wethers only 16%, the balance being mainly weaners. This creates great challenges for effective worm control because reproductive ewes typically contribute the majority of worm eggs on farms and wether paddocks are usually a good source of clean pastures.

2. On average, cattle made up 35% of the dry sheep equivalents but there was considerable range with 28% in Western Australia and 37% in the Northern Tablelands of NSW. Alternating grazing between sheep and cattle is one means for improving worm control and these figures suggest that this option is feasible in many regions of Australia.

3. Merino rams are joined to merino ewes for an average of 8 weeks and in many cases much longer. This exceeds the recommended period of 5 weeks, and may create problems for worm control because weaning and the shift to a clean paddock is delayed.

4. On average, 44% of producers use worm egg counts to monitor the need to drench. Those who do use worm egg counts typically check weaners 3 times per year, with this figure is generally higher in the Northern Tablelands of NSW and South Eastern Qld and lower in southern regions. This is generally encouraging, as worm egg count is the by far the best technique currently available for checking whether sheep, especially weaners, need drenching. However, worm egg count results sometimes need skilled interpretation, which make the results of the question about 'sources of advice' interesting (see below).

5. Who is interpreting the worm egg count results producers are obtaining? On average 76% of producers indicated they or their staff make the main worm control decisions, 18% from animal health and production advisors. There is a very good opportunity for producers to find and make use of a vet or agricultural adviser to help with interpreting worm egg counts and designing worm control programs: good advice invariably saves not just on drench costs but increases productivity, and may prove to be invaluable in slowing drench resistance. Surprisingly, only about 4% say that they ask reseller staff for advice.

6. On average, 48% of producers say they have conducted a drench resistance test of some kind, although of these, only 23% tested within the last two years. Drench resistance testing is an important part of IPMs because it allows the producer to construct a drench rotation that maximises efficacy and minimises the future development of resistance. Advisers generally recommend that resistance tests be conducted every 3 years. Of concern is that, of those indicating to have undertaken drench resistance testing, only 33% said they were using a faecal egg count reduction test or the DrenchRite test - the only recognised drench resistance tests. In summary, only 18% of producers had undertaken an industry accepted drench resistance test.

7. Using rams selected for resistance to worms was nominated by 14% of producers as one of their strategies for controlling worms. There was wide variation among regions, with 8% using worm resistant rams in the Central and Southern Tablelands and 24% in the Northern Tablelands of NSW. Of those using worm resistant rams, 73% indicated that the rams were selected on the basis of Australian Sheep Breeding Values.

8. On average across all regions, 44% of people use a contractor to mules their sheep; 43% do it themselves, or have family or friends do it; while 4% buy mulesed sheep and 9% do not mules Merino sheep. The proportion using mulesing contactors is highest in WA at 61%. These figures are consistent with other surveys.

9. The majority (61%) of producers said that their lambs' tails were docked level with the end of the vulva. This is the recommended length for tails and at this length minimises future breach strike.

10. On average, 20% of flocks across the regions surveyed had lice at last shearing, but this varied between 10% (central and southern tablelands of NSW) and 41% (Qld Granite Belt and Darling Downs). These figures are likely to be under-estimates, however, as they rely on people's subjective judgments: and lice can be difficult to confirm. Furthermore, many people treat routinely even when they can't see lice, and so mask any population that may have been present at shearing (see the next point).

11. Twenty two percent of producers surveyed 'never' treat for lice, while 22% treat only 'on detection'. This suggests that 56% of producers treat for lice either annually or otherwise regardless of lice being detected (see above). Again, there is huge variation: only 8% of Qld producers treated for lice 'never' or 'on detection', compared with 58% in the New England. It is understandable that producers in more extensive areas treat routinely because they have difficulty obtaining clean musters and do not handle sheep frequently. However, there is an opportunity to save on chemical and labour, reduce residues and slow resistance to lice products by treating only those mobs where lice are actually detected.

12. Backliners account for around 75% of shortwool lice treatments, and the vast majority of these are insect growth regulator chemicals such as triflumuron (e.g. Zapp®) or diflubenzuron (e.g. Magnum®). Over 80% of dips (mobile, plunge and shower) use diazinon. These findings are not surprising. They do however point to the enormous resistance pressure placed on two products - especially when people are using them every year. Diazinon is also under threat from the regulator over health and safety concerns and may well be deregistered later this year.

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EXECUTIVE SUMMARY

The IPM-sheep (Integrated Parasite Management – sheep) project, funded by Australian Wool Innovation Ltd, is devising and demonstrating integrated parasite control programs for the major sheep parasite areas within Australia.

Adoption of principles being developed in IPM-sheep across the wool industry will require producers to make incremental, but nevertheless significant, changes in their management approach. Integrated parasite management may involve changes in grazing management, animal husbandry operations and the timing of various management operations.

For these reasons, an understanding of current practices and the views of producers about parasite control are an important aspect of the design of technology transfer programs later in the project. Information for this aspect of the technology transfer has been obtained through a mail survey of producers in the main sheep parasite areas within Australia, as shown below.

A 10 page questionnaire was mailed to a random sample of 6362 producers in these areas in September and October of 2004, asking about their worm, blow fly and lice control practices. A response rate of 30.4 per cent was obtained with one reminder, with a further 21.9 per cent responding to a one page follow-up questionnaire which sought information on a small number of questions central to the project. This approach made it possible to detect, and control for, any non-response bias in the responses to the full questionnaire.

This report presents the results from the survey in a series of tables, starting with basic farm characteristics, clip characteristics and general animal husbandry practices and proceeding to a detailed examination of worm, blow fly and lice control practices in 2003 and in a typical year.

The main results are provided in the body of this report, together with basic explanatory information to assist in the reading of the tables. Appendix A1 provides further details on statistical aspects of the tables, together with a detailed account of the methods and the investigation of non-response bias.

Appendix A2 contains additional and more detailed tables, and these are referred to in the body of the report adjacent to the basic tables on the same topic. Appendix A3 contains copies of the questionnaires.

The results establish a benchmark against which the results from a second survey in two years time can be compared to establish the trends in sheep parasite control in the main sheep parasite areas. As this report is simply presenting these benchmark figures, no interpretation of these figures has been provided.

ACKNOWLEDGMENTS

The benchmark survey was funded by Australian Wool Innovation Ltd as part of the IPM-sheep project.

The assistance of the Board of Management of the IPM-sheep project in developing the content of the questionnaires, designing the analysis approach and reviewing the draft report is greatly appreciated.

We are indebted to the farmers who kindly gave their time to fill in the questionnaire and without whom the benchmark study would not have been possible. Those who took the trouble to supply additional information and comment are thanked for the valuable insights they provided.

Survey logistics and data entry was managed by Ruth McGregor.

1 INTRODUCTION

The IPM-sheep (Integrated Parasite Management–sheep) project, funded by Australian Wool Innovation Ltd, is devising and demonstrating integrated parasite control programs for the major sheep parasite areas within Australia. The primary focus of the project is mainstream wool producers. The institutions involved are University of New England, Department of Primary Industries and Fisheries, Queensland, Western Australian Department of Agriculture and University of Melbourne.

Adoption of principles being developed in IPM-sheep across the wool industry will require producers to make incremental, but nevertheless significant, changes in their management approach. Integrated parasite management may involve changes in grazing management, animal husbandry operations and the timing of various management operations. These changes may require producers to entertain a broader range of practices for parasite control than that to which they are accustomed. There may also be production and business risks associated with changes in parasite management which will play an important role in the adoption of integrated parasite management practices and the ultimate success of the project. For these reasons, an understanding of current practices and the views of producers about parasite control are an important aspect of the design of technology transfer programs later in the project. Information for this aspect of the technology transfer is being supplied by the socio-economic component of the IPM-sheep project.

AIMS OF THE SOCIO-ECONOMIC COMPONENT OF IPM-SHEEP

To quantify regional key performance indicators.

To determine regional parasite control practices.

To investigate and solve on-farm and industry barriers to adoption

To achieve the above aims, two benchmark surveys of wool producers are to be conducted, one close to project commencement, and a second one after several years of the project have elapsed. In addition, a program of focus groups and interviews with producers is to be undertaken.

This report presents the findings of the first benchmark survey.

The findings are divided between the main body of the report and Appendix A2. Basic tables are provided in the main body of the report, while in Appendix A2 are the more detailed tables or summaries of information from respondents in response to the “Other ...” section of questions. When additional information on a particular topic is available in Appendix A2, this is noted in the main body of the report in the section on that topic.

Details of the methodology are kept to a minimum in the main body of the report, with a detailed description of the methods used, including the investigation of, and adjustment for, non-response bias presented in Appendix A1. Copies of the questionnaires are provided in Appendix A3.

2 METHODS

2.1 Survey

The methods are described in full in Appendix A1. The results presented in this report are based on a random sample of wool producers drawn from a list of levy-payer addresses supplied by Australian Wool Innovation Ltd. The list covers postcode areas in the regions identified by regional IPM-sheep project managers as being within the 'sphere of influence' of the programs they intended to run. The content of the questionnaire was pilot tested in a mail out to 300 addresses from this list. On the basis of a satisfactory number of correctly filled out responses received in the first two weeks after mailing, the main survey was proceeded with. A copy of the questionnaire is provided in Appendix A3. This questionnaire was mailed out to 6362 addresses during September 2004, with a reminder and second copy of the questionnaire mailed out to non-responders a month later. A short one-page questionnaire containing a small number of key questions was mailed to remaining non-responders several weeks after the reminder. The survey data to be analysed for this report was taken as all questionnaires received by 10 February 2005. The final response rates are shown in Table 2.1. Further details of the final response rates are provided in Appendix A1.5.

Table 2.1 Survey response rates for the main questionnaire and the short one-page questionnaire.

Region	Response rate – full questionnaire (%)	Response rate – full questionnaire together with short questionnaire (%)
QLD	33.5	51.3
New England	35.7	56.5
NSW(remainder)	31.0	54.9
VIC	34.3	55.6
SA	37.3	56.5
WA	20.3	42.1
TOTAL	30.4	52.3

2.2 Analysis

A number of quality control procedures were carried out with the survey data, including testing for non-response bias, caused when those responding to the survey are systematically different in particular respects to those not responding. These procedures are fully described in Appendix A1. A range of analysis techniques were used according to the information that was required from the data and a full description of these techniques is given in Appendix A1.

As described in sections A1.8 to A1.10 in Appendix 1, a comparative analysis of the data from those who filled in the full survey and those who did not respond to the full survey, but responded to the short survey, suggested that there is some minor non-response bias present in the responses to the full survey. This includes under-representation of producers with greater numbers of cattle and under-representation of producers who had tested their sheep flock for drench resistance (for a full listing of significant differences between those responding to the full and short surveys, see Tables A1.2 to A1.11 in section A1.8 of Appendix 1). It was concluded from the analysis that the level of non-response bias was not sufficient to warrant adjusting all the findings from the full survey. However, the importance of the small set of questions chosen for the short survey (and common with the full survey) to the aims of the IPM-sheep project was considered as sufficient grounds for adjusting the findings from these questions to compensate for any non-response bias and provide the best possible estimates for generalising to the overall sheep producer population. A full account of the reasoning and

supporting data for this decision is given in sections A1.9 and A1.10 in Appendix 1. Tables with adjusted figures include those relating to:

- total cattle and sheep numbers,
- testing for drench resistance,
- factors considered to be important in deciding when to drench ewes,
- grazing strategies, and
- treatments for blowfly strike.

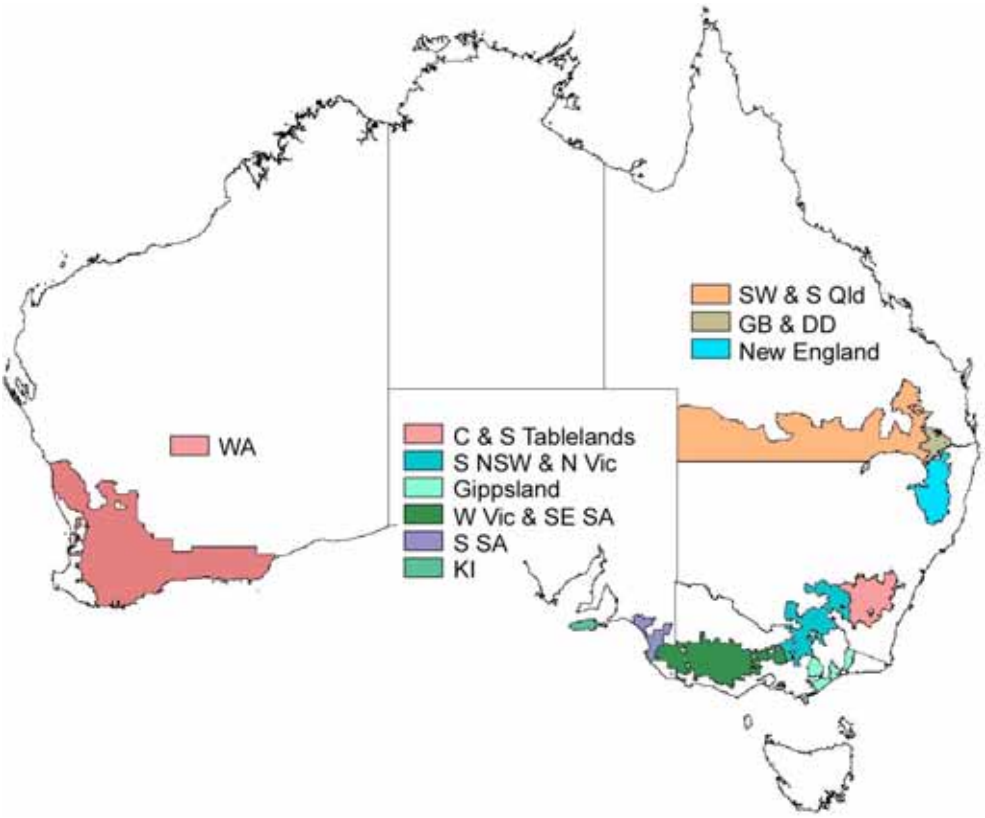
Tables with adjusted figures are noted as such where they occur in the report.

3 RESULTS

3.1 Location of Respondents

The regions from which responses were received are shown in Figure 3.1, below. The figure also shows the regions into which respondents have been grouped for the reporting of results in the ensuing sections. The number of responses from each postcode area within these regions is shown in Figure 3.2, below.

Figure 3.1 Regions in which respondents were located.

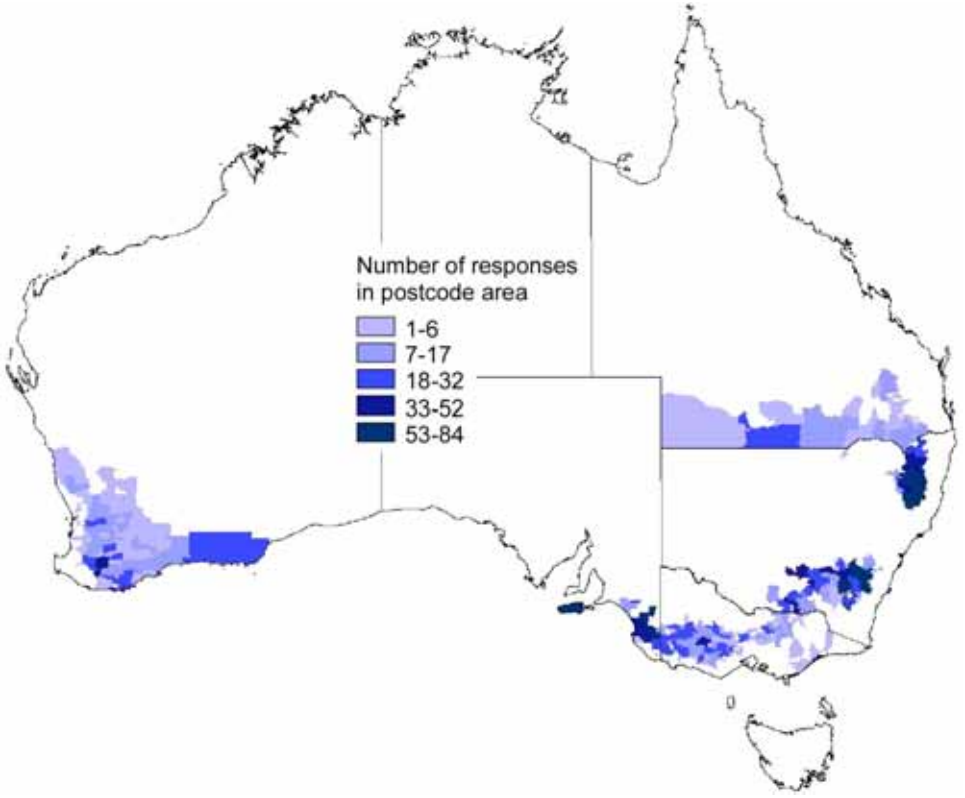


Abbreviation	Region
SW & S Qld	South western and southern Queensland
GB & DD	Queensland Granite Belt and Darling Downs
New England	New England region of New South Wales
C & S Tablelands	Central and southern tablelands of New South Wales
S NSW & N Vic	Southern New South Wales and northern Victoria
Gippsland	Gippsland region of Victoria
W Vic & SE SA	Western Victoria and south eastern South Australia
S SA	Southern region of South Australia
KI	Kangaroo Island
WA	South western region of Western Australia

3.1.1 Regional frequency of responses

The geographical distribution of responses is shown in Figure 3.2, below, together with the total number of usable responses to the full and short surveys from each of the regions in Figure 3.1 on the previous page.

Figure 3.2 Frequency of responses in each postcode area from which responses were received.



Region	Usable responses to full survey	Usable responses to short survey	Total
SW & S Qld	63	40	103
GB & DD	24	9	33
New England	179	105	284
C & S Tablelands	186	133	319
S NSW & N Vic	171	144	315
Gippsland	12	9	21
W Vic & SE SA	378	230	608
S SA	71	39	110
KI	42	13	55
WA	209	235	444
All regions	1335	957	2292

EXPLANATION OF TABLES

The tables presented in the ensuing sections show the results for each of the regions in Figure 3.1, above, as well as the results for all regions combined. The tables are of three types, depending on the type of data each question generated.

For continuous data, such as property size or flock size, the sample size (n), the minimum, median and maximum values, the mean and the 95% confidence interval on the estimate of the mean are provided. A small histogram of the frequency distribution is also provided. More information on the statistics presented in association with the summary tables for continuous data is provided in Appendix A1.11.1.

A number of questions provided ordinal data, such as ranking of importance of factors used in deciding whether to drench ewes. For these question, the findings are presented as proportions of respondents in each category. Where space permits, the upper and lower 95 per cent confident limits on the estimate of the proportion are provided in grey text either side of the proportion itself. The sample size (n) is also provided. Where the percentage in an individual cell is significantly higher than the percentage across all regions, this is indicated by bolding and underlining the percentage. When the percentage in an individual cell is significantly lower than the percentage across all regions, this is indicated by bolding only. For more information on the statistics presented in association with summary tables for ordinal data, see Appendix A1.11.2.

For nominal data, such as type of grazing strategy used, the findings are presented in the same way as for ordinal data, as described above.

Where questions are such that respondents could tick more than one choice, or give multiple answers, it is not possible to use a chi square test for significant regional differences. The tables of results for these questions carry a footnote explaining that the percentages for any one region sum to more than 100, due to the multiple choice or answers. More information on the analysis of multiple choice questions is given in Appendix A1.11.3.

Respondents who failed to complete particular questions are omitted from the tables that report on those questions. For this reason, the sample size reported in the table column headed “n” will vary from table to table and will generally be less than the 1335 full survey responses and the 957 short survey responses. In some cases, where a question was asked in both the full and short surveys, the percentages reported in tables are based on both surveys. More information on how the full and short survey data was used to adjust for the slight non-response bias in the full survey is provided in Appendix A1.10.

3.2 Respondent age and gender

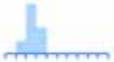
There were no significant differences between the regions in the age or gender composition of respondents. Across all regions, the mean age of respondents was 51 years, and 95 per cent of respondents were males. Further details of the age and gender composition of respondents are provided in Appendices A2.1 and A2.2.

3.3 Property Details

Respondents were asked to provide a range of details about their property, including the average annual rainfall, the rainfall in 2003, the proportion of their income derived from various sources and the areas under various land uses.

3.3.1 Rainfall

3.3.1.1 Mean annual rainfall in district (mm)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	62	229	508	800	517	35	
GB & DD	21	635	700	750	688	13	
New England	174	620	813	1250	827	13	
C & S Tablelands	183	178	650	1628	637	20	
S NSW & N Vic	168	250	593	950	590	19	
Gippsland	12	600	633	712	639	21	
W Vic & SE SA	371	203	610	914	614	10	
S SA	68	330	487	660	512	22	
KI	42	457	563	825	575	26	
WA	202	203	450	1143	473	20	
All Regions	1303	178	610	1628	611	8	

Histogram class limits: 100-260-420-580-740-900-1060-1220-1380-1540-1700.
Anova: F=117.35, d.f.=9, p<0.0005.

Comparison of 2003 rainfall with average annual rainfall showed that the northern regions had experienced a drier than average year in 2003, while the southern regions had experienced a wetter 2003. For example, half of respondents in south western and southern Queensland had experienced a deficit of over 98mm in 2003 compared to the annual average for their district. The corresponding figure for the Granite Belt and Darling Downs was 120mm. Regions further south in eastern Australia

also suffered deficits in 2003, although not as great as in Queensland. However, many respondents from the southern region of South Australia and from Kangaroo Island reported higher than average rainfalls for 2003. For example, half of Kangaroo Island respondents reported a 23mm or greater increase in rainfall in 2003 compared to their district average. In Western Australia, half of respondents reported more rainfall in 2003 than their district average and half reported less.

3.3.2 Income sources

3.3.2.1 Proportion of income derived from sheep and wool (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	60	10	72	100	68	7	
GB & DD	22	40	90	100	78	10	
New England	173	18	72	100	71	3	
C & S Tablelands	181	15	80	100	76	3	
S NSW & N Vic	170	0	58	100	58	4	
Gippsland	12	17	95	100	74	18	
W Vic & SE SA	372	10	70	100	70	2	
S SA	70	8	50	100	55	6	
KI	41	20	90	100	79	7	
WA	204	7	55	100	56	4	
All Regions	1305	0	70	100	67	1	

Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=14.52, d.f.=9, p<0.0005.

3.3.2.2 Other sources of income

Across all regions, the mean proportion of income derived from beef cattle was 12.5 per cent. The mean proportion of income from beef was significantly different across the regions (anova: F=21.25, d.f.=9, p<0.0005). The highest mean proportion of income from beef was in the New England region, with 24.4 per cent, while the lowest proportion was in Western Australia, with 4.1 per cent.

The mean proportion of income derived from cropping was 17.0 per cent across all regions, and this was also significantly different across the regions (anova: F=40.29, d.f.=9, p<0.0005). The highest mean proportion occurred in Western Australia (37.0 per cent) and the lowest in the New England region (0.9 per cent).

The mean proportion of income derived from sources other than sheep, beef and cropping was 3.5 per cent and there was no significant difference between the regions. Across all regions, 84.0 per cent of respondents had no income derived from sources other than sheep, beef and cropping, while 97.7 per cent derived over half of their income from sheep, beef and/or cropping.

Among those with income from sources other than sheep, beef and cropping, 58.5 per cent derived income from some other primary production (such as dairying, goats, pigs, grapes, olives), 17.0 per cent worked off-farm and 13.0 per cent derived income from off-farm investment.

3.3.3 Types of sheep and wool income

Considering just income from sheep and wool, respondents could be separated using cluster analysis (see Appendix A1.12) into two groups: those mainly dependent on meat sheep (first and second cross prime lambs or store lambs), and those mainly dependent on income from wool sales. These two groups are labelled "Group 1" and "Group 2" in the two tables below.

Income source	Mean percentage of income*		Significance of difference between means (t-test)
	Group 1	Group 2	
Wool sales	26.8	67.9	p<0.0005
Sheep sales (stores, culls and cast for age, boat wethers	10.1	24.7	p<0.0005
First cross ewe sales for breeding	2.2	1.4	n.s.
Meat sheep (1st or 2nd cross prime or store lambs)	60.9	6.0	p<0.0005

** income from each of the categories in the left hand column of the table, as a percentage of total income derived from wool sales, sheep sales, first cross ewe sales and meat sheep.*

Region	n	Proportion of respondents in Groups 1 and 2 (%)					
		Group 1			Group 2		
SW & S Qld	60	4	**12**	20	80	87	96
GB & DD	22	0	9	21	79	91	100
New England	173	11	**17**	22	78	83	89
C & S Tablelands	181	16	22	28	72	78	84
SW NSW & NE Vic	169	35	**43**	50	50	**58**	65
Gippsland	12	1	25	50	51	75	100
W Vic & SE SA	372	31	**36**	41	59	64	69
S SA	70	37	**49**	60	40	**51**	63
KI	41	6	17	29	71	83	94
WA	204	11	**16**	21	79	**84**	89
All regions	1304	**25**	28	**30**	**70**	73	**75**

$\chi 2 = 89.439$, d.f. = 9, $p < 0.0005$.

As the table above shows, there were significant differences between regions in the proportions of respondents in Group 1 (sheep and wool income mainly from meat sheep) and Group 2 (sheep and wool income mainly from wool sales). South-western New South Wales and north-eastern Victoria, western Victoria and south-eastern South Australia, and southern South Australia have relatively more

producers whose sheep and wool income is mainly from meat sheep, while Western Australia has relatively more producers whose sheep and wool income is mainly from wool sales.

3.3.4 Property size and land use

Respondents were asked to provide the areas of their properties under various grazing, cropping and other land uses, as well the total property area. For 53.3 per cent of respondents, the areas under the various grazing, cropping and other land uses were equal to the total property area. For the remainder, there were minor to very large disparities between the sum of areas and the total property areas, due mainly to either the omission of areas or the double counting of part or all of the four land uses: "Area grazed", "Area cropped", "Cropping area grazed as stubble" and "Cropping area grazed as green". The procedures followed to provide the best estimates of land use areas and total property area are described in Appendix A1.7.1.

3.3.4.1 Total area of property (ha)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	62	140	7,285	161,880	18,909	8,027	
GB & DD	23	283	2,320	7,285	2,749	852	
New England	178	51	874	5,261	1,119	138	
C & S Tablelands	183	86	700	8,903	987	159	
S NSW & N Vic	170	108	738	40,470	1,338	523	
Gippsland	12	255	443	3,830	1,051	714	
W Vic & SE SA	374	72	671	64,752	1,226	378	
S SA	71	123	1,200	9,308	1,547	333	
KI	41	62	672	2,752	692	151	
WA	208	95	1,576	11,900	2,027	237	
All Regions	1322	51	871	161,880	2,174	440	

Histogram class limits: 0-610-1220-1830-2440-3050-3660-4270-4880-5490-6100
Anova: F=38.71, d.f.=9, p<0.0005.
***Note**: respondents with properties larger than 6,000 ha (57) have been excluded from the histograms (and **only** from the histograms) to prevent the property size distribution being reduced to a single bar, due to the influence of the small number of very large properties.*

3.3.4.2 Proportion of total property area grazed (incl. cropping areas grazed (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	61	64	100	100	95	2	
GB & DD	22	85	100	100	96	2	
New England	178	40	100	100	97	1	
C & S Tablelands	183	33	100	100	92	2	
S NSW & N Vic	169	10	96	100	86	3	
Gippsland	12	50	92	100	87	10	
W Vic & SE SA	373	15	100	100	91	2	
S SA	71	37	96	100	89	4	
KI	41	56	89	100	85	4	
WA	208	18	90	100	83	3	
All Regions	1318	10	100	100	90	1	

Histogram class limits:10-19-28-37-46-55-64-73-82-91-100
Anova: F=12.06, d.f.=9, p<0.0005.

3.3.4.3 Proportion of total property area cropped (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	61	0	0	40	6	3	
GB & DD	22	0	0	18	3	2	
New England	178	0	0	33	2	1	
C & S Tablelands	183	0	5	75	14	3	
S NSW & N Vic	169	0	25	100	28	4	
Gippsland	12	0	0	49	8	10	
W Vic & SE SA	373	0	6	89	15	2	
S SA	71	0	8	89	21	6	
KI	41	0	7	58	12	5	
WA	208	0	33	96	34	3	
All Regions	1318	0	7	100	17	1	

Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=41.09, d.f.=9, p<0.0005.

3.3.4.4 Proportion of cropping area grazed as stubble (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	20	0	0	100	35	20	
GB & DD	7	0	0	100	21	36	
New England	56	0	0	100	13	9	
C & S Tablelands	108	0	46	100	48	9	
S NSW & N Vic	133	0	50	100	51	8	
Gippsland	6	0	0	0	0	0	
W Vic & SE SA	221	0	33	100	47	6	
S SA	45	0	62	100	56	14	
KI	27	0	18	100	40	18	
WA	187	0	100	100	68	6	
All Regions	810	0	50	100	50	3	

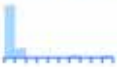
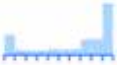
Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=9.36, d.f.=9, p<0.0005.

3.3.4.5 Proportion of cropping area grazed as green (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	20	0	13	100	25	17	
GB & DD	7	0	16	100	28	34	
New England	56	0	100	100	59	13	
C & S Tablelands	108	0	0	100	22	7	
S NSW & N Vic	133	0	0	100	7	3	
Gippsland	6	0	25	100	42	52	
W Vic & SE SA	221	0	0	100	13	4	
S SA	45	0	0	100	8	7	
KI	27	0	0	0	0	0	
WA	187	0	0	100	6	3	
All Regions	810	0	0	100	15	2	

Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=21.60, d.g.=9, p<0.0005.

3.3.4.6 Proportion of pastures improved (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	62	0	5	100	29	10	
GB & DD	23	0	0	100	15	13	
New England	179	0	60	100	55	5	
C & S Tablelands	185	0	80	100	70	5	
S NSW & N Vic	170	0	87	100	72	5	
Gippsland	12	20	68	100	66	20	
W Vic & SE SA	375	0	90	100	76	3	
S SA	71	0	90	100	79	7	
KI	42	0	100	100	82	10	
WA	208	0	95	100	76	5	
All Regions	1327	0	84	100	69	2	

Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=24.70, dig.=9, p=0.0005.

3.3.4.7 Number of paddocks

Almost one fifth of respondents (18.1 per cent) did not provide the number of paddocks in their response to Question 4. Using the information provided by the remainder, the number of paddocks and its distribution is not substantively different between the regions (although it is still statistically significant: F=3.40, d.f.=9, p=0.001). The mean number of paddocks ranged from 20 in the Granite Belt and Darling Downs to 39 in South Australia, with a national mean of 30. Across all regions, the 90 per cent of respondents had less than 55 paddocks.

3.3.4.8 Average paddock size (ha)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	55	19	283	5153	773	284	
GB & DD	17	18	168	438	164	62	
New England	148	6	33	111	37	4	
C & S Tablelands	150	6	28	144	33	3	
S NSW & N Vic	137	7	31	1349	49	20	
Gippsland	12	9	29	157	47	30	
W Vic & SE SA	311	5	27	1294	44	12	
S SA	60	5	35	354	44	12	
KI	32	9	24	61	27	5	
WA	170	5	58	231	66	6	
All Regions	1092	5	33	5153	84	17	

Histogram class limits: 0-46-92-138-184-230-276-322-368-414-460.
Anova: F=50.87, d.f.=9, p<0.0005.
***Note**: respondents with average paddock sizes larger than 500 ha (27) have been excluded from the histograms (and **only** from the histograms) to prevent the average paddock size distribution being reduced to a single bar, due to the influence of the small number of very large average paddock sizes.*

3.3.5 Cattle

3.3.5.1 Proportion of respondents with cattle in a typical year

Region	n	Proportion with cattle (%)		
SW & S Qld	102	79	**86**	92
GB & DD	30	57	73	89
New England	279	85	**89**	92
C & S Tablelands	313	47	53	58
SW NSW & NE Vic	311	47	53	58
Gippsland	21	44	65	85
W Vic & SE SA	600	51	55	59
S SA	110	56	65	74
KI	53	33	47	60
WA	444	19	**23**	27
All regions	2263	51	53	55

$\chi 2 = 359.686$, d.f. = 9, $p < 0.0005$.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.3.5.2 Cattle DSEs in a typical year

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	54	180	3203	18400	4395	1184	
GB & DD	12	48	1427	8236	2313	1634	
New England	151	19	2091	32210	2929	577	
C & S Tablelands	91	42	946	17650	1916	614	
S NSW & N Vic	90	24	1102	11032	1956	483	
Gippsland	7	131	359	9055	1775	3012	
W Vic & SE SA	215	12	1437	43300	2443	522	
S SA	43	259	1924	8790	2692	698	
KI	19	206	770	2866	1029	423	
WA	43	24	1750	14450	2412	866	
All Regions	725	12	1444	43300	2530	249	

Histogram class limits: 0-1000-2000-3000-4000-5000-6000-7000-8000-9000-10000.
Anova: F=3.20, d.f.=9, p=0.001.
***Note**: respondents with average cattle DSEs greater than 10,000 (23) have been excluded from the histograms (and **only** from the histograms) to prevent the average cattle DSE distribution being reduced to a single bar, due to the influence of the small number of very large average cattle DSEs.*

3.3.5.3 2003 compared to a typical year

Respondents with cattle who were carrying the same number of cattle DSEs in 2003 as in a typical year comprised 47.6 per cent of the sample. Those who were carrying less cattle in 2003 than in a typical year comprised 37.8 per cent of the sample, while the remaining 14.6 per cent of respondents were carrying more cattle DSEs in 2003, compared to a typical year.

There was a significant different between the regions in the proportions of respondents who were carrying more, less or the same cattle DSEs in 2003, compared to a typical year ($\chi 2=66.01$, d.f.=18, $p<0.0005$). Across the southern Australian regions, over 50 per cent of respondents were carrying the same number of cattle DSEs as in a typical year, with as many as 30 per cent carrying more in 2003 than in a typical year. The proportion who were carrying the same number of cattle DSEs declined northwards, to 25 per cent in the Granite Belt and Darling Downs. In south western and southern Queensland, 57 per cent of respondents were carrying fewer cattle DSEs in 2003 than in a typical year. Further details are provided in Appendix A2.3.

3.3.5.4 Calving

There were significant differences between the regions in the length of the calving period for cows (anova: F=4.85, d.f.=9, p<0.0005), with relatively longer mean calving periods around four months in duration in south western and southern Queensland, Granite Belt and Darling Downs, and southern South Australia. The mean length of calving period in the other regions was around 2.5 months. The mean length of calving period for heifers across all regions was 2.3 months, and there was no significant difference between the regions in the length of the calving period for heifers. Further details on calving periods are provided in Appendix A2.4 – A2.5.

Time of calving tended to be later in the calendar year in northern regions – around August to October – and earlier in the southern regions – around March to April. Further details on the time of calving are provided in Appendix A2.6 – A2.7.

3.3.6 Sheep

3.3.6.1 Sheep DSEs in a typical year

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	63	600	6000	72585	8773	2747	
GB & DD	24	500	3234	8846	3373	941	
New England	179	50	3570	28670	4871	648	
C & S Tablelands	186	22	2971	50750	4794	890	
S NSW & N Vic	171	6	2596	21687	3484	492	
Gippsland	12	1193	2728	17570	4564	3152	
W Vic & SE SA	378	420	3068	39200	4288	408	
S SA	71	680	2630	16240	4078	871	
KI	42	625	3750	15820	4170	955	
WA	209	300	4405	53150	5798	782	
All Regions	1335	6	3300	72585	4753	279	

Histogram class limits: 0-2000-4000-6000-8000-10000-12000-14000-16000-18000-20000.
Anova: F=7.23, d.f.=9, p<0.0005.
***Note**: respondents with average sheep DSEs of 20,000 and over (21) have been excluded from the histograms (and **only** from the histograms) to prevent the average sheep DSE distribution being reduced to a single bar, due to the influence of the small number of very large average sheep DSEs.*

3.3.6.2 2003 compared to a typical year

The figures for all regions and the regional pattern of differences between sheep DSEs in 2003 and in a typical year was very similar to that for cattle. Across all regions, 47.5 per cent of respondents carried the same number of sheep DSEs in 2003 as they did in a typical year, while 38.5 per cent carried less and 14.0 per cent carried more. The proportion of respondents carrying less DSEs in 2003 than in a typical year increased from 20-30 per cent in southern Australia to 70 per cent in south western and southern Queensland. Further details are provided in Appendix A2.8.

3.3.6.3 Flock composition in a typical year – ewes as a proportion of the total flock (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	63	0	46	100	44	7	
GB & DD	24	0	1	99	18	12	
New England	179	0	43	99	45	3	
C & S Tablelands	186	0	49	100	54	4	
S NSW & N Vic	171	0	52	100	57	4	
Gippsland	12	28	42	98	55	17	
W Vic & SE SA	378	0	50	100	56	3	
S SA	71	0	62	100	65	5	
KI	42	29	51	99	53	5	
WA	209	0	53	100	55	2	
All Regions	1335	0	50	100	53	1	

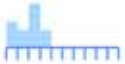
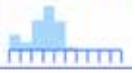
Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=12.61, d.f.=9, p<0.0005.

3.3.6.4 Flock composition in a typical year – wethers as a proportion of the total flock (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	63	0	23	100	32	9	
GB & DD	24	0	99	100	75	15	
New England	179	0	27	100	27	3	
C & S Tablelands	186	0	21	100	22	3	
S NSW & N Vic	171	0	0	100	16	3	
Gippsland	12	0	31	47	25	11	
W Vic & SE SA	378	0	17	100	21	3	
S SA	71	0	0	100	8	4	
KI	42	0	24	49	23	4	
WA	209	0	8	100	12	2	
All Regions	1335	0	16	100	21	1	

Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=25.03, d.f.=9, p<0.0005.

3.3.6.5 Flock composition in a typical year – weaners as a proportion of the total flock (%)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	63	0	22	100	23	5	
GB & DD	24	0	0	39	6	5	
New England	179	0	26	100	26	2	
C & S Tablelands	186	0	25	100	23	2	
S NSW & N Vic	171	0	26	100	26	3	
Gippsland	12	0	22	33	19	8	
W Vic & SE SA	378	0	23	100	22	2	
S SA	71	0	25	54	26	4	
KI	42	0	23	50	23	3	
WA	209	0	33	89	31	2	
All Regions	1335	0	25	100	25	1	

Histogram class limits: 0-10-20-30-40-50-60-70-80-90-100.
Anova: F=8.60, d.f.=9, p<0.0005.

3.4 Wool Cut and Fibre Diameter

3.4.1.1 Adult breeding ewe wool cut and fibre diameter by breed – all regions

	Merino	Merino crosses	Dual purpose breeds	Meat breed	Data given for several breeds
n	668	78	17	5	44
Average cut per head - kg*	5.04	4.52	5.26	3.90	4.48
n	766	72	23	5	50
Average fibre diameter - µ	19.94	28.35	26.64	28.60	26.02

Cut per head - anova: F=6.41, d.f.=4, p<0.0005; fibre diameter – anova: F=462.46, d.f.=4, p<0.0005.
**Figures for wool cut may slightly underestimate the greasy wool cut, due to the way this question was asked – further details are provided in section A1.14*

3.4.1.2 Sheep other than ewes

For wethers and weaners, there were insufficient data supplied by respondents to warrant reporting wool cut and fibre diameters for any breed other than Merino. Across all regions, Merino dry ewes and wethers averaged 5.27kg per head wool cut and 19.79µ fibre diameter. The corresponding figures for Merino weaners were 2.55kg per head wool cut and 18.70µ fibre diameter.

3.4.1.3 Wool cut (kg/head*), 2003 clip, adult sheep (breeding ewes, dry ewes and wethers) - Merino

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	38	3.4	4.8	7.0	4.8	0.3	
GB & DD	12	3.1	4.5	7.0	4.4	0.6	
New England	106	2.3	4.2	8.0	4.3	0.2	
C & S Tablelands	91	2.9	5.0	9.0	5.1	0.3	
S NSW & N Vic	81	3.2	5.4	7.8	5.5	0.2	
Gippsland	4	4.0	5.6	6.0	5.3	1.5	
W Vic & SE SA	179	2.6	5.3	8.7	5.3	0.2	
S SA	44	4.5	6.3	8.0	6.2	0.3	
KI	23	3.0	5.6	7.4	5.7	0.4	
WA	123	3.0	5.2	7.5	5.3	0.2	
All Regions	701	2.3	5.0	9.0	5.2	0.1	

Histogram class limits: 2.20-2.88-3.56-4.24-4.92-5.6-6.28-6.96-7.64-8.32-9.00.
Anova: F=19.07, d.f.=9, p<0.0005.

**Figures for wool cut may slightly underestimate the greasy wool cut, due to the way this question was asked – further details are provided in section A1.14*

3.4.1.4 Wool cut (kg/head*), 2003 clip, adult sheep (breeding ewes, dry ewes and wethers) - Other breeds

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	6	2.5	4.3	6.9	4.3	1.6	
GB & DD	1**						
New England	17	3.2	4.1	6.0	4.2	0.4	
C & S Tablelands	38	2.7	4.8	6.5	4.7	0.3	
S NSW & N Vic	36	2.0	4.3	8.1	4.6	0.4	
Gippsland	4	3.3	5.0	7.4	5.1	3.0	
W Vic & SE SA	96	2.3	4.8	9.3	4.9	0.2	
S SA	10	2.8	4.8	8.0	5.0	1.0	
KI	4	4.3	5.0	6.2	5.1	1.4	
WA	18	3.9	5.3	7.2	5.4	0.5	
All Regions	230	2.0	4.6	9.3	4.8	0.1	

Histogram class limits: 2.00-2.73-3.46-4.19-4.92-5.65-6.38-7.11-7.84-8.57-9.3.
Anova: F=2.01, d.f.=9, p=0.039.

** Figures for wool cut may slightly underestimate the greasy wool cut, due to the way this question was asked – further details are provided in section A1.14*

*** Figures for this single respondent have been omitted for confidentiality reasons. The respondent's data is included in the figures for all regions and the anova statistics.*

3.4.1.5 Fibre diameter (μ), 2003 clip, adult sheep (breeding ewes, dry ewes and wethers) - Merino

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	38	15.1	20.4	22.0	20.1	0.5	
GB & DD	11	16.9	18.3	21.0	18.7	0.9	
New England	120	15.5	18.2	20.5	18.3	0.2	
C & S Tablelands	102	16.7	19.0	23.0	19.3	0.3	
S NSW & N Vic	91	15.6	20.0	23.5	20.2	0.3	
Gippsland	6	17.6	19.6	20.1	19.2	1.1	
W Vic & SE SA	207	16.5	20.0	24.0	20.0	0.2	
S SA	45	18.5	22.0	24.0	21.8	0.4	
KI	25	20.0	21.8	23.8	21.7	0.3	
WA	145	17.5	20.6	23.0	20.6	0.2	
All Regions	790	15.1	20.0	24.0	19.9	0.1	

Histogram class limits: 15-15.9-16.8-17.7-18.6-19.5-20.4-21.3-22.2-23.1-24.
Anova: F=44.26, d.f.=9, p<0.0005.

3.4.1.6 Fibre diameter (μ), 2003 clip, adult sheep (breeding ewes, dry ewes and wethers) - other breeds

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	2	24.9	28.5	32.0	28.5	45.1	
GB & DD	1*						
New England	10	18.4	28.0	35.0	26.9	3.2	
C & S Tablelands	19	18.2	28.0	32.0	28.2	1.4	
S NSW & N Vic	31	19.2	28.0	31.0	26.9	1.1	
Gippsland	3	27.3	28.0	29.0	28.1	2.2	
W Vic & SE SA	68	20.0	28.0	33.0	27.8	0.6	
S SA	9	24.0	28.0	30.0	27.4	1.6	
KI	2	22.5	23.0	23.5	23.0	6.2	
WA	4	20.0	20.5	21.6	20.7	1.1	
All Regions	149	18.2	28.0	35.0	27.3	0.5	

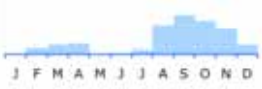
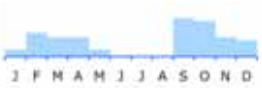
Histogram class limits: 18.0-19.7-21.4-23.1-24.8-26.5-28.2-29.9-31.6-33.3-35.0.
Anova: F=3.62, d.f.=9, p<0.0005.
** Figures for this single respondent have been omitted for confidentiality reasons. The respondent's data is included in the figures for all regions and the anova statistics.*

Separate figures by region for wool cut and fibre diameter for Merino sheep in the following classes: breeding ewes, dry ewes and wethers, and weaners, are provided in Appendices A2.9-A2.14. There were insufficient numbers of respondents within each region with other breeds in these classes to warrant the calculation of regional tables.

3.5 Animal Husbandry (Other Than Parasite Management)

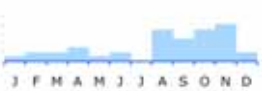
3.5.1 Shearing and crutching

3.5.1.1 Proportion of respondents shearing and crutching ewes in each month of the year

Region	n	Proportion of respondents shearing in month	n	Proportion of respondents crutching in month
SW & S Qld	53		52	
GB & DD	13		14	
New England	170		168	
C & S Tablelands	176		173	
S NSW & N Vic	158		160	
Gippsland	12		12	
W Vic & SE SA	352		347	
S SA	69		69	
KI	38		39	
WA	197		186	
All Regions	1238		1220	

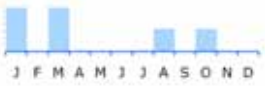
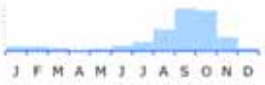
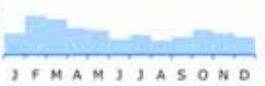
Figures for the histograms above are provided in Appendix A2.15.

3.5.1.2 Proportion of respondents shearing and crutching wethers in each month of the year

Region	n	Proportion of respondents shearing in month	n	Proportion of respondents crutching in month
SW & S Qld	48		44	
GB & DD	20		20	
New England	148		136	
C & S Tablelands	131		129	
S NSW & N Vic	88		87	
Gippsland	9		9	
W Vic & SE SA	253		245	
S SA	38		36	
KI	34		33	
WA	141		130	
All Regions	910		869	

Figures for the histograms above are provided in Appendix A2.16.

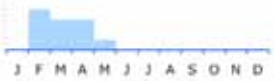
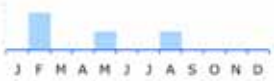
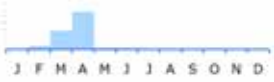
3.5.1.3 Proportion of respondents shearing and crutching weaners in each month of the year

Region	n	Proportion of respondents shearing in month	n	Proportion of respondents crutching in month
SW & S Qld	50		43	
GB & DD	6		4	
New England	147		145	
C & S Tablelands	144		126	
S NSW & N Vic	120		103	
Gippsland	9		9	
W Vic & SE SA	270		236	
S SA	52		38	
KI	37		29	
WA	181		118	
All Regions	1016		851	

Figures for the histograms above are provided in Appendix A2.17.

3.5.2 *Breeding program*

3.5.2.1 Proportion of respondents putting rams with ewes each month of the year in 2003

Region	Merino ewes mated to Merino rams	Merino ewes mated to meat breed rams	Cross-bred ewes
SW & S Qld			
GB & DD			
New England			
C & S Tablelands			
S NSW & N Vic			
Gippsland			
W Vic & SE SA			
S SA			
KI			
WA			
All Regions			

Figures for the histograms above are provided in Appendix A2.18.

3.5.2.2 Number of weeks Merino rams left with Merino ewes

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	42	6.0	8.1	16.0	9.4	0.8	
GB & DD	7	6.0	6.0	10.0	7.1	1.5	
New England	151	3.0	6.0	20.0	6.9	0.4	
C & S Tablelands	134	1.4	6.0	20.0	7.3	0.5	
S NSW & N Vic	99	1.1	7.0	20.0	8.0	0.7	
Gippsland	8	5.0	6.3	13.0	7.0	2.1	
W Vic & SE SA	230	2.0	7.0	28.0	7.8	0.5	
S SA	47	5.0	8.0	32.0	9.2	1.3	
KI	35	5.0	7.0	28.0	8.4	1.5	
WA	189	1.4	7.0	52.1	7.9	0.6	
All Regions	942	1.1	7.0	52.1	7.8	0.2	

Histogram class limits: 1.0-3.1-5.2-7.3-9.4-11.5-13.6-15.7-17.8-19.9-22.0
Anova: F=3.52, d.f.=9, p<0.0005.
***Note**: respondents who left rams with ewes from six months or more (6) have been excluded from the histograms (and **only** from the histograms) to prevent the distribution being reduced to a single bar, due to the influence of the small number of relatively long time periods.*

3.5.2.3 Number of weeks meat breed rams left with Merino ewes

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	12	6.0	8.0	12.9	8.7	1.4	
GB & DD	4	6.0	8.3	12.0	8.6	4.0	
New England	46	5.0	6.5	16.0	7.7	0.9	
C & S Tablelands	65	1.4	7.0	21.7	8.3	0.9	
S NSW & N Vic	70	5.0	8.0	28.0	9.6	1.0	
Gippsland	4	5.7	6.3	20.0	9.6	11.1	
W Vic & SE SA	174	2.0	8.0	52.1	8.9	0.7	
S SA	45	6.0	8.0	32.0	10.0	1.4	
KI	26	5.0	8.0	32.0	10.1	2.6	
WA	93	4.6	8.0	52.1	9.3	1.5	
All Regions	539	1.4	8.0	52.1	9.0	0.4	

Histogram class limits: 1.0-3.1-5.2-7.3-9.4-11.5-13.6-15.7-17.8-19.9-22.0
Anova: F=0.96, d.f.=9, p=0.476.
***Note**: respondents who left rams with ewes from six months or more (10) have been excluded from the histograms (and **only** from the histograms) to prevent the distribution being reduced to a single bar, due to the influence of the small number of relatively long time periods.*

3.5.2.4 Number of weeks rams left with Cross-bred ewes

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	4	4.0	10.0	12.9	9.2	6.5	
GB & DD	0						
New England	36	5.0	8.0	16.0	8.6	1.0	
C & S Tablelands	43	1.4	8.0	20.0	9.9	1.4	
S NSW & N Vic	50	5.0	10.0	30.3	12.0	1.8	
Gippsland	5	6.0	8.0	26.0	11.4	10.3	
W Vic & SE SA	140	1.1	8.0	26.0	10.0	0.7	
S SA	20	5.0	10.0	20.0	10.6	1.9	
KI	9	5.0	10.0	26.1	11.7	5.5	
WA	13	4.6	8.0	52.1	16.0	10.2	
All Regions	320	1.1	8.0	52.1	10.5	0.6	

Histogram class limits: 1.0-3.5-6-8.5-11-13.5-16-18.5-21-23.5-26.0
Anova: F=2.78, d.f.=9, p=0.006.
***Note**: respondents who left rams with ewes from six months or more (9) have been excluded from the histograms (and **only** from the histograms) to prevent the distribution being reduced to a single bar, due to the influence of the small number of relatively long time periods.*

3.5.2.5 Typical marking percentage – Merino ewes mated to Merino rams

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	40	65	89	115	87	4	
GB & DD	5	75	80	90	81	7	
New England	139	40	85	110	86	2	
C & S Tablelands	118	60	85	110	83	2	
S NSW & N Vic	90	65	85	108	86	2	
Gippsland	7	70	80	100	84	9	
W Vic & SE SA	201	60	85	120	85	1	
S SA	41	70	93	120	92	4	
KI	28	50	84	100	82	5	
WA	168	60	85	120	86	1	
All Regions	837	40	85	120	86	1	

Histogram class limits: 40-48-56-64-72-80-88-96-104-112-120.
Anova: F=3.72, d.f.=9, p<0.0005.

3.5.2.6 Typical marking percentage – Merino ewes mated to meat breed rams

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	8	80	93	100	92	6	
GB & DD	4	80	80	85	81	4	
New England	41	60	92	110	92	3	
C & S Tablelands	53	60	90	110	90	3	
S NSW & N Vic	59	60	90	115	90	3	
Gippsland	3	90	90	110	97	29	
W Vic & SE SA	145	65	90	120	91	2	
S SA	37	70	100	120	98	4	
KI	22	65	90	120	89	6	
WA	76	60	90	110	88	2	
All Regions	448	60	90	120	91	1	

Histogram class limits: 60-66-72-78-84-90-96-102-108-114-120.
Anova: F=3.04, d.f.=9, p=0.002.

3.5.2.7 Typical marking percentage – Cross-bred ewes

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	2	90	93	95	93	32	
GB & DD	1*						
New England	31	90	130	145	123	6	
C & S Tablelands	39	70	110	145	108	5	
S NSW & N Vic	43	75	100	130	107	4	
Gippsland	5	98	120	120	115	12	
W Vic & SE SA	121	80	118	150	116	3	
S SA	16	90	123	150	119	9	
KI	6	85	108	180	115	37	
WA	8	80	100	140	104	20	
All Regions	272	70	115	180	114	2	

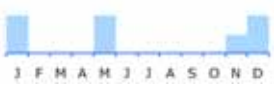
Histogram class limits: 70-81-92-103-114-125-136-147-158-169-180.
Anova: F=3.76, d.f.=9, p<0.0005.
** Figures for this single respondent have been omitted for confidentiality reasons. The respondent's data is included in the figures for all regions and the anova statistics.*

3.5.2.8 Marking percentages in 2003 compared to typical years

Across all regions, and for Merino ewes mated to Merino rams, Merino ewes mated to meat-breed rams, and cross-bred ewes, there were more respondents reporting lower marking percentages in 2003 compared to a typical year, than respondents who reported either the same marking percentage in 2003, or a higher percentage in 2003. For Merino ewes mated to Merino rams, there were sufficient responses in each of the regions to indicate a significant difference between the regions, with greater proportions of respondents in some Queensland and New South Wales regions experiencing lower marking percentages in 2003 and lower proportions of respondents in Western Australia experiencing lower marking percentages.

Detailed figures on the differences between 2003 marking percentages and those for a typical year are given in Appendix A2.19.

3.5.2.9 Proportion of respondents weaning lambs each month of the year in 2003

Region	Merino ewes mated to Merino rams	Merino ewes mated to meat breed rams	Cross-bred ewes
SW & S Qld			
GB & DD			*As there was only one respondent for this graph, their details have been omitted for confidentiality reasons. The respondent's data is included in the graphs for all regions.*
New England			
C & S Tablelands			
S NSW & N Vic			
Gippsland			
W Vic & SE SA			
S SA			
KI			
WA			
All Regions			

Figures for the histograms above are provided in Appendix A2.20.

3.5.3 *Supplementary Feeding*

3.5.3.1 Proportion of respondents who use supplementary feeds

Region	n	Proportion using feeds (%)		
SW & S Qld	57	34	**47**	60
GB & DD	16	32	56	81
New England	170	67	74	80
C & S Tablelands	179	75	81	87
SW NSW & NE Vic	168	83	88	93
Gippsland	12	40	67	93
W Vic & SE SA	369	75	79	84
S SA	69	62	72	83
KI	41	68	80	93
WA	204	93	**96**	99
All regions	1285	78	80	83

$\chi 2$ =93.32, d.f. = 9, p < 0.0005. 2 cells (10.0%) have expected counts less than 5.

3.5.3.2 Feed types in supplementary feeding of ewes

Region	n*	Proportion of feeds mentioned in categories below (%)						
		Barley, oats, wheat, triticale, corn	Lupins, beans, lentils, peas	Cottonseed, cottonseed meal	Straw, hay, silage, forage	Pellets, nuts	Bypass meal	Blocks, licks
SW & S Qld	34	15	3	18	3	0	9	53
GB & DD	14	14	0	14	0	21	0	50
New England	195	26	22	2	3	15	4	29
C & S Tablelands	226	51	13	0	12	10	0	14
S NSW & N Vic	266	57	11	0	17	3	0	13
Gippsland	8	63	0	0	13	25	0	0
W Vic & SE SA	493	48	14	0	23	2	0	12
S SA	71	20	38	0	34	0	0	9
KI	62	47	24	0	27	0	0	2
WA	368	39	35	0	18	1	0	8
All Regions	1737	43	20	1	17	5	1	14

** n in this table is the number of feed types mentioned by respondents. Respondents were able to indicate more than one feed type. For example, pellets and nuts comprised 5 per cent of the feed types mentioned across all regions.*

3.5.3.3 Feed types in supplementary feeding of weaners

Region	n*	Proportion of feeds mentioned in categories below (%)						
		Barley, oats, wheat, triticale, corn	Lupins, beans, lentils, peas	Cottonseed, cottonseed meal	Straw, hay, silage, forage	Pellets, nuts	Bypass meal	Blocks, licks
SW & S Qld	18	17	17	17	6	6	0	39
GB & DD	9	11	0	11	0	33	0	44
New England	132	29	18	2	5	14	6	26
C & S Tablelands	182	48	23	0	15	8	1	6
S NSW & N Vic	194	51	19	1	19	2	0	9
Gippsland	13	46	8	0	23	15	0	8
W Vic & SE SA	391	45	17	1	26	2	0	10
S SA	46	26	35	0	30	0	0	9
KI	62	40	31	0	27	0	2	0
WA	329	35	38	0	17	2	0	8
All Regions	1376	41	24	1	19	4	1	10

** n in this table is the number of feed types mentioned by respondents. Respondents were able to indicate more than one feed type. For example, pellets and nuts comprised 4 per cent of the feeds mentioned across all regions.*

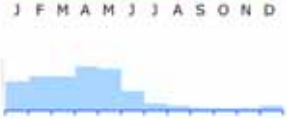
3.5.3.4 Duration of supplementary feeding

The duration of the period over which ewes received supplementary feeding varied from one month to 12 months, with a mean of five months across all regions. The mean duration of the supplementary feeding period ranged from four months in south western and southern Queensland, in New England, in southern South Australia and Kangaroo Island, to six months in Gippsland.

The figures for the supplementary feeding of weaners were very similar, with the same range of durations, and mean duration, as for the feeding of ewes. The differences in the mean duration between regions were also very similar to those for the feeding of ewes.

Further details on the duration of supplementary feeding for ewes and weaners are in Appendix A2.21.

3.5.3.5 Proportion of respondents feeding ewes and weaners in each month of the year

Region	n	Proportion of respondents feeding ewes	n	Proportion of respondents feeding weaners
SW & S Qld	20		12	
GB & DD	8		5	
New England	110		69	
C & S Tablelands	123		103	
S NSW & N Vic	132		94	
Gippsland	5		6	
W Vic & SE SA	248		187	
S SA	43		20	
KI	32		27	
WA	186		159	
All Regions	907		682	

Figures for the histograms above are provided in Appendix A2.22.

3.6 Grazing Management

3.6.1 Grazing strategies used in 2003

Region	n	Proportion with grazing strategy below (%)						
		Set stocked	Set stocked at lambing only	Alternating between sheep and cattle	Alternating between sheep and crop stubble	Alternating between sheep and forage crop	Cell grazing	Rotational grazing
SW & S Qld	94	52	17	42	16	15	4	41
GB & DD	32	72	10	40	1	9	9	18
New England	280	57	34	32	3	8	11	33
C & S Tablelands	310	54	30	18	34	11	4	38
S NSW & N Vic	307	40	41	25	47	11	3	44
Gippsland	21	48	41	33	10	2	10	39
W Vic & SE SA	598	55	30	24	30	11	6	39
S SA	110	17	46	27	31	5	4	71
KI	55	44	49	23	39	0	4	40
WA	436	41	26	7	60	6	6	30
All Regions	2243	48	31	22	36	9	6	38

Note 1: percentages may sum to more than 100 as respondents could give more than one strategy.
Note 2: percentages are adjusted for non-response bias as described in Appendix 1.10.

3.6.2 Key objectives in using grazing strategies

Region	n	Proportion with key objective below (%							
		Parasite control	Pasture mgt	Animal mgt	Sustain-ability	Ease	Use of crops and stubbles	Maximise or increase productivity or production	Other
SW & S Qld	55	27	31	27	7	7	4	5	35
GB & DD	19	16	47	21	5	16	0	11	21
New England	146	36	47	33	5	13	1	9	17
C & S Tablelands	150	21	47	44	2	13	7	3	15
S NSW & N Vic	129	18	38	46	2	11	15	8	18
Gippsland	8	38	38	63	0	13	0	0	13
W Vic & SE SA	307	21	40	37	2	14	5	5	19
S SA	63	32	35	35	0	13	27	5	13
KI	36	22	44	31	3	19	0	11	14
WA	159	14	48	36	3	13	15	11	17
All Regions	1072	23	42	37	3	13	8	7	18

Note: percentages may sum to more than 100 as respondents could give more than one strategy.

3.7 Worm Control

3.7.1 Number, timing and type of treatment – September 2002 to December 2003

3.7.1.1 Unweaned lambs

Region	n*	Prop'n treating unweaned lambs (%)	Mean number of times treated	Prop'n using capsules (%)**	Month with highest prop'n of treatments**	Prop'n of treatments which were the most popular product - Moxidectin (%)**
SW & S Qld	40	40	1.3	0.0	Dec	28
GB & DD	15	47	1.4	0.0	Feb	25
New England	161	67	1.4	0.7	Dec	29
C & S Tablelands	175	47	1.3	0.0	Oct	24
S NSW & N Vic	152	35	1.2	0.0	Jul, Sep	21
Gippsland	12	42	1.2	0.0	Aug	17
W Vic & SE SA	345	41	1.3	0.0	Sep	37
S SA	70	30	1.1	0.0	Jul	30
KI	39	51	1.3	0.0	Jul	81
WA	191	16	1.3	0.0	Aug, Sep	29
All Regions	1200	40	1.3	0.2	Sep	32

Chi-squared test for proportion treating unweaned lambs: $\chi 2=106.39$, d.f.=9, $p<0.0005$. 1 cell (5.0%) has an expected count less than 5.
Kruskal-Wallis test for number of times treated: $\chi 2=6.72$, d.f.=9, $p=0.665$
** the sample size given is for the proportion treating unweaned lambs. For the remaining figures in the table, the sample size will be equal to the sample size given, multiplied by the proportion treating unweaned lambs.*
*** proportion of treatments.*

Further details for the treatments for worm control in unweaned lambs are provided in Appendix A2.23.1 and Appendix A2.23.3.

3.7.1.2 Weaners

Region	n*	Prop'n treating weaners (%)	Mean number of times treated	Prop'n using capsules (%)**	Month with highest prop'n of treatments**	Prop'n of treatments which were the most popular product - Moxidectin (%)**
SW & S Qld	36	94	1.9	0	Feb	39
GB & DD	9	100	2.9	0	Aug	42
New England	157	95	2.9	2.8	Apr	32
C & S Tablelands	164	96	2.2	2.3	Dec	27
S NSW & N Vic	142	92	2.1	3.3	Nov	29
Gippsland	11	100	2.4	3.8	Nov	27
W Vic & SE SA	312	94	2.2	4.2	Dec	36
S SA	60	92	1.9	3.9	Jul, Sep, Nov	41
KI	37	92	2.4	2.4	Feb, Sep	63
WA	190	96	1.6	0.7	Dec	24
All Regions	1118	94	2.2	2.9	Dec	33

Chi-squared test for proportion treating weaners: $\chi 2=5.10$, d.f.=9, $p=0.826$. 5 cells (25.0%) have expected counts less than 5.
Kruskal-Wallis test for number of times treated: $\chi 2=136.60$, d.f.=9, $p<0.0005$
** the sample size given is for the proportion treating weaners. For the remaining figures in the table, the sample size will be equal to the sample size given, multiplied by the proportion treating weaners.*
*** proportion of treatments.*

Further details for the treatments for worm control in weaners are provided in Appendix A2.23.2 and Appendix A2.23.4.

3.7.1.3 Maiden ewes

Region	n*	Prop'n treating maiden ewes (%)	Mean number of times treated	Prop'n using capsules (%)**	Month with highest prop'n of treatments**	Prop'n of treatments which were the most popular product - Moxidectin (%)**
SW & S Qld	40	60	2.1	0.0	Feb, Nov	43
GB & DD	15	47	3.3	0.0	Aug	39
New England	161	80	2.8	2.3	Sep	27
C & S Tablelands	175	78	2.3	2.6	Nov	26
S NSW & N Vic	152	72	1.9	4.8	Nov	25
Gippsland	12	67	2.6	0.0	Nov	24
W Vic & SE SA	345	75	2.1	4.1	Dec	40
S SA	70	73	1.7	4.8	Dec	33
KI	39	87	2.2	1.3	Jan	64
WA	191	79	1.4	1.9	Dec	23
All Regions	1200	76	2.1	3.1	Dec	32

Chi-squared test for proportion treating maiden lambs: $\chi 2=19.62$, d.f.=9, p=0.02. 2 cells (10.0%) have expected counts less than 5.
Kruskal-Wallis test for number of times treated: $\chi 2=189.31$, d.f.=9, p<0.0005.
** the sample size given is for the proportion treating maiden ewes. For the remaining figures in the table, the sample size will be equal to the sample size given, multiplied by the proportion treating maiden ewes.*
*** proportion of treatments.*

Further details for the treatments for worm control in maiden ewes are provided in Appendix A2.23.5 and Appendix A2.23.7.

3.7.1.4 Adult ewes

Region	n*	Prop'n treating adult ewes (%)	Mean number of times treated	Prop'n using capsules (%)**	Month with highest prop'n of treatments**	Prop'n of treatments which were the most popular product - Moxidectin (%)**
SW & S Qld	40	85	2.2	0.0	Dec	43
GB & DD	16	75	2.9	0.0	Aug	39
New England	161	94	3.1	2.2	Sep	27
C & S Tablelands	175	94	2.3	3.0	Dec	26
S NSW & N Vic	152	91	1.9	3.5	Nov	25
Gippsland	12	100	2.6	0.0	Nov	24
W Vic & SE SA	345	95	2.1	4.9	Dec	40
S SA	70	96	1.8	5.1	Jan	33
KI	39	97	2.3	1.1	Jan	64
WA	191	86	1.4	0.0	Dec	23
All Regions	1201	92	2.1	3.0	Dec	32

Chi-squared test for proportion treating adult ewes: $\chi 2=31.38$, d.f.=9, p<0.0005. 4 cells (20.0%) have expected counts less than 5.
Kruskal-Wallis test for number of times treated: $\chi 2=248.69$, d.f.=9, p<0.0005
** the sample size given is for the proportion treating adult ewes. For the remaining figures in the table, the sample size will be equal to the sample size given, multiplied by the proportion treating adult ewes.*
*** proportion of treatments.*

Further details for the treatments for worm control in adult ewes are provided in Appendix A2.23.6 and Appendix A2.23.8.

3.7.1.5 Wethers

Region	n*	Prop'n treating wethers (%)	Mean number of times treated	Prop'n using capsules (%)**	Month with highest prop'n of treatments**	Prop'n of treatments which were the most popular product - Moxidectin (%)**
SW & S Qld	32	88	2.0	0.0	Feb	50
GB & DD	22	96	3.0	0.0	Jan, Mar, Aug, Sep, Nov	33
New England	136	89	2.6	0.3	Sep	25
C & S Tablelands	130	92	2.0	0.4	Dec	27
S NSW & N Vic	86	85	1.7	0.0	Dec	26
Gippsland	9	100	2.0	0.0	Nov	17
W Vic & SE SA	244	86	1.7	0.0	Dec	39
S SA	30	80	1.2	0.0	Dec	36
KI	35	86	1.8	0.0	Jan	56
WA	130	65	1.3	0.0	Dec	24
All Regions	854	84	1.9	0.2	Dec	32

Chi-squared test for proportion treating wethers: $\chi 2=47.09$, d.f.=9, $p<0.0005$. 3 cells (15.0%) have expected counts less than 5.
Kruskal-Wallis test for number of times treated: $\chi 2=165.67$, d.f.=9, $p<0.0005$
** the sample size given is for the proportion treating wethers. For the remaining figures in the table, the sample size will be equal to the sample size given, multiplied by the proportion treating wethers.*
*** proportion of treatments.*

Further details for the treatments for worm control in wethers are provided in Appendix A2.23.9 and Appendix A2.23.10.

3.7.2 Drenching of newly introduced sheep

Across all regions, 59 per cent of respondents reported that they purchased sheep and brought them on to their property. The proportion ranged from 49 per cent in Western Australia to 91 per cent in the Granite Belt and Darling Downs. Further details are provided in Appendix A2.23.11.

The proportions of those who purchased sheep who also drenched them on their arrival to their property are shown below.

Region	n	Proportion drenching sheep on arrival (%)		
SW & S Qld	46	54	67	81
GB & DD	20	85	95	105
New England	100	89	94	99
C & S Tablelands	102	84	90	96
SW NSW & NE Vic	104	72	80	88
Gippsland	7	60	86	112
W Vic & SE SA	227	82	86	91
S SA	38	63	76	90
KI	26	71	85	98
WA	97	60	69	78
All regions	767	81	83	86

$\chi 2$ =40.01, d.f. = 9, p <0.0005.

Across all regions, the drench most commonly used was Moxidectin, which was used by 39 per cent of respondents. Further details are provided in Appendix A2.23.12.

3.7.3 *Monitoring worm egg counts*

Region	n	Proportion of respondents monitoring worm egg counts (%)		
SW & S Qld	63	42	54	66
GB & DD	24	43	63	82
New England	173	52	**59**	66
C & S Tablelands	179	41	49	56
SW NSW & NE Vic	168	32	39	47
Gippsland	12	40	67	93
W Vic & SE SA	368	35	40	45
S SA	70	26	37	48
KI	42	23	38	53
WA	206	26	**33**	39
All regions	1305	41	44	46

$\chi 2$ =42.22, d.f. = 9, p <0.0005.

3.7.3.1 Frequency of monitoring worm egg counts

Across all regions, the frequency with which respondents typically monitored worm egg counts ranged from an average of 3.0 times per year for weaners to 2.6 times per year for adult ewes. The typical frequency of monitoring was significantly different between regions for weaners, adult ewes and wethers, with higher frequencies being reported in the Granite Belt and Darling Downs, and in the New England region, and generally lower frequencies in the southern Australian regions.

Additional information on the typical frequency of monitoring worm egg counts is provided in Appendices A2.22.13–A2.22.15.

3.7.3.2 Frequency of monitoring worm egg counts in 2003 compared to typical frequency

Across all regions, and for all three classes of sheep, 95 per cent or more of respondents had the same frequency of monitoring in 2003 as they did in a typical year.

Additional information on the comparison between the frequency of monitoring of worm egg counts in 2003 and in a typical year is provided in Appendices A2.23.16 – A2.23.18.

3.7.4 Drench resistance testing

Region	n	Proportion of respondents who have tested for drench resistance (%)		
SW & S Qld	101	19	**28**	37
GB & DD	33	42	59	76
New England	276	51	**57**	63
C & S Tablelands	314	39	44	50
SW NSW & NE Vic	310	40	45	51
Gippsland	21	44	65	85
W Vic & SE SA	606	44	48	52
S SA	108	38	47	57
KI	54	44	57	70
WA	438	46	51	56
All regions	2261	46	48	50

$\chi 2$ =35.96, d.f. = 9, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.4.1 Year of most recent drench resistance test – all regions

Year of most recent drench resistance test	Proportion of respondents (%)		
1980	0.0	0.4	0.9
1982	0.0	0.2	0.6
1986	0.0	0.2	0.6
1989	0.0	0.6	1.3
1990	2.3	3.9	5.5
1991	0.0	0.4	0.9
1992	0.3	1.3	2.3
1993	0.0	0.7	1.4
1994	1.3	2.6	3.9
1995	2.7	4.5	6.3
1996	0.8	2.0	3.2
1997	1.6	3.0	4.4
1998	5.0	7.2	9.4
1999	5.0	7.2	9.4
2000	10.3	13.2	16.1
2001	9.2	11.9	14.6
2002	14.6	17.8	21.0
2003	11.7	14.7	17.7
2004	6.0	8.3	10.6

n=539

Respondents were grouped into those whose most recent drench resistance test was previous to the year 2000 and those whose most recent test was in 2000 or more recently, as a measure of the recency of adoption of drench resistance testing. There was no significant difference between the regions in this measure. Further information is provided in Appendix A2.23.19.

3.7.4.2 Type of drench resistance test

Region	n	Proportion of respondents using tests below (%)											
		DrenchRite			FECR			DrenchRite or FECR*			Other**		
SW & S Qld	7	0	0	0	6	43	80	0	14	40	6	43	80
GB & DD	6	0	0	0	0	0	0	0	17	46	54	83	113
New England	55	0	4	9	22	35	47	0	7	14	41	55	68
C & S Tablelands	45	5	16	26	2	11	20	1	9	17	50	64	78
SW NSW & NE Vic	30	0	7	16	0	3	10	0	10	21	66	80	94
Gippsland	5	0	40	83	0	20	55	0	0	0	0	40	83
W Vic & SE SA	88	3	9	15	6	14	21	2	7	12	61	70	80
S SA	17	0	6	17	0	12	27	0	6	17	56	76	97
KI	11	0	0	0	0	18	41	0	18	41	35	64	92
WA	53	0	4	9	4	13	22	4	13	22	57	70	82
All regions	317	5	8	10	12	16	20	6	9	12	62	67	72

$\chi 2$ =42.84, d.f. = 27, p = 0.027. 26 cells (65.0%) have expected counts less than 5.
** Sufficient information given to identify test as DrenchRite or FECR test, but not sufficient to determine which of the two.*
*** Tests other than DrenchRite and FECR tests, or cases where information given was only sufficient to identify that some form of drench resistance testing had been carried out by the respondent.*

3.7.5 Treatments and techniques for worm control

Region	n	Proportion of respondents using technique below (%)							
		Smart grazing	Other grazing	Sheep un-drenched	Feeding	Rams	Organic	Drenching	Other
SW & S Qld	54	19	28	2	11	13	4	80	15
GB & DD	24	4	21	0	8	8	0	96	8
New England	176	29	47	2	13	24	1	89	10
C & S Tablelands	184	34	33	5	21	8	3	89	11
S NSW & N Vic	164	30	35	3	21	5	2	84	15
Gippsland	12	25	25	0	33	17	8	100	17
W Vic & SE SA	363	33	34	3	23	10	3	91	10
S SA	70	40	30	3	26	19	1	84	16
KI	42	31	48	14	36	21	5	86	5
WA	200	23	23	18	19	21	1	89	18
All regions	1289	30	33	6	20	14	3	89	12

Note: percentages may sum to more than 100 as respondents could give more than one strategy.
"Sheep un-drenched" = Leave some sheep un-drenched at summer treatments. "Feeding" = Feeding strategy. "Rams" = Use rams selected for resistance to worms. "Organic" = Organic methods.

A small number of respondents gave explanatory descriptions of the treatments or techniques they were using. Further information about these is provided in Appendix A2.23.20.

3.7.6 Views about the importance of factors when deciding whether to drench ewes

3.7.6.1 Ewes – results from faecal worm egg count

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	74	45	56	67	18	28	38	0	**3**	7	5	13	21
GB & DD	19	83	**94**	100	0	5	14	0	0	0	0	2	7
New England	229	58	**64**	70	10	**15**	19	8	12	16	6	9	13
C & S Tablelands	242	49	55	62	17	22	28	9	13	18	5	9	13
SW NSW & NE Vic	238	48	54	61	17	22	27	4	**8**	11	12	16	21
Gippsland	18	19	42	65	23	**46**	69	0	10	24	0	2	9
W Vic & SE SA	439	45	49	54	21	26	30	9	12	15	10	13	16
S SA	84	39	50	60	5	**13**	20	9	17	25	12	21	29
KI	44	32	47	61	12	25	37	12	**25**	38	0	3	9
WA	329	34	**39**	44	23	28	33	12	16	20	12	17	21
All regions	1716	48	51	53	21	23	25	11	13	14	12	13	15

$\chi 2$ =93.96, d.f. = 27, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.6.2 Ewes – condition score of sheep

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	79	20	30	40	22	32	43	12	21	29	9	**17**	25
GB & DD	18	0	5	15	49	70	91	0	17	34	0	8	21
New England	245	24	29	35	33	40	46	18	24	29	4	7	11
C & S Tablelands	273	21	26	32	34	40	46	20	26	31	5	8	11
SW NSW & NE Vic	269	16	21	26	37	43	49	17	22	27	9	**14**	18
Gippsland	18	8	29	50	21	44	67	3	22	41	0	4	13
W Vic & SE SA	512	22	26	30	40	45	49	15	19	22	8	11	13
S SA	91	11	19	27	29	39	49	25	**35**	44	2	7	12
KI	46	8	20	32	20	34	48	22	35	49	2	11	19
WA	381	19	23	27	42	47	52	18	22	27	4	7	10
All regions	1932	23	25	27	41	43	45	21	23	25	8	9	11

$\chi 2$ =49.51, d.f. = 27, p = 0.005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.6.3 Ewes – time of year

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	81	17	**26**	36	35	45	56	9	17	25	5	**12**	19
GB & DD	19	25	48	70	12	33	54	0	16	33	0	3	11
New England	261	39	45	51	34	40	46	8	12	15	1	3	5
C & S Tablelands	295	49	54	60	26	32	37	6	9	12	2	5	7
SW NSW & NE Vic	287	48	54	59	30	35	41	5	9	12	1	3	4
Gippsland	20	43	64	85	5	23	42	0	11	24	0	2	8
W Vic & SE SA	551	49	53	57	32	36	40	7	9	12	1	2	3
S SA	105	45	55	64	25	34	43	5	11	17	0	0	2
KI	52	58	**71**	83	9	**20**	31	0	7	14	0	2	7
WA	395	32	**37**	41	44	**49**	54	6	9	12	3	**6**	8
All regions	2066	46	48	50	36	38	41	8	10	11	3	4	5

$\chi 2$ =93.49, d.f. = 27, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.6.4 Ewes – seasonal weather conditions

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	82	37	**48**	59	23	33	44	4	**11**	18	1	7	12
GB & DD	21	34	**56**	77	20	41	62	0	3	11	0	0	0
New England	261	42	**48**	54	32	38	44	7	**10**	14	2	**4**	7
C & S Tablelands	269	19	24	29	32	38	44	18	23	28	11	15	20
SW NSW & NE Vic	273	17	22	26	32	38	44	20	25	30	11	15	20
Gippsland	19	8	28	48	18	40	62	8	29	49	0	4	13
W Vic & SE SA	493	18	21	25	36	41	45	23	26	30	9	11	14
S SA	90	10	18	25	19	29	38	24	34	43	12	20	28
KI	45	6	16	27	15	28	42	7	18	29	23	**37**	51
WA	373	12	**16**	20	32	37	42	26	**31**	35	13	16	20
All regions	1926	23	25	27	35	38	40	22	24	26	12	13	15

$\chi 2$ =196.16, d.f. = 27, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.6.5 Ewes – availability of pasture

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	78	9	18	27	33	44	55	11	19	28	10	19	28
GB & DD	17	0	19	37	36	59	83	0	19	37	0	3	12
New England	245	21	26	32	35	41	47	18	24	29	5	**9**	12
C & S Tablelands	259	12	16	21	34	40	46	21	27	32	12	16	21
SW NSW & NE Vic	256	15	20	25	28	33	39	21	26	32	16	**20**	25
Gippsland	18	4	24	44	46	**68**	89	0	4	13	0	4	13
W Vic & SE SA	476	19	22	26	34	39	43	24	28	32	8	**11**	14
S SA	85	12	21	30	25	35	45	24	34	44	4	10	17
KI	45	6	16	27	7	**19**	30	21	35	49	17	**30**	43
WA	370	15	19	23	30	35	40	24	29	34	14	17	21
All regions	1849	19	20	22	35	38	40	25	27	29	13	15	17

$\chi 2$ =63.02, d.f. = 27, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.6.6 Ewes – quality of pasture

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	75	8	16	24	33	44	56	12	22	31	9	18	27
GB & DD	17	0	3	12	52	**73**	94	1	20	39	0	3	12
New England	246	16	21	26	37	44	50	20	26	31	6	**9**	13
C & S Tablelands	257	9	13	17	30	36	42	21	26	32	19	**25**	30
SW NSW & NE Vic	254	12	17	21	28	33	39	20	25	31	19	**25**	30
Gippsland	18	2	20	39	30	54	77	3	22	41	0	4	13
W Vic & SE SA	468	16	19	23	34	39	43	25	29	33	10	13	16
S SA	85	3	10	16	32	43	53	20	30	39	10	18	26
KI	45	5	15	26	13	25	38	19	32	46	14	27	40
WA	361	14	18	22	30	35	40	27	32	37	11	15	19
All regions	1826	16	17	19	36	38	40	26	28	30	15	17	19

$\chi 2$ =69.27, d.f. = 27, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.6.7 Ewes – presence of daggy sheep in mob

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	70	11	20	29	16	27	37	16	26	36	17	**28**	38
GB & DD	18	0	15	31	16	38	61	13	35	57	0	12	27
New England	245	21	27	33	26	32	38	27	33	38	5	8	12
C & S Tablelands	275	23	29	34	23	28	33	28	34	40	6	9	13
SW NSW & NE Vic	274	19	24	30	26	32	37	24	29	35	10	**14**	19
Gippsland	19	0	11	25	19	42	64	16	38	59	0	10	23
W Vic & SE SA	516	20	24	28	29	33	37	28	32	36	9	11	14
S SA	92	12	20	29	25	35	45	27	37	47	2	8	13
KI	49	7	17	28	23	36	50	27	41	54	0	6	12
WA	391	28	**32**	37	31	36	41	20	**25**	29	4	**7**	9
All regions	1949	24	26	28	31	33	35	28	31	33	9	10	12

$\chi 2$ =61.23, d.f. = 27, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.7 Views on the importance of factors when deciding whether to drench weaners

3.7.7.1 Weaners – results from faecal worm egg count

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	39	58	72	86	2	13	23	0	8	16	0	8	16
GB & DD	13	78	92	107	0	8	22	0	0	0	0	0	0
New England	134	59	67	75	8	13	19	3	7	12	6	12	17
C & S Tablelands	133	58	66	74	9	15	21	2	6	10	7	13	18
SW NSW & NE Vic	109	47	56	65	11	18	26	4	9	15	10	17	23
Gippsland	9	23	56	88	12	44	77	0	0	0	0	0	0
W Vic & SE SA	244	58	64	70	12	16	21	2	4	7	11	16	20
S SA	45	48	62	76	2	11	20	1	9	17	7	18	29
KI	31	37	55	72	3	16	29	3	16	29	1	13	25
WA	138	41	49	58	13	20	26	7	12	18	12	19	25
All regions	895	59	62	65	14	16	19	6	7	9	12	15	17

$\chi 2$ =37.93, d.f. = 27, p = 0.079. 10 cells (25.0%) have expected counts less than 5.

3.7.7.2 Weaners – condition score of sheep

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	45	18	31	45	24	38	52	14	27	40	0	4	10
GB & DD	11	1	27	54	0	18	41	0	18	41	8	36	65
New England	152	25	32	39	33	41	48	17	24	30	1	4	7
C & S Tablelands	154	33	40	48	30	38	45	10	16	21	3	6	10
SW NSW & NE Vic	138	17	25	32	40	48	57	10	16	22	6	12	17
Gippsland	9	3	33	64	12	44	77	0	22	49	0	0	0
W Vic & SE SA	294	33	39	44	36	41	47	10	14	18	3	5	8
S SA	51	10	22	33	26	39	53	17	29	42	2	10	18
KI	36	11	25	39	20	36	52	13	28	42	1	11	21
WA	167	25	32	39	36	44	51	10	16	21	4	8	13
All regions	1057	30	33	36	38	41	44	16	18	20	6	7	9

$\chi 2$ =51.82, d.f. = 27, p = 0.003. 11 cells (27.5%) have expected counts less than 5.

Weaners – time of year

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	44	22	36	51	26	41	55	1	9	18	3	14	24
GB & DD	12	22	50	78	0	17	38	0	17	38	0	17	38
New England	154	40	47	55	26	33	41	9	15	21	1	5	8
C & S Tablelands	165	44	52	60	24	31	38	7	12	17	2	5	8
SW NSW & NE Vic	148	48	56	64	27	35	43	3	7	12	0	2	4
Gippsland	12	22	50	78	1	25	50	0	0	0	1	25	50
W Vic & SE SA	321	48	54	59	29	34	39	5	8	11	2	4	6
S SA	57	43	56	69	12	23	34	4	12	21	1	9	16
KI	36	31	47	64	16	31	46	3	14	25	0	8	17
WA	180	38	46	53	30	37	44	7	11	16	3	7	10
All regions	1129	48	51	54	31	33	36	9	10	12	4	5	7

$\chi 2$ =42.05, d.f. = 27, p = 0.033. 11 cells (27.5%) have expected counts less than 5.

3.7.7.3 Weaners – seasonal weather conditions

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	46	25	39	53	25	39	53	5	15	26	0	7	14
GB & DD	15	35	**60**	85	4	27	49	0	13	31	0	0	0
New England	157	42	**50**	58	26	34	41	8	**13**	19	0	**3**	6
C & S Tablelands	150	19	26	33	32	39	47	20	27	34	4	**8**	12
SW NSW & NE Vic	127	11	18	25	25	34	42	20	28	36	13	20	27
Gippsland	10	19	50	81	0	20	45	0	20	45	0	10	29
W Vic & SE SA	278	16	**21**	26	30	36	41	23	28	33	11	15	19
S SA	52	18	31	43	17	29	41	12	23	35	7	17	28
KI	32	3	16	28	10	25	40	8	22	36	21	**38**	54
WA	162	14	20	26	22	29	36	18	25	31	20	**27**	33
All regions	1029	25	28	30	31	34	37	21	24	26	13	15	17

$\chi 2$ =123.51, d.f. = 27, p < 0.0005. 8 cells (20.0%) have expected counts less than 5.

3.7.7.4 Weaners – availability of pasture

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	40	6	18	29	22	38	53	18	33	47	2	13	23
GB & DD	11	0	9	26	1	27	54	16	45	75	0	18	41
New England	149	22	29	36	32	40	48	15	22	29	4	**9**	13
C & S Tablelands	141	11	18	24	40	48	56	16	23	30	6	11	17
SW NSW & NE Vic	124	13	20	27	26	35	43	18	25	33	13	20	27
Gippsland	10	2	30	58	19	50	81	0	20	45	0	0	0
W Vic & SE SA	279	18	23	28	30	35	41	20	25	30	12	17	21
S SA	47	10	21	33	10	21	33	22	36	50	10	21	33
KI	34	5	18	30	17	32	48	9	24	38	12	26	41
WA	157	11	17	23	27	34	42	18	25	32	17	**24**	30
All regions	992	19	21	24	34	37	40	22	25	28	14	17	19

$\chi 2$ = 42.52, d.f. = 27, p = 0.029. 8 cells (20.0%) have expected counts less than 5.

3.7.7.5 Weaners – quality of pasture

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	41	11	24	38	11	24	38	20	34	49	6	17	29
GB & DD	12	0	17	38	1	25	50	14	42	70	0	17	38
New England	145	21	**28**	36	28	36	44	20	28	35	4	**8**	13
C & S Tablelands	143	12	19	25	35	43	51	18	25	32	7	13	18
SW NSW & NE Vic	123	11	18	24	26	34	43	15	22	29	18	26	34
Gippsland	9	0	11	32	36	67	97	0	22	49	0	0	0
W Vic & SE SA	271	14	18	23	29	35	40	22	28	33	14	19	24
S SA	47	6	17	28	15	28	40	19	32	45	11	23	36
KI	32	5	19	32	15	31	47	5	19	32	15	31	47
WA	161	11	17	23	26	33	40	20	27	34	17	24	30
All regions	984	17	20	22	32	35	38	24	27	29	16	18	21

$\chi 2$ = 42.41, d.f. = 27, p = 0.030. 8 cells (20.0%) have expected counts less than 5.

3.7.7.6 Weaners – presence of daggy sheep in mob

Region	n	Proportion of respondents (%)											
		Very important			Important			Somewhat important			Not important		
SW & S Qld	40	10	23	35	10	23	35	12	25	38	16	30	44
GB & DD	11	1	27	54	1	27	54	8	36	65	0	9	26
New England	147	29	37	44	17	25	31	21	28	36	6	11	16
C & S Tablelands	160	23	30	37	22	29	36	14	21	27	14	21	27
SW NSW & NE Vic	139	15	22	28	24	31	39	20	28	35	13	19	26
Gippsland	10	0	20	45	19	50	81	0	10	29	0	20	45
W Vic & SE SA	296	20	25	30	25	30	36	24	29	34	11	15	19
S SA	50	11	22	33	19	32	45	11	22	33	12	24	36
KI	36	16	31	46	11	25	39	16	31	46	3	14	25
WA	170	24	31	38	29	36	43	18	24	31	5	9	14
All regions	1059	25	28	30	27	30	33	24	26	29	14	16	18

$\chi 2$ =38.19, d.f. = 27, p = 0.075. 8 cells (20.0%) have expected counts less than 5.

3.7.7.7 Other factors regarded by respondents as important in deciding when to drench ewes

Factor	Proportion of respondents (%)		
Death of sheep	1	3	5
Signs of disease, ill thrift or weakness	28	35	42
Routine practice	51	58	65
Weaning	1	4	7

n=179
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.7.7.8 Other factors regarded by respondents as important in deciding when to drench weaners

Factor	Proportion of respondents (%)		
Death of sheep	2	8	14
Signs of disease, ill thrift or weakness	29	40	51
Routine practice	22	32	42
Weaning	12	21	29

n=179

3.7.8 Main advisor for worm control

Region	n	Proportion of respondents using source of advice below (%)							
		Self or staff	Local vet	Pvte vet consult't	Ag consult't	Ag dept officer	Rural mer'se rep	Drug co. rep	Other
SW & S Qld	61	89	0	0	0	12	0	0	0
GB & DD	24	96	0	4	0	0	0	0	0
New England	177	76	3	12	1	0	6	1	1
C & S Tablelands	180	76	9	2	1	1	6	2	4
S NSW & N Vic	170	74	4	8	4	2	4	3	1
Gippsland	12	83	0	0	0	8	0	8	0
W Vic & SE SA	375	75	8	7	2	2	4	1	1
S SA	70	77	11	6	1	0	4	0	0
KI	42	71	19	10	0	0	0	0	0
WA	202	74	12	5	5	2	1	2	0
All regions	1313	76	8	7	2	2	4	1	1

$\chi 2$ =159.12, d.f. = 27, p < 0.0005. 51 cells (63.8%) have expected counts less than 5.
"Pvte vet consult't" = Private veterinary consultant. "Ag consult't" = Ag consultant. "Ag dept officer" = Ag department officer. "Rural mer'se rep" = Rural merchandise representative. "Drug co. rep" = Drug company representative.

Further information on other advisors for worm control nominated by respondents is provided in Appendix A2.23.21

3.8 Blow Fly Control

3.8.1 Incidence of blow fly strike in 2003 (respondent basis)

3.8.1.1 Breech strike in ewes

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	31	75	87	99
GB & DD	10	30	60	90
New England	143	67	74	81
C & S Tablelands	143	81	87	92
SW NSW & NE Vic	123	72	79	86
Gippsland	10	55	80	100
W Vic & SE SA	269	77	81	86
S SA	60	76	85	94
KI	41	60	73	87
WA	175	84	89	93
All regions	1005	80	82	84

$\chi 2$ =20.44, d.f. = 9, p = 0.015. 2 cells (10.0%) have expected counts less than 5.

3.8.1.2 Breech strike in wethers

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	23	15	35	54
GB & DD	15	0	20	40
New England	117	30	38	47
C & S Tablelands	110	42	52	61
SW NSW & NE Vic	69	48	59	71
Gippsland	9	3	33	64
W Vic & SE SA	196	47	54	61
S SA	23	8	26	44
KI	35	29	46	62
WA	119	51	60	68
All regions	716	46	50	53

$\chi 2$ = 28.60, d.f. = 9, p = 0.0007. 2 cells (10.0%) have expected counts less than 5.

3.8.1.3 Breech strike in weaners

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	28	51	68	85
GB & DD	5	0	20	55
New England	135	59	67	75
C & S Tablelands	132	66	73	81
SW NSW & NE Vic	111	58	67	75
Gippsland	10	42	70	98
W Vic & SE SA	239	64	70	76
S SA	51	47	61	74
KI	36	39	56	72
WA	174	73	79	85
All regions	921	67	70	73

$\chi 2 = 19.96$, d.f. = 9, $p = 0.018$. 3 cells (15.0%) have expected counts less than 5.

3.8.1.4 Body strike in ewes

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	31	31	48	66
GB & DD	10	30	60	90
New England	143	41	50	58
C & S Tablelands	143	35	43	51
SW NSW & NE Vic	122	46	55	64
Gippsland	10	19	50	81
W Vic & SE SA	269	36	42	48
S SA	60	37	50	63
KI	41	36	51	67
WA	175	30	37	44
All regions	1004	42	45	48

$\chi 2 = 14.40$, d.f. = 9, $p = 0.109$. 2 cells (10.0%) have expected counts less than 5.

3.8.1.5 Body strike in wethers

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	22	39	59	80
GB & DD	15	60	**80**	100
New England	117	35	44	53
C & S Tablelands	109	39	49	58
SW NSW & NE Vic	68	41	53	65
Gippsland	9	12	44	77
W Vic & SE SA	200	40	47	53
S SA	22	5	23	40
KI	34	19	35	51
WA	114	18	26	34
All regions	710	40	44	47

$\chi 2 = 33.17$, d.f. = 9, $p < 0.0005$. 1 cell (5.0%) has expected count less than 5.

3.8.1.6 Body strike in weaners

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	28	35	54	72
GB & DD	6	100	100	100
New England	133	60	**68**	76
C & S Tablelands	127	42	51	60
SW NSW & NE Vic	107	47	56	65
Gippsland	9	23	56	88
W Vic & SE SA	231	42	49	55
S SA	51	47	61	74
KI	38	54	68	83
WA	167	36	43	51
All regions	897	51	54	57

$\chi 2 = 30.19$, d.f. = 9, $p < 0.0005$. 4 cells (20.0%) have expected counts less than 5.

3.8.1.7 Pizzle strike in wethers

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	22	0	9	21
GB & DD	15	0	0	0
New England	114	1	5	9
C & S Tablelands	106	0	4	7
SW NSW & NE Vic	64	0	6	12
Gippsland	9	0	**22**	49
W Vic & SE SA	194	1	3	6
S SA	22	0	9	21
KI	34	0	3	9
WA	107	0	1	3
All regions	687	3	4	6

$\chi 2$ = 15.55, d.f. = 9, p=0.077. 9 cells (45.0%) have expected counts less than 5.
Note: in contrast to breech and body strike, pizzle strike was not listed as a type of strike in the questionnaire. The figures above are from those who nominated pizzle strike in the "Other" space. The figures may have been higher if pizzle strike had been listed as a type of strike in the questionnaire.

3.8.1.8 Pizzle strike in weaners

Region	n	Proportion of respondents reporting fly strike (%)		
SW & S Qld	27	0	0	0
GB & DD	5	0	0	0
New England	129	0	1	2
C & S Tablelands	123	0	2	5
SW NSW & NE Vic	102	0	3	6
Gippsland	9	0	0	0
W Vic & SE SA	224	0	0	1
S SA	50	0	0	0
KI	36	0	3	8
WA	162	0	0	0
All regions	867	0	1	2

$\chi 2$ = 10.51, d.f. = 9, p = 0.311. 11 cells (55.0%) have expected counts less than 5.
Note: in contrast to breech and body strike, pizzle strike was not listed as a type of strike in the questionnaire. The figures above are from those who nominated pizzle strike in the "Other" space. The figures may have been higher if pizzle strike had been listed as a type of strike in the questionnaire.

3.8.1.9 Poll strike

Four respondents indicated in the "Other" space in the question on blow fly strike that they had sheep affected by poll or head strike in 2003. Two respondent had ewes and weaners affected, one had ewes and wethers affected and one had all three classes of sheep affected.

3.8.2 Incidence of fly strike in 2003 (sheep basis)

The previous section reported on the incidence of fly strike in terms of the proportion of respondents or properties affected. It is possible to use the percentage of affected sheep reported by respondents, together with the data they supplied as to their flock composition and size in 2003, to calculate the proportions of sheep within the total number of sheep encompassed by the sample affected by the various types of fly strike. These are shown in the table below. Poll or head strike has been omitted due to the very small number of respondents reporting this type of fly strike.

Region	Proportion of sheep affected by types of fly strike below (%)							
	Ewes		Wethers			Weaners		
	Breech	Body	Breech	Body	Pizzle	Breech	Body	Pizzle
SW & S Qld	4.1	0.9	0.7	1.3	0.0	2.5	1.1	0.00
GB & DD	1.3	1.7	0.3	3.4	0.0	0.4	4.7	0.00
New England	1.1	1.0	0.5	0.6	0.1	1.7	2.0	0.00
C & S Tablelands	2.0	0.5	1.2	2.2	0.1	1.8	1.5	0.01
S NSW & N Vic	2.5	1.8	0.6	1.7	0.3	2.2	2.0	0.04
Gippsland	1.4	0.6	0.4	0.8	1.0	3.4	3.4	0.00
W Vic & SE SA	2.9	0.8	1.6	1.3	0.1	2.8	1.4	0.01
S SA	3.7	0.9	0.3	0.5	0.2	1.1	1.0	0.00
KI	1.3	2.0	0.8	1.3	0.0	1.1	2.3	0.01
WA	2.3	1.0	3.6	2.6	0.0	2.4	1.0	0.00
All regions	2.3	1.0	1.3	1.6	0.1	2.2	1.5	0.01

Sample sizes are the same as in the tables in the previous section.

3.8.3 Typical treatment for blow fly strike

3.8.3.1 Treat routinely for prevention at about the same time each year

Region	n	Proportion of respondents using treatment (%)		
SW & S Qld	101	30	40	49
GB & DD	30	7	21	36
New England	274	51	**57**	63
C & S Tablelands	311	40	46	52
SW NSW & NE Vic	308	45	50	56
Gippsland	21	31	52	74
W Vic & SE SA	592	37	41	44
S SA	108	16	**24**	32
KI	52	29	43	56
WA	434	32	37	41
All regions	2231	41	43	45

$\chi 2$ =61.93, d.f. = 9, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.8.3.2 Treat when weather suggests a fly wave might occur

Region	n	Proportion of respondents using treatment (%)		
SW & S Qld	101	25	**35**	44
GB & DD	30	24	**41**	59
New England	274	19	24	29
C & S Tablelands	311	20	24	29
SW NSW & NE Vic	308	24	**29**	34
Gippsland	21	4	21	38
W Vic & SE SA	592	18	22	25
S SA	108	6	**12**	18
KI	52	20	33	45
WA	434	13	**16**	20
All regions	2231	21	23	24

$\chi 2$ =40.95, d.f. = 9, p <0.0005.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.8.3.3 Treat whole mob once fly strike starts

Region	n	Proportion of respondents using treatment (%)		
SW & S Qld	101	31	**40**	50
GB & DD	30	5	18	33
New England	274	24	29	34
C & S Tablelands	311	21	26	31
SW NSW & NE Vic	308	21	26	31
Gippsland	21	17	38	59
W Vic & SE SA	592	18	22	25
S SA	108	17	25	33
KI	52	9	20	30
WA	434	16	20	24
All regions	2231	23	24	26

$\chi 2$ = 27.47, d.f. = 9, p = 0.001.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.8.3.4 Treat individual sheep which become struck

Region	n	Proportion of respondents using treatment (%)		
SW & S Qld	101	44	54	64
GB & DD	30	60	76	91
New England	274	50	**56**	61
C & S Tablelands	311	57	63	68
SW NSW & NE Vic	308	58	64	69
Gippsland	21	32	53	75
W Vic & SE SA	592	68	72	75
S SA	108	80	**86**	93
KI	52	63	75	87
WA	434	73	**77**	81
All regions	2231	66	68	70

$\chi 2 = 75.03$, d.f. = 9, $p < 0.0005$.
Note: percentages are adjusted for non-response bias as described in Appendix A1.10.

3.8.4 Other methods of fly control

Figures for other methods of blow fly control nominated by respondents are provided in Appendix A2.24.1.

3.8.5 Who performs the mules operation for respondents

Region	n	Proportion of respondents with mules performed as below (%)											
		Contractor			Self, family member, friend			Has Merinos but does not mules			Purchase mulesed sheep		
SW & S Qld	58	21	33	45	32	45	58	9	19	29	0	3	8
GB & DD	13	0	0	0	27	54	81	12	38	65	0	8	22
New England	157	33	41	48	41	48	56	5	10	15	0	1	2
C & S Tablelands	156	35	42	50	41	49	57	3	7	11	0	2	4
SW NSW & NE Vic	140	37	46	54	25	33	41	7	13	18	4	9	13
Gippsland	10	10	40	70	19	50	81	0	10	29	0	0	0
W Vic & SE SA	333	38	43	49	37	42	47	7	10	13	2	5	7
S SA	61	24	36	48	40	52	65	0	5	10	0	7	13
KI	40	14	28	41	56	70	84	0	0	0	0	3	7
WA	198	54	61	67	26	33	39	1	4	7	0	3	5
All regions	1166	41	44	47	40	43	46	8	9	11	3	4	5

$\chi 2 = 92.63$, d.f. = 27, $p < 0.0005$. 10 cells (25.0%) have expected counts less than 5.

A full listing of the main categories of people who performed mulesing for respondents is provided in Appendix A2.24.2.

3.8.6 *Length at which lambs' tails are docked*

Region	n	Proportion of respondents docking tail to length below (%)											
		Much shorter than tip of vulva in ewes			Just shorter than tip of vulva			Equal to tip of vulva			Longer than tip of vulva		
SW & S Qld	55	0	4	9	8	18	28	53	65	78	4	13	22
GB & DD	14	0	14	33	5	29	52	31	57	83	0	0	0
New England	164	1	4	7	11	17	23	53	60	68	12	18	24
C & S Tablelands	175	1	5	8	15	21	27	55	62	69	8	13	18
SW NSW & NE Vic	159	2	5	8	12	18	24	57	64	72	8	13	18
Gippsland	12	0	0	0	0	8	24	40	67	93	1	25	50
W Vic & SE SA	353	4	7	9	18	22	27	53	58	63	10	13	17
S SA	68	0	0	0	13	24	34	47	59	71	9	18	27
KI	41	0	0	0	1	10	19	57	71	85	7	20	32
WA	195	0	2	4	4	8	11	55	62	68	22	29	35
All regions	1237	3	4	6	16	18	20	58	61	64	15	17	19

$\chi 2 = 62.97$, d.f. = 27, $p < 0.0005$. 9 cells (22.5%) have expected counts less than 5.

3.9 Lice Control

3.9.1 *Frequency of treatment for lice*

Region	n	Proportion of respondents treating at frequency below (%)											
		Annually			Longer than annually			On detection			Never		
SW & S Qld	62	71	**81**	90	3	11	19	0	**3**	8	0	**5**	10
GB & DD	23	61	**78**	95	0	**0**	0	5	22	39	0	**0**	0
New England	156	19	**26**	32	11	17	23	14	21	27	30	**37**	45
C & S Tablelands	173	22	**28**	35	12	18	24	19	25	32	22	**28**	35
SW NSW & NE Vic	153	35	42	50	13	20	26	16	23	30	9	15	21
Gippsland	11	16	45	75	0	9	26	1	27	54	0	18	41
W Vic & SE SA	345	34	39	44	12	16	19	21	26	30	16	20	24
S SA	66	55	**67**	78	5	14	22	3	11	18	2	9	16
KI	35	24	40	56	11	26	40	7	20	33	3	14	26
WA	188	35	43	50	22	**29**	35	16	22	28	3	**7**	11
All regions	1212	38	41	44	16	18	20	20	22	24	17	19	21

$\chi 2 = 163.50$, d.f. = 27, $p < 0.0005$. "On detection" includes respondent's and neighbour's sheep.

A full listing of treatment frequency categories is provided in Appendix A2.25.1.

3.9.2 Incidence of lice at last shearing

Region	n	Proportion of respondents with lousy sheep at last shearing (%)		
SW & S Qld	59	25	**37**	50
GB & DD	22	20	**41**	61
New England	167	12	18	24
C & S Tablelands	183	6	**10**	14
SW NSW & NE Vic	164	10	15	21
Gippsland	12	1	25	50
W Vic & SE SA	369	13	17	21
S SA	68	6	15	23
KI	42	13	26	39
WA	195	23	**30**	36
All regions	1281	17	20	22

$\chi 2 = 47.87$, d.f. = 27, $p < 0.0005$.

3.9.3 Incidence of lice in last five years (number of years)

Region	n	Minimum	Median	Maximum	Mean	95% CI	Histogram
SW & S Qld	63	0	1	3	0.9	0.3	
GB & DD	24	0	1	5	1.3	0.7	
New England	173	0	0	5	0.6	0.2	
C & S Tablelands	184	0	0	5	0.4	0.1	
S NSW & N Vic	170	0	0	5	0.5	0.1	
Gippsland	12	0	0	3	0.9	0.8	
W Vic & SE SA	375	0	0	5	0.6	0.1	
S SA	71	0	0	5	0.6	0.2	
KI	42	0	0	3	0.8	0.3	
WA	206	0	1	5	1.1	0.2	
All Regions	1322	0	0	5	0.7	0.1	

Histogram class limits: 0.00-0.99-1.99-2.99-3.99-4.99-5.99.
Kruskal-Wallis test: $\chi 2 = 64.51$, d.f.=9, $p<0.0005$.

3.9.4 Use of lice control techniques in the period 2001 – 2003

3.9.4.1 Incidence of use of lice control techniques among respondents

Region	n*	Proportion of respondents treating lice who used the technique below one or more times in the period (%)					
		Off-shears				Long wool	
		Mobile dipping contractor	Plunge dip	Shower dip	Pour-on 'backliner'	Hand jetting	Pour-on 'backliner'
SW & S Qld	55	4	11	9	89	16	7
GB & DD	18	0	33	11	78	6	6
New England	73	7	8	8	71	11	4
C & S Tablelands	81	7	17	14	68	2	4
S NSW & N Vic	88	13	13	15	65	8	5
Gippsland	5	20	0	20	100	0	20
W Vic & SE SA	205	9	14	14	73	8	4
S SA	52	8	6	10	83	6	0
KI	26	4	4	19	69	19	12
WA	140	13	3	9	81	13	9
All regions	743	9	11	12	75	9	5

Note: percentages may sum to more than 100 as respondents could give details on more than one technique.

3.9.4.2 Extent of use of techniques among respondents who treated lice in the period 2001 – 2003

	Off-shears				Long wool	
	Mobile dipping contractor	Plunge dip	Shower dip	Pour-on 'backliner'	Hand jetting	Pour-on 'backliner'
Mean number of treatments* in period	1.42	1.89	2.16	2.77	2.06	1.85
Minimum number of treatments in period	1	1	1	1	1	1
Maximum number of treatments in period	6	6	6	9	6	6
Number of respondents	66	79	90	557	69	40

** a treatment is defined as the application of a single product, i.e. if a mixture of two products is applied, this is counted as two treatments.*

3.9.5 Main product groups used for lice control, 2001 – 2003, by type of control technique

Product group	Proportion of treatments within each technique that used the active constituents in the left hand column (%)					
	Off-shears				Long wool	
	Mobile dipping contractor	Plunge dip	Shower dip	Pour-on 'backliner'	Hand jetting	Pour-on 'backliner'
Organophosphate	82.8	83.8	69.0	1.0	32.7	5.6
Synthetic pyrethroids	0.0	0.0	0.0	5.8	2.0	37.0
Insect Growth Regulator	6.9	12.7	25.0	92.8	33.3	57.4
Spinosad/Extinosad	2.3	0.0	0.5	0.2	27.2	0.0
Magnesium fluorosilicate	4.6	3.5	5.4	0.0	0.7	0.0
Ivermectin	0.0	0.0	0.0	0.0	4.1	0.0
Other	3.4	0.0	0.2	0.0	0.0	0.0
Number of treatments	87	142	184	1478	147	54
Number of respondents	64	79	89	546	71	31

3.9.6 Main product groups used for lice control, 2001 – 2003, by year

Product group	Proportion of treatments each year that used the active constituents in the left hand column (%)		
	2001	2002	2003
Organophosphate	18.7	17.7	18.7
Synthetic pyrethroids	5.9	4.4	5.3
Insect Growth Regulator	72.3	73.8	72.1
Spinosad/Extinosad	1.7	2.1	2.7
Magnesium fluorosilicate	0.9	1.3	0.7
Ivermectin	0.2	0.4	0.3
Other	0.3	0.3	0.3
Number of treatments	646	709	739
Number of respondents	508	557	573

A full listing of lice control products and their frequency of use is provided in Appendix A2.25.2.

3.9.7 Other forms of lice control

A very small number of respondents provided information on other forms of lice control. Details of these are provided in Appendix A2.25.3.

3.9.8 Suspected lice resistance

Region	n	Proportion of respondents who have suspected resistance to a lice product on their property (%)		
SW & S Qld	62	31	**44**	56
GB & DD	24	14	**33**	52
New England	158	5	10	15
C & S Tablelands	165	4	8	12
SW NSW & NE Vic	167	4	8	12
Gippsland	12	1	25	50
W Vic & SE SA	355	7	10	13
S SA	70	7	16	24
KI	41	2	12	22
WA	202	8	12	17
All regions	1256	11	13	14

$\chi 2 = 74.58$, d.f. = 9, $p < 0.0005$.

3.9.9 Products to which resistance may have occurred.

Region	n	Proportion of respondents who suspected resistance had occurred to the products in the groups below (%)			
		Organo-phosphate	Synthetic pyrethroids	Insect Growth Regulator	Magnesium fluorosilicate
SW & S Qld	25	0	32	84	0
GB & DD	8	0	38	88	0
New England	14	14	29	57	0
C & S Tablelands	9	11	89	22	0
SW NSW & NE Vic	10	20	60	20	0
Gippsland	2	0	50	100	0
W Vic & SE SA	27	26	48	44	0
S SA	9	0	89	22	0
KI	5	0	60	40	0
WA	21	43	33	38	5
All regions	130	16	47	51	1

Note: percentages may sum to more than 100 as respondents could give more than one product.

A full list of products that respondents named as products to which resistance might have occurred is provided in Appendix A2.25.4.