Report

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National Sheep Health Monitoring Project – Economic modelling

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1 Background

The National Sheep Health Monitoring Project (NSHMP) managed by Animal Health Australia (AHA) seeks to *maintain and increase market access through effective partnerships for the reduction of sheep production conditions* and through the enhancement of value chain performance (return value to stakeholders). NSHMP is jointly funded by WoolProducers Australia (WPA) and Sheepmeat Council of Australia (SCA) through the use of AHA-held producer levies.

The NSHMP evolved from the national surveillance program for Ovine Johne's Diseases (OJD) which commenced in 1999. By 2006 the value of expanding the program to include data collected for other endemic diseases was identified and commenced in NSW, followed by all other states in 2007. Over time, monitoring of additional diseases impacting on-farm productivity was included to enhance value chain performance.

SCA and WPA requested that the NSHMP be reviewed in 2015-16 and Greenleaf Enterprises Pty Ltd were contracted to complete the review. As part of the review, economic modelling was developed and the results are in this report.

2 Methodology

2.1 Model Development

The costs of diseases included in the project were allocated to each sector of the supply chain including meat sheep producers, processors and wool producers for lamb and mutton. Where possible, the impact the NSHMP has on maintaining trade access was also quantified. For each disease the factors in Table 1 were considered.

Table 1: Factors impacted negatively by disease in each sector of the chain

Disease Factors	Producers	Processor	Wool Production	Other
Mortalities	✓			
Reduced growth rates	✓		✓	
Underweight at sale	✓	✓*		
Condemns (Carcase)	✓	✓	✓	
Condemns (Offal)		✓		
Downgrading		✓		
Trimming		✓		
Wool Quality			✓	
Skins Quality		✓		
Reduced fleece weight			✓	
Restriction of trade				✓

* The carcases which are underweight when processed have been included as a lost opportunity (reduced market price & increase cost per kg processed) for the processing sector.

A desktop analysis was undertaken to estimate costs for each factor. Total values were calculated using the data from the desktop analysis and prevalence data from the Endemic Disease Information System (EDIS). The disease impact was multiplied by the current sale price for lamb and mutton obtained from Meat and Livestock Australia. This approach to the model ensures that it can remain relevant for years to come. The inputs about impacts and

costs of disease are critical for an accurate output. The process used to obtain these inputs is explained in the literature review below.

2.2 Literature review

The economic model was built with the functionality to be updateable as industry costs and sales values change. This required data at a component level to be built up in the model as opposed to using total industry costs from reports and multiplying by prevalence data.

The impacts of each disease were needed for lamb (less than two years of age) and mutton (over two years of age). A comprehensive literature review was undertaken as well as consultation with epidemiologists from AHA, Meat and Livestock Australia and some educators for direction. The following reports were useful for this project:

- Bush R, Windsor P, Toribio J and Webster S (2008). Financial modelling of the potential cost of ovine Johne's disease and the benefit of vaccinating sheep flocks in southern New South Wales. In: Australian Veterinary Journal, vol 86, no 10 pp 398-403.
- Eppleston J and Windsor P (2007). Lesions attributed to vaccination of sheep with Gudair™ for the control of ovine paratuberculosis: post farm economic impacts at slaughter. In: Australian Veterinary Journal, vol 85 no 4.
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- Sackett D, Holmes P, Abbott K, Jephcott S and Barber M (2006). Assessing the economic cost of endemic disease on the profitability of Australian beef cattle and sheep producers AHW.087. Animal Health and Welfare. Report prepared for Meat & Livestock Australia, Sydney. Available at: http://www.mla.com.au/Research-and-development/Final-report-details?projectid=3578.

Multiple data sources combined: Prevalence data were obtained from EDIS (2016). The information contained in the GHD (2009) and GHD (2014) reports were used as a starting

point. These reports did not include all diseases, often used calculations based on older costing data, or only provided total values. In these instances, additional information was drawn from the wider literature review. For this reason, the total costs per disease differ from other reports because of different diseases considered and different prevalence information, therefore the total values should not be compared. For example, trimming quantities removed from carcases for some diseases were taken from the field study by Hernandez-Jover et al (2013) which was the most recent data source. The GHD (2014) report also referenced this work but information from other reports was also included and compared to the values of GHD (2009), GHD (2014) and Paton (1994).

Comparative industry cost estimate: Although the individual costs differ from other reports, the values were similar when variation in prevalence from the NSHMP data was taken into consideration.

Data gaps: There were minimal data available on some of the diseases. Where data were unavailable the cost impacts were left blank. Because of this, the total disease costs are on the conservative side.

Potential research needs: Gaps in data for particular diseases indicate potential research areas where more understanding of the impact of particular diseases is required.

3 Results of economic modelling

3.1 Disease costs

The total cost to industry from the 17 diseases/conditions captured by the NSHMP for 2015 was $116,954,879 summarised in Table 2. Of the total cost, $48,984,558 was cost to meat sheep, $40,037,413 was cost to slaughtered wool sheep and $27,932,909 was the cost to processors. Arthritis prevalence was only captured in South Australia where plant inspectors collect the NSHMP data including antimortem inspections as opposed to supernumerary's in other states that only collect data post slaughter. There is high confidence that arthritis is widespread across regions and climatic zones (GHD, 2014) which means the actual cost of arthritis to the industry was significantly greater than stated here. The total disease costs are conservative with zero cost for some of the diseases because of a lack of information. As more information becomes available the total cost is expected to increase. The total value was calculated using EDIS prevalence figures.

A limitation of this report/project is that it only shows the cost of the diseases to industry and not the net cost with prevention or treatment factored in. Total opportunity costs need to be factored when prioritising diseases but breakeven points are not well understood due to lack of data. For example, it is stated in the GHD, 2014 report that there is no net gain from moving all affected flocks experiencing Caseous Lymphadenitis to the lowest level of disease, however it is important from a social and animal welfare perspective and thus should be better understood. This project was focused on review of project total effectiveness rather than on the actual costs and opportunities but recognises further industry work on understanding treatment break-evens is required.

Table 2: Total costs of 17 diseases captured by the NSHMP for 2015

COST OF DISEASES TO AUSTRALIAN AGRICULTURE - 2015				
	Meat Production	Wool production	Processor	WHOLE SUPPLY CHAIN
Arthritis	$ 21,623,104	$ -	$ 3,963,250	$ 25,586,354
Caseous lymphadenitis	$ 10,997,380	$ 4,169,915	$ 6,470,258	$ 21,637,553
Cancer	$ 42	$ -	$ 15	$ 57
Cysticercus tenuicollis	$ -	$ -	$ 1,174,500	$ 1,174,500
Dog bite lesions	$ 42,756	$ -	$ 42,756	$ 85,512
Knotty gut/nodule worm lesions	$ -	$ -	$ -	$ -
Grass seed lesions	$ 9,524,647	$ 28,495,080	$ 9,524,647	$ 47,544,373
Hydatids	$ 469	$ -	$ 10,125	$ 10,594
Liver flukes	$ -	$ 7,078,922	$ 161,380	$ 7,240,302
Lungworm	$ -	$ -	$ -	$ -
Melanosis	$ -	$ -	$ -	$ -
Ovine Johne's Disease	$ 676,316	$ 293,496	$ 35,513	$ 1,005,325
Pleurisy	$ 2,196,252	$ -	$ 2,205,162	$ 4,401,414
Pneumonia	$ 258,736	$ -	$ 258,790	$ 517,526
Sarcocystis	$ 2,451,791	$ -	$ 2,450,224	$ 4,902,015
Sheep measles	$ 561,014	$ -	$ 984,238	$ 1,545,252
Vaccination lesions of any cause	$ 652,051	$ -	$ 652,051	$ 1,304,102
Total cost	**$ 48,984,558**	**$ 40,037,413**	**$ 27,932,909**	**$ 116,954,879**

The cost of disease was calculated using the product costs for lamb and mutton from Meat and Livestock Australia as at 22/1/2016. These are detailed in Table 3 below.

Table 3: Product costs for lamb and mutton (Meat and Livestock Australia, 2015)

Product Costs		
Product	Value ($/kg)	
	Lamb	Mutton
Liveweight	$ 4.14	$ 3.73
Carcase Weight	$ 7.50	$ 6.75
Trim	$ 4.00	$ 4.00
Liver	$ 1.50	$ 1.35
Heart	$ 2.50	$ 2.25
Tripe	$ 3.37	$ 3.03
Lungs	$ 0.50	$ 0.45
Kidneys	$ 5.00	$ 4.50
Pasture Costs	$ 1.50	$ 1.35
Runner	$ 5.70	$ 5.13
Wool clip (2014 EMI average)	$ 10.46	$ 10.46

The total cost of diseases has fluctuated year to year. From 2012 to 2014 the cost of disease increased, in 2015 the cost of disease decreased to close to the 2012 value. A detailed comparison of disease costs shows various increases and decreases across the diseases, prevalence being the only varying factor.

Table 4: Comparison of total costs of 17 diseases captured by the NSHMP from 2013 to 2015

Cost of conditions						
Condition	2010	2011	2012	2013	2014	2015
Arthritis	$ -	$ -	$ 2,020,219	$ 18,990,162	$ 28,492,910	$ 25,586,354
Caseous lymphadenitis	$ 25,506,456	$ 33,936,027	$ 22,223,123	$ 19,241,199	$ 21,901,982	$ 21,637,553
Cancer	$ 239	$ 48	$ 107	$ 350	$ 191	$ 57
Cysticercus tenuicollis	$ 2,047,172	$ 916,052	$ 918,950	$ 885,910	$ 1,132,219	$ 1,174,500
Dog bite lesions	$ 131,399	$ 25,146	$ 43,683	$ 67,982	$ 79,559	$ 85,512
Knotty gut/nodule worm lesions	$ -	$ -	$ -	$ -	$ -	$ -
Grass seed lesions	$ 31,569,381	$ 58,362,353	$ 55,277,802	$ 63,756,519	$ 60,313,689	$ 47,544,373
Hydatids	$ 3,291	$ 5,777	$ 1,988	$ 4,288	$ 17,612	$ 10,594
Liver flukes	$ 16,043,113	$ 17,062,604	$ 18,437,645	$ 11,328,215	$ 16,814,521	$ 7,240,302
Lungworm	$ -	$ -	$ -	$ -	$ -	$ -
Melanosis	$ -	$ -	$ -	$ -	$ -	$ -
Ovine Johne's Disease	$ 2,423,070	$ 3,308,172	$ 1,836,972	$ 1,096,009	$ 817,449	$ 1,005,325
Pleurisy	$ -	$ -	$ -	$ 2,134,620	$ 4,807,770	$ 4,401,414
Pneumonia	$ -	$ -	$ -	$ -	$ 197,981	$ 517,526
Sarcocystis	$ 3,192,788	$ 12,696,580	$ 4,458,606	$ 2,276,661	$ 4,312,375	$ 4,902,015
Sheep measles	$ 2,280,998	$ 1,659,942	$ 3,301,031	$ 1,419,251	$ 1,726,878	$ 1,545,252
Vaccination lesions of any cause	$ -	$ -	$ 175,731	$ 654,179	$ 1,123,088	$ 1,304,102
Total cost	**$ 83,197,907**	**$ 127,972,701**	**$ 108,695,855**	**$ 121,855,345**	**$ 141,738,222**	**$ 116,954,879**

Without detailed statistical analysis there is no evident trend in disease prevalence. This is demonstrated below in Figure 1, where the total costs fluctuate year to year along with the prevalence and cost of each disease. Grass seed lesions were the largest cost to the industry and varied significantly from year to year. Without detailed analysis, conclusions on the accuracy of the project should not be drawn from total disease costs or prevalence data. It is accepted that there are many variables that impact disease prevalence, analysis of these was not in the scope of this report.

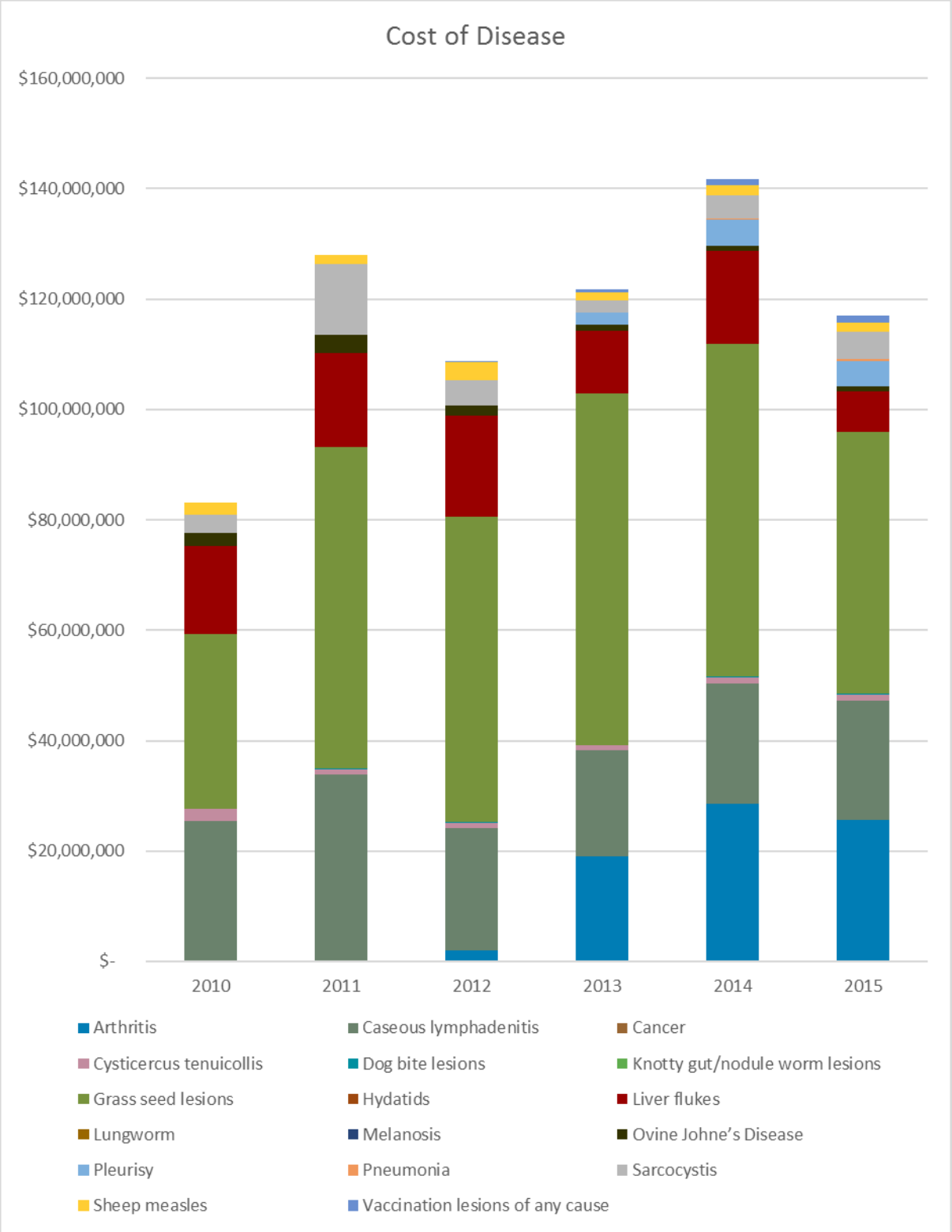

Figure 1: Bar chart of disease costs from financial years 2010 to 2015

3.2 Quantity of data collected

The total number of head monitored for 2015 was 3,209,505 (see Table 5) from 15,385 lines which is 10% of national total slaughter. Only 76% of head monitored (2,342,125 head from

12,060 lines) was from direct lines, meaning feedback to producers could not occur for the total head monitored using the current traceability system.

Table 5: Percentage of total slaughter monitored by year

Year	Number of lines	Number of animals	Total slaughter	Percent of total slaughter
2010	9,894	1,718,550	24,767,400	7%
2011	11,169	1,925,407	22,725,400	8%
2012	17,626	3,241,411	26,073,000	12%
2013	15,335	3,095,959	31,500,600	10%
2014	17,412	3,727,501	32,336,400	12%
2015	15,385	3,209,505	32,277,000	10%

Monitoring coverage varies by state. Based on the 2014 calendar year data in Table 6, South Australia had the highest percentage of animals monitored at 26% whilst Victoria and Western Australia had the lowest percentage at 7% of the kill. South Australia had significantly higher monitoring percentages because of additional funding provided by state producers for permanent inspectors to be based at the largest plants.

Table 6: Percentage of total slaughter by state in 2014 calendar year

Animals processed & inspected in 2014 calendar year			
State	Total Processed	Animals Inspected	Percentage of Kill
NSW	7,495,100	862,783	12%
VIC	13,856,800	909,803	7%
QLD	935,100	184,549	20%
SA	5,331,100	1,362,522	26%
WA	3,692,300	268,681	7%
TAS	1,025,700	139,163	14%
Total	**32,336,100**	**3,727,501**	**12%**

4 References

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