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COST BENEFITS OF E-SURVEILLANCE SYSTEM FOR ANIMAL HEALTH MONITORING

GHD Hassall completed, on behalf of Animal Health Australia, a benefit-cost analysis of the potential implementation of an E-Surveillance system on the small stock chain of Australian abattoirs. The aim of this analysis was to determine the potential benefit to producers and animal health policy makers of tracking the incidence of endemic disease within the Australian sheep and goat populations.

BACKGROUND

A number of projects on abattoir surveillance and reporting of disease conditions to producers have been completed in Australia1. The results from these analyses have indicated benefits to the producing sector of such surveillance, but have not included a benefit-cost analysis for the whole of the supply chain.

Currently, abattoir surveillance in sheep is limited to the national ovine Johne's disease (OJD) surveillance program; the National Sheep Heath Monitoring (NSHMP) program; and the partial surveillance data collected by the Australian Quarantine and Inspection Service (AQIS) and reported through its Export Production and Condemnation Statistics (EPACS) database. Each of these surveillance programs is limited to a select number of abattoirs and a select range of diseases.

The concept of an E-surveillance system is for the electronic recording and storage of disease/condition information of sheep, lamb and goat carcases and offal at abattoirs for later retrieval by authorised producers, processors, farm advisors and animal health authorities. The current National Livestock Identification Scheme (NLIS) for sheep and goats is based on whole of property identification using visually readable eartags. It is proposed that the information collected would be stored using the Property Identification Code (PIC) of individual slaughter lines, until such time that individual electronic devices begin to be used for sheep and goats.

It is felt that the collection and dissemination of this information will allow:

- Producers to identify disease concerns and adopt management practice to reduce and eradicate disease, improving productivity and profitability;
- Increased awareness by processors to diseases and conditions that cause waste, providing the opportunity to take corrective action;
- Animal health authorities to
  - monitor diseases and conditions from a food safety perspective and use the information to provide assurance to customers;
  - monitor trends in prevalence of certain conditions and aid in the early detection of new, emerging or exotic diseases;
  - measure the effects of regional disease control and extension programs; and
- Farm advisors to measure the effectiveness of control programs on client farms.

METHOD

This study calculated the economic losses of 10 important diseases/conditions of sheep, lambs and goats (Table 1.) All of these diseases are detectable by routine meat inspection to the Australian sheep and goat industries using diseases prevalence and carcass condemnation data and by surveying selected abattoirs. Detailed methodology and selection criteria for the 10 diseases is provided in Appendix D of the full report.

Data for average slaughter numbers from 2005-2008 were collected and used in this analysis.

In addition, 6 large export abattoirs and five large domestic abattoirs were surveyed by phone to determine their average yearly throughput, condemnations and running costs. The survey can be found in Appendix A of the full report.

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The estimation of losses at processing have been primarily based on AQIS condemnation data and disease prevalence data. Tables 4 and 11 of the full report provide condemnation data and disease prevalence data from AQIS. In addition, Table 13, in the full report, provides a list of assumptions at processor level, in terms of the costs of disease processing. For example, for each condemned carcase, another 30 need to be trimmed; average trimming is 2.5kg per carcase; the value of a sheep carcase that has not been condemned is $1.80/kg, etc.

Total losses at processing were estimated as the total number of slaughtered (sheep & lambs) multiplied by a condemnation rates for carcases and offal, multiplied by the lost value of the carcase and offal respectively.

The on-farm disease cost analysis was conducted using an average Self-replacing Merino flock and a first Cross Terminal Sire operation. The gross margins assumed for both groups were the net return reported on a per head basis by DPI NSW (2007)2 as shown in Table 1.

TABLE 1. BASE CASE GROSS MARGINS

	Self-replacing Merino	1st Cross Terminal Sire
Enterprise gross Margin	$65,450	$71,250
$/ewe	$65.45	$71.25
Average $/head across the entire flock*	$35.38	$32.10

** 1850 and 2220 total annual stock numbers in the self-replacing merino and prime lame enterprises respectively*

It is important to note that disease costs were estimated for on-farm impacts only and did not consider any flow-on impacts beyond animal production; for example, human health impacts.

COSTS AND BENEFITS OF E-SURVEILLANCE INTRODUCTION

The final part to this analysis was to weigh the costs of mandatory introduction of the esurveillance system within the small stock processing sector in Australia, with the total costs of disease. The following were considered in the analysis as costs:

- System installation in abattoirs
- Additional labour for operation
- Transfer of data to primary producers
- Cost of implementing management practices on-farm.

The following were the benefits considered

- Avoided on-farm costs of disease/conditions
- Reduced carcass condemnations (full & trimmed)
- Reduced offal and skin condemnations
- Avoided industry/market closures.

RESULTS

Table 2 shows the total disease costs to industry as a whole. Except for arthritis and OJD, these costs were assessed on the basis of reported onfarm incidence of each of the diseases/conditions as reported by NSHMP and condemnations reported by AQIS.

The cost of implementing an E-surveillance system will vary depending on the size of the abattoir. Table 3 provides a breakdown of the average cost of installation and annual running costs for a small, medium and large abattoir.

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TABLE 2.
DISEASE COSTS - TOTAL TO INDUSTRY AS A WHOLE ($'MILLION PER ANNUM)

	Total costs to small stock industry
Liver fluke	38.80
Pleurisy-pneumonia	6.03
Bladder worm	0.02
Sheep measles	1.63
Cheesy gland	4.74
Arthritis	24.53
Hydatid tapeworm	0.01
Grass seeds	17.42
OJD	4.41
Nephritis	13.56
Total	110.62
Average per disease	11.06

TABLE 3.
E-SURVEILLANCE SYSTEMS COSTS

	Installation costs	Annual running costs
Small Abattoir (200,000 head small stock p.a.)	$178,333	$25,000
Medium Abattoir (500,000 head small stock p.a.)	$189,333	$35,000
Large Abattoir (1.2 million head small stock p.a.)	$215,000	$45,000

A key assumption in the accrual of benefits from the implementation of an E-surveillance system is the proportion of producers who adopt management strategies as a result of being made aware of the condition of stock they have recently sold to slaughter. In addition, the costs of treatments are a key element to this analysis.

Using figures estimated by industry, the benefit of E-surveillance to processors by reduced condemnations was estimated and is provided in Table 4.

Finally, the analyses provided an estimated 80% of the benefits of the introduction of an Esurveillance system going to the producer. However, the installation of the system comes at significant cost to the processor. Table 5 provides an estimate of the financial impact on processors. This tables shows that a larger processor might expect a benefit-cost ratio of 1.59 from the inclusion of E-surveillance in their operations. Whereas, a smaller processor would need to increase their average per head benefit by $0.24 to approach the costs incurred with installation and running of the system.

TABLE 4.
BENEFIT OF E-SURVEILLANCE TO PROCESSORS BY REDUCED CONDEMNATIONS (%)

	Reduced Condemnations (%)
Liver fluke	21.6
Pleurisy-pneumonia	12.0
Bladder worm	12.0
Sheep measles	12.0
Cheesy gland	24.0
Arthritis	14.4
Hydatid tapeworm	12.0
Grass seeds	16.8
OJD	21.6
Nephritis	7.20

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TABLE 5.
FINANCIAL IMPACT ON PROCESSORS

	Large	Medium	Small
Annual smallstock throughput	1,2000,000	500,000	200,000
NVP	$188,339	-$79,369	-$163,020
BCR	1.59	0.81	0.40

SUMMARY

The establishment of an E-Surveillance system for the small stock (sheep, lamb and goats) supply chain is anticipated to have a benefit cost ratio of 3.3, with most (80%) of the benefits gained at the producer level and the balance by processors. This compares to 86% of costs of the diseases/conditions being borne by producers and the balance by processors. This suggests a subsidisation of processor benefits by the actions of producer management on-farm, especially given that on-farm benefits in this analysis have been assessed as net of the cost of management.

The benefit cost analysis has been shown to be relatively insensitive to changes in the major assumptions including the adoption by industry of management practices to reduce the prevalence of diseases and conditions on-farm, with such improvements then flowing through to the processing sector. In addition, the estimates of improvements in diseases/conditions on-farm are conservative and therefore the BCR is expected to be robust under changing circumstances.

The threshold analysis provides further evidence of this, as there is a need to include just four diseases/conditions for there to be net benefits from the introduction on an E-Surveillance system. Similarly, the average benefit per disease could fall to as low as $0.38 million annually for a system including 10 diseases to still deliver net benefits.

Demonstration of the financial impacts on typical processors, by size, shows the benefit of economies of scale. Larger processors are expected to gain net financial benefits from the introduction on an E-Surveillance system while medium to small processors would not. The average benefit per head processed would need to increase from $0.08 to $0.24 before their investment in E-Surveillance would breakeven. However, prior to introducing the system, a number of factors would need further investigation including:

- extending the system to more diseases,
- capturing AQIS data via an E-Surveillance process,
- equivalence between plants,
- asymmetry of information,
- mandatory versus voluntary, and the
- additional cost of labour.

REFERENCES

DPI (2007) Farm Enterprise Budget Series, NSW Department of Primary Industries, May.
MLA (2011) Cost benefits of e-surveillance system for animal health monitoring, Final Report, June.