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Implementation of improvements to the National Livestock Identification System for sheep and goats

Consultation regulation impact statement

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Summary

This paper has been prepared to seek stakeholder views on options for modifying the current National Livestock Identification System (NLIS) for sheep and goats. The views received will contribute to preparing a regulation impact statement (RIS) for the Standing Council on Primary Industries (SCoPI) to consider.

The NLIS for sheep and goats was created in 2006 to enhance Australia's capacity to identify and trace livestock from property of birth to slaughter or export. Such capacity is important for managing biosecurity, food safety, market access and animal welfare risks. The NLIS was developed to meet the National Livestock Traceability Performance Standards (NLTPS) endorsed in May 2004 by the Primary Industries Ministerial Council (PIMC). The PIMC (now SCoPI) consists of the Australian, state, territory and New Zealand ministers responsible for agriculture, fisheries, aquaculture, food and forestry. The objective of the council is to develop and promote sustainable, innovative and profitable agriculture, fisheries, aquaculture, food and forestry industries.

The current NLIS for sheep and goats relies on arrangements based on visual identification, coupled with documentation recording movements of mobs of animals. Varying approaches to meeting the standard occur across jurisdictions, which may affect whole-of-life traceability of animal movements across Australia. Traceability is defined as the proportion of animals that can be successfully traced between defined points in the supply chain or over time.

In 2011 the PIMC noted the NLIS for sheep and goats does not enable tracing of animals to the standard the NLTPS requires. The PIMC established a working group to consider the feasibility of electronic identification devices for sheep and goats. The PIMC Working Group reported that no insurmountable technical barriers existed to implementing an electronic NLIS for sheep and goats, but a substantial investment of resources and funding would be needed from all jurisdictions.

Issue 1: ABARES is seeking advice on the adequacy of the current National Livestock Identification System for sheep and goats in meeting the traceability requirements of the National Livestock Traceability Performance Standards and in reducing the biosecurity, food safety, market access and animal welfare risks.

Before SCoPI makes a decision on options to improve identification and traceability of sheep and goats, likely impacts of the proposed changes have to be assessed in the form of a RIS. The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) was asked to prepare this RIS.

This paper (known as a consultation RIS) outlines the method ABARES proposes using to conduct the analysis and seeks advice and information from stakeholders on various matters pertinent to successful completion of a decision RIS. This consultation RIS identifies a number of matters that need resolution before the decision RIS can be prepared; including data needed from stakeholders in order to undertake a comprehensive cost–benefit analysis in line with Office of Best Practice Regulation guidelines (COAG 2007).

In preparing this consultation RIS, ABARES consulted relevant state and territory agencies and the Office of Best Practice Regulation. Consultations included a workshop on 17 May 2013 at which participants from most relevant state and territory agencies reviewed data, information and assumptions for the consultation RIS.

Options for improving the National Livestock Identification System

The existing mob-based system is being used as the baseline for comparison. Three options for improving the NLIS have been proposed in this consultation RIS:

- Option 1 Enhanced mob-based system—enhancement of existing mob-based system with improvements in the verification and enforcement of business rules throughout the supply chain.
- Option 2 Electronic Identification (EID) system—the EID of animals with exemptions for sheep and goats sold directly from their property of birth to abattoirs or export depots.
- Option 3 EID system without exemptions.

Enhancements to the existing mob-based system (Option 1) aim to improve the traceability of sheep and goats through the supply chain. In 2010 the Centre for International Economics (CIE) identified two improvements to enhance the mob-based system involving changes to the business rules. These changes included improvements in the accuracy and completion of movement documentation (such as national vendor declaration forms) and improvements in rules for verification and compliance with the NLIS for sheep and goats. The extent to which these improvements may need to be applied may vary between each state and territory due to the differing approaches to implementing the current NLIS. As part of the consultation phase of this RIS it will be necessary to clarify the improvements required for the enhanced mob-based system in each state and territory and collect data to estimate the cost of these enhancements.

Issue 2: ABARES is seeking assistance to refine the documentation and the verification and compliance activities required to implement all options.

An accredited NLIS EID tag (Option 2 and Option 3) contains a microchip the manufacturer encodes with a unique identification number to be linked to the producer's property identification code (PIC). The number is uploaded to the NLIS database along with the tag's National Livestock Identification System number through use of electronic scanners along the supply chain from farm to abattoir or live export of the animal.

When an animal with its own unique PIC is moved to a different location in the supply chain its EID tag is scanned and the consignee uploads movement forms. Records are then available for each animal in the NLIS database. By allocating an individual NLIS number to each tag (or animal), there is no need to collect information on the livestock's property of birth, as it is stored in the database under the NLIS identification number. It is envisaged that livestock would have only one EID tag attached during their life and tags would only be replaced if lost or faulty.

Issue 3: ABARES is seeking suggestions on any other viable option for improving the National Livestock Identification System for sheep and goats and information on how they might meet the National Livestock Traceability Performance Standards.

Estimating the impact of improvements to the National Livestock Identification System for sheep and goats

To evaluate the proposed options, the incremental costs and benefits associated with each, relative to the current system, need to be estimated. Improved traceability could reduce the consequences of a number of potential risks including those associated with biosecurity, food safety and potential market access restrictions; and improve productivity, market access and

animal welfare relative to the current system. Incremental benefits arise from the ability to rapidly and accurately trace animals and take timely action to eliminate or contain the risk or to gain from other benefits (such as improved animal productivity on farm). The total incremental benefits of an option are the sum of benefits arising from all potential risks, taking into account the likelihood of those risks occurring, and improvements to productivity, trade and animal welfare.

Two possible approaches can be used to evaluate the costs and benefits associated with each option:

- The first approach is to identify the level of traceability that could be achieved with each option and evaluate the costs of implementing that option and the benefits associated with that level of traceability. While it is possible that the level of traceability that could be achieved under each option may differ, a problem with this approach is that it implies lower levels of traceability for some options are considered acceptable under the NLTPS.
- The second approach is to assume a given level of traceability needs to be attained (such as 98 per cent) and evaluate the costs of achieving that level of traceability for each option. Because the level of traceability is the same for all options using this approach the benefits are likely to be similar and the analysis becomes largely one of investigating the cost-effectiveness of each option. However, it would remain important to evaluate the benefits to ensure it is worthwhile proceeding with any option relative to the existing approach.

For this consultation RIS the second approach has been adopted. Only one of the potential benefits—the incremental benefits assumed to flow from improved traceability reducing the length of a foot-and-mouth disease (FMD) outbreak—has been considered to illustrate the approach. Due to limited available information on the relationship between improved traceability and a reduction in the expected consequence, assumptions have been made about the magnitude of reduction in the cost of an FMD outbreak directly attributable to an increase in traceability based on previous studies on improving the NLIS for sheep and goats.

Issue 4: ABARES seeks comments on the proposed methodology for the benefit–cost analysis for the decision RIS.

Traceability

The incremental benefits that could be achieved under an improved NLIS would depend on the additional traceability each option provides. In this consultation RIS the current traceability is assumed to be 90 per cent based on discussions with jurisdictions. This represents a national average across the individual traceability standards relevant to sheep and goats, noting that some jurisdictions may be achieving higher levels and others lower levels of traceability.

For the purposes of evaluating the costs and benefits of options to improve traceability, it is necessary to more clearly define the levels of traceability in the short-term and in the long-term that would meet NLTPS requirements.

A workshop held with most state and territory agencies agreed that the desired level of traceability for sheep and goats is 98 per cent for short-run tracing. Short-run tracing relates to the requirements in the NLTPS of achieving:

> Within 24 hours of the relevant Chief Veterinary Officer (CVO) being notified, it must be possible to determine the location(s) where a specified animal was resident during the previous 30 days.

Within 24 hours it must be also possible to determine the location(s) where all susceptible animals that resided concurrently and/or subsequently on any of the properties on which a specified animal has resided in the last 30 days.

Lifetime traceability refers to the ability to determine all locations where a specified animal has been resident during its life and the location of all susceptible animals that resided concurrently with a specified animal at any time during the specified animal's life. This relates to the following parts of the NLTPS:

Within 14 days of the relevant CVO being notified, it must be possible to determine all locations where a specified animal has been resident during its life.

Within 21 days of the relevant CVO being notified, it must also be possible to determine the location of all susceptible animals that resided concurrently with a specified animal at any time during the specified animal's life.

Given the lack of information about lifetime traceability, a 95 per cent level of traceability is proposed in this consultation RIS, with the costs and benefits of achieving this level of traceability open for discussion during the consultation process. Revised traceability figures may be used in the final assessment, depending on the information obtained from the consultation process.

Issue 5: ABARES seeks advice on the measures and associated costs necessary to achieve that target for each option.

Issue 6: ABARES seeks up-to-date information on the level of traceability, both for short run and lifetime tracing, that could be achieved under the three options, and any other proposed options.

Estimating the costs of increased traceability

For this analysis, only the costs from improving the traceability of sheep and goats from 90 per cent to 98 per cent for a fast moving disease (NLTPS standards 1.1 and 1.2) have been estimated. The costs of achieving lifetime traceability (NLTPS standards 3.1 and 3.2) will be considered in the decision RIS.

The cost of implementing each option, to obtain the target levels of traceability, was estimated by taking into account the additional labour, materials and capital requirements. The costs included are labour cost for all options to achieve the target levels of traceability and equipment and tag costs for the two EID options. The equipment for the EID options (such as software and scanners) are assumed to be required in all key points in the supply chain including farms, saleyards, abattoirs and export premises. Costs for each option are calculated based on the estimated number of sheep and goats that go through the supply chain.

In estimating the costs of the different options, ABARES drew on data provided in recent work by the PIMC Working Group on NLIS (sheep and goats), the CIE (2010) report and the PWC (2010) report, on information and data from various state departments of agriculture and on ABARES survey data. For the enhanced mob-based tracing option, two alternative scenarios for costs were considered (estimates from the CIE and a doubling of those estimates), which may in part reflect some variation in the cost of improving the current system in different jurisdictions. For the EID options, three tag costs ($1.30, $0.90 and $0.80) were assumed based on discussions with jurisdictions.

Estimating the benefits from increased traceability

Increasing traceability levels in the sheep and goat industries is expected to generate gross benefits in the form of:

- cost savings, attained by reducing the potential impact of pest and disease outbreaks, food safety/product integrity issues and market access restrictions
- improvements to farm productivity, market access and animal welfare.

The sum of these benefits represents the aggregate gross benefit of implementing each identification option. Benefits from improvements in short-run traceability are expected to accrue mainly in reductions in the potential impact of fast moving diseases, while benefits from better lifetime traceability are expected to come mainly from mitigating the costs of slow moving diseases and food safety incidents.

Biosecurity benefits

For this analysis, only the benefits from improving the traceability of sheep and goats from 90 per cent to 98 per cent for a fast moving disease (NLTPS standards 1.1 and 1.2) have been estimated. Benefits from increasing the lifetime traceability to 95 per cent will be included in the decision RIS, subject to information obtained during the consultation process.

For illustration, the benefits of reducing the length and therefore consequences of an FMD outbreak through improved traceability were estimated. As the size of the outbreak could vary, two potential economic costs of an FMD outbreak were assumed: $17 billion and $52 billion. These estimates represent a plausible range of effects of an FMD outbreak over 10 years depending on the recovery of export markets and are based on estimates made from recent studies of the effects of an FMD outbreak.

With little information on the relationship between improved traceability and reduction in the duration and losses from the disease, a pay-off matrix was constructed. In the matrix it is assumed that the avoided losses from every one percentage point improvement in traceability could range between 1 per cent and 3 per cent of the losses incurred before the increase in traceability.

Other benefits

Animal welfare

Under the current Export Supply Chain Assurance System (ESCAS) for exports of live sheep and goats, a mob-based accounting system is used to trace animals through the supply chain to final slaughter. Licensed exporters must:

- provide evidence of compliance with internationally agreed welfare standards
- demonstrate control through the supply chain
- demonstrate traceability through the supply chain
- meet reporting and accountability requirements
- include independent auditing.

The purpose of independent auditing is to assess if the supply chain meets the World Organisation for Animal Health code on animal welfare outcomes for sheep and goats and that appropriate control and traceability of animals exists (DAFF 2013). It is the combination of the mob-based accounting system with the additional verification and auditing requirements that enables traceability of these animals. As such, it represents a higher-cost system of traceability than the current NLIS for sheep and goats domestically. Improvements to the NLIS for sheep and goats may influence the operation of ESCAS, potentially affecting the likelihood and associated costs of non-compliance.

As the ESCAS system is already based on a mob-based approach, it is not expected that Option 1 would add much benefit to the existing system. Similarly, as direct-to-live exports are excluded under Option 2, significant additional animal welfare benefits are unlikely to be realised from this option compared with the current system. Therefore, the enhanced animal welfare benefits under ESCAS are most likely to be associated with Option 3.

Issue 7: ABARES seeks opinions on how the alternative options to the current National Livestock Identification System for sheep and goats may influence the operation of the Export Supply Chain Assurance System.

Issue 8: ABARES seeks opinions on the potential animal welfare benefits from improving the current National Livestock Identification System for sheep and goats.

Food safety

Knowing where a food product can be found in the supply chain enables sources of food safety (such as chemical residues or microbial hazards) to be quickly traced. Tracing can reduce food safety related costs by allowing identification of products for rapid and effective recall, investigation to prevent recurrence, and management of at-risk animals to be undertaken.

Under the current mob-based system, animals can be traced back where records are complete. After-slaughter tracing of sheep and goats depends on matching documentation with slaughter sequence and transferring information to the carcass. Aligning documentation with animal identification is improved through using electronic tags (FSANZ 2009).

Electronic tags also allow animals from particular populations with diseases or defects to be identified when not directly consigned to an abattoir. This can allow inspection to be tailored to the spectrum and prevalence of hazards, enhancing risk-based meat hygiene programs and improving food safety (FSANZ 2009).

Issue 9: ABARES seeks information on the extent and frequency of food safety incidents and how reductions in this may differ between a mob-based and the Electronic Identification tracing system.

Market access

The European Union—Australia's third largest destination for sheep meat exports—has a compulsory EID system. European Union authorities or importers could require equivalence in tracing of sheep and goats, which could limit Australia's access to this high-value market.

Issue 10: ABARES seeks opinions on the likelihood and extent of trade restrictions that the European Union may impose on the basis of a lack of equivalence.

Producer productivity from electronic identification

Electronic identification can enable full monitoring of individual animals, providing productivity benefits from information such as monitoring of live weights, wool production or drug application.

Electronic identification has a clear advantage in this respect. However, the relatively low level of voluntary adoption of the technology suggests that productivity benefits may not be sufficient to offset the current cost of the technology. If an EID system becomes mandatory for identification, productivity benefits would still be relevant to assessing the effect of the options. If the cost of the technology were to decline, or if producers that have not yet adopted the EID

system could achieve sufficient productivity gains, this technology could be expected to provide additional benefits to the sheep and goat industry if they are used widely.

Issue 11: ABARES invites submissions about improvements in producer productivity from adopting an electronic identification system.

Results

The quantitative results estimated for this consultation RIS are based on currently available information, which needs to be reviewed during public consultations. Estimates of present values of costs and benefits over a 25 year period are reported. Present values are calculated using a 7 per cent discount rate (the standard government rate determined by the Office of Best Practice Regulation).

Preliminary estimate of costs

The preliminary estimates of costs are based on achieving 98 per cent traceability in the short-run. There are likely to be additional costs associated with achieving the 95 per cent lifetime traceability objective under each option.

The enhanced mob-based option is estimated to cost between $9.6 million and $19.2 million a year to improve the average level of traceability from 90 per cent to 98 per cent.

The EID option with exemptions is estimated to cost between $17.2 million and $29.4 million a year and between $24.8 million and $44 million a year without exemptions (Table S1). The costs for each option result from a range of tag costs quantifying the cost of decreasing prices. The difference in costs between Option 2 and Option 3 represents the number of animals estimated to move through exempt pathways in the supply chain.

Table S1 Estimated costs for each option (2012–13 dollars)

Option	Present value of total cost a ($m)	Annual equivalent b ($m/year)	Potential traceability c (%)
Current (baseline)	0	0	90
Option 1: Enhanced mob			98
– Labour cost (Option 1a)	112	9.6	
– Labour cost (Option 1b) **d**	224	19.2	
Option 2: Electronic identification with exemption			98
– with a tag cost of $0.80	200	17.2	
– with a tag cost of $0.90	229	19.6	
– with a tag cost of $1.30	342	29.4	
Option 3: Electronic identification with no exemption			98
– with a tag cost of $0.80	289	24.8	
– with a tag cost of $0.90	334	28.6	
– with a tag cost of $1.30	513	44.0	

a present value is the sum of discounted capital and ongoing costs incurred over 25 years calculated using a 7 per cent discount rate. **b** estimated at a 7 per cent discount rate. **c** Average for standards 1.1 and 1.2 only. **d** Option 1b is estimated for a doubling of labour costs used in Option 1a (details of values used in Option 1a are provided in Appendix 4).
Source: ABARES preliminary estimates.

A breakdown of costs, by capital or infrastructure, annual tag costs and labour costs, is provided in Table S2. In Option 1 all costs are attributed to labour, while in the remaining options labour makes up 12 per cent of total costs. For Option 2 and Option 3, tagging costs contribute the

largest share of costs at, on average, 79 per cent of estimated costs per year. For the EID options, on average, 9 per cent of total costs are attributed to capital or infrastructure.

Table S2 Breakdown of estimated costs for each option (2012–13 dollars) a

Cost/Option	Option 1a: Improved mob ($m/year)	Option 1b: Improved mob ($m/year)	Option 2: EID with exemption ($m/year)	Option 3: EID no exemption ($m/year)
Capital/infrastructure cost	0	0	2.2 **b**	2.2 **b**
Tagging cost				
– with a tag cost of $0.80	0	0	12.2	19.2
– with a tag cost of $0.90	0	0	14.6	23.1
– with a tag cost of $1.30	0	0	24.3	38.5
Labour cost	9.6	19.2	2.8	3.4
Total cost	9.6	19.2	–	–
– with a tag cost of $0.80	–	–	17.2	24.8
– with a tag cost of $0.90	–	–	19.6	28.6
– with a tag cost of $1.30	–	–	29.4	44.0

a Estimated at a discount rate of 7 per cent. **b** The total industry infrastructure cost is $10.25 million spread across the 5-year phase-in of the proposal.

Issue 12: ABARES invites comments and seeks relevant data and additional information in order to refine these cost estimates.

Preliminary estimates of benefits

Expected annual costs of an FMD outbreak are estimated at $255 million per year and $810 million per year and are calculated using two values for the actual costs of an FMD outbreak; $17 billion (Matthews 2011) and $52 billion (ABARES forthcoming) respectively. In the calculation of expected annual costs it is assumed that the probability of an FMD incursion is 0.015; as Australia has been free of FMD for more than 100 years.

In this analysis it is assumed that similar levels of traceability would yield similar benefits regardless of the approach taken to achieve those traceability levels. Based on discussion with jurisdictions, it is assumed that a one percentage point improvement in traceability results in a reduction of between 1 per cent and 3 per cent in the impact of a foot-and-mouth disease outbreak. These figures were deduced using estimates PricewaterhouseCoopers used as a lower bound (1 per cent) and the average of the rates for Option 1 and 3 the Centre for International Economics used as an upper bound (about 3 per cent).

Measures of performance

Net present value and benefit–cost ratio are used to compare options in this consultation RIS and are estimated from benefit and cost measures detailed above.

Given that all options are providing the same or similar benefits, the relative economic feasibility between them is largely determined by the extent of differences in their implementation costs. That is, high cost options are less favourable than lower cost options.

Generally, the feasibility of options improves as the size of potential costs of a disease outbreak and the percentage reduction in these costs increase (Table S3).

It is premature to compare alternative options as all the benefits that could be achieved from the alternative options have not yet been included nor have any additional costs of achieving

lifetime traceability. Opportunities to further reduce the cost of electronic tags may present over time which could influence the assessment (some analysis of this possibility is in the report).

Table S3 Performance measures given different outbreak costs and different benefits from traceability

Expected cost of an FMD outbreak			**$17 billion**			**$52 billion**
Reduction in disease cost (%) **a**	1	2	3	1	2	3
Option 1a						
– Net present value ($m)	118	332	531	590	1245	1854
– Benefit–cost ratio	*2.1*	*4.0*	*5.8*	*6.3*	*12.1*	*17.6*
Option 1b						
– Net present value ($m)	6	220	419	479	1133	1742
– Benefit–cost ratio	*1.0*	*2.0*	*2.9*	*3.1*	*6.1*	*8.8*
Electronic identification tag price = $1.30						
Option 2						
– Net present value ($m)	–113	101	301	360	1014	1624
– Benefit–cost ratio	*0.7*	*1.30*	*1.9*	*2.1*	*4.0*	*5.7*
Option 3						
– Net present value ($m)	–284	–70	129	189	843	1453
– Benefit–cost ratio	*0.4*	*0.9*	*1.3*	*1.4*	*2.6*	*3.8*
Electronic identification tag price = $0.90						
Option 2						
– Net present value ($m)	1	215	414	474	1128	1737
– Benefit–cost ratio	*1.0*	*1.9*	*2.8*	*3.1*	*5.9*	*8.6*
Option 3						
– net present value ($m)	–104	110	309	368	1023	1632
– Benefit–cost ratio	*0.7*	*1.3*	*1.9*	*2.1*	*4.1*	*5.9*
Electronic identification tag price = $0.80						
Option 2						
– Net present value ($m)	29	243	442	502	1156	1765
– Benefit–cost ratio	*1.1*	*2.2*	*3.2*	*3.5*	*6.8*	*9.8*
Option 3						
– Net present value ($m)	–59	155	354	413	1068	1677
– Benefit–cost ratio	*0.8*	*1.5*	*2.2*	*2.4*	*4.7*	*6.8*

a As a result of a one percentage point increase in traceability.

Consultation

ABARES seeks input from stakeholders on the issues outlined in this consultation RIS and any other relevant matters. This consultation RIS is subject to an eight-week consultation period. ABARES welcomes feedback on options for improving the NLIS for sheep and goats, economic analysis and any other aspect of the consultation RIS document by **Friday, 6 December 2013**.

Submissions can be emailed to nlis.consultation@daff.gov.au or mailed to:

NLIS Consultation
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Canberra City ACT 2601
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1 Introduction

In October 2012 the Standing Council on Primary Industries (SCoPI) agreed that the former Department of Agriculture, Fisheries and Forestry (DAFF) should prepare a regulatory impact statement (RIS) to assess the options for improving the current National Livestock Information System (NLIS) for tracing sheep and goats through the supply chain. DAFF asked the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) to prepare the RIS.

The primary function of a RIS is to inform government decision making. This RIS will be completed in line with the Council of Australian Government Best Practice Regulation guidelines. The process involves a RIS for consultation and a RIS for decision makers (COAG 2007).

A consultation RIS is used to seek stakeholder input through public consultations, into development of a decision RIS. This report fulfils the consultation component of this RIS by:

- identifying the problem with the current NLIS for sheep and goats that the Australian Government seeks to address
- outlining the objectives of the RIS
- identifying alternative policy options to address the problem
- providing a preliminary assessment of the costs and benefits of each option to address the problem.

In preparing this consultation RIS ABARES consulted relevant state and territory agencies and the Office of Best Practice Regulation. Part of the consultation included a workshop on 17 May, with participation from most relevant state and territory agencies to review the data, information and assumptions.

Following public consultations a decision RIS will be prepared incorporating feedback from the consultations. The COAG guidelines for the RIS require the decision RIS to provide a comprehensive account on each component (above) and to include 'a consultation statement, a recommended option and a strategy to implement and review the preferred option' (DOFD 2012). The decision RIS will evaluate the costs and benefits of each option to improve the current NLIS for sheep and goats.

The remainder of this paper provides background information (Chapter 2); an outline of the problem (Chapter 3); objectives of government action (Chapter 4); discussion of options to improve traceability of sheep and goats (Chapter 5); impacts of implementing the options (Chapter 6 and Chapter 7); and how to submit comments (Chapter 8).

2 Background

National Livestock Identification System

The NLIS is Australia's system for identifying and tracing livestock. The system plays a key role in ensuring cattle, sheep and goats in Australia can be traced from property of birth to slaughter or export in the event of a threat to biosecurity, meat safety, product integrity and market access.

SAFEMEAT—a partnership between the livestock industries and the state, territory and Australian governments—developed the NLIS for sheep and goats in January 2006 to meet the National Livestock Traceability Performance Standards (NLTPS). The NLIS for sheep and goats was introduced in 2006 as a mob-based system where visually readable ear tags and a movement documentation system were used to trace animals. In 2008 recording of mob-based movements on the NLIS was introduced to enhance the traceability system and enable movement records to be quickly accessed through a central database. Upload of property-to-property movements on the database has been rolled out since 2010 but the method of implementation varies across jurisdictions.

National Livestock Traceability Performance Standards

The NLTPS, endorsed in May 2004 by the Primary Industries Ministerial Council (PIMC), outlines the requirements and timeframes for livestock to be traced quickly and reliably if needed (Appendix 1).

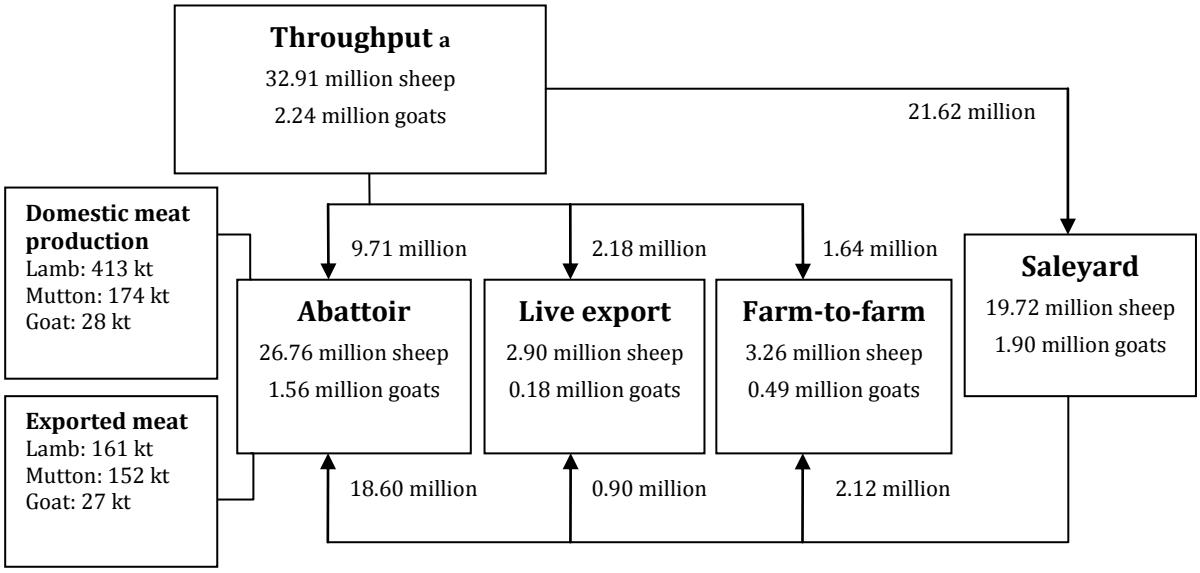
Sheep and goats are covered by sections 1 and 3 of the NLTPS. Section 1 describes the standards for tracing recent movements, such as for an outbreak of a highly contagious disease outbreak (such as foot-and-mouth disease [FMD]) and Section 3 outlines lifetime traceability requirements.

> **Section 1: Applicable to all FMD susceptible livestock species**
>
> Within 24 hours of the relevant CVO being notified, it must be possible to determine the location(s) where a specified animal was resident during the previous 30 days.
>
> Within 24 hours it must be also possible to determine the location(s) where all susceptible animals that resided concurrently and/or subsequently on any of the properties on which a specified animal has resided in the last 30 days.
>
> **Section 3: Applicable to all FMD susceptible livestock species except cattle (lifetime traceability excluding the preceding 30 days)**
>
> Within 14 days of the relevant CVO being notified, it must be possible to determine all locations where a specified animal has been resident during its life.
>
> Within 21 days of the relevant CVO being notified, it must also be possible to determine the location of all susceptible animals that resided concurrently with a specified animal at any time during the specified animal's life.

To conform to the NLTPS, movement of sheep and goats to and from farms, saleyards, abattoirs and export depots needs to be traceable (Figure 1). Australia's sheep flock consists of 73 million head (ABARES 2012a) and about 4 million head of goats (FAO 2012). Between 2007–08 and 2011–12 approximately 33 million sheep were moved per year and 2.24 million goats sold (Figure 1). In 2010–11 sales of Australian livestock generated about $21 billion in revenue; about $5.2 billion from sheep meat and wool, $0.4 billion from live sheep exports and $0.1 billion from farmed goats. New South Wales and Victoria are the largest producers of sheep

and goats by herd size and value of production followed by Western Australia—the largest live animal exporter (ABARES 2012b; ABS 2012a).

Figure 1 Number of sheep and goats moving through the supply chain, annual average 2007–08 to 2011–12



a Throughput is defined as the average number of animals directly sold off farms and that move through an individual state's supply chain each year. Throughput only accounts for the first movement of sheep and goat sold directly off farms each year and does not include the number of animals sold onward from saleyards.
Source: Adapted from CIE 2010. Data from ABARES 2012a; ABS 2012a; DAFF 2012; Foster forthcoming

The movement of sheep and goats through the supply chain by state and territory are detailed in Table 1. The large sheep-producing states of New South Wales and Victoria are estimated to process on average 60 per cent of Australia's sheep and goat throughput each year; with Victoria the largest processor. In Australia 28 million sheep and goats are slaughtered in abattoirs each year. Victoria's share is approximately 40 per cent at roughly 11 million animals. Additionally, 42 per cent of transactions through Australian saleyards occur in Victoria. New South Wales follows with the second largest volume of animals through the supply chain; at 27 per cent of Australia's saleyard transactions and 26 per cent of abattoir slaughters. Western Australia and South Australia also have large numbers of animals moving through abattoirs, averaging 14 per cent and 16.5 per cent, respectively. South Australia also supplies a large number of sheep and goat to saleyards each year, with approximately 74 per cent of the states' throughput moving through this path.

In other routes of the supply chain, it is estimated that New South Wales accounts for the highest number of farm-to-farm transactions at 39 per cent of total transactions. However, farm-to-farm transactions account for a relatively small percentage of total movements each year. Western Australia is estimated to account for the overwhelming majority of Australia's live sheep and goat exports each year. Western Australia exports approximately 2.2 million animals on average per year, accounting for more than 70 per cent of Australia's total. Victoria is estimated to be the second largest live sheep and goat exporter accounting for 12 per cent of total exports followed by South Australia with 9 per cent. Tasmania and the Northern Territory have very small sheep and goat supply chains in comparison to other Australian jurisdictions.

Table 1 Sheep and goat numbers moving through the supply chain, by state (annual average 2007–08 to 2011–12) a

Jurisdiction/ Supply chain	Throughput c (million)	Saleyard (million)	Abattoir (million)	Farm-to-farm (million)	Live exports (million)
NSW **b**	8.90	5.88	7.33	1.46	0.10
Vic.	12.29	9.17	11.09	0.74	0.47
Qld	1.57	1.22	1.28	0.24	0.06
SA	5.48	4.02	4.66	0.49	0.28
WA	6.80	1.28	3.95	0.72	2.17
Tas.	0.10	0.05	0.01	0.09	0.00
NT	0.01	0.008	0.006	0.002	0.001
Australia	35.14	21.62	28.32	3.75	3.08

a Total number of animal movements for each route of the supply chain correspond to the description provided in Figure 1. **b** Includes the ACT. **c** Throughput is defined as the average number of animals directly sold off farms and move through an individual state's supply chain each year. Throughput only accounts for the first movement of sheep and goat sold directly off farms each year and does not include the number of animals sold onward from saleyards.
Source: ABARES preliminary estimates.

National Livestock Identification System operations, summary by jurisdiction

The information here represents the information ABARES received from jurisdictions and is not based on an assessment by ABARES (see Appendix 6 for details).

New South Wales

Mob-based NLIS is based on visual tags, movement documentation and recording on the NLIS database. New South Wales is the only jurisdiction reporting a high level of traceability (above 90 per cent) being achieved with the current mob-based NLIS.

Compliance activities are undertaken at saleyards by Livestock Health and Pest Authority (LHPA) inspectors. Any tagging non-compliance is instructed to be corrected with later re-inspections to check compliance. The more intensive compliance work will occur more frequently at sheep sales from May 2013.

Occasional audits at saleyards are done in conjunction with Department of Primary Industries (DPI) regulatory staff and Rural Crime Inspectors, such as in Operation Shepherd in 2011. NSW DPI conducts quarterly desktop monitoring of NLIS compliance of every sheep saleyard and every sheep abattoir and sends each saleyard or abattoir a performance report. The reports on saleyard compliance are also sent to LHPAs so that inspectors can follow-up on poor performance.

Victoria

In audits of the operation of the NLIS (Sheep & Goats) in the supply chain, Victoria continues to find compliance issues, in particular those related to the accuracy of information in National Vendor Declarations (NVDs). Victoria has proposed changes to the NLIS business rules to increase the traceability of the mob-based system.

Victoria does not require recording of property-to-property movements because, as other states have found, it is extremely difficult and resource intensive to monitor and enforce producer compliance.

Victoria is already progressing electronic identification of sheep and goats in their jurisdiction. It has attractively priced EID tags, scanning infrastructure in abattoirs and a saleyard sector that is willing to implement an EID system for sheep and goats.

Queensland

The current operation of NLIS (Sheep & Goats) in Queensland still finds non–vendor bred lines of sheep and goats that have incomplete travel documents. These documents lack 'other PICs', which is vital information for tracing. The percentage of non–vendor bred NVDs can be around 33 per cent at each sale, but Queensland is working on reducing this number. At the start inspectors would find situations of 80 per cent of non–vendor bred NVDs without other PICs filled in.

Property-to-property movements are impossible for Queensland inspectors to monitor other than through roadside interceptions or leads from saleyard consigned lots and going back to properties to audit such movements on the NLIS database.

South Australia

NLIS (Sheep & Goats) commenced in South Australia in 2006 and operates entirely in accordance with nationally agreed business rules. The only variation from the business rules is the timeframe for database notification—reduced to two days from seven days for movements associated with shows and other livestock events, and live export depots.

PIRSA actively undertakes compliance monitoring and enforcement at virtually all sheep sales. Systematic audits conducted at three saleyards during 2012 consistently showed tagging compliance of 99 per cent, movement documentation compliance at 97 per cent overall and around 85 per cent for non–vendor bred consignments. Monitoring of property-to-property movements for mob-based database compliance will begin in July 2013, recognising that compliance with this aspect of the system is limited relative to other key sectors. A strong correlation still exists between ongoing participant/system performance and PIRSA's compliance efforts.

The main ongoing issues limiting performance of the current system relate to the completeness of movement documentation accompanying non–vendor bred sheep in particular, and incorrectly identified adult (pre 2006) sheep. To-date virtually no saleyards are routinely using emergency tags, and none have adequate checking and verification procedures. Consequently, much non-compliance is escaping detection.

Western Australia

Sheep being consigned from their property of birth are required to be fitted with a year colour tag embossed with the brand or PIC registered to the owner of the property, or they can use an RFID tag registered to the property of consignment on the NLIS database before they leave that property.

Sheep being consigned from a property that is not their property of birth are required to be fitted with a pink post breeder tag or RFID tag. All movements of sheep are required to be recorded on the NLIS database as a mob-based movement, unless an RFID is fitted, in which case there is an option to transfer those devices on the database instead of as a mob-based movement.

It is the responsibility of the receiver of animals to ensure that the database transfers are made, however operators of saleyards, abattoirs and export depots are required to make the necessary

transfers into and out of their premises. All movements of sheep are required to be accompanied by a valid waybill (or NVD/waybill). Because of the requirement for mandatory transaction tagging, only the PIC or brand of the property of consignment is required to be written on the waybill.

Tasmania

The Tasmanian sheep and goat industry is slightly different in nature compared with other states. The industry is characterised by relatively simple movements of animals, a high proportion of small to micro-holdings, a high proportion of movements direct to slaughter, and interstate movements are generally one way—to Victoria.

NLIS (Sheep & Goats) in Tasmania is based on visual tags with paper mob-based movement documentation. Presently there is no requirement to upload sheep and goat information to the NLIS database although some saleyards or processors may do so. This is a major point of difference with other states.

Adoption of a full mob-based system for sheep and goats in Tasmania has been delayed, primarily due to the uncertainty surrounding the final form of NLIS (Sheep & Goats). Three regional departmental officers attend between 85 per cent and 90 per cent of saleyard sales. Monitoring and auditing from an NLIS systems perspective is presently negligible. Improvements required to bring the present system in line with the basic NLIS mob-based system are:

- mandatory reporting to the NLIS database, including scanned vendor declarations and movement records
- ongoing extension and communications
- better compliance procedures, processes and guidelines
- implementation of processes and agreements with industries; for example, saleyards
- increased jurisdictional monitoring and auditing of producer, saleyard and processing compliance, with an emphasis on (a) monitoring and auditing of producers, saleyards and processors through the NLIS database and (b) an improved system to detect and respond to property-to-property non-compliance.

Northern Territory

The Northern Territory currently uses a mob-based movement recording system for sheep and goats. All sheep and goats are required to be identified with an approved NLIS transaction tag identifying the PIC before movement off a property. A completed Northern Territory Waybill must accompany the livestock and the original document must be handed to the receiving property owner on delivery. All subsequent movements to properties require an additional transaction tag attached to the animal prior to movement, except if sheep or goats are moving from a property to agistment, show or service then a further transaction tag is not required to be attached providing the ownership does not change and the animals are returning to the origin property.

The Northern Territory has a small population of sheep and goats, currently with no abattoir or saleyard for these species. The department monitors compliance at annual shows.

3 Statement of the problem

Improved traceability of sheep and goats is important in reducing the risk from a number of threats to industry including:

- Biosecurity—outbreaks, in Australia's population of sheep and goats, of endemic or exotic diseases, such as anthrax, blue tongue, Ovine Johne's, foot-and-mouth, scrapie, screw-worm flies and sheep and goat pox, can have devastating effects on industry. The rapid and reliable tracing of sheep and goats plays a significant part in emergency disease response. The faster the animals are traced the greater the chance of controlling the disease outbreak and so minimising its economic and social effects.
- Food safety—incidents, such as detection of contaminants beyond acceptable standards and presence of pathogens in meat products, can impose costs including trade restrictions, reduced consumption, product recalls, business disruption and increased costs of standard enforcement. Tracing of animals is an important aspect of minimising the trade effects of contamination and ensuring no recurrence of such events.
- Market access—traceability builds market reputation and confidence in Australia's sheep and goat products thereby enabling maintenance or expansion of market access. The European Union could impose restriction on imports of Australian sheep and goat meat based on Australia falling short of the EU's standard of animal identification or on lack of confidence in the Australian system. An audit conducted by the European Commission in 2008, found traceability levels for sheep and goats in Australia, at that time, were well below that required by the EU from countries exporting sheep meat. The EU is a key market for Australian sheep meat.

Improved traceability could also improve:

- Animal welfare—animal identification and traceability are likely to be key elements in any future approach to providing assurance on animal welfare outcomes for Australian livestock exports (Matthews 2011).
- Farm productivity—individual tagging of sheep and goats can enable full monitoring of individual animals and realise productivity benefits from use of data on live weights, wool production and lambing.

Reduction of biosecurity, food safety and market access risks to industry and improving animal welfare and industry productivity are limited by a number of issues in the current NLIS for sheep and goats including:

- limitations in meeting the National Livestock Traceability Performance Standards (NLTPS)
- possible difficulty maintaining market access.

Based on current information, there is uncertainty about the adequacy of the current NLIS for sheep and goats in meeting the traceability requirements of the NLTPS. Implementation of the current system and its performance varies by state and territory.

Meeting National Livestock Traceability Performance Standards

In September 2009 the 17th PISC meeting reported that the NLIS for sheep and goats did not enable tracing of animals to meet standards required in the NLTPS (SCoPI 2012). Results from the following auditing exercises demonstrate this.

In August 2007 exercise Sheepcatcher was undertaken nationally across all jurisdictions except the Northern Territory and the ACT to evaluate the performance of existing mob-based NLIS for sheep and goats against the NLTPS. Results showed that the NLIS did not enable complete tracing of animals (or their cohorts) to the standard the NLTPS required. The main defects were in the ability to trace cohorts' whole-of-life and the considerable number of staff needed (mainly from saleyards, abattoirs and stock agents) to locate and interpret the paperwork collected in the NLIS to facilitate tracing of sheep at that time (AHA 2007).

In April 2012 following improvements to the mob-based system, which included establishing an NLIS database, the New South Wales Department of Primary Industries conducted exercise Tuckerbox. The aim of the exercise was to test the mob-based tracing system for sheep and goats and compare it to the electronic identification (EID) NLIS for cattle. It was concluded that the mob-based NLIS for sheep and goats could be used to quickly trace the movements of mobs of sheep within and out of New South Wales (NSW DPI 2012a). However, the exercise did not assess the whole-of-life traceability requirements of the NLTPS.

To improve the consistency of the NLIS with the NLTPS, two areas were identified:

- the accuracy and reliability of the NLIS for sheep and goats
- national consistency in the identification system.

Accuracy and reliability

In a response scenario, governments and industry rely on the NLIS database to quickly and efficiently locate thousands of potentially infected sheep and goats. The database includes information provided by vendors and buyers on NVDs. For the current mob-based system to work reliably, vendors need to provide consignees (saleyards, abattoirs and agents) with an accurate mob-based movement record (such as an NVD or transported stock statement). Uploads of mob-based movement files supplied to the NLIS database must account for transfer of all sheep and goats. If information in the NLIS database is inaccurate and/or incomplete it is of limited value for traceability purposes (Britt 2012). Furthermore, in the event of an exotic disease or food safety emergency, Australia will struggle to respond effectively using a system that contains incomplete and inaccurate information.

Problems of reliability and accuracy of tracing sheep and goats exist in the current mob-based identification system. Factors that contribute to these problems include:

- compliance with the NLIS guidelines in the supply chain
- reliance on accurate input of information from NVDs, which are manually populated
- difficulties with accurately reading and writing other property identification codes (PICs) on NVDs.

The results of several studies question the past and current reliability of information from NVDs in the identification system. Exercise Sheepcatcher in 2007 showed that data were incorrectly transcribed or wrongly reported in 13 per cent of sampled records across Australia. Similarly, despite improvements to the system, problems with reliable and accurate transcription of PIC numbers persist in Victoria. A recent audit of Victorian sheep saleyards indicated that 60 per cent of NVDs for non–vendor bred consignments had one or more PIC with transcription errors (Britt 2013a). Transcription errors in other jurisdictions may differ from that of Victoria.

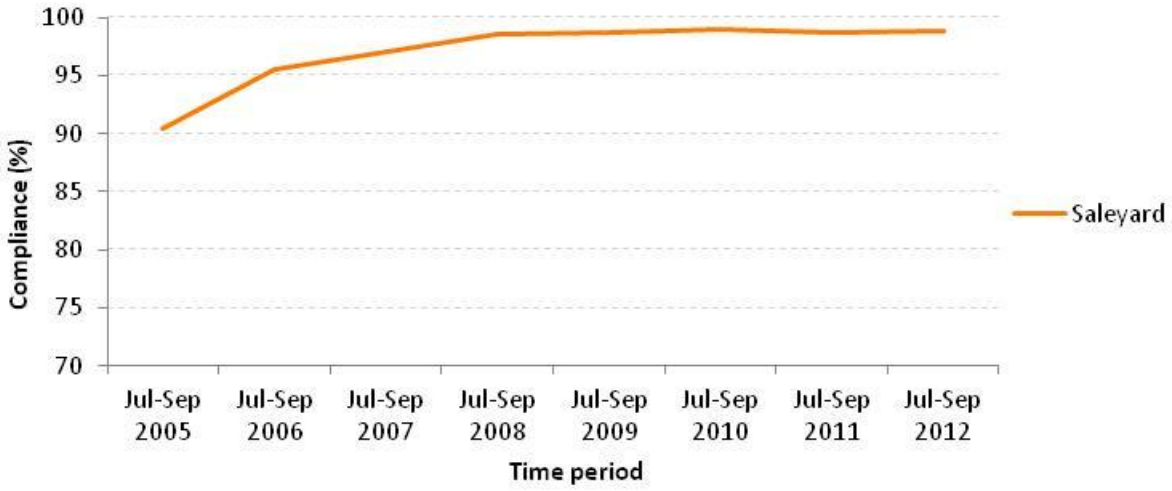
The Livestock Saleyard Association of Victoria also claims it is not practical to conduct the checking needed and to correct errors likely to be commonly encountered in a busy sheep

saleyard as this would create significant logistical delays on sale days (McDonald 2013, letter to Vic. DPI dated 25 February).

In New South Wales, despite mandatory requirements to upload data to the NLIS database, results from exercise Tuckerbox in 2012 still showed data gaps and delays in uploading livestock movement data (SCoPI 2012). Likewise Operation Shepherd that the New South Wales Department of Primary Industries conducted across New South Wales in 2011 showed that 113 of 3396 NVDs (3.3 per cent) were found to have incorrect or incomplete information. This was reduced to 2 per cent after the operation (Bell 2011).

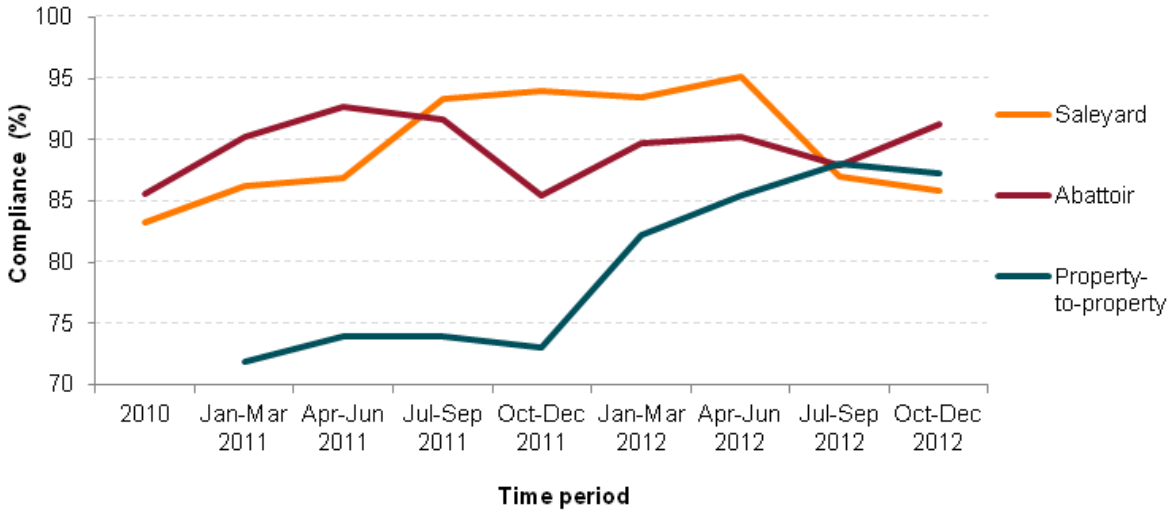
A New South Wales DPI report (2012b) completed for the October–December 2012 quarter provides the most recent compliance measures for the cattle and sheep and goat NLIS in New South Wales (Figure 2, Figure 3). Measures were estimated through a desktop audit of each database and are calculated as the per cent compliance of information stored in the database with NLIS requirements. A range of variables—data uploaded from NVD forms—is used to estimate compliance measures. For example, in the sheep and goat NLIS, such variables include valid and traceable 'to PIC' and 'from PIC', upload of data on a NVD form within the required deadline or an image upload. Estimates of compliance measures for the sheep and goat NLIS and the cattle NLIS could differ as the variables assessed would differ between the mob-based and the EID system. This report indicates that completeness of NVD and compliance remains an issue in New South Wales.

Figure 2 Compliance measures for the cattle NLIS in New South Wales saleyards



Note: NSW DPI has provided lifetime traceability 'at and after saleyard' for cattle. Traceability information is omitted from this figure since compliance for cattle and for sheep and goats is being compared, not traceability.
Source: NSW DPI 2012c.

Figure 3 Compliance measures for the sheep and goat NLIS in New South Wales



Source: NSW DPI 2012c.

Recent Aus-Meat audits of saleyards found that in Carcoar (NSW) saleyard 27 per cent of NVDs were inaccurate and in Wagga Wagga (NSW) 16 NVDs out of an unspecified total were identified as incomplete (Aus-Meat 2012a, b). In Dublin (SA) 45 per cent of NVDs were identified as incomplete (Aus-Meat 2012c). Of the incomplete NVDs in Wagga Wagga, 68 per cent (11 out of 16) related to livestock being declared as non–vendor bred with no additional PICs recorded, representing 2640 head of sheep (Aus-Meat 2012b). In Dublin 14 per cent of the sample did not correctly list additional PICs (Aus-Meat 2012c).

Data show that saleyard compliance with the cattle NLIS in New South Wales—where cattle have an individual electronic identification system—is high and stable at about 99 per cent (Figure 2). In contrast, Figure 3 shows that overall compliance for saleyards, abattoirs and agents trading sheep and goats is lower and more variable than compliance measures estimated for saleyards trading cattle. Compliance measures for saleyards trading sheep and goats vary between a low of 83 per cent in 2010 and a peak of 95 per cent in 2012 (NSW DPI 2012b).

Additionally, NSW DPI (2012b) estimates that the completeness of NVDs for sheep transactions at saleyards in that state was about 90.8 per cent, with about 69 per cent of mob information uploaded within two days and 97.5 per cent within seven days. In contrast, for all cattle transactions at saleyards, 99.4 per cent of NVDs were valid, 95.1 per cent of NVDs were uploaded to the database within two days and 99.7 within seven days.

A nationally consistent identification system

The NLIS for sheep and goats is directed by the National Business Rules, which outline stakeholder roles and responsibilities and identification, documentation and verification requirements. These rules form the basis for introducing harmonised legislation in each jurisdiction and adopting codes of best practice by industry. Various Stock Acts and supporting regulations support the requirements in each jurisdiction.

While state and territory legislation forms the regulatory framework for the NLIS, levels of application of existing visual identification arrangements across jurisdictions vary (PIMC Working Group 2012). In New South Wales, South Australia and Western Australia, movement of sheep or goats between properties must be recorded on the NLIS database. In Victoria NLIS

recording of property-to-property movements of sheep and goats is not mandatory and in Queensland it is voluntary with an industry expectation to record (MLA 2012a).

Differences in the requirements for identification also exist between jurisdictions. For example, in Western Australia tags are printed with the property brand (equivalent to a PIC); and post-breeder brand tags for each subsequent property must be added to the animal's ear. In the other jurisdictions the option for sheep not born on the property is to use a post-breeder tag (essentially as a transaction tag). If a post-breeder tag is not used, when trading sheep the vendor must list all PICs on the NVD (NSW DPI n.d.). Post-breeder tags are also used if the original tag is lost.

Under current regulations, NLIS accredited visual ear tags are required in all jurisdictions for movement of sheep and goats. Use of electronic NLIS tags (EID) is voluntary in all jurisdictions. In South Australia EID tags can only be used as a visual tag for NLIS purposes (T Woonton [Biosecurity SA] 2013, pers. comm., 5 June).

Differences in implementing NLIS for sheep and goats between jurisdictions are likely to result in differences in traceability through the supply chain. This may create difficulties in effectively tracing animals in the event of a biosecurity or food safety incident.

Market access requirements

In the European Union, electronic identification and individual recording of sheep movements is compulsory. Animals sold direct to slaughter within 12 months are not required to have electronic tags but must have a visual tag identifying the property of birth (DEFRA 2012). European Union authorities and/or importers could require equivalence in tracing of sheep and goats, which would prevent Australia accessing this high-value market under its current tracing system for sheep and goats. The European Union accounts for 9 per cent of Australia's lamb exports, valued at $94.5 million in 2011–12, which is constrained by an import quota. It is the third largest destination for lamb behind the United States and the Middle East (Table 2).

Table 2 Exports of sheep and goat products, by destination, 2011–12

Destination	Mutton ($m)	Lamb ($m)	Live exports ($m)
China	13.9	73.3	–
European Union	–	94.5	–
Hong Kong	–	21.1	–
Japan	23.9	63.1	–
Malaysia	19.6	–	–
Middle East	179.1	244.2	300.0
Papua New Guinea	–	39.8	–
Singapore	22.4	–	1.2
Taiwan	19.2	–	–
Turkey	–	–	37.0
United States	21.4	305.1	–
Other	62.4	219.7	6.8
Total	362.0	1 060.7	345.0

Source: ABARES 2012c

Market access could also be compromised in the event of a food safety incident. For example, discovery of food contaminants, such as E. coli or of veterinary chemicals, could result in rejection of contaminated consignments and lead to delisting of establishments allowed to

export. In the absence of the ability to rapidly trace the source of contamination, a food safety incident could see closure of key export markets for extended periods.

The case for intervention

The proposed form of government action is adoption by SCoPI of an improved NLIS for sheep and goats with the intent to legislate this system in each jurisdiction.

If improvements to the NLIS for sheep and goats were to be adopted and implemented industry-wide, government would need to take on a legislative role as it is unlikely that such a system could be implemented without a requirement for mandatory compliance. In economic terms, this would represent a market failure. Through tracing, the NLIS for sheep and goats aims to reduce the risks associated with industry goods, including biosecurity, food safety and market access.

The goat and sheep industry would not, to a sufficient extent, voluntarily reduce the risks associated these industry through improvements to the NLIS because of two economic characteristics of an industry good—non-rivalrous and non-excludable. In this case, the industry goods are biosecurity, food safety and market access benefits.

An industry good is non-rivalrous (where consumption of this good by a firm or individual within the industry does not diminish the quantity available for consumption by others) and non-excludable (where it is impossible or very costly to exclude any individual or firm within the industry from consuming the good once it is supplied).

The economic characteristics mean individual producers can 'ride for free' on others providing the service, so the industry is unlikely to provide an optimal investment in providing the good (that is, investment in livestock tracing NLIS). Consequently, resources are not allocated efficiently.

A further characteristic of an industry good is that the benefits from it can be directly and fully apportioned to a specific industry or industries. For example, the sheep and goat industry directly benefits from reduced biosecurity and food safety incidents and improved market access that result from a well-functioning NLIS. It is also likely that there would be some wider benefits to other production industries from a well functioning NLIS for sheep and goats and it would be desirable over time for all animal industries to adopt a similar approach.

On its own, the existence of a market failure does not justify government intervention since intervention is not without cost. The cost of any intervention needs to be weighed against the potential benefits in deciding whether intervention is justified. Also, the question of who bears the cost of that intervention is relevant and relates to the private benefit from intervention versus the public benefit. Some of the benefits considered in this request may have both private and public benefits.

Uncertainty exists about the extent to which the current mob-based NLIS system achieves the traceability requirements of the NLTPS. Operation of the system and provision of resources in jurisdictions differ despite nationally agreed business rules and implementation timelines (Appendix 6).

Issue 1. ABARES is seeking advice on the adequacy of the current National Livestock Identification System for sheep and goats in meeting the traceability requirements of the National Livestock Traceability Performance Standards and in reducing the biosecurity, food safety, market access and animal welfare risks.

4 Objectives

The objectives of government action are to ensure that risk to the sheep, goat and wider livestock industries can be managed within acceptable limits for:

- biosecurity (pest and disease control)
- food safety
- market access.

PIMC (now SCoPI) introduced the NLIS for sheep and goats in 2006 to manage these types of risks and meet the NLTPS (PIMC 2006)—although animal welfare and productivity have since been improved.

The options for changes to existing policies seek to provide improved risk management within a more efficient framework. The system needs to be efficient in terms of the timeliness of decisions and actions, resources and regulatory burden placed on industries, while seeking to provide whole-of-life traceability for all sheep and goats in accordance with the NLTPS.

This report seeks to identify the options that would meet the NLTPS. These options will be compared to ensure they create benefits to society greater than the costs of implementation. This report aims to provide guidance on the options that generate greatest net benefits with least regulatory burden.

5 Options for tracing sheep and goat movements

This consultation RIS proposes and assesses three options to improve the traceability of animals through the supply chain, relative to the baseline. They are:

- Option 1: Enhanced mob-based system—enhancement of the existing mob-based system (the baseline) with improvements in verification and enforcement of business rules throughout the supply chain: assuming full implementation from 2014.
- Option 2: Electronic identification (EID) system—the EID of animals with exemptions for sheep and goats sold directly from property of birth to abattoirs or export depots: assuming the option is phased in from 2014 and fully implemented by 2018.
- Option 3: EID system without exemptions: assuming the option is phased in from 2014 and fully implemented by 2018.

Changing the implementation date is not expected to change the relative cost of each option significantly.

Mandatory transaction tagging, initially suggested by Victoria as another option, is not assessed in this consultation RIS. Transaction tagging is the application of a pink post-breeder ear tag whenever an animal is consigned from a property that is not their property of birth. Animals have one year-of-birth tag and a pink tag for each time they are sold—all tags must remain with the animal through its life (DAFWA 2012). In Western Australia, transaction tagging is mandatory for the mob-based system. In New South Wales, Victoria, South Australia and Tasmania transaction tagging is not required.

Previous work by PWC (2010) and the CIE (2010) did not consider mandatory transaction tagging a viable option. While it improves traceback, use of transaction tags can compromise trace forward where the PICs of previous owners' properties are recorded on tags only and not in the database, making it difficult to trace animal cohorts sold by these properties. PWC (2010) estimated that an option combining mandatory transaction with the enhanced mob-based system would result in higher cost of implementation and lower traceability than would be realised under an enhanced mob-based system alone. CIE (2010) concluded that transaction tagging needed to be removed as an option for non–vendor bred sheep.

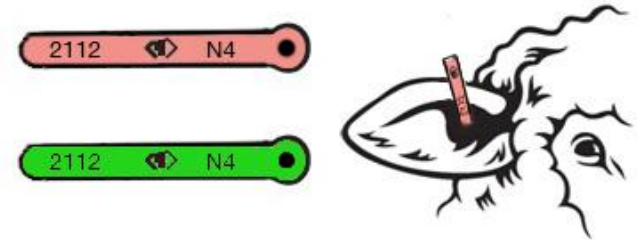
Baseline

For this consultation RIS the baseline is the current mob-based system, which includes all improvements and modifications to the NLIS for sheep and goats since it was implemented in January 2006 (NLIS 2012b). A key enhancement occurred in November 2008, with the mandatory upload of movement records to a central database from a paper-based format. In June 2012 an updated version of the National Business Rules was released incorporating the agreed enhancements.

The baseline system for sheep and goats consists of visual tags and mandatory movement records (typically paper-based forms subsequently entered into the NLIS database) to track the mob-based movements of livestock. Recent compliance with improvements to the National Business Rules, completed in June 2012, is also accounted for in the baseline with the voluntary use of EID systems. As such, information stored in the database enables tracing at mob level.

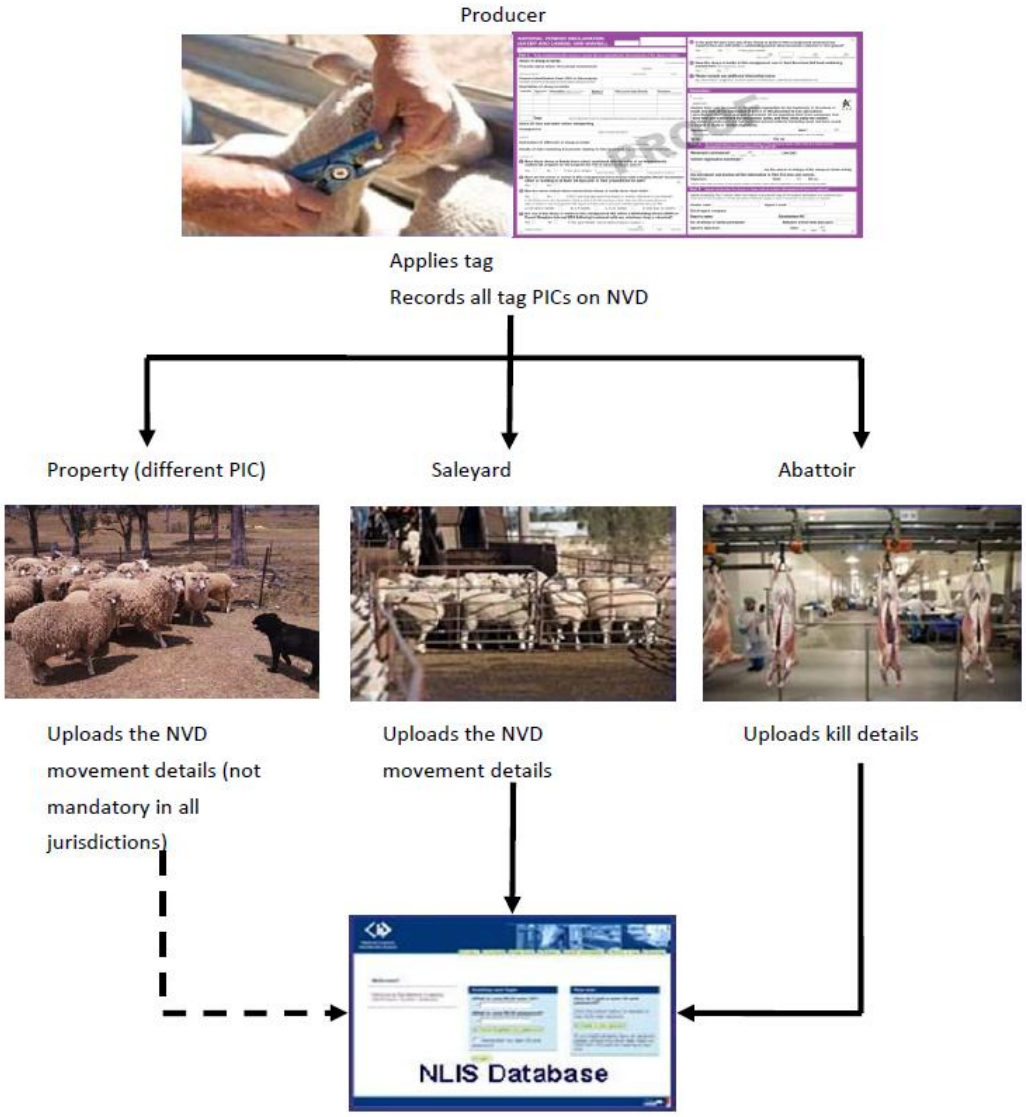
In the baseline, the National Business Rules require that all sheep and goats sold (unless exempt) must have an approved NLIS ear tag (Figure 4), must be accompanied by a completed movement record and must have their movement recorded on the NLIS database (for which there are no exemptions). Together, it is these three pieces of information that facilitate tracing of sheep and goats at the mob-based level through the supply chain. Potential movement records include an NVD and waybill (Figure 5) or a transport stock statement. The NVD is preferred as it collects all information for tracing livestock (MLA 2012a).

Figure 4 Visual NLIS tags: birth year colour coded breeder tag and pink post-breeder tag



Source: Vic. DPI 2010a

Figure 5 National Vendor Declaration/waybill and use in the supply chain



Source: Adapted from MLA 2013a, b

Two types of visual tags may be used on sheep and goats in this system: breeder tags and post breeder tags (Figure 4). Breeder tags, attached to livestock at their property of birth, display the PIC and are colour coded for the animal's year of birth. Post-breeder tags are pink and are used on livestock that have lost their breeder tags (for example, when leaving a property that is not their place of birth) and for stock born in transit. Breeder and post-breeder tags should never be removed and cannot be re-used. Livestock from Western Australia carry both breeder and post-breeder tags.

Animals exempt from tagging include:

- dairy goats transferred property-to-property only
- rangeland (feral) goats sent directly to an abattoir for slaughter through a depot (but when retained for farming in a depot they must be tagged)
- slink lambs sent to the knackery
- sheep and goats moved to properties with the same PIC (NLIS 2012b).

These tagging exemptions apply for all options outlined in this consultation RIS.

All exemptions are detailed and defined by the National Business Rules for sheep and goats. An exemption for property-to-property movements of dairy goats is an interim measure that is expected to be replaced with a more permanent form of identification (NLIS 2012b). While feral goats sent directly to an abattoir through a depot do not require a tag, depots must update movement records on the NLIS database.

Movement records must be completed when livestock are sold and moved through the supply chain. An NVD and waybill is used to record:

- the PIC of the property from which livestock are sold
- the PIC number on breeder tags if different from the seller's PIC
- the PIC of the property, saleyard or abattoir to which the livestock have been sold
- the number sold
- the NVD serial number
- the date of transfer
- whether the animals were vendor bred
- some animal's health information
- export requirements.

For all transactions it is the vendor's responsibility to complete the movement record which is provided to the consignee to lodge information in the NLIS database. In property-to-property transactions the consignee may be a selling agent or the property manager and it is their responsibility to complete and lodge information on the NLIS database. In sales to abattoirs and saleyards it is the responsibility of these facilities to lodge the NVD forms (MLA 2012a; PIMC Working Group 2012). When live exports are sold to a depot it is the responsibility of the depot operator to update the NLIS database, unless the livestock were purchased from a saleyard (NLIS 2012b).

Operation at the state and territory level

Initial information provided to ABARES indicates that implementation of the current NLIS for sheep and goats and its performance in respective jurisdictions varies. This is due to variations in commitment by jurisdictions to the current system that has and continues to occur despite nationally agreed business rules and implementation timelines (T Woonton [Biosecurity SA] 2013, pers. comm., 5 June). Appendix 6 provides an overview of the current NLIS operations by jurisdictions.

New South Wales reported high performance of the current system. In New South Wales the Livestock Health and Pest Authority undertakes compliance activities at saleyards where half of sales occur. It conducts intensive compliance inspections on sheep sales where pens with non–vendor bred or mixed lines or untagged sheep are targeted. It also conducts audits at saleyards in conjunction with Rural Crime Inspectors. New South Wales believes that compliance and tagging rates could improve to 98 or 99 per cent. Bell et al. (2013) reported that the NLIS for sheep and goats based on mobs is capable of tracing FMD and meeting national tracing standards using the NLIS database.

Unlike New South Wales, Victoria and Queensland have identified problems with the current system, in particular, relating to the accuracy of the NVDs which affect the traceability of sheep and goats. Victoria advised that for the current NLIS to achieve at least 98 per cent traceability for some elements of the NLTPS, considerable checking and verification of the traceability of sheep and goats is required at each point of the supply chain. Improving the current NLIS in Victoria and other jurisdictions producing and marketing sheep and goats would reportedly require significant additional resources compared with New South Wales.

Option 1: Enhanced mob-based system

Enhancements to the mob-based NLIS system aim to improve traceability of sheep and goats through the supply chain. The CIE (2010) recommended two improvements to the business rules: they are improvements in the accuracy and completion of movement documentation (such as NVD forms) and improvements in rules for verification and compliance with the NLIS system. The costs and benefits of these improvements are included in Option 1.

To maximise traceability several aspects of the NLIS for sheep and goats need to be monitored for compliance. These are:

- NVD forms must be completed accurately and with legible handwriting.
- Information on NVD forms should be entered in the NLIS database as it is given on the NVD form, within the set deadline. Human error—during data upload—will reduce traceability but cannot be eliminated.
- The timeliness of data entry will affect compliance. Formal deadlines are one to two days for saleyards, two days for abattoirs and seven days for properties and other sectors.
- If information/data in an NVD form is not uploaded to the database a copy of the completed form should be scanned into the NLIS database.
- Missing or non-readable tags need to be replaced with accredited tags, preferably by the seller to maintain traceability.
- Avoid slaughter of animals without tags (CIE 2010).

Where the baseline system produces traceability values that are less than 100 per cent there is room for improvement in traceability, but at a cost. Additionally, it is assumed that the

enhancements would vary by jurisdiction because of the differences in how they operate their existing mob-based systems.

To improve traceability of the current mob-based NLIS (sheep and goats) system, modifications to the business rules and enhancements to the operating system are needed. Examples include enforcing mandatory upload of property-to-property movements; requirements for more rapid upload of movements; and enhanced verification by producers, saleyards, processors and exporters (Appendix 2). A guide for what activities could be undertaken to improve verification and compliance in the current mob-based system is detailed in CIE (2010).

Issue 2: ABARES is seeking assistance to refine the documentation and the verification and compliance activities required to implement all options.

Option 2: Electronic identification with exemptions

In Option 2 sheep and goats transferred from their property of birth to abattoirs or exported live are exempt from wearing EID tags and must have visual tags. For all other transactions of livestock EID tags must be used.

As the current NLIS system to trace sheep and goat movements uses visual tags and mandatory movement records—with voluntary use of EID tags—limited information is available on applying an EID system for these livestock movements. Background information on EID options for this RIS was sourced from recommendations provided by the PIMC Working Group (2012) and the current EID NLIS for cattle.

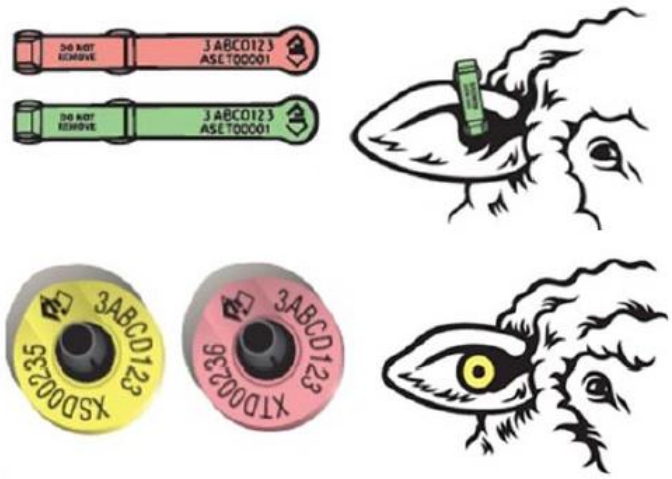
As for the baseline, in an EID system vendors would be required to apply tags to all sheep and goats and complete movement documents for all livestock when they are sold or transferred (MLA 2012b). However, the difference is that each tag would individually identify sheep and goats in the NLIS database.

Two types of NLIS accredited EID tags (Figure 6) may be used for animals sold through the non-exempt pathways and born after the date of implementation for this option:

- EID breeder tags must be attached to livestock upon departure from their property of birth.
- EID post-breeder tags which are applied in a similar manner to visual post-breeder tags (as described in the baseline above).
- Animals born before the implementation date or sold through an exempt pathway would display visual tags.

An accredited NLIS EID tag contains a microchip encoded by the manufacturer with a unique number, called the radio-frequency identification (RFID) number. Upon purchase this number is linked to the producer's PIC and this information is uploaded to the NLIS database along with the tag's National Livestock Identification System number. The National Livestock Identification System number is physically displayed on the EID tag (MLA 2012b) and can be read using electronic scanners or visually (Figure 7). The electronic tag RFID Standard was introduced in December 2008 (NLIS 2012a).

Figure 6 Electronic NLIS tags: pink post-breeder tags and breeder tags (green year-of-birth tag and yellow button tag)



Source: Vic. DPI 2010b

Figure 7 Electronic scanners—handheld scanners and panel reader

Notes: Panel reader is set up with scale indicator and three-way drafting system
Source: Vic. DPI 2010c

When livestock are moved to a different PIC their EID tag is scanned and the consignee (the buyer for a property-to-property transfer, operator of a saleyard or abattoir) uploads the movement forms, records are then available for each animal in the NLIS database. By allocating an individual NLIS number to each tag (or animal), there is no need to collect information on the livestock's property of birth, as it is stored in the database under the NLIS identification number. While the EID system allows for a reduction in the quantity of information collected it is likely that other parts of the NLIS database would have to be monitored in order to maximise traceability.

It is envisaged that livestock would only have one EID tag attached during their life and tags would only be replaced if lost or faulty. Tags may also be removed during carcass processing (PIMC Working Group 2012).

Use of EID tags in this option would require eventual phasing out of visual-based tags in pathways where electronic tags are not exempt (PIMC Working Group 2012). In this study it is assumed that all sheep and goats born after the implementation date and sold through non-exemption pathways would have an EID tag.

Option 3: Electronic identification without exemptions

For Option 3, an EID system without exemptions, all sheep and goat sold from their property of birth would be required to have an accredited EID tag instead of the visual breeder tags used in the baseline. Unlike Option 2 this means sheep and goats transferred from their property of birth to abattoirs or exported live would be required to wear an EID tag. Implementation of this option would require eventual phasing out of all visual tags, which may be implemented by applying EID tags on animals born after the implementation date for this option (PIMC Working Group 2012).

Guidelines for operating this option are described in Option 2: Electronic identification with exemptions.

Issue 3: ABARES is seeking suggestions on any other viable option for improving the National Livestock Identification System for sheep and goats and information on how they might meet the National Livestock Traceability Performance Standards.

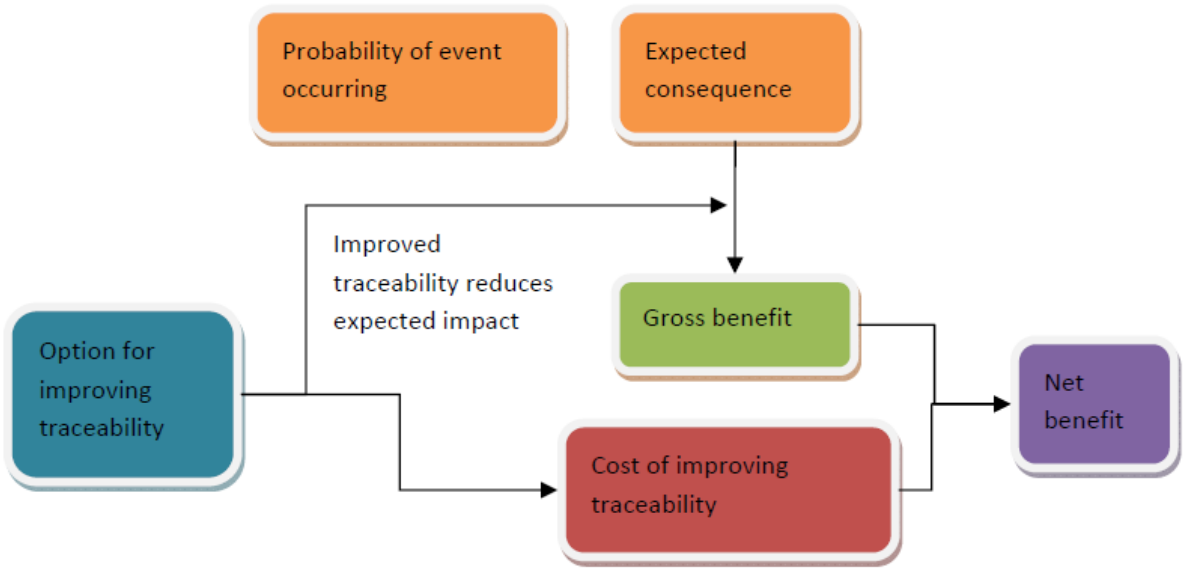
6 Assessing costs and benefits of options for NLIS improvements

To evaluate alternative options for identifying and tracing sheep and goats, the likely costs and benefits associated with each option relative to the current system need to be estimated. Improved traceability could:

- reduce the consequence of a number of potential risks, including those associated with biosecurity, food safety and potential market access restrictions
- improve productivity, market access and animal welfare relative to the baseline system.

Incremental benefits arise from the ability to rapidly trace animals and take timely action to eliminate or contain the risk or to gain from other benefits (as listed above). The total incremental benefits of an option are the sum of benefits arising from all potential risks, taking into account the likelihood of those risks occurring, and improvements to productivity, trade and animal welfare. Estimation of the benefits from improving the NLIS for sheep and goats is illustrated in Figure 8.

Figure 8 Framework for estimating the costs and benefits



Source: ABARES

While the cost of implementing each option can be calculated with some degree of confidence, three major sources of uncertainty in estimating the benefits are:

- The increase in traceability provided by each option relative to the baseline. Data on the traceability performance of the current system and that of other options particularly on lifetime traceability are limited and, where available, quite dated.
- The benefits directly attributable to an increase in traceability. To determine the benefits from an increase in traceability, a relationship between changes in traceability and contingent changes in the benefit (that is, the reduced effect of a disease outbreak) is important but uncertain.

- The size of likely consequences is uncertain. The size of potential benefits would also depend on the magnitude of the total cost (or effect) of all pest and disease, food safety, animal welfare and any other effects that an improvement in traceability is thought to reduce. No reliable estimate of total expected cost exists that could be attributed to all these threats.

These uncertainties must be considered in the approach used to estimate and compare the benefits and the costs.

Assessment approach

Two approaches can be used to evaluate the costs and benefits of alternative options, depending on the objective of the analysis:

- The first approach is to identify the level of traceability that could be achieved with each option and then evaluate the costs of implementing that option and the benefits associated with that level of traceability. While it is possible that the level of traceability that could be achieved under each option may differ, a problem with this approach is that it implies that lower levels of traceability for some options are considered acceptable under the NLTPS.
- The second approach is to assume a given level of traceability needs to be attained (such as 98 per cent) and then evaluate the costs of achieving that level of traceability for each option.

Following discussions with jurisdictions, this consultation RIS used the second approach. Because the level of traceability is the same for each option using this approach, the benefits would be similar and the analysis would become largely one of investigating the cost-effectiveness of each. The benefits would still be estimated to ensure it is worthwhile proceeding with any option.

The advantages of this approach to evaluating the costs and benefits of each option include:

- simplification of the analysis, with fewer assumptions about the benefits of improved traceability
- a more equal basis for comparing the viable options to improve the NLIS for sheep and goats
- analysis more consistent with the NLTPS, which implies a given (high) level of traceability.

It is proposed that the second approach be used for the decision RIS, subject to the outcome of consultations.

Issue 4: ABARES seeks comments on the proposed methodology for the benefit–cost analysis for the decision regulation impact statement.

Estimated traceability of each option

Traceability, as used here, refers to the proportion of the animal population that could be successfully traced within a specified period. Required periods of time denoting successful tracing are given in the NLTPS (Chapter 2), which comprises various elements each with specific traceability requirements. A single traceability parameter is obtained by averaging traceability levels realised across the individual standards applicable to sheep and goats.

In analysing traceability in sheep and goats under different systems of identification, previous studies (CIE 2010; PWC 2010) used results obtained from exercise Sheepcatcher (AHA 2007) as an initial reference for assumptions and projections made to infer likely levels of traceability that could be achieved under different options, and to construct a baseline against which the

options could be compared. Each option was assumed to achieve a different level of traceability, all of which were higher than the assumed baseline of 85 per cent.

In the case of cattle, traceability for the current electronic NLIS (Cattle) is estimated at 97 per cent in the short term and is much smaller for lifetime traceability (F Dixon [Department of Agriculture and Food Western Australia] 2013, pers. comm., 4 June).

Operation of the NLIS for sheep and goats has changed since exercise Sheepcatcher and no clear undisputed evidence of the average level of traceability across all the standards applicable to sheep and goats currently exists. As well, no consensus has been reached on the average level of traceability that could be achieved given improvements to the NLIS for sheep and goats.

Based on discussions with relevant state and territory agencies this consultation RIS assumes the average traceability of the current system is 90 per cent, noting that some jurisdictions may be above and others below this figure. For the purposes of evaluating the costs and benefits of alternative options to improve traceability, it is assumed that the desired level of traceability for sheep and goats is 98 per cent for the standards that relate to a fast moving disease (1.1 and 1.2) and 95 per cent for the standards that relate to lifetime traceability (3.1 and 3.2). The analysis in Chapter 7 assumes it is technically feasible to attain these levels of traceability under all options.

In this consultation RIS, only the costs from improving the traceability of sheep and goats from 90 per cent to 98 per cent for a fast moving disease (NLTPS standards 1.1 and 1.2) have been estimated. The costs of achieving lifetime traceability (NLTPS standards 3.1 and 3.2) will be considered in the decision RIS.

Issue 5: ABARES seeks advice on the measures and associated costs necessary to achieve the target for each option.

Issue 6: ABARES seeks up-to-date information on the level of traceability, both for short run and lifetime tracing, that could be achieved under the three options and any other proposed options.

Estimating the costs of increased traceability

Varying amounts of investment would be needed to achieve a given level of traceability for each option. The main cost components in the mob-based and electronic systems are described here.

In estimating the costs of the different options, ABARES has drawn on data provided in recent work by the PIMC Working Group on NLIS (sheep and goats), the CIE (2010) report and the PWC (2010) report and on information and data from various state departments of agriculture and ABARES survey data.

Option 1: Enhanced mob-based system

As this option aims to achieve high compliance with the existing system, cost estimates are made for all additional costs associated with meeting full compliance; and are estimated using cost data associated with verification and auditing activities to increase accuracy of information on animal movements within the system. This estimate covers the annual operational costs of labour. No other costs have been included for this option.

For this consultation RIS, cost estimates are based on verification and compliance activities identified by CIE (2010) and ABARES estimates of the number of sheep and goats moving through the supply chain (see Chapter 2). Additionally, as a result of costs estimated by PWC (2010) that indicate a much higher labour cost requirement for an enhanced mob-based system

compared with CIE (2010), a range of costs have been provided. This range accounts for differing assumptions on the labour resources needed to fulfil the activities to implement an enhanced mob-based system. It is expected that these activities and their costs will be refined during the consultation phase. Britt (2013b) provided a detailed description of proposed procedures for verification and compliance activities to increase the traceability performance of the mob-based system of sheep and goat identification to a level that would meet the NLTPS requirements that have yet to be fully costed (Appendix 2).

Option 2 and Option 3: Electronic system

The EID systems for sheep and goats would involve two significant types of cost:

- Capital or equipment costs—an initial investment in equipment at abattoirs, saleyards, export premises and a small proportion of farms. Only 20 per cent of Australia's sheep producers are estimated to require electronic tag scanning equipment (PIMC Working Group 2012).
- Ongoing costs—where producers pay for EID tags every year, plus labour costs all parties in the supply chain would incur. A conservative capital cost has been estimated as a result of the assumption that many sections of the supply chain may have existing equipment.

Estimates on the capital cost for industry are based on PIMC Working Group (2012) and PWC (2010) cost estimates.

The PIMC Working Group (2012) identified activities that would no longer be necessary with the EID system:

- vendors would no longer need to visually copy PIC numbers from breeder tags onto NVD forms
- stock agents, saleyards and processors would no longer have to transcribe breeder PICs from NVDs to the movement record
- transaction tagging, practiced in Western Australia, would no longer be needed.

However, implementation of an EID system for sheep and goats would result in a range of additional verification and compliance measures. For example, additional costs may be incurred to detect tags scanning incorrectly and to replace missing, lost and non-readable tags. Therefore, on the whole it is anticipated that the cost associated with verification activities would increase marginally from the baseline. Increases in the cost of verification are based on PWC (2010). Further information is needed during the consultation period, to clarify the verification and compliance measures for the electronic options and the cost of these improvements.

It is likely that the cost of electronic tags would change over time due to the effect of recycling. The likely direction and magnitude of this change on the cost of improving the NLIS for sheep and goats will be considered further in the decision RIS in consultation with stakeholders and with consideration given to recent trends in these costs and similar technology. For the consultation RIS three alternative prices for electronic tags are considered, ranging from $0.80 to $1.30. These prices were agreed by PISC representatives in anticipation that EID tag prices may fall in the future if large quantities are produced.

Estimating the benefits of increased traceability

Increasing traceability levels in the sheep and goat industry is expected to generate gross benefits. Benefits would mainly take the form of cost savings, attained by reducing the potential consequences or costs of pest and disease outbreaks, food safety/product integrity issues and

market access restrictions; and improvements to farm productivity, market access and animal welfare. The sum of these benefits represents the aggregate gross benefit of implementing each identification option.

Using the expected consequence allows the impact of improved traceability to reduce risks with different probabilities of occurrence and consequence to be compared every year. For example, the annual expected cost of a disease/biosecurity incident is the actual cost of damage from the event when it occurs, multiplied by the probability of its occurrence. Likewise, the benefits of improved traceability to reduce the cost of a food safety incident or reduced market access can be calculated as the estimated cost of the event multiplied by the probability of its occurrence.

Biosecurity benefits

Improvements in the NLIS for sheep and goats are expected to generate benefits through management of endemic diseases—such as anthrax, blue tongue and Ovine Johne's—and exotic diseases—such as FMD, scrapie, screw-worm flies and sheep and goat pox. Therefore, improvements in the NLIS for sheep and goats would generate cost savings, through better management of a range of diseases. To estimate the total benefits of these cost savings, the expected impact of each disease must be estimated and the reduction in this cost from improved traceability calculated.

Estimates of costs of sheep and goat diseases

Outbreaks in Australia of endemic diseases in sheep and goats can have devastating effects on industry and be costly to contain. For example, it is estimated that in Australia Ovine Johne's disease—a wasting disease that affects sheep—costs $4.4 million annually through lost productivity and additional on-farm costs (Sackett et al. 2006). Periodic outbreaks of anthrax in Australia affecting sheep and cattle have resulted in costs from control and loss in exports ranging from $1 million to $15 million (PWC 2010). Similarly, it is estimated that if new strains of bluetongue emerged in Australia causing disease and mortality as seen overseas, vaccination would cost about $1 per sheep, with additional costs from reduced production and increased disease control costs (PWC 2010).

A biosecurity incident in Australia could affect industries beyond the sheep and goat industry. For example, exotic diseases like FMD—which affects all cloven hoofed animals—could cost Australia at least $17 billion (in 2012–13 prices; Productivity Commission 2002) over 10 years in the event of an outbreak through lost export markets (Matthews 2011). In the 2001 UK FMD outbreak, movement of infected sheep (before they displayed any symptoms) resulted in rapid spread of infection throughout the country, increasing the outbreak size (NSW DPI 2012c). While Australia has been free of FMD for more than 100 years, increases in trade of goods and movement of people increases the chances of a disease outbreak. As a result of potential disease outbreaks, the NLTPS was established to ensure rapid and reliable tracing of animals to ensure appropriate accounting for the risks posed to industries.

Table 3 illustrates the procedure to follow in estimating likely benefits that could be obtained from improved traceability of sheep and goats. Summation of benefits in the form of reduced impacts of individual diseases that could be quantified and reported (in the last column), denotes the overall biosecurity benefit obtained from improvements in traceability of sheep and goats.

Table 3 Hypothetical disease management benefits from improved traceability in sheep and goats

Disease	Size of impact	Probability of an outbreak	Expected impact a	Sheep traceability reduces impacts?	Benefits from better sheep traceability
Foot-and-mouth	high	low	high	yes	+ve
Scrapie	medium	low	medium	yes	+ve
Anthrax	medium	medium	medium	yes	+ve
Screwworm fly	low-medium	medium	medium	yes	+ve
BSE **b**	high	low	high	no	0
Swine fever	medium	low-medium	medium	no	0

a Expected impact is the product of values in columns 2 and 3; **b** bovine spongiform encephalopathy

Source: ABARES assumptions.

Other benefits

The potential benefits of improved traceability further include market access and improvements to export supply chain assurance, systems for live exports, food safety and productivity benefits. However, information available for estimating these benefits is limited.

Animal welfare

Under the current ESCAS for exports of live sheep and goats, a mob-based accounting system is used to trace animals through the supply chain to final slaughter. Licensed exporters must:

- provide evidence of compliance with internationally agreed welfare standards
- demonstrate control through the supply chain
- demonstrate traceability through the supply chain
- meet reporting and accountability requirements
- include independent auditing.

The purpose of independent auditing is to assess if the supply chain meets the World Organisation for Animal Health's code on animal welfare outcomes for sheep and goats and that appropriate control and traceability of animals exists (DAFF 2013). It is the combination of the mob-based accounting system and the additional verification and auditing requirements that enables traceability of these animals. As such it represents a higher cost system of traceability than the current NLIS for sheep and goats domestically. Improvements to the NLIS for sheep and goats, along the lines of the three options considered in this paper, may influence the operation of ESCAS, potentially affecting the likelihood and associated costs of non-compliance.

As direct to live exports are excluded under Option 2, it is unlikely any significant additional animal welfare benefits would eventuate from adopting this option compared with the current system.

Issue 7: ABARES seeks opinions on how alternative options to the current National Livestock Identification System for sheep and goats may influence the operation of the Export Supply Chain Assurance System.

An independent review of live animal export trade (Farmer 2011) was undertaken to help the Australian Government establish new safeguards that provide verifiable and transparent supply chain assurance for every livestock consignment that leaves Australia for feeder/slaughter

purposes. It noted the importance of traceability of animals for a number of purposes, including facilitating refinement of suitability for export. The review found that selection and certification of livestock suitable for live export remains an important operation in the export process and is sometimes poorly conducted.

The Farmer review recommended that the Australian, state and territory governments and industry work together to implement individual identification of all sheep and goats as soon as practicable. While the review did acknowledge that accountability for sheep and goats could in principle be achieved without individual identification, it found that individual animal identification is likely to provide the greatest level of assurance that animals are kept within a defined supply chain. This implies that Option 3 in this RIS is the preferred option relevant to animal welfare. However, the extent of assurance from this option and the implications for animal welfare are not yet well understood.

If improvements to NLIS for sheep and goats deliver improved animal welfare, this benefit has to be included in the cost–benefit analysis. For a number of reasons, this benefit is difficult to quantify. The most prominent is that animal welfare provides non-monetary benefits; it is not possible to assign a dollar value through the operation of markets. Methods involving extensive and costly surveys could be used to estimate the total cost people would be prepared to pay to ensure improvements in the treatment of animals destined for export markets to a desired level. Therefore, quantifying improvements to animal welfare as a result of improvements to the NLIS for sheep and goats is an area for further research.

In the absence of a quantitative estimate, judgement is needed on whether the potential welfare benefits are sufficient to cover the gap in implementation costs between the full electronic NLIS for sheep and goats and other, less costly, options.

Issue 8: ABARES seeks opinions on the potential animal welfare benefits from improving the current National Livestock Identification System for sheep and goats.

Food safety

Improved animal traceability could enhance the efficiency and cost effectiveness of tracing products through the supply chain, thus strengthening measures for achieving or maintaining food safety standards. Knowing where a food product can be found in the supply chain enables the source of a food safety problem to be quickly traced (Karippacheril et al. 2011).

Cost of food safety incidents

A food safety incident, such as detection of contaminants beyond acceptable standards and presence of pathogens in meat products, can impose costs including restricted trade, reduced consumption, disrupted businesses and increased costs of standard enforcement.

Failure to meet importing country requirements can result in temporary or permanent exclusion from a market. Hill et al. (1997) argued that the risk of Australia's meat trade being adversely affected by food safety concerns is far greater than the risk of exotic diseases. For example, in 2011–12 nine consignments of Australian mutton exports to the US were rejected due to contamination (Brewster 2012a, b).

Cost of business disruption can occur through product recalls. Recalls can be expensive, with business facing direct costs from stock recovery, additional testing and stock destruction (Ozfoodnet 2006), as well as potential consumer backlash and reduced demand for product (Marsh et al. 2004). During 2002–11 meat had the second most recalls by food type in Australia,

accounting for around 15 per cent of the 663 recalls. Of these meat recalls over half were the result of microbial detection of *Listeria monocytogenes* (FSANZ 2011).

Incidents of meat contamination could also increase cost of enforcement. In Australia when a sample is detected with a chemical residue above the Australian Standard, the National Residue Survey asks the relevant state or territory government to trace the sample back to its property of origin (DAFF 2011a). During 2011–12 a total of 5540 samples were collected from sheep and analysed (DAFF 2012). The National Residue Survey requested 11 traceback investigations for sheep in 2011–12 and five in 2012–13. Most cases relate to metals particularly cadmium and lead (DAFF 2011b).

Traceability for food safety

Traceability of sheep and goats can reduce food safety related costs through:

- identification of products for rapid and effective recall
- investigation through the supply chain to prevent recurrence (FSANZ 2009)
- management of at-risk animals to be undertaken.

Recall of products

Rapid, targeted and effective recall is central to minimising trade disruption and any potential public health risks (FSANZ 2012). When a food safety problem is identified, food businesses must be able to quickly remove unsafe food from the marketplace.

The Australian Standard for the Hygienic Production and Transportation of Meat and Meat Products for Human Consumption require processors to accept only animals that are identifiable and accompanied by vendor declarations to improve traceback if required. Traceability after slaughter, particularly for sheep and goats, depends on matching documentation with slaughter sequence and transferring tag information to the carcass. Aligning documentation with animals' identification is improved through use of electronic tags and/or stomach bolus (FSANZ 2009).

Prevention of recurrence

Tracing sought by the National Residue Survey monitoring program aims to prevent further contraventions of Australian Standards. Action varies from simple advice in the case of a minor problem, through quarantining the property concerned, to prosecution where serious contamination has occurred (DAFF 2011b).

The type of residue determines the nature of traceability required in traceback investigations. For a residue from a drench or antibiotic injection with a short withholding period, it is necessary to trace the animal only to the location where the treatment was applied. For heavy metal residues, where the chemical accumulates, the full life history of the animal's movement is important as the contamination could have occurred at any time in its life (Paul Fry [National Residue Survey] 2013, pers. comm., April).

Individual identification plays a role in the traceability of sheep and goats. Of the 16 cases the National Residue Survey nominated for tracing between 2011–12 and 2012–2013, one was not traced to the likely contamination source. A liver sample, found to contain lead, came from a ewe consigned from a sheep feedlot, where no possible source of contamination was found. Without individual animal identification, it was not possible in this case to trace the animal back to the property of origin (DAFF 2011b).

While traceability issues for residues in sheep are most likely to occur in mixed saleyard lines and consignments from feedlots, tracebacks under the current mob-based system are still possible when records are good. For example, a traceback investigation in 2011 successfully traced an animal back through a feedlot to its property of origin (Paul Fry [National Residue Survey] 2013, pers. comm., April).

Management of at risk animals

The international Codex Alimentarius Code of Hygienic Practice for Meat, also states that provision of relevant information on animals intended for slaughter facilitates application of risk-based meat hygiene programs (FSANZ 2009).

EID tags provide options to manage residue risk in animals that move from property to property by assigning a risk status to the individual device so the animal's risk status is not lost as it moves around. On scanning the electronic devices into lairage, a risk status would trigger a message at the abattoir, allowing them to manage animals appropriately. Device-based risk status allows a degree of management of individual 'at risk' animals that is not possible under a mob-based system (Paul Fry [National Residue Survey] 2013, pers. comm., April).

Traceback of sheep and goats for food safety enhancement is possible under the current mob-based system where complete paperwork is available. Use of electronic tags would allow animals from particular populations with diseases or defects to be identified when not directly consigned to the abattoir. This could allow inspection procedures to be tailored to the spectrum and prevalence of hazards enhancing risk-based meat hygiene programs and improving food safety (FSANZ 2009).

Issue 9: ABARES seeks information on the extent and frequency of food safety incidents and how reductions in this may differ between a mob-based and an electronic identification tracing system.

Market access

As well as the potential benefits from reducing biosecurity risks, conforming to the NLTPS has the benefit of assuring export markets that Australia has the capacity to traceback to the source any biosecurity or food safety threat and take necessary remedial action as quickly as possible. The whole sheep and goat industry could benefit from such capacity as it supports continuity of access to export market—particularly the European Union. In an audit conducted in 2008 the European Commission found the traceability levels for sheep and goats in Australia at that time were well below what the European Union required from countries exporting sheep meat.

In the late 1990s the European Union demanded a 'closed system' for hormonal growth promotant-free cattle destined to that market and that the animals be whole-of-life traceable (PWC 2006). To comply with this requirement and satisfy the market, EID tag technology was introduced in Australia (PWC 2006). Additionally, the importance of a rapid and accurate livestock tracing system was highlighted following discovery of bovine spongiform encephalopathy in Canada and the US in 2003. Canada was able to regain export market access for beef to most countries faster than the US due to a tracing system that successfully identified cohorts (PWC 2010).

The European Union has introduced an EID system for sheep and goats. The European Union, as a key market for Australian sheep meat, could impose restrictions on import of Australian sheep and goat meat based on Australia falling short of the European Union's own standard of animal identification or lack of confidence in the Australian system. The likelihood of such a restriction occurring is uncertain.

Issue 10: ABARES seeks opinions on the likelihood and extent of trade restrictions the European Union may impose based on a lack of equivalence.

Productivity benefit

Arguments have been made that the EID systems would enable full monitoring of individual animals for a wide range of beneficial attributes. This would have the potential of raising producer productivity in various sectors of the industry, such as breeding and fine wool production.

Electronic identification has a clear advantage. However, in considering productivity benefits, it should be recognised that the system has been available for producers on a voluntary basis for some time. A degree of uptake, dictated by the market and producers' understanding of the likely costs and benefits, has already occurred on a limited scale. This means some producers have invested in the system, with likely productivity benefits being appropriated by those who have used the technology.

The relatively low level of voluntary adoption of the technology suggests that productivity benefits are insufficient incentive to offset the cost of the technology. If the EID system becomes mandatory for identification, productivity benefits though by themselves may not offset the systems costs, are still relevant to assessing the effect of the options. If the cost of the technology were to decline, or if producers adopted the system and could achieve sufficient productivity gains this technology could provide additional benefits to the sheep and goat industry.

If an EID system were mandated, the cost of implementation could be reduced by the amount already invested in the technology.

Issue 11: ABARES invites submissions about improvements in producer productivity from adopting an electronic identification system.

7 Results

The quantitative analysis presented in this chapter is for illustrative purposes and is not comprehensive. It is based on currently available information and a number of assumptions that will be reviewed following public consultations.

The costs presented in this chapter represent those associated with achieving a 98 per cent level of traceability for the fast-moving disease standards (1.1 and 1.2). The costs are preliminary and will be updated based on information obtained during public consultations. The cost of achieving a 95 per cent level of traceability for the whole-of-life standards (3.1 and 3.2) will be assessed as part of the decision RIS, depending on the information obtained from public consultations.

At this stage only the benefits from reducing the impact of an FMD outbreak in Australia as a result of a 98 per cent level of traceability for the fast-moving disease standards (1.1 and 1.2) have been quantified. These benefits have been estimated under some assumptions about the likely impact of an FMD outbreak in Australia and the ability of improved traceability to reduce this impact. The benefits from reducing the impact of other biosecurity threats and other benefits described in Chapter 6 (food safety/product integrity, market access, productivity and animal welfare) as a result of increasing traceability to 98 per cent for the fast-moving disease standards and to 95 per cent for the whole-of-life standards will be assessed as part of the decision RIS based on information obtained from public consultations.

Preliminary estimate of costs

The estimated annual costs and present values of the total implementation cost of improving traceability together with the potential traceability level, for each option are presented in Table 4. Present values are calculated for costs incurred over the next 25 years using a discount rate of 7 per cent. The discount rate accounts for the time preference of money and was chosen on the advice of the Office of Best Practice Regulation (Australian Government 2013).

Table 4 Estimated implementation costs for each option (2012–13 dollars)

Option	Present value of total cost a ($m)	Annual equivalent b ($ m/year)	Potential traceability c (%)
Current (baseline)	0	0	90
Option 1: Enhanced mob			98
– labour cost (Option 1a)	112	9.6	
– labour cost (Option 1b) **d**	224	19.2	
Option 2: Electronic identification with exemption			98
– with a tag cost of $0.80	200	17.2	
– with a tag cost of $0.90	229	19.6	
– with a tag cost of $1.30	342	29.4	
Option 3: Electronic identification no exemption			98
– with a tag cost of $0.80	289	24.8	
– with a tag cost of $0.90	334	28.6	
– with a tag cost of $1.30	513	44.0	

a Present value is the sum of discounted capital and ongoing costs incurred over 25 years calculated using a 7 per cent discount rate. **b** Estimated at a 7 per cent discount rate. **c** Average for standards 1.1 and 1.2 only. **d** Option 1b is estimated for a doubling of labour costs used in Option 1a (details of values used in Option 1a are provided in Appendix 4).

Source: ABARES preliminary estimates.

To improve the average level of traceability from 90 per cent to 98 per cent under the enhanced mob-based option, it is estimated to cost $9.6 million per year under Option 1a and $19.2 million per year for Option 1b. The estimate of $19.2 million for Option 1b represents a doubling of the cost under Option 1a, which is a result of information presented by PWC (2010) suggesting the cost could be almost double that under CIE (2010). This is a conservative increase in cost; for the mob-based system to achieve 98 per cent traceability it is estimated it would cost three times that of the CIE (2010) cost estimate in Year 1 and decline to two times the cost by the start of Year 3, as 'start up' costs decline and compliance levels improve (T Britt [Department of Environment and Primary Industries] 2013, pers. comm., 31 May).

In Option 1 all costs are attributed to labour for additional verification and compliance measures. As Option 1 would not require any new infrastructure for it to be implemented, no additional capital costs would be incurred. A comparison of the costs broken down by component for each option is summarised in Table 5 with additional detail documented in Chapter 6 and Appendix 4.

Option 2 is estimated to cost between $17.2 million and $29.4 million a year depending on the assumption made about the cost of electronic tags. Option 3 is estimated to cost between $24.8 million and $44 million a year, depending on the cost of electronic tags. The difference between Option 2 and Option 3 is based on the estimated number of animals that move through the non-exempt pathways of the supply chain. For Option 2 and Option 3, tagging costs contribute the largest share of costs at, on average, 79 per cent of estimated costs per year. Labour costs then follow averaging 12 per cent of the total cost per year with capital or infrastructure, the smallest component, at 9 per cent on average per year.

Option 2 and Option 3 would require a significant upfront cost to establish the necessary equipment for saleyards, abattoirs and other supply chain agents to implement an electronic-based system. A total capital cost of $10.25 million has been estimated for Option 2 and Option 3—a conservative estimate based on costing information drawn from the PIMC Working Group (2012) and PWC (2010) reports. This total includes estimates of the capital costs for abattoirs, live export premises, saleyards and a small proportion of farms in Australia. The capital cost for farms has taken into account the estimate of the PIMC Working Group (2012) that 80 per cent of the sheep flock is 'closed'. Therefore, only 20 per cent of Australia's sheep producers are predicted to require EID tag scanning equipment. Overall, the cost of infrastructure is small relative to the ongoing costs of introducing a new electronic system for sheep and goat identification.

Ongoing costs represent the largest cost component for all options. The enhanced mob-based system would have the largest increase in labour costs over the base case at approximately $9.6 million per year for Option 1a and $19.2 million for Option 1b, to ensure full compliance through increased verification and enforcement. Option 2 and Option 3 are assumed to require a marginal increase in labour cost of $2.8 million and $3.4 million, respectively, to ensure animals are tagged with an electronic tag and the electronic system is properly scanning them.

The largest ongoing cost for Option 2 and Option 3 is the cost of electronically tagging all animals moving through the supply chain. This estimate is based on a range of electronic tag costs. It has been anticipated that tag recycling may reduce the cost of tags, following introduction of an EID system. The cost estimates do not account for tag recycling and further information is required to quantify the magnitude of this impact. The estimated costs of all options will be reviewed and will likely be amended based on information stakeholders provide during consultations.

Table 5 Breakdown of estimated costs for each option (2012–13 dollars) a

Cost/Option	Option 1a Improved mob ($m pa)	Option 1b Improved mob ($m pa)	Option 2 EID exemption ($m pa)	Option 3 EID no exemption ($m pa)
Capital/infrastructure cost	0	0	2.2[b]	2.2[b]
Tagging cost				
– with a tag cost of $0.80	0	0	12.2	19.2
– with a tag cost of $0.90	0	0	14.6	23.1
– with a tag cost of $1.30	0	0	24.3	38.5
Labour cost	9.6	19.2	2.8	3.4
Total cost	9.6	19.2	–	–
– with a tag cost of $0.80	–	–	17.2	24.8
– with a tag cost of $0.90	–	–	19.6	28.6
– with a tag cost of $1.30	–	–	29.4	44.0

a Estimated at a discount rate of 7 per cent. **b** The total industry infrastructure cost is $10.25 million depreciated across five years.

For option 1, costs for Victoria are high as large numbers of sheep and goats move through its supply chain each year (Table 6). Large numbers of interstate animals move through Victorian saleyards and abattoirs; for example, New South Wales turns-off more animals than any other state, but like many other states, a percentage is sent through the Victorian supply chain.

Table 6 Estimated additional costs by component per annum (2012–13 dollars)

Option/cost	NSW a $m	Vic. $m	Qld $m	WA $m	SA $m	Tas. $m	NT $m	Aust. $m
Option 1								
Labour cost (Option 1a) **b**	2.6	3.9	0.5	0.8	1.7	0.03	0.003	9.6
Labour cost (Option 1b)	5.2	7.8	1.0	1.6	3.4	0.05	0.01	19.2
Option 2								
Tagging cost **c**								
– tag price of $0.80	5.2	2.7	0.7	1.1	2.0	0.4	0.005	12.2
– tag price of $0.90	6.2	3.3	0.9	1.3	2.4	0.5	0.006	14.6
– tag price of $1.30	10.3	5.4	1.5	2.2	4.1	0.8	0.010	24.3
Labour cost **b**	0.8	1.2	0.1	0.2	0.6	0.01	0.001	2.8
Infrastructure cost **d**	0.5	0.8	0.1	0.4	0.4	0.01	0.001	2.2
Option 3								
Tagging cost **c**								
– tag price of $0.80	7.1	4.0	0.9	3.9	2.7	0.6	0.005	19.2
– tag price of $0.90	8.6	4.8	1.1	4.7	3.2	0.7	0.006	23.1
– tag price of $1.30	14.3	7.9	1.9	7.9	5.3	1.2	0.010	38.5
Labour cost **b**	0.9	1.4	0.2	0.3	0.6	0.01	0.001	3.4
Infrastructure cost **d**	0.5	0.8	0.1	0.4	0.4	0.01	0.001	2.2

a includes the ACT. **b, c, d** estimated at a 7 per cent discount rate. Labour costs are estimated based on number of animals moving through the supply chain.
Source: ABARES preliminary estimates

Tagging would be the largest cost associated with the EID system. If Option 3, with no exemptions, were adopted New South Wales would incur the highest cost for tagging as it produces the largest number of lambs each year. Victoria and Western Australia, as large lamb producing states, would also incur high tagging costs. But Western Australia would incur a much

lower tagging cost under Option 2 because a large proportion of its throughput moves directly to abattoirs or for live export.

Issue 12: ABARES invites comments and seeks relevant data and additional information in order to refine these cost estimates.

Preliminary estimate of benefits

Potential FMD consequences reported in Table 7 represent a range of costs likely to be imposed on the Australian economy based on the assumption that the current NLIS for sheep and goats achieves an average 90 per cent level of traceability for the fast-moving disease standards (1.1 and 1.2).

The 90 per cent figure is an estimate that reflects different assumptions about traceability in each state, weighted by the proportion of sheep in that state. In the absence of empirical evidence acceptable to all jurisdictions about traceability performance at the national level, disagreement on the 90 per cent baseline traceability considered here may persist. Issues about the current baseline traceability will be resolved during consultations based on information from jurisdictions. However, since all options are assumed to improve traceability to the same level from a common baseline, the relative feasibility of options would remain the same, in the absence of other benefits that may increase returns for the EID system relative to the mob-based system, irrespective of traceability levels in the baseline.

Given the uncertainty surrounding the magnitude of the consequences, two values for the consequences of a foot-and-mouth outbreak have been applied, $17 billion and $52 billion. Matthews (2011) notes that FMD could cost Australia at least $17 billion (in 2012–13 prices) over 10 years, in the event of an outbreak, through lost export markets. Matthews (2011) further notes that these costs are based on optimistic assumptions about the time it takes to regain valuable export markets. If market access is severely restricted, these losses are estimated to increase to $52 billion (ABARES 2013).

Australia has not had an FMD outbreak for well over a century (DAFF, 2013b; Fox 2010). This puts the annual probability of incursion at less than 0.01. In a submission to the Productivity Commission, Prowse (2006) assumed a probability of incursion of 0.005, or once in every 200 hundred years. It is generally agreed, however, that increases in volumes of goods and numbers of people entering Australia every year would have caused the annual probability of incursion to increase. CIE (2010) assumed an FMD outbreak is likely to occur once or twice in a 100 year period—that is, with a range of annual probability of incursion of 0.01 to 0.02. In this analysis, an assumed incursion probability of 0.015, equivalent to the average of the range assumed by CIE, was used in estimating the expected annual consequence of an FMD outbreak.

Table 7 Range of potential foot-and-mouth disease costs used in the analysis

	Actual cost	Incursion probability	Expected annual cost
Disease cost 1 ($m)	17 000	0.015	255
Disease cost 2 ($m)	52 000	0.015	810

Source: ABARES assumptions.

Researchers express considerable uncertainty about the magnitude of the benefits that could be attributed to improvements in traceability. PWC assumed the relationship between increases in traceability and resulting benefits was linear, such that a given percentage improvement in traceability would yield a similar percentage increase in benefits. The CIE assumed that a one

percentage point improvement in traceability under the enhanced mob-based system would yield a 1.83 per cent increase in benefits. A one percentage point improvement in traceability under the EID with exemption option was assumed to yield a 3.74 per cent benefit and under the EID with no exemption option was assumed to yield a 3.95 per cent benefit. The CIE argued that this reflected better prospects for successful zoning under the EID options.

In this analysis it is assumed that similar levels of traceability would yield similar benefits regardless of the approach taken to achieve those traceability levels. Based on discussion with jurisdictions, it is assumed that a one percentage point improvement in traceability results in a reduction of 1 per cent to 3 per cent in the impact of an FMD outbreak, using estimates on rates used by PWC (1 per cent) as a lower bound and the average of the rates for Option 1 and Option 3 used by the CIE (about 3 per cent) as an upper bound. Present values are calculated from annual benefits assumed to accrue over 25 year period using a discount rate of 7 per cent (details of the results are in Appendix 3).

An improvement in traceability in one type of disease-susceptible animal is expected to reduce the overall consequences of disease by a certain proportion. If the same level of improvement occurs in more than one animal type, a larger percentage reduction in disease consequence is expected. As the aim of this analysis is to investigate benefits from improvements in traceability of sheep and goats only, traceability of other livestock species is assumed to remain unchanged from present levels. Therefore, annual total benefits accruing to the whole livestock sector and the Australian economy are the savings in expected annual costs from improvements to traceability of sheep and goats.

Measures of performance

With all options yielding similar benefits under the limited analysis here, net present value, benefit–cost ratio or present value of implementation cost can all be used as cost–benefit analysis measures to compare the three options in this consultation RIS. Net present value is the difference between the present values of benefits and costs; benefit–cost ratio is the ratio of dividing the former by the latter.

The estimated present values of benefits and costs and the benefit–cost ratios for the three options, with potential FMD outbreak costs of $17 billion and $52 billion, are presented in Table 8. The measures of performance are presented for 1 per cent, 2 per cent and 3 per cent reductions in the cost of an outbreak for a one percentage point increase in traceability for each option. More detailed results are provided in Appendix 5.

Generally, the feasibility of options improves as the size of potential costs of disease outbreak and the percentage reduction in these costs—for a given increase in traceability—both increase.

Given that all options are providing the same or similar benefits, the relative economic feasibility between them is largely determined by the extent of differences in their implementation costs. That is, expensive options are less favourable than lower cost options.

As potential disease consequences increase, the potential benefit from improved traceability increases proportionately—that is, doubling the expected disease cost would double the potential benefits from an increase in traceability. Similarly, for a given disease impact, greater percentage reductions in the cost of disease would result in proportional increases in benefits.

Assumptions about trends in technology and labour costs

Past trends in technology and labour costs show the former to have been declining while the latter have been rising over time. With the EID system having a high technological component of its total implementation cost (in terms of capital investment in tagging and scanning equipment) and low labour component in comparison with the mob-based system, the implication is that the relative feasibility of the EID system can be expected to continue to improve over time.

If prevailing trends in technology and labour prices continue, a time would come when the costs of the two options equalise and beyond which the EID option would be increasingly preferred. The length of time that must elapse before the costs of the two options became equal depends on the average annual rates of decline in technology prices and increase in labour prices.

Table 8 Performance measures given different outbreak costs and different benefits from traceability

Expected cost of an FMD outbreak			**$17 billion**			**$52 billion**
Reduction in disease cost (%) **a**						
Option 1a						
– Net present value ($m)	118	332	531	590	1245	1854
– Benefit–cost ratio	*2.1*	*4.0*	*5.8*	*6.3*	*12.1*	*17.6*
Option 1b						
– Net present value ($m)	6	220	419	479	1133	1742
– Benefit–cost ratio	*1.0*	*2.0*	*2.9*	*3.1*	*6.1*	*8.8*
Electronic identification tag price = $1.30						
Option 2						
– Net present value ($m)	–113	101	301	360	1014	1624
– Benefit–cost ratio	*0.7*	*1.30*	*1.9*	*2.1*	*4.0*	*5.7*
Option 3						
– Net present value ($m)	–284	–70	129	189	843	1453
– Benefit–cost ratio	*0.4*	*0.9*	*1.3*	*1.4*	*2.6*	*3.8*
Electronic identification tag price = $0.90						
Option 2						
– Net present value ($m)	1	215	414	474	1128	1737
– Benefit–cost ratio	*1.0*	*1.9*	*2.8*	*3.1*	*5.9*	*8.6*
Option 3						
– Net present value ($m)	–104	110	309	368	1023	1632
– Benefit–cost ratio	*0.7*	*1.3*	*1.9*	*2.1*	*4.1*	*5.9*
Electronic identification tag price = $0.80						
Option 2						
– Net present value ($m)	29	243	442	502	1156	1765
– Benefit–cost ratio	*1.1*	*2.2*	*3.2*	*3.5*	*6.8*	*9.8*
Option 3						
– Net present value ($m)	–59	155	354	413	1068	1677
– Benefit–cost ratio	*0.8*	*1.5*	*2.2*	*2.4*	*4.7*	*6.8*

a As a result of a one percentage point increase in traceability. FMD = foot-and-mouth disease.

A stylised exercise is undertaken to demonstrate how trends in costs of labour and technology might affect investment decisions for NLIS for sheep and goats over time. Labour costs are assumed to rise by 1.6 per cent a year in line with the trend in real average weekly earnings over the past decade (ABS 2012b). Similar data on past and future price trends for the particular type

of technology used in the full EID system are not available. Martin (2012) estimated the EID tag price to fall annually by 20 per cent in Victoria and 10 per cent in the rest of Australia, between 2014 and 2017. The fall in prices is attributed mainly to expected cost savings from recycling transponders. These two rates are used in this analysis as boundaries for likely reduction in EID prices nationally.

Initial (current) annual implementation costs for the two options in Year 0 and costs in Year 1 are given in the two upper rows of Table 9 for the assumed percentage declines in tag prices. Between these two years the difference, or the gap in cost, between Option 3 and Option 1a narrows from $25 million in Year 0 to $21 million and $19 million in Year 1 owing to the annual decline in the cost of technology of 10 per cent and 20 per cent, respectively. Parallel gap in costs between Option 3 and Option 1b is considerably smaller; $16 million declining to $12 million and $10 million for the smaller and larger declines in tag prices, respectively. With progressive increases in labour cost and parallel decline in the cost of technology after Year 1, the gap between the costs of the two options continues to narrow each year until the difference in annual costs between the options is eliminated.

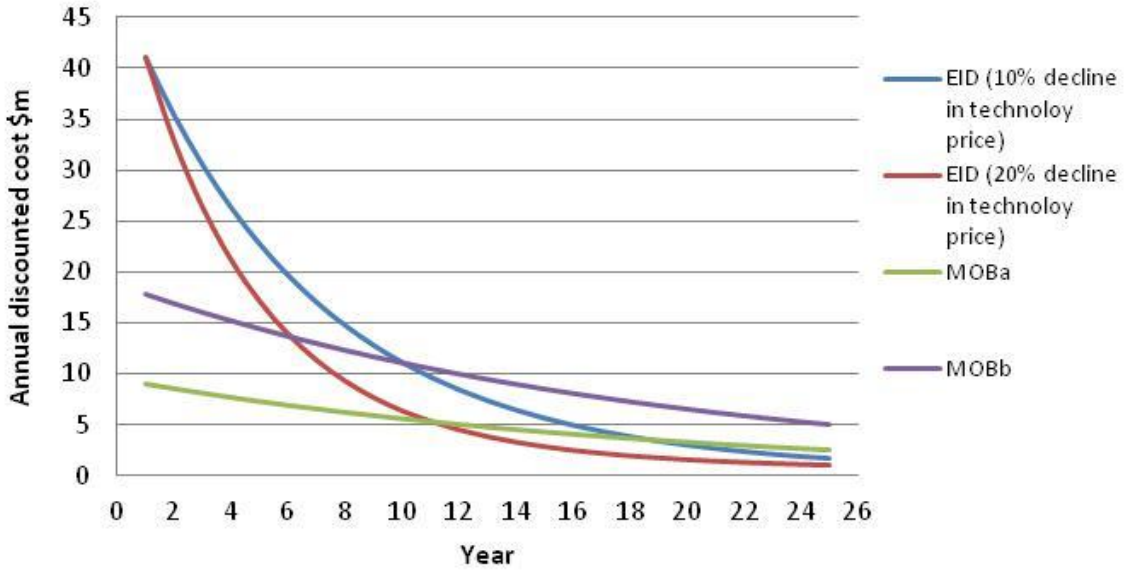
Table 9 Present value of option implementation costs with reduced tag costs and increasing labour cost

		Option 1a cost	**Annual cost difference a ($m)**
		Annual cost ($m)	
	Option 1	Option 3	
10 per cent annual decline in tag cost			
– Year 0	8.9	40.1	31.2
– Year 1	8.5	35.4	27.0
– Year 19	3.5	3.5	0.0
– Year 20	3.3	3.1	–0.2
20 per cent annual decline in tag cost			
– Year 0	8.9	40.1	31.2
– Year 1	8.5	32.9	24.4
– Year 10	5.3	5.3	0.0
– Year 11	5.0	4.5	–0.5
		Option 1b cost	**Annual cost difference a ($m)**
		Annual cost ($m)	
	Option 1b	Option 3	
10 per cent annual decline in tag cost			
– Year 0	17.9	40.1	22.2
– Year 1	17.0	35.4	18.5
– Year 10	11.1	11.2	0.1
– Year 11	10.6	9.7	–0.8
20 per cent annual decline in tag cost			
– Year 0	17.9	40.1	22.2
– Year 1	17.0	32.9	15.9
– Year 6	13.7	13.9	0.1
– Year 7	13.0	11.3	–1.7

a As the two options are assumed to realise equal annual gross benefits, the annual cost difference is also the difference in net benefits.

Under the estimated initial costs for each option and the assumed trends in costs it is estimated that it would take about 16 years at the lower and about nine years at the higher annual rate of decline assumed in tag prices, for the EID system to be economically preferred to Option 1a. If the total cost was as in Option 1b, the estimated time for Option 3 to become more feasible than Option 1b is about seven years for the lower rate and five years for higher rate of decline in tag prices (Figure 9).

Figure 9 Breakeven cost for EID and enhanced mob-based NLIS through time



EID = electronic identification. NLIS = National Livestock Identification System.

Source: ABARES calculations

This analysis indicates that, in the long term, neither option would provide the least-cost strategy if it continued to be operated indefinitely in preference to alternatives. Since the options considered are not mutually exclusive, the least-cost strategy is more likely to be realised by choosing to invest first in the option with the lower (but increasing) annual cost and switch later to the alternative option when its annual cost declines to the level of the former. If the mob-based system is used solely, the present value of costs of Option 1a and Option 1b are $128 million and $255 million, respectively. If the EID system were implemented alone, the cost would be $301 million with a 10 per cent and $223 million with a 20 per cent annual decline in tag prices.

With a 10 per cent decline in tag prices the least cost (of $124 million) would be realised if the system switched from mob-based (Option 1a) to full EID from Year 15 onward. At a rate of 20 per cent decline in tag prices, the least cost ($107 million) would be realised if the system switched from mob-based to full EID from Year 12. Both costs are smaller than the cost of implementing either of the two options (Table 10).

Similarly, with a 10 per cent decline in tag prices the least cost (of $212 million) would be realised if the system switched from mob based (Option 1b) to full EID from year 11 onward. At a rate of 20 per cent decline in tag prices, the least cost ($146 million) would be realised if the system switched from mob-based to full EID from year 7. Both costs are smaller than the cost of implementing any of the two options (Table 11).

Table 10 Present values of option costs, with decline in technology prices and an increase in labour cost, Option 1a scenario

	Option 1a ($m)	Option 3 ($m)	Option 1a/3 ($m)
10 per cent decline in tag price			
– Year 0–19 (Option 1)	110	0	110
– Year 20–onward (Option 3)	0	14	14
– Year 0–24	128	301	124
20 per cent decline in tag price			
– Year 0–11 (Option 1)	77	0	77
– Year 12–onward (Option 3)	0	30	30
– Year 0–24	128	223	107

Table 11 Present values of option costs, with decline in technology prices and an increase in labour cost, Option 1b scenario

	Option 1b ($m)	Option 3 ($m)	Option 1b/3 ($m)
10 per cent decline in tag price			
– Year 0–10 (Option 1)	143	0	143
– Year 11–onward (Option 3)	0	69	69
– Year 0–24	255	301	212
20 per cent decline in tag price			
– Year 0–6 (Option 1)	94	0	48
– Year 7–onward (Option 3)	0	70	98
– Year 0–24	255	223	146

Observations

Little information is available on the:

- overall level of traceability against the complete set of standards stipulated in the NLTPS, especially those dealing with traceability over animal lifetime
- relationship between the ability of improved traceability to reduce the total effects stemming from various threats to biosecurity and food safety/product integrity
- actual or expected size of these impacts.

Therefore, benefits and costs of improving only the elements of traceability relevant to mitigating expected consequences of fast-moving diseases were estimated and compared for different options.

Of the options examined in this analysis, it is assumed that when fully implemented all proposed options would provide a level of traceability of 98 per cent for standards 1.1 and 1.2 of the NLTPS, from an assumed current level of traceability of 90 per cent. To attain the higher traceability levels additional investment costs must be incurred. Moreover, there may be additional costs of achieving the target level of 95 per cent for lifetime traceability that would be needed to meet standards 3.1 and 3.2 of the NLTPS.

For all options, additional benefits from higher traceability largely depend on the magnitude of the biosecurity threat and the percentage reduction of that threat due to improvements in traceability. Generally, the benefit rises as the size of potential costs of disease outbreak and the percentage reduction in these costs—for a given increase in traceability—both increase.

At this stage it is premature to compare alternative options as not all the benefits that could be achieved from the alternative options have been included and any additional costs of achieving lifetime traceability have not been included.

Over time expected increases in real prices of labour and reductions in real tag prices could change the relative feasibilities of the options. Besides the size of annual implementation costs for each option, the length of time from now to when this could occur would depend on the magnitudes of potential declines in tag prices and increases in labour cost.

With present lack of information on lifetime traceability and how improving this aspect of traceability of sheep and goats could contribute to biosecurity and food safety benefits, the effects and costs of achieving lifetime traceability have not been considered in this analysis. It is considered necessary to assess all aspects of traceability as given in the NLTPS and given the complexity of the relationship between traceability and efficiency of containment and control of different diseases, an informed judgement on the issue will entail additional effort, enlisting contributions from a wide range of experts, such as vets, disease epidemiologists and modellers of disease spread. The public consultation phase that follows release of this consultation RIS will endeavour to enlist these contributions.

Some measures of other benefits perceived to accrue from higher traceability levels; such as welfare, market assurance and productivity benefits; also need to be incorporated in the analysis of the feasibility of alternative options. The benefits from these other sources may differ by option.

8 How to submit comments

ABARES seeks input from stakeholders on the alternative proposals for improving the NLIS for sheep and goats, outlined in this consultation RIS. This consultation RIS is subject to an eight-week consultation period. The aim is to solicit views and opinions of a wide range of stakeholders—including state and commonwealth agricultural departments, sheep and goat industry, abattoirs, saleyards, live export depots, ear tag producers and other related businesses—together with relevant data and information, to incorporate into the second phase of the analysis, the decision RIS.

ABARES welcomes feedback on the identified options for improving the NLIS, on the proposed method for economic analysis and on any other aspect of the consultation RIS. Particular issues of importance are highlighted in relevant sections of this document and repeated below.

It is preferred that all submissions will be made available on the internet for others to view. Stakeholders should indicate if their submission is confidential and/or if sections contain confidential or sensitive information that is not for publication.

The closing date for submissions is Friday, 6 December 2013.

Submissions can be emailed to nlis.consultation@daff.gov.au or mailed to:

NLIS Consultation
ABARES Adaptation and Biosecurity Branch
GPO Box 1563
Canberra City ACT 2601
Australia

This consultation RIS seeks particular feedback on:

Issue 1: ABARES is seeking advice on the adequacy of the current National Livestock Identification System for sheep and goats in meeting the traceability requirements of the National Livestock Traceability Performance Standards and in reducing the biosecurity, food safety, market access and animal welfare risks.

Issue 2: ABARES is seeking assistance to refine the documentation and the verification and compliance activities required to implement all options.

Issue 3: ABARES is seeking suggestions on any other viable option for improving the National Livestock Identification System for sheep and goats and information on how they might meet the National Livestock Traceability Performance Standards.

Issue 4: ABARES seeks comments on the proposed methodology for the benefit–cost analysis for the decision RIS.

Issue 5: ABARES seeks advice on the measures and associated costs necessary to achieve the target for each option.

Issue 6: ABARES seeks up-to-date information on the level of traceability, both for short run and lifetime tracing, that could be achieved under the three options, and any other proposed options.

Issue 7: ABARES seek opinions on how alternative options to the current National Livestock Identification System for sheep and goats may influence the operation of the Export Supply Chain Assurance System.

Issue 8: ABARES seeks opinions on the potential animal welfare benefits from improving the current National Livestock Identification System for sheep and goats.

Issue 9: ABARES seeks information on the extent and frequency of food safety incidents and how reductions in this may differ between a mob-based system and an electronic identification tracing system.

Issue 10: ABARES seeks opinions on the likelihood and extent of trade restrictions that the European Union may impose on the basis of a lack of equivalence.

Issue 11: ABARES invites submissions about improvements in producer productivity from adopting an electronic identification system.

Issue 12: ABARES invites comments and seeks relevant data and additional information in order to refine these cost estimates.

Appendix 1 National Livestock Traceability Performance Standards

Applicable to all FMD susceptible livestock species [1]

1.1 Within 24 hours of the relevant CVO[2] being notified[3], it must be possible to determine the location(s)[4] where a specified animal was resident during the previous 30 days.

1.2 Within 24 hours it must be also possible to determine the location(s)[4] where all susceptible animals that resided concurrently and/or subsequently on any of the properties on which a specified animal has resided in the last 30 days.

Applicable to cattle only[5]

2.1 Within 48 hours of the relevant CVO[2] being notified[3], it must be possible to establish the location(s)[4] where a specified animal has been resident during its life.

2.2 Within 48 hours of the relevant CVO[2] being notified[3], it must be possible to establish a listing of all cattle that have lived on the same property as the specified animal at any stage during those animals' lives.

2.3 Within 48 hours of the relevant CVO[2] being notified[3], it must also be possible to determine the current location4 of all cattle that resided on the same property as the specified animal at any time during those animals' lives.

Applicable to all FMD susceptible livestock species except cattle (lifetime traceability excluding the preceding 30 days—addressed by 1.1 and 1.2 above)

3.1 Within 14 days of the relevant CVO[2] being notified[3], it must be possible to determine all locations[4] where a specified animal has been resident during its life.

3.2 Within 21 days of the relevant CVO[2] being notified[3], it must also be possible to determine the location[4] of all susceptible animals that resided concurrently with a specified animal at any time during the specified animal's life.

Notes:

1. For the purposes of these Standards, 'FMD susceptible species' means cattle, sheep, goats, and domesticated buffalo, deer, pigs, camels and camelids.

2. 'The relevant CVO' means the state or territory Chief Veterinary Officer, or their delegate, in the jurisdiction where the specified animal is located or has been traced to.

3. For the purposes of these Standards, the term 'notified' means the relevant CVO is aware of an incident that required tracing.

4. 'Location' means any definable parcel of land including (but not limited to): any parcel of land with a Property Identification Code, travelling stock routes, saleyards, abattoirs, feedlots, live export collection depots, showgrounds, Crown land and transport staging depots.

5. Given the risks posed by bovine spongiform encephalopathy, it was considered appropriate to establish separate Standards for cattle.

Source: AHA 2012

Appendix 2 Business rule changes proposed by Victoria

The following business rule changes are proposed by Victoria to improve performance of the current NLIS (Sheep & Goats) system (Britt 2013b):

> Use of transaction tags as a method for identifying non–vendor bred sheep and goats will no longer be permitted

Explanation—The CIE (2010) report identified that while transaction tagging enhances traceback (establishing the sequence of the property identification codes [PICs] of residence in an animal's life), it compromises long-term trace-forward (locating animals that have resided on a PIC concurrently with an animal of interest during that animal's life). The CIE (2010) report concluded that transaction tagging needed to be removed as an option for non–vendor bred sheep.

> In the absence of transaction tagging, producers selling non–vendor bred sheep will need to record the PICs on the tags attached to introduced sheep, typically by the breeder, on the NVDs that they supply at the time of dispatch. This will improve the ability to 'trace-forward' because the 'additional PICs' recorded by consignors of non–vendor bred sheep will be available to record by receivers in mob based uploads to the NLIS database.
>
> For sheep and goats traded—through saleyards, or sent directly to an abattoir for processing, or arriving at a depot in preparation for live export, or received by a producer directly from another producer—the person receiving the sheep and goats must within 2 days unload to the NLIS database a pdf of the verified, accompanying NVD.

Explanation—Storing pdfs of National Vendor Declarations (NVDs) on the NLIS database is currently voluntary. Storing NVD images on the NLIS database would help when NVDs need to be located during a disease emergency. It would also help with auditing of participant compliance with the system.

> Mob-based movement recording for property-to-property movements needs to mandatory with completion required within two days of arrival.

Explanation—To facilitate prompt traceback and trace-forward, mob-based movement recording needs to occur for property movements including for movements into live export depots. 'Additional PICs' recorded on NVDs or detected on post-arrival inspection need to form part of the mob-based movement upload.

An appropriately resourced audit program, including on-farm checking of records, to support the legislation is needed to monitor compliance.

> Verification procedures need to be mandated to ensure the traceability of incoming stock before they are permitted to move forward in the supply chain.

Explanation—Verification is crucial to ensuring sheep and goats are correctly identified with visually readable NLIS (Sheep & Goats) approved devices, and that accompanying NVDs are complete and accurate, before animals are permitted to move forward in the supply chain. Verification needs to occur in a systematic manner as part of documented standard operating procedures. Details of verification procedures for different sectors are shown in Table 11.

Saleyards are critical points in the supply chain from a disease control perspective as animals arrive for sale from numerous consignors, have contact with one another, and are dispersed to a range of buyers.

Where the industry performs verification at each point along the supply chain, such procedures need to be subject to periodic third-party or government audit to confirm they are operating as expected. Sanctions through industry quality assurance arrangements or legal action should be available as a remedy if evidence that procedures are not being followed is detected. Where performed by government, such procedures would need to be subject to periodic independent audit to confirm they are operating as expected.

Table 12 Examples of verification procedures for incoming stock

Issue	Procedure	Record keeping	Corrective action
Untagged sheep – one or more in a consignment	Inspect each incoming consignment for the presence of untagged sheep. Producers, live export depots and saleyards to maintain a supply of pink post-breeder tags printed with relevant PIC and a serial number.	When no untagged sheep are detected in a consignment, make record confirming checking has occurred. For each post-breeder tag used record in the tag register the serial number sequence against the PIC of dispatch (saleyards to include with copy of NVD and PSS). Establish a post-breeder tag register. For processors and saleyards: • Where mobs have been returned to the vendor, record the movements as part of the mob-based movement upload.	Saleyards; and producers and live export deports: • tag every untagged sheep in the consignment with a saleyard post-breeder tag, or • alternatively, mobs where no sheep has an NLIS tag the mob may be returned to the vendor's property. Processors: • where more than 2% of the consignment is untagged, alert the state Department of Primary Industries/ Agriculture of the PIC of dispatch and date of arrival. Only process if the last PIC of residence is known, or • mobs where no sheep has an NLIS tag may be returned to the vendor's property, however alert the state Department of Primary Industries/Agriculture must also be alerted.
Incomplete, inaccurate or absent NVD	Check there is an accompanying NVD for all incoming consignments. Check Q3 on NVD for declared vendor bred and non–vendor bred consignments. Follow checking procedure (below).	Make record confirming the NVD has been checked. Record remedial action, if required	Saleyards and processors: • If an NVD is yet to arrive, hold sheep until a completed NVD arrives. Do not sell or sell. • For incomplete and inaccurate NVDs, do not sell or process until NVD deficiencies have been remedied, as appropriate. Producers and live export depots: • Report incomplete or inaccurate NVDs to state department.
Vendor bred checking procedure Confirm that sheep that are declared 'vendor bred' all have tags with a PIC identical to that on the accompanying NVD.	Check tags on a minimum of 5% of sheep in each consignment to confirm that the PICs on tags match the NVD PIC. Take particular note of variations in the brands of tags used.	Make record confirming that each consignment or line has been checked (saleyards to also record the PIC on the tags that were examined.) Record remedial action if required	If 'rogue PICs' (that is, PICs not recorded on NVD) are present, before sheep are sold/processed/ introduced check tags on each sheep in the consignment and establish a list of all PICs present on tags. Append a record of these to the NVD and in the mob-based movement upload.
Non–vendor bred checking	Check tags on a minimum of 10% of sheep in each	Make record confirming each consignment/line has	If 'rogue PICs' are present, before sheep are sold or processed check

Issue	Procedure	Record keeping	Corrective action
procedure Confirm that sheep that are declared 'non–vendor bred': • have all tag PICs recorded, or • are identified with post-breeder tag with a PIC matching that on the NVD.	consignment to confirm that the PICs on tags match the NVD PICs. If there is a suspicion that more additional PICs are recorded than actually present on tags in the mob, check tags on all sheep and record PICs present.	been checked (saleyards record the PICs on the tags checked). Record remedial action if required	tags on each sheep in the consignment and establish a list of all PICs present on tags. Append a record of these to the NVD, in the mob-based movement upload.
Transcription errors in NVD 'additional PICs', and WA brands (which are used in WA on tags instead of PICs)	Where established that a PIC has been recorded incorrectly, check all sheep in the consignment and record from the tags on sheep the correct PIC and attach to the NVD a record of the corrected PIC and record in the mob based movement. Saleyards and processors: • Ensure software can accommodate WA brands and has state algorithms to detect PICs that contain transcription errors • Enter all 'additional PICs' into PIC checking software before sheep are sold.	Ensure all PICs recorded for non–vendor bred sheep are correct and are entered on mob-based movement files and PSSs.	The PICs actually present on tags (that is, with transcription errors corrected) must be included in mob-based movement uploads and post-sale summaries. PICs that contain transcription errors must be corrected before sheep are released to buyers. Corrected PICs must be included on mob-based movement files that are uploaded to the NLIS database.

Appendix 3 Illustration of estimated reduction in disease cost

Table 13 Annual expected disease cost at different traceability percentages and disease scale; using a 5 per cent decline in disease cost for a 1 percentage point increase in traceability

Actual disease cost ($b)		**17**	**52**
Option	**Traceability (%)**	**Expected annual cost ($m)**	
Baseline traceability	90	255	780
	91	242	741
	92	230	704
	93	219	669
	94	208	635
	95	197	604
	96	187	573
	97	178	545
	98	169	517

Notes: Annual expected costs assume a probability of incursion of 0.015 for all outbreak sizes

Source: ABARES

Benefits from each option are calculated as the difference between disease cost at the baseline level of traceability (90 per cent) and its cost at the target traceability of 98 per cent.

Table 14 Annual gross benefit ($m)

Option	**Actual disease cost ($b)**	
	17	52
Enhanced mob	86	263
Electronic identification with exemptions	86	263
Full electronic identification	86	263

Source: ABARES

Appendix 4 Costs of implementing options: methods and assumptions

This appendix outlines the methods and assumptions used to calculate the cost of each proposed option. Costs estimated for each option are calculated as the additional costs over and above the base case. All costs are estimated over a 25-year period, using an interest rate of 7 per cent.

A summary of the key parameters and assumptions used to cost each option is provided in Table 16. Additionally, a comprehensive list is provided for the data sources used.

Option 1: Enhanced mob-based system

The enhanced mob-based system focuses on improvements to the current system; which aim to ensure full compliance through improved verification and auditing activities. The increase in cost over the base case is calculated as the additional labour costs incurred for full compliance. Estimates are based on assumptions of verification and enforcement costs from CIE (2010) and ABARES estimates of the number of sheep and goats moving through the supply chain. No infrastructure or equipment costs have been estimated as the additional cost is only the extra labour required to improve compliance in the current system.

There are no additional costs for tagging, as rules for tagging in this option are identical to those in the baseline.

Option 2 and Option 3—Electronic tag-based system

Option 2 and Option 3 are identification systems based on electronic tagging. Additional costs incurred for this system include an initial payment for infrastructure (capital costs), ongoing costs for tags and marginal increases in labour costs over the baseline.

The capital costs associated with installing the necessary equipment (including scanners and related hardware and software) to implement an electronic identification system were based on cost estimates provided by the PIMC Working Group (2012) and PWC (2010). Although some pathways are exempt from using EID tags, in Option 2 they would be required to have and use EID equipment due to movements of livestock from the saleyards (which are not exempt). As such, the capital costs for both options are assumed to be identical.

Most costs under this system are the ongoing costs, which are principally the cost to electronically tag all sheep and goats moving through the supply chain. The CIE (2010) estimated the cost per tag and is relatively similar to calculations of the PIMC Working Group (2012).

A small increase in labour resources for the electronic system over the baseline system is expected based on PWC (2010) estimates. This study accounts for the additional labour to ensure all sheep and goats have a certified EID tag and are properly scanned. ABARES acknowledges other cost estimates may suggest scanning and labour costs are lower than assumed in this report. However, given limited available information, the costs of scanning under EID options relative to the baseline have been estimated based on PWC (2010). The PWC report, accounts for additional labour requirements under these options reflecting the findings of both the PWC (2010) and the PIMC Working Group (2012). Further, this consultation RIS is actively seeking additional data to refine these estimates through public consultations for inclusion in the decision RIS.

Supply chain movements to estimate costs

The number of animals moving through the supply chain were calculated as a percentage of the estimated total flock of sheep and goats turned-off each year (based on a 5-year turn-off rate from 2007–08 to 2011–12). The total flock of sheep and goats was estimated at approximately 77 million with around 35 million animals turned-off annually. The proportion of sheep and goats moving through different parts of the supply chain was then estimated using data from the ABARES Australian Agricultural and Grazing Industry survey. All supply chain movements were estimated using statistics from ABARES, the ABS and Department of Agriculture transaction levy data.

Additional costs over the baseline for Option 1 are estimated as the increased ongoing labour costs for verification and enforcement activities. This cost applies to all 35 million animals passing through the supply chain in which extra labour is used to ensure full compliance. Additional labour costs for Option 2 and Option 3 differ to Option 1 due to the phasing in of the electronic system.

Using ABARES statistics it is estimated that 25 per cent of the Australian sheep herd are turned-off each year. As such, it is assumed on average that 100 per cent of the herd in Year 0 would be turned-off by Year 5. While some animals may be retained beyond Year 5, assumptions are based on the average observation, which is assessed in Year 5. Therefore, in Year 1 through Year 4 the additional labour costs would only apply to lambs. Once all adult sheep with visual tags have exited the system, which is assumed to occur in Year 5, all animals moving through the relevant supply chains would have an electronic tag and be included in the estimation of costs.

When fully implemented, ongoing labour costs for Option 2 are calculated based on the livestock number passing through non-exempt pathways. Under Option 2, ongoing labour costs would only apply to about 23 million animals because 12 million animals would have been exempted each year. For Option 3 labour costs are based on the total number of animals passing through the supply chain each year; estimated at 35 million.

The required number of electronic tags is based on the number of lambs marked and the number of goats turned-off each year. This would provide an estimate for the total annual tagging cost for this option. The total number of animals tagged in Option 3 has been calculated as the number of lambs marked that would move through non-exempt routes of the supply chain. The cost of tagging in Option 2 also includes the number of marked lambs that would not be turned-off in Year 1, but sold later as adult sheep. The major cost saving in Option 2 would be the reduced number of animals tagged compared to Option 3, with an estimated 13 million fewer animals tagged under Option 2.

Cost estimates

The capital costs used in this consultation RIS to implement a proposed system have been drawn from the estimates provided by the PIMC Working Group (2012) and PWC (2010). As Option 1 would not require any new infrastructure for it to be implemented, it would not result in additional capital costs.

Option 2 and Option 3 would require significant upfront costs to establish the necessary equipment for saleyards, abattoirs and other supply chain agents to implement an electronic system. A total capital cost of $10.25 million has been estimated for Option 2 and Option 3—a conservative estimate based on the costing information drawn from the PIMC Working Group (2012) and PWC (2010) reports. This total includes estimates of the capital costs for abattoirs, live export premises, saleyards and a small proportion of farms in Australia. The capital cost for

farms has taken into account the estimate of the PIMC Working Group (2012) that 80 per cent of the sheep flock is 'closed'. Therefore, only 20 per cent of Australia's sheep producers are predicted to require EID tag scanning equipment. Overall, the cost of infrastructure is small relative to the ongoing costs of introducing a new electronic system for sheep and goat identification.

Ongoing costs represent the largest cost component for all options. The enhanced mob-based system has the largest increase in labour costs over the base case at approximately $9.6 million per year for Option 1a and $19.2 million for Option 1b over a 25-year period, to ensure full compliance through increased verification and enforcement. Option 2 and Option 3 are assumed to require a marginal increase in labour cost of $2.8 million and $3.4 million, respectively, to ensure the electronic system is properly scanning and animals are tagged with an electronic tag.

The largest ongoing cost for Option 2 and Option 3 are the costs to electronically tag all animals moving through the supply chain. These estimates have been based on a range of electronic tag costs. It is anticipated that tag recycling may reduce the cost of tags following introduction of an EID system. The current cost estimates have not accounted for tag recycling; more information is needed to quantify the magnitude of this affect. If sufficient data can be obtained through the consultation RIS it will be incorporated into the decision RIS. Table 15 details the overall cost of tagging and other cost components for Option 2 and Option 3 under different tag cost scenarios.

Table 15 Estimated additional costs, by component a year (2012–13 dollars)

Cost	NSW d ($m)	Vic. ($m)	Qld ($m)	SA ($m)	WA ($m)	Tas. ($m)	NT ($m)	Australia ($m)
Option 1								
Labour cost (Option 1a) **a**	2.6	3.9	0.5	0.8	1.7	0.03	0.003	9.6
Labour cost (Option 1b)	5.2	7.8	1.0	1.6	3.4	0.05	0.01	19.2
Option 2								
Tagging cost **b**								
– tag price of $0.80	5.2	2.7	0.7	1.1	2.0	0.4	0.005	12.2
– tag price of $0.90	6.2	3.3	0.9	1.3	2.4	0.5	0.006	14.6
– tag price of $1.30	10.3	5.4	1.5	2.2	4.1	0.8	0.010	24.3
Labour cost **a**	0.8	1.2	0.1	0.2	0.6	0.01	0.001	2.8
Infrastructure cost **c**	0.5	0.8	0.1	0.4	0.4	0.01	0.001	2.2
Option 3								
Tagging cost **b**								
– tag price of $0.80	7.1	4.0	0.9	3.9	2.7	0.6	0.005	19.2
– tag price of $0.90	8.6	4.8	1.1	4.7	3.2	0.7	0.006	23.1
– tag price of $1.30	14.3	7.9	1.9	7.9	5.3	1.2	0.010	38.5
Labour cost **a**	0.9	1.4	0.2	0.3	0.6	0.01	0.001	3.4
Infrastructure cost **c**	0.5	0.8	0.1	0.4	0.4	0.01	0.001	2.2

a, **b**, **c** estimated at a 7 per cent discount rate. Labour costs are estimated based on number of animals moving through the supply chain. **d** includes the ACT

Source: ABARES preliminary estimates

Table 16 Summary of key assumptions

	Option 1	Option 2	Option 3
Timeframe and implementation			
Implementation timeframe	Full implementation from 2014	Phased in from 2014. By 2018 system is fully implemented.	Phased in from 2014. By 2018 system is fully implemented
Implementation and infrastructure costs	None	Total infrastructure and implementation cost of $10.25 million.	Total infrastructure and implementation cost of $10.25 million
Estimation of ongoing labour costs			
Number of animals costed (based on animals turned-off)	For Option 1, 35 million animals.	When Option 2 is fully implemented, approximately 23 million sheep and goats.	When Option 3 is fully implemented, approximately 35 million sheep and goats.
Labour costs	Increase of $0.01 per sheep off farm over base case. Increase of $0.30 per sheep through saleyard over base case. Increase of $0.075 per sheep through abattoir over base case.	Increase of $0.10 per sheep through saleyard over base case. Increase of $0.05 per sheep through abattoir over base case.	Increase of $0.10 per sheep through saleyard over base case. Increase of $0.05 per sheep through abattoir over base case.
Estimation of tagging costs			
Number of animals costed (based on lambs marked and goats turned-off)	Same as current system	When Option 2 is fully implemented, a total of approximately 23 million lambs and goats annually.	When Option 3 is fully implemented, a total of approximately 35 million lambs and goats annually.
Additional cost per tag	No additional costs	Electronic tagging cost above cost of visual tag (visual tag = $0.30): – $0.50 with an EID tag price of $0.80 – $0.60 with an EID tag price of $0.90 – $1.00 with an EID tag price of $1.30	Electronic tagging cost above cost of visual tag (visual tag = $0.30): – $0.50 with an EID tag price of $0.80 – $0.60 with an EID tag price of $0.90 – $1.00 with an EID tag price of $1.30

Data

The data used to derive sheep and goat movements and the assumptions to estimate costs were sourced from:

- ABARES (2012a) AAGIS survey data

  Sheep turn-off rates
  Percentages of sheep sales by destination

- ABARES (2012b) agricultural commodity data

  Sheep flock
  Sheep and lamb slaughtered
  Live exports

- ABS (2012a, b) data on agricultural commodities

  Lambs marked

- DAFF (2012) transaction levy data

  Goat numbers slaughtered
  Goat numbers transacted

- FAO (2012) agriculture statistics

  Goat population estimates

- Centre for International Economics (2010) report on NLIS

  Labour costs for enhanced-mob based system

- PricewaterhouseCoopers (2010) reports on NLIS

  Labour costs for electronic tagging identification systems
  Electronic tagging equipment costs

- PIMC Working Group (2012) report on NLIS

  Capital cost estimates

Appendix 5 Costs and benefits of options

For a given NLIS option, reduction in disease outbreak costs and outbreak size, Tables 16 and 17 show:

- the present value of the cost of implementing the option (present value costs)
- the present value of gross benefits (present value gross benefits)
- the net present value, which is present value of benefits less present value of costs
- the benefit–cost ratio.

Present values are estimated using a 7 per cent discount rate, to allow comparison of benefits and costs over time.

Table 17 Net present value over a range of percentage reductions in a potential cost of $17 billion

Option	Reduction in disease cost (%)		
	1	**2**	**3**
Option 1a			
Present value cost	112	112	112
Present value gross benefits	230	443	643
Net present value	118	332	531
Benefit–cost ratio	*2.1*	*4.0*	*5.8*
Option 1b			
Present value cost	224	224	224
Present value gross benefits	230	443	643
Net present value	6	220	419
Benefit–cost ratio	*1.0*	*2.0*	*2.9*
Electronic identification tag price = $1.30			
Option 2			
Present value of costs	342	342	342
Present value of gross benefits	230	443	643
Net present value	–113	101	301
Benefit–cost ratio	*0.7*	*1.3*	*1.9*
Option 3			
Present value cost	513	513	513
Present value gross benefits	230	443	643
Net present value	–284	–70	129
Benefit–cost ratio	*0.4*	*0.9*	*1.3*
Electronic identification tag price = $0.90			
Option 2			
Present value of costs	229	229	229
Present value of gross benefits	230	443	643
Net present value	1	215	414
Benefit–cost ratio	*1.0*	*1.9*	*2.8*
Option 3			
Present value cost	334	334	334
Present value gross benefits	230	443	643
Net present value	–104	110	309
Benefit–cost ratio	*0.7*	*1.3*	*1.9*
Electronic identification tag price = $0.80			
Option 2			
Present value cost	200	200	200
Present value gross benefits	230	443	643
Net present value	29	243	442
Benefit–cost ratio	*1.1*	*2.2*	*3.2*
Option 3			
Present value cost	289	289	289
Present value gross benefits	230	443	643
Net present value	–59	155	354
Benefit–cost ratio	*0.8*	*1.5*	*2.2*

Table 18 Net present value over a range of percentage reductions in a potential cost of $52 billion

Option	Reduction in disease cost (%)		
	1	**2**	**3**
Option 1a			
Present value cost	112	112	112
Present value gross benefits	702	1357	1966
Net present value	590	1245	1854
Benefit–cost ratio	*6.3*	*12.1*	*17.6*
Option 1b			
Present value cost	224	224	224
Present value gross benefits	702	1357	1966
Net present value	479	1133	1742
Benefit–cost ratio	*3.1*	*6.1*	*8.8*
Electronic identification tag price = $1.30			
Option 2			
Present value of costs	342	342	342
Present value of gross benefits	702	1357	1966
Net present value	360	1014	1624
Benefit–cost ratio	*2.1*	*4.0*	*5.7*
Option 3			
Present value cost	513	513	513
Present value gross benefits	702	1357	1966
Net present value	189	843	1453
Benefit–cost ratio	*1.4*	*2.6*	*3.8*
Electronic identification tag price = $0.90			
Option 2			
Present value of costs	229	229	229
Present value of gross benefits	702	1357	1966
Net present value	474	1128	1737
Benefit–cost ratio	*3.1*	*5.9*	*8.6*
Option 3			
Present value cost	334	334	334
Present value gross benefits	702	1357	1966
Net present value	368	1023	1632
Benefit–cost ratio	*2.1*	*4.1*	*5.9*
Electronic identification tag price = $0.80			
Option 2			
Present value cost	200	200	200
Present value gross benefits	702	1357	1966
Net present value	502	1156	1765
Benefit–cost ratio	*3.5*	*6.8*	*9.8*
Option 3			
Present value cost	289	289	289
Present value gross benefits	702	1357	1966
Net present value	413	1068	1677
Benefit–cost ratio	*2.4*	*4.7*	*6.8*

Appendix 6 Current operations

This appendix contains information on the current NLIS operations provided by each jurisdiction. This is information ABARES has received from jurisdictions and is not based on any assessment by ABARES.

New South Wales

Mob-based NLIS is based on visual tags, movement documentation, and recording on the NLIS database.

All sheep must have an ear tag before they leave their property of birth or next property of consignment. All movements of mobs of sheep must be accompanied by a correctly completed NVD with all other tag PICs written on the NVD. Each movement must also be uploaded to the NLIS database, including property-to-property movements.

Compliance activities are undertaken at saleyards (about 50 per cent of sales) by Livestock Health and Pest Authority (LHPA) inspectors who check that sheep are tagged for sale. Any untagged sheep are brought to the attention of the selling agents who are then required to obtain an emergency tag/s to attach to any untagged sheep.

More intensive compliance inspections are carried out by LHPA inspectors at some sheep sales where pens with non–vendor bred or mixed lines or untagged sheep are targeted. Any tagging non-compliance is instructed to be corrected with later re-inspections to check compliance. NVDs are examined to compare tag PICs on the sheep in the pen with 'Other PICs' written by the vendor on the NVD. The saleyard operator is asked to enter any missing PICs into their software for that NVD for upload into the NLIS database. The more intensive compliance work will occur more frequently at sheep sales from May 2013.

Occasional audits at saleyards are done in conjunction with DPI regulatory staff and Rural Crime Inspectors, such as in Operation Shepherd in 2011.

NSW DPI conducts quarterly desk top monitoring of NLIS compliance of every sheep saleyard and every sheep abattoir and sends each saleyard or abattoir a performance report. Areas such as compliance with required timeliness of uploads to the NLIS database, recording of NVD data, whether to 'To' and 'From' PICs are traceable are measured and each saleyard's and abattoir's performance is ranked against other saleyards or abattoirs for that quarter. The reports on saleyard compliance are also sent to LHPAs so that inspectors can follow-up on poor performance.

New South Wales is the only jurisdiction reporting a high level of traceability (in the 90s) being achieved with the current mob-based NLIS.

Victoria

In audits of the operation of the NLIS (Sheep & Goats) in the supply chain, Victoria continues to find compliance issues in particular those related to the accuracy of information in the NVDs. Victoria has proposed changes to the NLIS business rules to increase the traceability of the mob-based system.

Victoria does not require recording of property-to-property movements because, as other states have found, it is extremely difficult and resource intensive to monitor and enforce producer compliance.

Victoria is already progressing electronic identification of sheep and goats in their jurisdiction. It has attractively priced EID tags, scanning infrastructure in abattoirs and a saleyard sector that is willing to implement EID system for sheep and goats.

Queensland

The current operation of NLIS Sheep & Goats in Queensland still finds non–vendor bred lines of sheep and goats that have travel documents that are incomplete. These documents lack 'other PIC's' which is vital information for tracing. The percentage of non–vendor bred NVDs can be around 33 per cent at each sale but Queensland has been working on reducing this number over time. At the start, Inspectors would find situations of 80 per cent of non–vendor bred NVDs without other PICs filled in.

Property-to-property situation is impossible for Queensland inspectors to monitor other than leads from saleyard consigned lots, and going back to properties to audit or reported property-to-property movements to the NLIS database. There is no ability for inspectors to know when property-to-property movements are occurring, other than road side interception.

South Australia

NLIS Sheep & Goats commenced in South Australia in 2006 and operates entirely in accordance with the nationally agreed business rules. The only variation from the business rules is the timeframe for database notification—reduced from seven days to two days for movements associated with shows and other livestock events, and live export depots.

NLIS is managed in partnership with a state-based NLIS Industry Implementation Working Group on which all industry sectors are represented. It is supported by regulations under the *Livestock Act 1997*, which were updated in 2009–10 to accommodate various enhancements including the mob-based database. Two full-time staff equivalents currently allocated to the program are 90% funded by the South Australian sheep industry.

Compliance monitoring and enforcement is actively undertaken by PIRSA at virtually all sheep sales. Such activity also extends to abattoirs, shows and other livestock events, seasonal ram and off-shears sales and, to a lesser extent, live export depots. Systematic audits conducted at three saleyards during 2012 consistently showed tagging compliance of 99 per cent, with movement documentation compliance at 97 per cent overall and around 85 per cent for non–vendor bred consignments.

The main ongoing issues limiting performance of the current system relate to the completeness of movement documentation accompanying non–vendor bred sheep in particular, and incorrectly identified adult (pre-2006) sheep. To date virtually no saleyards are routinely using emergency tags, and none have adequate checking and verification procedures. Consequently much non-compliance is escaping detection.

Monitoring of property-to-property movements for mob-based database compliance will commence in July 2013, recognising that compliance with this aspect of the system is very limited relative to the other key sectors.

Whilst all industry sectors and participants have a shared responsibility for ensuring all stock are correctly identified and traceable at all points along the supply, in reality there is still a strong correlation between ongoing participant/system performance and compliance efforts by PIRSA.

Western Australia

Sheep being consigned from their property of birth are required to be fitted with a year colour tag which is embossed with the brand or PIC registered to the owner of the property, or they can optionally use an RFID tag that is registered to the property of consignment on the NLIS database, before they leave that property. If RFID tags are used, the male button should be the year colour. Tags are required to be applied to the left ear of a male animals and the right ear of a female animal.

Sheep being consigned from a property that is not their property of birth are required to be fitted with a pink post breeder tag which is embossed with the brand or PIC registered to the owner of the property they are being consigned from or they can optionally be fitted with a pink post breeder RFID tag that is registered to the property of consignment on the NLIS database. Post breeder tags are required to be applied to the right ear of a male animals and the left ear of a female animal.

All movements of sheep are required to be recorded on the NLIS database as a mob-based movement unless an RFID is fitted, in which case there is an option to transfer those devices on the database instead of a mob-based movement.

It is the responsibility of the receiver of animals to ensure that the database transfers are made; however, operators of saleyards, abattoirs and export depots are required to make the necessary transfers into and out of their premises. Agents, abattoir buyers and export buyers can use an agent or buyer's PIC. It is their responsibility to ensure that animals transferred to their PICs are transferred off.

Untagged animals in saleyards, abattoirs and export depots are required to be tagged with pink post-breeder tags bearing a unique serial number before they leave. Movements of those animals to the premises are to be recorded on the database, including the serial number on the applied tag and the PIC of the property of consignment.

All movements of sheep are required to be accompanied by a valid waybill (or NVD/waybill). Because of the requirement for mandatory transaction tagging, only the PIC or brand of the property of consignment is required to be written on the waybill.

The allowance for use of PICs on producer tags and voluntary use of RFIDs has only recently (1 May 2013) been introduced as part of the implementation of new regulations. Previously only a brand on a visual tag could be used.

Tasmania

The *Animal (Brands and Movement) Act 1984* and the Animal (Brands and Movement) Regulations 2003 provide the basis for compulsory identification of animals, the regulation of movement of animals, a system of permanent identification of animals and other related matters. NLIS requirements for sheep and goats are embedded in these two pieces of legislation.

The Tasmanian sheep and goat industry is slightly different in nature compared to other states. The Tasmanian industry is characterised by the following attributes:

- movements of sheep and goats are considered simple and less complex than movements within some mainland jurisdictions
- a high proportion of small to micro-holdings (that is, hobby farms)
- a high proportion of movements direct to slaughter

- interstate movements are generally one way, towards Victoria.

NLIS for sheep and goats in Tasmania is based on visual tags with paper mob-based movement documentation. The movement documentation can be in the form of national vendor declarations, generic vendor declarations or a movement record prescribed by legislation. Presently there is no requirement to upload sheep and goat information to the NLIS database, although some saleyards or processors may do so. This is a major point of difference compared to other States.

The adoption of a full mob-based system for sheep and goats in Tasmania has been delayed, primarily due to the uncertainty surrounding the final form of NLIS for sheep and goats.

Important aspects of the Tasmanian system are:

- Sheep and goats must not leave their property of residence unless tagged with an NLIS tag; to be authorised for NLIS tags the property must have a PIC. An exemption exists for dairy goats being consigned direct to slaughter or to another dairy property.
- Sheep born on a property must be identified with a breeder tag, which is colour coded by year of birth. The year-of-birth colour code system is based on eight colours which are rotated through a cycle.
- Sheep not identified with an NLIS tag (perhaps the original tag was lost) and not on their property of birth must be identified with a pink post-breeder tag.
- Consignors dispatching sheep or goats that are already NLIS identified have two options for recording PIC information:
  - Option 1—recording all the PICs from NLIS tags attached to the animals in the consignment in addition to the PIC from which the consignment was dispatched, or
  - Option 2 – each animal can be identified with a pink NLIS post-breeder tag and only the one PIC printed on the NLIS tag is recorded on the vendor declaration.
- From 1 January 2006 all sheep and goats must be identified with an NLIS breeder tag before being dispatched to a saleyards or to another property.
- Consignors must provide a vendor declaration (that is, NVD or a generic vendor declaration) when dispatching sheep or goats of any age to a saleyard, abattoir or another property with a different PIC; this must be retained for seven years:
  - NVDs are used for sheep consigned to a saleyards and abattoirs
  - NVDs or generic vendor declarations are used for property-to-property movements involving sales
  - movement records are used for property-to-property movements not involving sales.

Traceability of current system

The Tasmania system at present is heavily underpinned by saleyard presence by three regional departmental officers. These officers attend saleyards for several purposes, including NLIS, animal welfare, biosecurity and general extension. Presently officers attend 85 to 90 per cent of sales at saleyards. Monitoring and auditing from an NLIS system (database) perspective, is presently negligible. Two staff are involved in other aspects of NLIS for sheep and goats.

Improvements to this system

A number of improvements are required to bring the present system in line with the basic NLIS mob-based system:

- Mandatory reporting to the NLIS database (including scanned vendor declarations and movement records).
- Ongoing extension and communications.
- Improvement of compliance procedures, processes and guidelines.
- Implementation of processes and agreements with industries, such as saleyards.
- Increased jurisdictional monitoring and auditing of producer, saleyard and processing compliance with an emphasis on:
  - monitoring and auditing of producers, saleyards and processors through the NLIS database system
  - improving the system to detect and respond to property-to-property non-compliance.

Northern Territory

The Northern Territory currently uses a mob-based movement recording system for sheep and goats. All sheep and goats are required to be identified with an approved NLIS transaction tag identifying the Property Identification Code (PIC) on the tag prior to movement off a property. A completed Northern Territory waybill must accompany livestock and the original document handed to the receiving property owner on delivery. A duplicate (Pink) copy is required to be sent to the department within 28 days of the stock arriving at the destination.

The movement information is recorded on the Northern Territory waybill database. All subsequent movements to properties require an additional transaction tag attached to the animal before movement if sheep or goats are moving from a property to agistment, show or service then a further transaction tag is not required to be attached providing the ownership does not change and the animals are returning to the origin property. If sheep and goats are spelled overnight in a transit centre a further transaction tag is not required.

However a new waybill identifying the details of the second leg of the journey must be completed.

No previously attached transaction tags can be removed from an animal.

The Northern Territory has a small population for sheep and goats, currently with no abattoir or saleyard for these species. The department monitors compliance at annual shows.

Glossary

ABARES	Australian Bureau of Agricultural Resource Economics and Sciences
baseline	the current mob-based National Livestock Identification System for sheep and goats
CIE	Centre for International Economics
COAG	Council of Australian Governments
CVO	Chief Veterinary Officer
DAFF	Department of Agriculture, Fisheries and Forestry
EID	electronic identification
ESCAS	Export Supply Chain Assurance System
NLIS	National Livestock Identification System
NLTPS	National Livestock Traceability Performance Standards
non-excludable	it is impossible or very costly to exclude any individual or firm within the industry from consuming the good once it is supplied
non-rivalrous	consumption of this good by a firm or individual within the industry does not diminish the quantity available for consumption by others
NVD	National Vendor Declaration
PIC	property identification code
PIMC	Primary Industries Ministerial Council
PWC	PricewaterhouseCoopers
RFID	radio-frequency identification
RIS	regulation impact statement
SCoPI	Standing Council on Primary Industries

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