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**Department of Agriculture,
Water and the Environment**



Enhancing supply chain profitability through reporting and utilisation of peri-mortem information

Animal health and disease extension and adoption strategy – gap analysis Final Report APL Project 2021/0036

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Executive Summary

The project titled 'Enhancing supply chain profitability through reporting and utilisation of peri-mortem information' (Health 4 Wealth) has been exploring the value proposition of implementing a national ante and post-mortem data collection and reporting system. This would assist in quantifying the benefits to all stakeholders including producers, processors and regulators. The project aims to develop a national system to enable producers to monitor disease prevalence in livestock and make better informed decisions. For simplicity, the project will be referred to as "abattoir surveillance" throughout this report.

This "Gap Analysis" report is a preliminary component of one of the final components of the Health 4 Wealth project – development of a draft animal health and disease extension and adoption strategy. The gap analysis was completed by firstly constructing a framework to methodically interrogate elements of an extension and adoption process applicable to all stakeholder groups involved in abattoir surveillance and reporting. Individual frameworks were constructed for the pig, beef and sheep/lamb industries to remove any complexity that could occur with a combined single framework approach. The frameworks drew on categories listed in MLA's Producer Adoption Outcomes Report to understand the existing or potential learning pathways for extension and adoption, including awareness activities, short term training programs and workshops, long term practice change and capability building, enablers, and an assessment of human resource capacity within the industry.

In addition, "foundational elements" involved in data collection and reporting were investigated, including the necessity for equivalence in reporting between the relevant jurisdictions.

A summary of the major outcomes of the gap analysis are provided in the table below. The various gaps identified in the table (and reported in greater depth in the body of the report) will be considered when developing the extension and adoption strategy.

Summary of gap outcomes

Extension/adoption element	Gap analysis
A. Foundational elements (processors) – data collection and sharing	
Diseases/conditions that can be directly assessed by inspectors	<ol style="list-style-type: none">1. Finalise Australian National Standard and agree on data collection equipment and source of funding2. Agree on priority diseases3. Determine whether it is a whole-of-industry, national system4. Confirm central database establishment, funding and governance rules
Diseases/conditions accurately identified by inspectors	<ol style="list-style-type: none">1. Training of inspectors in diseases/conditions identification2. Monitoring/auditing of inspectors in place3. Investigate the potential to automate disease/condition identification and recording
Processor generated reports are contextualised	<ol style="list-style-type: none">1. Pigs - SARDI role to be agreed by the industry2. Cattle and sheep: to be determined
Reports based on individual animal ID or by line	<ol style="list-style-type: none">1. Pigs: need to confirm2. Cattle, sheep: need to confirm
Timely reporting	<ol style="list-style-type: none">1. Database access process2. Investigate potential to link processor report with payment advice

Extension/adoption element	Gap analysis
	3. Reports to be generated by central database or individual processors or combination 4. Value based pricing potential
B. Producer/advisor sector activities	
Awareness activities (field days, forums, webinars, newsletters, articles, podcasts)	1. Determine potential for an overarching abattoir surveillance 'portal' (e.g. Paraboss) 2. Consider if localised diseases/conditions information is required 3. Requirements to engender trust in information (e.g. co-branding)
Short Term Training Programs and Workshops, incl. electronic learning modules.	1. Develop standardised training/workshop packages
Long Term Practice Change and capability building, incl. producers learning from other producers/hands on implementation.	1. Producer demonstration sites or champions, branded product supply chains etc. with costs/benefits information
Enablers: e.g. tools and calculators	1. Calculators can be developed as awareness tools 2. Interactive dashboards preferred to static PDF reports
Human resource capacity, service providers	1. System is still in a testing phase and not suited to full scale extension yet 2. Role of traditional government extension agencies versus private sector agents

Table of Contents

Acknowledgements	2
Executive Summary	3
1. Background to Research	9
2. Objectives of the Research Project	10
3. Research Methodology	11
4. Results / Discussion	12
5. Consultation list	19
6. Literature cited	20
7. Appendices	21
1.1 Appendix A: Document summary	22
1.2 Appendix B: Preliminary gap analyses frameworks	30

List of Tables

Summary of gap outcomes	3
Table 1 Gap analysis	13
Table 2 Consultation list (Confidential)	19
Table 3 Document summary	22
Table 4 Extension and adoption framework - pigs	30
Table 5 Extension and adoption framework - cattle	33
Table 6 Extension and adoption framework - sheep	36

List of Figures

Figure 1 Extension and adoption modified program logic (MLA 2021)

11

Glossary

Term / abbreviation	Definition
AgVic	Agriculture Victoria
AHA	Animal Health Australia
AMPC	Australian Meat Processor Corporation
APL	Australian Pork Limited
AWI	Australian Wool Innovation
CLA	Caseous lymphadenitis (Cheesy gland)
DAWE	Department of Agriculture, Water and Environment
DPI	Department of Primary Industries
EAD	Emergency Animal Disease
EDIS	Endemic Diseases Information System
FSMA	Food Safety Meat Assessors
ISC	Integrity Systems Company
LDL	Livestock Data Link
LGA	Local Government Area
LLS	Local Land Services
MDC	MLA Donor Company
MINTRAC	National Meat Industry Training Advisory Council Limited
MLA	Meat & Livestock Australia
NSHMP	National Sheep Health Monitoring Program
OPV	On Plant Veterinary Officer
SARDI	South Australian Research and Development Institute
H4W	'Health 4 Wealth'

I. Background to Research

The 'Enhancing supply chain profitability through reporting and utilisation of peri-mortem information' (Health 4 Wealth) project has been exploring the value proposition of implementing a national ante and post-mortem data collection and reporting system, to quantify the benefits to all stakeholders including producers, processors and regulators. The project aims to develop a national system to enable producers to monitor disease prevalence in livestock and make better informed decisions.

Funded by the Rural Research and Development for Profit Program, the project is a partnership between Australian Pork Limited (APL), Meat & Livestock Australia (MLA), Australian Meat Processor Corporation (AMPC), Agriculture Victoria (AgVic) and the South Australian Research and Development Institute (SARDI).

The broader project has a number of objectives and research has already been completed on the following:

- A business case for a peri-mortem data capture and reporting system that meets the needs of stakeholders across the beef, goatmeat, pork and sheepmeat supply chains
- Standards and software that can be used to collect and consistently report disease-related carcass and offal condemnations (total and partial) during ante- and post-mortem inspection
- Validation studies to identify challenges or barriers to implementation and recommend solutions prior to rollout of the national system.

2. Objectives of the Research Project

This current project will draw on the previous components discussed with the aim of developing a national extension and adoption strategy which will allow standardised data collection and reporting systems to be integrated into Australia's beef, pork and sheepmeat supply chains.

Broadly this extension and adoption strategy project will include two components:

- **Undertake a gap analysis to:** (a) map and identify animal health and disease extension and adoption programmes, tools and resources already available to producers for beef, pork and sheepmeat to support them with their animal disease feedback; and (b) clearly identify gaps within these resources which need to be addressed
- **Develop a draft animal health and disease extension and adoption strategy:** based on the above with emphasis on identifying the pathways, channels and partners best placed to work with producers to understand and action their animal disease feedback.

At the completion of this project the beef, pork and sheepmeat industries will have a clearly defined adoption pathway to support animal disease feedback through the value chain to the producer. For simplicity, the project will be referred to as “abattoir surveillance” throughout this report. In undertaking this gap analysis, GHD has identified the animal health and disease extension and adoption tools and resources required for the pork, beef and sheepmeat industries for the implementation of abattoir surveillance. This has included the development of the existing or potential learning pathways for consideration in the development of the extension and adoption strategy. Categories for extension and adoption have been aligned with those in MLA's Producer Adoption Outcomes Report (MLA 2021) and include the following:

- a. Awareness activities: for example, field days, forums, webinars, newsletters, articles, podcasts.
- b. Short Term Training Programs and Workshops: building producers' knowledge and skills by participating in training activities like workshops or electronic learning modules.
- c. Long Term Practice Change and capability building: more intensive programs perhaps using small groups, producers learning from other producers, and application of new knowledge supported over the longer term. Mix of theory and hands on implementation.
- d. Enablers: for example, tools and calculators.
- e. Assessment of human resource capacity within the industry. For example, are there enough suitable service providers in industry to deliver what is needed and if not, recommend how this be addressed.

3. Research Methodology

GHD completed the following process in preparing this gap analysis:

1. Review of a range of reports from completed Health4Wealth projects to date (accessed from APL's Dropbox site), and additional reports provided by APL or accessed by GHD. A summary of the reports is attached in Appendix A.
2. Construction of three draft extension and adoption gap analyses frameworks (one each for pigs, cattle and sheep) based on the information from the above reports. Note that the structure of the frameworks was guided by the extension and adoption categories as listed by MLA in its Producer Adoption Outcomes Reports (see Figure 1), with the inclusion of additional categories related to essential foundational elements for data collection and sharing by the processing sectors. The three completed frameworks are attached in Appendix B.

MLA's evaluation approach uses a modified form of program logic as shown below. This focusses on evaluating those outputs (products) from inputs (projects or project groups) that have attributable outcomes (adoption) and impacts.

In many cases, products are defined as an output from a related set of individual projects that have contributed to that product.



Figure 1 Extension and adoption modified program logic (MLA 2021)

3. Review and initial editing of the frameworks by the relevant technical experts (David Hamilton for pigs, MLA staff for cattle, and Clive Richardson for sheep).
4. Further consultation. The technical experts and GHD consulted with selected key informants from the industries familiar with abattoir surveillance (see Table 2). The draft frameworks were used in each case to guide consultation.
5. Final gap analysis framework. The culmination of each of the above steps resulted in the extension and adoption gap analysis summary table below (Table 1). The gap analysis lists a number of gaps in the reporting and utilisation of peri-mortem information for the pig, cattle and sheep industries that require consideration in the development of the extension and adoption strategy.

4. Results / Discussion

The gap analysis shown in Table 2 includes the following (see column headings):

1. Elements for inclusion in an extension and adoption strategy. The elements are divided into two components: A. Foundational elements for data collection and sharing/reporting by processors; and B. Producer/advisor sector extension and adoption activities.
2. Issues of importance. For each of the elements presented in Column 1, GHD has summarised issues highlighted in the various Health 4 Wealth (H4W) reports (Appendix A) that are critical to the success of the extension and adoption strategy.
3. Lessons from H4W project outcomes and consultation. GHD has further analysed specific aspects for extension and adoption, with the inclusion of feedback from the consultation phase.
4. Gap analysis. GHD systematically reviewed each of the extension and adoption elements and determined the gaps highlighted by the H4W projects and broader industry processes that are potential barriers to the orderly implementation of an extension and adoption process. The gaps for each element are numbered to allow ease of cross referencing with the yet to be constructed extension and adoption strategy.

It should be noted that the gaps are not uniform across the species. In particular, there are less gaps that have been identified for the pig industry compared to the cattle and sheep industries. These differences will be reflected in the extension and adoption strategy, with priorities and timelines for different extension and adoption elements varying between the species where appropriate.

Table 1 Gap analysis

Extension/adoption element	Issues of importance	Lessons from H4W projects and consultation	Gap analysis
A. Foundational elements (processors) – data collection and sharing			
Diseases/conditions that can be directly assessed by inspectors (i.e. do not require additional laboratory assessment).	<ul style="list-style-type: none"> ➤ Standardised language: agreement needed across all sectors of the industry – see report: <i>Australian National Standard for the Development, Collection and Reporting of Animal Health, Disease and Defect Data through the Supply Chain by Management for Technology Pty Ltd and Food and Veterinary Services Pty Ltd (no date)</i>. ➤ Priority diseases: agreed list of diseases and conditions, with impact and/or consequence data. ➤ Additional diseases: responsibility of individual establishments. ➤ Export and domestic abattoirs involvement: choice of individual establishment but need to consider critical mass. ➤ Individual plant or central database: needed to collect and allow reporting and analysis of de-identified data (sufficient for contextualisation). 	<ul style="list-style-type: none"> • H4W pilot trials have demonstrated the practicality of collecting and disseminating data. • COVID 19 has limited involvement of some establishments. • Domestic abattoirs are not excluded, but they represent small % of total kill. • Central database: for pigs, operated by SARDI, with conversations underway with APL as to its future continued operation and the development of appropriate governance rules. • Central database: for cattle, access via MLA Livestock Data Link (LDL) – currently being restructured. • Central database: for sheep, via the National Sheep Health Monitoring Program (NSHMP) with AHA managing the Endemic Diseases Information System (EDIS) which can provide de-identified data to State DPIs to direct their extension work and for DAWE to support market access efforts. NSHMP data is also stored on the (LDL). Also 	<p>1. Australian National Standard for the Development, Collection and Reporting of Animal Health, Disease and Defect Data through the Supply Chain needs to be finalised for all industries. Potential endorsement by the Australian Meat Industry Language and Standards Committee in May 2022.</p> <p>a. Participating plants use different systems for gathering data (electronic or paper), but all must be able to demonstrate compliance with National Standard metrics and terminology. Software vendors play a role in this.</p> <p>b. Funding of data collection equipment needs to be resolved (mix of individual plant, levy funds, government contributions) over time. Can the cost of implementation and adoption be offset by tapping into common industry funds/levies?</p> <p>2. Agree on priority diseases (pigs have agreement - 17; cattle 5; sheep – 19 NSHMP conditions could potentially be reduced to 10 based on prevalence/significance for animal welfare and the cost impact on the processor: arthritis, CLA, grass seeds, sheep measles, dog bites, hydatids, pleurisy/pneumonia, bruising, liver fluke, vaccination lesions.</p> <p>3. Whole of industry, national system</p> <p>a. pigs – supported</p> <p>b. cattle/sheep – uncertain if there is agreement for a national system or individual company systems.</p>

Extension/adoption element	Issues of importance	Lessons from H4W projects and consultation	Gap analysis
		National Animal Health Information Program.	<p>4. Central database (PIC data available to PIC owner, with additional deidentified, aggregated data sets available for comparison)</p> <p>a. pigs – SARDI to host but need to finalise funding and governance, privacy rules and role of APL.</p> <p>b. cattle and sheep - uncertain. Potentially depends on critical mass of plants/throughput to be cost-effective. If agreed (e.g. EDIS, LDL replacement), will need to determine funding and governance, privacy rules.</p>
Diseases/conditions accurately identified by inspectors/QA staff (noting % of false positives is damaging)	<p>➤ Australian Meat Processing Training Package “AMPA3120 - Perform ante and post-mortem inspection - Ovine and Caprine” is delivered as part of the Certificate III and IV in Meat Safety (Meat Inspection).</p> <p>Competency is assessed at line speed by a Registered Training Organisation, with the RTO’s assessment required for an award (Certificate III or IV in Meat Safety).</p> <p>➤ In an export establishment a new inspector is initially evaluated/assessed by the On Plant Veterinary Officer (OPV), a DAWE officer. If assessed as competent the inspector is then subject to ongoing evaluation by the OPV and FSMA, and can be deregistered as an Australian Authorised Officer if they</p>	<ul style="list-style-type: none"> • NSHMP in conjunction with Charles Sturt University confirmed the accuracy of experienced meat inspector in disease/condition reporting. • The accuracy of animal health data is a function of meat inspectors’ competency to recognise diseases and conditions at chain speed. • The NSHMP annually assesses inspector competency as part of the NSHMP’s quality control (these learnings likely to be similar for pigs and cattle). • Assessment role falls to the Commonwealth (FSO) or third party AAO. • Competency will be assessed by the department and on plant verification should be performed by the OPV/department if the 	<p>1. Training: Inspectors have the basic training in disease/condition recognition, but need extra training in data entry.</p> <p>a. on-line e-training to be developed.</p> <p>2. Monitoring/auditing by third party required – who will complete this task?</p> <p>3. Video/camera technology could be developed to automate disease/condition identification and recording.</p>

Extension/adoption element	Issues of importance	Lessons from H4W projects and consultation	Gap analysis
	<p>do not demonstrate ongoing competency.</p> <ul style="list-style-type: none"> ➤ Domestic abattoirs - depends on individual states. Inspectors may be subject to an initial evaluation before registration of plants. Meat inspection is audited as part of the routine plant registration audits in most states. 	<p>inspector is employed by the plant or a third party.</p> <ul style="list-style-type: none"> • Persons will need to be competent to Cert 4 in meat processing (meat safety) for export and Cert 3 for domestic. 	
Processor generated reports are contextualised – comparisons with own past lines, peers, regions, seasonal and other nuances. No judgement reporting	<ul style="list-style-type: none"> ➤ Is there sufficient contextualisation in processor reports to ensure valid comparisons? ➤ What changes to reports are required by processors to improve contextualisation? 	<ul style="list-style-type: none"> • It is necessary that processors and producers can benchmark themselves nationally/regionally/seasonally against others. • Without context, reports can be misleading and lead to incorrect intervention. • Trend towards smaller lot sizes adds to need for care in interpretation and contextualisation. 	<ol style="list-style-type: none"> 1. Pigs. Report format generated by a 3rd party (SARDI) to be agreed by the industry. 2. Cattle and sheep: comparisons of lots over days, weeks, months or specific Local Government Areas (LGAs) is difficult given stock are seldom of uniform quality. Recently revised reports need to be assessed for appropriateness. 3. Consistency will be brought about by implementing the voluntary standard.
Reports available based on individual animal ID or by line	<ul style="list-style-type: none"> ➤ Does not having individual animal RFIDs cause issues with data collection and feedback? 	<ul style="list-style-type: none"> • Individual animal ID allows better data analysis, e.g. the relationship between pathology/disease and carcase weight at slaughter (incl. for research purposes). 	<ol style="list-style-type: none"> 1. Pigs: lot level is likely to be sufficient, but confirm that individual animal ID is required to provide better analysis and interpretation, including for research. 2. Cattle, sheep: confirm that it is unlikely that information other than lot level is required.
Report – timely, whether by LDL or direct. Is there any contact with producer if	<ul style="list-style-type: none"> ➤ Immediacy/timeliness of feedback is important as delays can cause harm/loss. 	<ul style="list-style-type: none"> • Note that the On Plant Vet (OPV) is responsible for EADs and notifiable diseases 	<ol style="list-style-type: none"> 1. Database access: can processors and producers directly access via password, and then complete comparative analyses,

Extension/adoption element	Issues of importance	Lessons from H4W projects and consultation	Gap analysis
“critical” disease/condition identified or other escalation?	<ul style="list-style-type: none"> ➤ A meat processing enterprise manual is being prepared through AUSVETPLAN that will open up additional reporting avenues and improve preparedness for processors. 	<p>direct to relevant authorities – these aspects are out of scope for this project.</p> <ul style="list-style-type: none"> • Timeliness is critical with data going “stale” very quickly. For processors, the power of the data will help inform purchasing decisions. For producers, data allows animal health treatments to improve profitability. 	<p>noting that processors technically own the data and pay to collect it, and recognising privacy issues associated with data.</p> <ol style="list-style-type: none"> 2. Is it possible to link processor report with payment advice? 3. Can individual processors use abattoir surveillance as a marketing tool to attract producer clients in addition to national system (a hybrid model)? 4. Value based pricing would promote uptake.
B. Producer/advisor sector activities			
Awareness activities targeted (field days, forums, webinars, newsletters, articles, podcasts)	<ul style="list-style-type: none"> ➤ Apart from the fact sheets described above, is there a library of extension material, who is responsible for maintaining the collections? ➤ Is there any evaluation of activities to demonstrate what producers find most useful? ➤ It is likely that awareness activities are necessary but not sufficient to achieve practice change/adoption by producers. 	<ul style="list-style-type: none"> • There is a range of fact sheets and other animal health information hosted by the State DPIs, APL, MLA, Australian Wool Innovation (AWI) and pharmaceutical companies, however there is no overarching abattoir surveillance theme that cuts across all agencies/companies. • There has been little evaluation of the suitability or impact of extension materials for producers. • The greatest impact on producers will be when a report highlights a financial incentive from practice change. 	<ol style="list-style-type: none"> 1. Potentially an overarching abattoir surveillance ‘portal’ subscribed to by all relevant agencies (e.g. Paraboss - Australia's premier resource for parasite management information for sheep, goats and cattle). A library of extension materials and dates for industry events (e.g. field days). 2. Consider if some diseases/conditions information could be localised and thus more relevant to specific regions (problem is universal, solution local). 3. Trust in information is important, with co-branding seen as more impartial (see MLA's “Solutions to Feedback” library with linkage of carcass performance outcomes to a library of solutions).
Short Term Training Programs and Workshops, incl. electronic learning modules.	<ul style="list-style-type: none"> ➤ What training programs & workshops for producers have been completed and who organised/delivered? 	<ul style="list-style-type: none"> • Pigs: Over 30 presentations to producers, vets and processors, both face-to-face and on-line have been done by the H4W research team. 	<ol style="list-style-type: none"> 1. Develop standardised training/workshop packages for each species that can be used as core materials for training events hosted by extension agencies, processors etc.

Extension/adoption element	Issues of importance	Lessons from H4W projects and consultation	Gap analysis
	<ul style="list-style-type: none"> ➤ Are any electronic learning modules available (e.g. Sheep Connect webinar by Joan Lloyd on arthritis). 	<ul style="list-style-type: none"> • Cattle, Sheep: A number have been completed but relatively ad hoc. Workshop materials example is <i>Feedback Focus – identify, evaluate, manage</i>. A collaborative and coordinated approach recognising that diseases impacting the processor also impact production and profitability for producers by AHA, Integrity Systems Company (ISC, part of MLA), National Meat Industry Training Advisory Council (MINTRAC), Zoetis, and run by individual processors such as JBS, Gundagai Meat Processors, TFI and Fletcher International. • Face to face is best for large groups. Targeted on-line can work on a one-to-one basis. 	
Long Term Practice Change and capability building, incl. producers learning from other producers/hands on implementation.	<ul style="list-style-type: none"> ➤ The percentage of producers who have adopted abattoir surveillance, and if adoption is less than ideal, what is required to achieve better outcomes? ➤ Potential for producers to be nominated as champions. ➤ Recognise species differences: intensive industries (e.g. pigs, feedlots) are higher input systems that can apply treatments with higher chance of economic return. 	<p>Most producers are interested in abattoir feedback, but uncertain of accuracy of data, including independence.</p> <p>Credibility of the data integrity and transparency of the collection and monitoring process is required. Confidence in data confidentiality is also very important.</p>	<p>I. Demonstrate real world applications of the process as well as costs and benefits using real-life examples (producer demonstration sites or champions, branded product supply chains etc.).</p>

Extension/adoption element	Issues of importance	Lessons from H4W projects and consultation	Gap analysis
	<ul style="list-style-type: none"> ➤ Extensive industries (grazing cattle, sheep) are generally lower input systems with higher risk of achieving economic returns from additional treatments. 		
Enablers: e.g. tools and calculators.	<ul style="list-style-type: none"> ➤ Any evidence of the effectiveness of the tools? Will the development of tools/calculators promote adoption? 	<ul style="list-style-type: none"> • MINTRAC has developed software for small to medium processors who wish to collect data and provide feedback to their producers. • Sheep: a draft calculator has been developed by MLA. 	<ol style="list-style-type: none"> 1. Calculators to be developed as awareness tools. The complexities of treatment interventions within a whole farm context most likely requires expert advice before practice change adoption. . 2. Interactive dashboards preferred to static PDF reports.
Human resource capacity, service providers	<ul style="list-style-type: none"> ➤ Have all agencies/service providers been approached? If not, why not? Are they not seen to be relevant? ➤ How supportive are they? ➤ What has been the feedback from agencies/service providers? ➤ What is their capacity to support extension and adoption, incl. number of staff with appropriate training, funding etc? 	<ul style="list-style-type: none"> • Pigs: The system is strongly supported by processors, producers and pig veterinarians. Plants currently bear the cost of data collection and reporting. • Understanding human resource capacity gaps may be premature as trials are still in the logistic testing stage. • Covid 19 restrictions delayed previously scheduled awareness and training events – some loss of momentum. • Human resource capacity will develop over time as trials progress. 	<ol style="list-style-type: none"> 1. Recognise that, despite success of H4W trials, the system is still in a testing phase and not suited to full scale extension. 2. Traditional government extension agencies are unlikely to have resources other than for awareness activities, so private sector agents (e.g. vet consultants, animal health company technicians, processor liaison staff) are more likely to be the future, front line providers. 3. Co-funded digital supply officers employed by processors (MDC funding).

Source: GHD analysis drawing on extension and adoption categories listed in MLA's Producer Adoption Outcomes Report (2021)

5. Consultation list

GHD's framework analysis has drawn on consultation with key informants listed in Table 2. Note that the names do not represent a complete list of people consulted, as the three technical specialists have also sought feedback from their industry contacts. In addition, the feedback of industry contributors captured within the various H4W projects and pilot trials have been captured within the frameworks and gap analysis (see for example comments from the H4W Online Collaboration Event Outcomes Report, August 2017 in Appendix A).

The names of those consulted should remain confidential at this stage until this draft is reviewed by the Project Management Committee. After review, contributors can be contacted by GHD seeking their permission for their names to be included in the final document.

Table 2 Consultation list (Confidential)

Name	Industry role
David Hamilton	Pig technical specialist
Clive Richardson	Sheep technical specialist
Verity Suttor, Demelsa Lollback, Renelle Jeffery	Cattle technical specialists
Rob Barwell	Animal Health Australia
Tamara Biffin	Australian Meat Industry Council
Richard Shephard	Veterinary consultant
Scott Ison	NSW Local Land Services (LLS)
Ian Rogan	Chair, Central Tablelands LLS
Dr Joan Lloyd	Veterinary Research Consultant
Chair	NSW Farmers Sheepmeat Committee
District Veterinary Officer	LLS NSW
Business Manager	Prime lamb marketing group, NSW
Confidential	Private veterinary consultant, NSW

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7. Appendices

1.1 Appendix A: Document summary

GHD has reviewed the final reports for projects completed so far (accessed from APL's Dropbox site) and summarised issues from the reports with potential extension and adoption implications. Note that GHD is waiting on two key reports that are yet to be finalised - the pork pilot trial and Cost Benefit Analysis report.

** Note that GHD extracted the main extension and adoption implications from the reports. There may be additional implications from the reports that are not included in the below summary.

Table 3 Document summary

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
2016-2238 Internal	H4W Online Collaboration Event Outcomes Report. Era, August 2017	<p>Event had 4 key themes: 'Data Collection and Sharing', 'Generating Value from Animal Health Data' (How should peri-mortem data be best reported to engage producers and enhance on-farm management practices to improve animal health and wellbeing?), 'Stakeholder Engagement' and 'What Else?'. From Appendix – all ideas content with extension implications.</p> <ul style="list-style-type: none"> • Greg Marr - language needs to be modernized, mean something useful to veterinarians to interpret for producers, E.g. Pyaemia • David Rutley - diseases/conditions being assessed are quite generic, e.g. arthritis and pneumonia/pleurisy can be caused by many different pathogens • Clive Richardson – insufficient number of meat inspectors. Plant managers not yet convinced of value of collecting data especially in mutton plants where a good % of the kill is sourced from saleyards. At industry level, cost burden of maintaining the data base and access to data. Ensure processors cannot make producer “black lists”. • John Langbridge - data entry in manual system takes time. On a fast moving sheep chain a carcass or offal set can move past every 6 seconds. Need smart system of data collection e.g. voice recognition software. David Hamilton - touch pad recording system operating at 650/hr in the Netherlands • Sarah-Jane Wilson - plethora of information that is collected but under-utilised due to many factors • David Hudson – need common language across livestock industries • Verity Gilbertson – need key principles around data accessing, sharing and security • Robert Wyld - data needs to be reported in a context in a way that allows an individual producer to make informed decisions. • Rebecca Austin - Need to ensure info is collected in the same manner across industry so that there can be greater value generated. Ensure information is presented back to producers in an 'actionable' format, Needs to be easy to understand • Rebecca Austin - need to leverage off other meetings industry forums gathering of relevant stakeholders • John Langbridge – encourage industry champions • Peter McKenzie - Most pig plants will deduct \$\$ for loss of offal via ascarids or anticoagulants. Averaging works to a point - then they deduct. • David Rutley - The SA Sheep Enhanced Abattoir Surveillance (EAS) data is mob based but system must be allowed to evolve

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
		<ul style="list-style-type: none"> • Sarah-Jane Wilson - Producers are suffering from workshop fatigue, so we need to look to some innovative ways to engage with them on this. Most producers have strong connections with their livestock agents, rural merchandisers etc. • Pat Kluver – an app could be used to capture this data and value add so producers get full understanding of on-farm risks/benefits • Johann Schroder - disease data must find its way back to producer as soon as possible • John Langbridge - Carcase yield and quality is an obvious area to show how improvements in animal health may show improvements in returns to the farmer. The less obvious area is around co-products. Have a staged extension program with priority diseases/conditions? • Tony Abel - Face 2 Face is the best way to communicate with stakeholders. Not MLA road show but rather local consultants vets agents providing support to individuals or small groups. Perhaps MLA MDC could fund 50% of costs for the first 2 or so years • Andy Pointon – feedback should flag the need for more skilled diagnostic investigation, not chucking the latest drench at it to find out it was money down the drain. The initiative needs to be championed to extensive large animal veterinary services to support the delivery of herd health management services.
H4W Pork Finals	Fact sheets	17 individual fact sheets for 17 pig diseases/conditions: Abscess, Anaemia, Arthritis, Ascarids, Bruising, Colitis, Contamination, Dermatitis, Erysipelas, Fever, Ileitis, Melanoma, Nephritis, Pericarditis, Peritonitis, Pleurisy, Pneumonia,
H4W Beef Finals	Fact sheets	5 individual fact sheets for 5 beef diseases/conditions: Hydatids, Liver abscess, Liver fluke, Nephritis, Pneumonia
Sheep	From NSHMP	Sheep diseases include: Arthritis, Bruising, Cirrhosis, CLA, Cysticercus tenui, Dog Bites, Cancer, Fever Septic, Hydatids, Liver Fluke, Lung Worm, Knotty Gut, Melanosis, Nephritis, OJD (inspection on request by producer), OVIS, Pleurisy, Rib Fractures, Sarcocyst, Grass Seeds, Vaccination Lesions
2018-0064	H4W: Red meat pilot trials Final Report APL Project V.RDP.2100 Verity Suttor February	<ul style="list-style-type: none"> • 8 red meat processing plants. Feedback via Livestock Data Link (LDL) or company • The project has demonstrated proof-of-concept that individual carcase disease and defect data can be effectively and efficiently transferred from beef abattoirs to producers through existing industry infrastructure such as LDL and NLIS. • The project was not able to demonstrate proof-of-concept that individual or lot-based carcase disease and defect data can be effectively and efficiently transferred from small stock abattoirs to producers through existing industry infrastructure such as LDL and NLIS, although not all plants were trying to upload data to these industry systems. • Agriculture Victoria and LLS District Veterinarians undertook the on-farm production impacts session to highlight to producers the symptoms of the five top conditions; their impacts on productivity and the cost associated with this; and how and why the LDL feedback will benefit producers in managing these diseases. • Surveys were provided to producers who attended the webinars or producer days to gather feedback on whether they would use their animal disease feedback to monitor herd health and make change on farm; whether the report was easy to use and what additional reports would be useful; and lastly what extension support they would need to interpret their animal disease feedback.

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
		<ul style="list-style-type: none"> • All producers who participated in the soft launch for disease and defect data feedback and associated online feedback surveys indicated that they would use the animal disease report within LDL to track progress towards controlling or eliminating a disease within their herd. Most indicated that, with this information, they would be more likely to consult with an animal health professional for advice on reducing and eradicating disease within their herds. • The report includes case study write-ups for participating abattoirs, incl potential BCAs • Producers prefer to receive ongoing support through targeted on-line webinars, either focused on a particular region or a particular disease over extension materials, such as flyers or tech tips, or face-to-face workshops including plant tours to see infected or diseased offal. • Very small slaughter lots are typical of production systems in southern Australia. This increases the challenge of producer education and limits the ability to significantly improve animal health performance across the whole supply chain. Implementing change, particularly through production systems where livestock production is not necessarily the primary source of income (and in many cases, is a sideline or opportunistic) presents significant challenges. • The ability for an information flow from some small stock procurement models in Australia may be managed on a mob or lot basis, which means there are very limited opportunities for providing feedback to the original supplier on animal health performance through the supply chain.
2017-2262	Assessment of value from reporting peri-mortem data collected at abattoirs Final Report Project Number (i.e. APL Project 2017/2262) January 2019 Herd Health Pty Ltd Dr Richard Shephard	<p>Ab surv only suitable for direct lines of sheep to abattoir, misses out on saleyards purchases</p> <p>Potential for false positive condition could be damaging to success</p> <p>No judgement calls on feedback is important</p> <p>Producers need contextualized info to make sense of feedback – comparisons, peer data etc.</p>
2017-2251	H4W Pilot Studies Design Day Final Report APL Project 2017/2251 June 2018 Joan Lloyd Consulting Pty Ltd	<p>Design considerations for pilot trials – see report of final trials above</p> <p>No additional extension considerations</p>
2017-2235	Development and implementation of an accredited training program	The aim of this project was to prepare suitable training materials and a training strategy for a new unit of competency for inclusion in the AMP Australian Meat Industry Training Package, entitled 'Collect, monitor and analyse animal health data', being developed by the Australian Industry and Skills Committee (AISC).

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
	in animal health data collection. Final Report APL Project 2017/2235 November 2018 National Meat Industry Training Advisory Council Jenny Kroonstuiver	<p>The inclusion of an animal health data monitoring responsibility to the QA function in a meat processing plant is a significant addition to the role. Many government-appointed meat inspectors will not collect animal health data remains unresolved. While there are Fact Sheets available on Livestock Data Link for the sheep diseases and conditions, these do not exist in a similar form for cattle and pigs. The following is urged for fact sheets:</p> <ul style="list-style-type: none"> • a consistent style and format be adopted across all species so that the Fact Sheets are instantly recognisable and easily understood • that emphasis be placed on seeking appropriate veterinary advice • that a full range of Fact Sheets be made available as soon as possible, especially to those plants involved in the trials • That mechanisms for the future review and updating of the Fact Sheets be put in place as part of the process. <p>Extension? Importance of consistency in approaches, language etc. between industries</p>
2017-2227	Communications Strategy for the H4W Project for RR&D4P 'Enhancing supply chain profitability through reporting and utilization of peri-mortem information by livestock producers' Final Report APL Project 2017/2227 March 2018	<p>The objectives of this consultancy project were to:</p> <ul style="list-style-type: none"> • Develop branding and identity for the H4W Project development so the project develops its own identity. This will include where best to host the project webpage, templates, style guide, 'look & feel' and logo. • Meet with each of H4W project partners to determine a communications 'wish list' and expectations for communications outcomes. • More detailed stakeholder analysis, including an engagement plan for each key stakeholder group. • Create a profile for the project through a communications tool kit including: standard blurb, fact sheets and latest project updates etc. with recommendations for a Project Champion. • Identify potential industry and stakeholder meetings that the Project Champion can attend to: - Create awareness about the project and what it aims to achieve; - Ask what they would like out of project; - Offer support • Collate various reports that can be summarised into briefing notes for the tool kit. • Consultation meetings with project partners and potentially a few key stakeholders for initial branding feedback.
2017-2205	Collection, utilisation and sharing of post-mortem animal health data in the red meat supply chain APL Project 2017. 2205 October 2017.MINTRAC	<p>Electronic survey to assess the base line of current activity in the processing sector relating to the collection, utilisation and sharing of post-mortem animal health data in the red meat supply chain.</p> <p>For cattle the main diseases/conditions for which information was being collected included; abscess, hydatids, pleurisy/pneumonia, bruising, liver fluke.</p> <p>For sheep the main disease/conditions for which information was being collected included; arthritis, CLA, grass seeds, sheep measles, dog bites, hydatids, pleurisy/pneumonia, bruising, liver fluke. However, there are 10 more conditions and diseases being recorded in plants where data is gathered for the National Sheep Health Monitoring Program.</p> <p>The pork processors all recorded approximately the same 10 conditions with minor variation between companies. Abscess, Anaemia, Arthritis, Bruising, Erysipelas, Septicaemia, Melanoma, Peritonitis, Pleurisy, Vaccination Abscess.</p> <p>Barriers to recording animal health data included the unwillingness of government inspectors to collect data in some plants, the speed of mutton and lamb chains and other difficulties associated with the capture of data such as no touch screen computer terminals at inspection points.</p>

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
		<p>Just over 50% of the plants electronically surveyed currently provide animal health data to producers and they prefer to use email to distribute this information. Interestingly one hundred percent of those who do not provide data believe they would do so if there was a simplified system.</p> <p>Overall the processors believed access to animal health data would be advantageous to the supply chain in terms of increasing returns for both producers and processors.</p> <p>In a few cases the government employed inspectors identified diseases and conditions, but company QA staff recorded the data.</p>
2017-004	<p>Development of standards for ante/post-mortem processor data collection and reporting for the pork industry</p> <p>Final Report</p> <p>APL Project 2017/004</p> <p>May 2018</p> <p>South Australian Research and Development Institute</p> <p>Jessica Jolley, Andrew Pointon, David Hamilton</p>	<p>H4W - Proposed Australian Pork Industry Model</p> <p>HEALTH 4 WEALTH</p> <p>The diagram illustrates the flow of data between Plant Data and Industry Data, separated by a dashed blue line.</p> <p>PLANT DATA</p> <ul style="list-style-type: none"> Official Condemnation Data <ul style="list-style-type: none"> • Role of DAWR Training Material <ul style="list-style-type: none"> • Role to be played by MINTRAC IT <ul style="list-style-type: none"> • Base software • Must interface with plant's IT system Recorded Data <ul style="list-style-type: none"> • Base list of conditions • Customised, plant-specific additional data Producer/Vet Reports <ul style="list-style-type: none"> • Customised, plant-specific • Supported by explanations / interpretations • Programs for "problem-herds" <p>Arrows indicate "Back-and-forth communication between processors, producers and vets" between Recorded Data and Producer/Vet Reports. A curved arrow labeled "Special investigations / inspections" points from Producer/Vet Reports to Recorded Data.</p> <p>INDUSTRY DATA</p> <ul style="list-style-type: none"> Central Database <ul style="list-style-type: none"> • Management and oversight by APL and PPRG • Secondary epidemiological use <ul style="list-style-type: none"> • Research prioritization use • Animal welfare data for transparency – social license • Certification / Market access • Analysis of trends • Use by DAWR, AHA, states • Animal health surveillance <p>A green arrow labeled "DE-IDENTIFIED DATA" points from Recorded Data to the Central Database. A note above the Central Database mentions "Queries from states, AHA, DAWR, researchers, consumers, etc."</p> <p>Processors with their producers will drive uptake and adoption.</p>

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
		<p>Explanatory fact-sheets with easy-to-understand explanations and descriptors (e.g. what is meant by condition X, management advice/considerations and options for solutions) needs to be developed for each condition, in consultation with pig veterinarians, for use by producers.</p> <p>Stark difference in the establishment recorded data on the major carcasses defects leading to slaughter floor interventions, collected for the same 4 month time period. One establishment collected data on seven conditions, while at the other extreme, another establishment collected data on 42 conditions. A reason for the establishment differences in the conditions for which data are being collected is the lack of a standardised recording system and variation in recording language and defect definition.</p>
	<p>Health4Wealth- pilot trials for the pork industry and producer engagement and case studies</p> <p>Draft Final Report</p> <p>APL Project 2018/0034</p> <p>APL Project 2019/0034</p> <p>October 2021</p>	<p>The projects aimed to trial the logistics of collecting, recording and reporting abattoir data on individual carcasses in a minimum of six pork abattoirs. Trials were initiated at two export plants utilising radio-frequency identification (RFID) chips in the gambrels to identify and track individual carcasses on the slaughter floor. At one plant, input terminals at three inspection points (carcase, viscera and retain rail) enabled three sets of pathology and consequence data to be collected and uploaded to SARDI via the cloud, using a Marel software system. At SARDI, data were processed, analysed, and entered into a H4W database. The second plant only utilised an input terminal at the retain rail, which allowed carcase and consequence data to be collected and entered into the H4W database, but not viscera data. The trial at both plants has continued with some modification till the present.</p> <p>An approachable, but informative, one-two page H4W data reporting template was developed for producers and processors. It presented the data in a largely visual format, minimising the need to wade through pages of tables or spreadsheets. The feedback on the format from producers, processors and veterinary consultants has been universally positive.</p> <p>Overall, there was strong support for the H4W feedback system and a belief in the value of the data collected when assessing the extent of on-farm issues. It was clear however, that to realise its full potential in early detection of developing herd health problems, the report must be available within a few days of slaughter.</p> <p>It was also clear that there is an immediate need for firm data governance rules to be developed, and that all stakeholders need to be included in their development.</p>
NA	<p>Milestone Report No. 3. Enhancing supply chain profitability through reporting and utilization of peri-mortem information by livestock producers. June 16, 2018</p>	<ul style="list-style-type: none"> • Pork Industry workshop (SARDI, processors, farmers, veterinarians, APL, AHA and state and federal government representatives) to review and establish agreed animal health conditions for pork • Dr Derk Oorberg (Vion) presented to MLA, Supply Chain Group Meeting and one-on-one sessions with producers and processors on capturing animal health conditions and providing online pig feedback systems to producers • MINTRAC contracted to develop and implement accredited training program in animal health data collection. Pilots and 'train the trainer' workshops in October 2018. • Standards developed for beef, sheep and pork data collection, validation pilots underway. • Project to analyse data from National Sheep Health Monitoring Project (NSHMP) at state, region, abattoir and individual producer level to determine whether this data supplied has led to reduction in diseases <p>Reports and presentations have been completed and used in workshops.</p> <p>SARDI provided a news report which was approved by DAWR and has been publicly distributed.</p>

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
NA	Milestone Report No. 5. Enhancing supply chain profitability through reporting and utilization of peri-mortem information by livestock producers. November 16, 2018	Pilot trials underway, 2 Pork and 8 red meat (cattle, sheep and goat)
NA	Milestone Report No. 7. Enhancing supply chain profitability through reporting and utilization of peri-mortem information by livestock producers. June 20, 2020	<p>AHA finalized the Pork (14) and Beef (5) Factsheets on the top conditions identified for the pilot trials.</p> <p>News article included in Integrity Matters eNewsletter around the launch of beef disease and defect data available in LDL: <u>Disease and defect feedback available for beef producers</u></p> <p>Development of Processor flyer around the announcement of beef disease & defect feedback available LDL. This has been through internal supplier communication channels. This has occurred through 3 supply chains.</p> <p>Livestock Data Link animal disease module animation: includes reference to industry programmes that have contributed to disease and defect data being able to be capture and reported in LDL. Please refer to the news article link above for the video.</p> <p>Increasing revenue through processor feedback: news article in Australian pork newspaper http://www.porknews.com.au/documents/pasteditions/APN0520.pdf</p> <p>7 stakeholder forums / meetings / presentations / workshops / webinars</p> <p>Red Meat Trial: One company to date has done a webinar with their top 20 producer group where animal disease feedback was mentioned about being available in LDL. Also, a couple of producer workshops were held last year with a beef plant and sheep plant where producers were introduced to animal disease feedback.</p> <p>1 Facebook post linking to integrity matters article</p> <p>Trials: Red meat; MLA met with additional processors interested in capturing animal disease and defect data and providing this to suppliers/producers. 2 companies outside H4W project now supplying feedback to feedlots and producers. Software providers have enabled another plant outside H4W trials to turn on animal disease functionality. Companies involved in trial keen to turn on animal disease functionality at other plants after trial complete.</p> <p>A number of the plants are in the process of completing the data validation and 3 beef plants have moved to releasing disease and defect data back to their suppliers. One plant has completed the pilot and is continuing to collect and provide disease and defect data back to their feedlot. They are interested to explore Livestock Data Link as the system to provide feedback to their direct consignment producers. It is interesting to note that a number of companies who have used Government inspectors have had a lot resistance and challenges with them collecting data as part of the pilot</p>

Dropbox Filename	Report Title	GHD summary of extension and adoption elements
		To date the majority of the red meat plants involved in the Health 4 Wealth pilot trials have standardised the recording of the agreed conditions; amended existing systems to enable standardised defects and diseases to be recorded; developed producer reporting systems; and completed the preliminary data collection. A couple of the small stock plants have had delays in finalising the producer reporting and data collection method. This is due to challenges around individual data recording through carcase hook tracking as well as linking mob data to goat producers.
NA	Milestone Report No. 8. Enhancing supply chain profitability through reporting and utilization of peri-mortem information by livestock producers. April 7, 2021	<p>Red Meat: Several producer workshops were conducted by MLA. These workshops have focused on providing awareness of the NSHMP, the Health 4 Wealth program and the data that will come available through the H4W initiative. The three beef plants that launched animal disease and condition reporting via LDL ran producer webinars or producer days to introduce their suppliers to the animal disease feedback. These webinars or workshops provided producers with information on the processor's business especially around livestock and the current market; H4W pilot trials; LDL, and on-farm production impacts due to disease condition. Agriculture Victoria and Local Land Services District Veterinarians undertook the on-farm production impacts session to highlight to producers the symptoms of the five top conditions; their impacts on productivity and the cost associated with this; and how and why the LDL feedback will benefit producers in managing these diseases.</p> <p>Red Meat: Surveys were provided to producers who attended the webinars or producer days to gather feedback on whether they would use their animal disease feedback to monitor herd health and make change on farm; whether the report was easy to use and what additional reports would be useful; and lastly what extension support they would need to interpret their animal disease feedback</p> <p>Pork: (14) Individual online presentations on H4W have been delivered by Dr Hamilton to different stakeholders' who represented more than 50% of pig production in Australia. Further online presentations on H4W have been made to consultant pig veterinarians and their producer clients (presenting the producers individual farm data).</p> <p>Pork Trials at 2 export abattoirs: Discussions with and presentations to third export abattoir were held. This abattoir had developed their own data collection and producer feedback system. After ongoing discussions/negotiations they have now agreed to contribute their data to the national data base, meaning a significant proportion of the Australian pig industry will now be captured. Data from this abattoir is currently being analysed for compatibility with the current H4W data categories, to allow similar reports to be generated.</p> <p>Software system vendors played a vital role in the red meat pilot trials as they were required to embed the draft <i>Australian National Standard for the Development, Collection and Reporting of Animal Health Data</i> into their systems. Significant development was required by the vendors to incorporate the standards into their kill floor systems to enable plants to collect post-mortem data in a consistent way. Similarly, two pork export abattoirs are collecting data for standardised disease conditions.</p>

I.2 Appendix B: Preliminary gap analyses frameworks

Table 4 Extension and adoption framework - pigs

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
A. Foundational elements (processors) – data collection and sharing			
– Diseases/conditions that can be directly assessed by inspectors/QA staff (i.e. do not require additional laboratory assessment)	17 H4W fact sheets finalised for agreed priority list of diseases/conditions	<p>Agreement and support for a standardised language across all establishments and for use by the broader industry, such as pig production veterinarians.</p> <p>An agreed list of 17 conditions and impact or consequence data was developed as the minimum base data for collection in all seven pork export establishments.</p> <p>Current focus on export abattoirs – need to get domestics on board.</p> <p>Customised, plant specific additional data is available to individual establishments.</p> <p>Need to collect de-identified data in a central database for animal health surveillance, market access</p>	<p>Are all 7 export abattoirs now collecting and disseminating data? If not, why not?</p> <p>How many domestic abattoirs are there? export abattoirs now collecting and disseminating data? If not, why not?</p> <p>Does the standardised recording/reporting of diseases/conditions allow for valid comparisons between processors?</p> <p>Is the central database operational? If not, why not?</p>
– Diseases/conditions accurately identified by inspectors/QA staff (noting % of false positives is damaging)	N/A	Has the inclusion in the AMP Australian Meat Processing Training Package, entitled 'Collect, monitor and analyse animal health data', been developed and deployed by the Australian Industry and Skills Committee (AISC).	<p>What system of ongoing inspector training and evaluation is required?</p> <p>Who is responsible?</p>
– Processor generated reports are contextualised – comparisons with own	N/A	Is there sufficient contextualisation in reports to ensure valid comparisons?	What changes to reports are required by processors to improve contextualisation?

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
past lines, peers, regions, seasonal and other nuances. No judgement			
– Reports available based on individual animal ID or by line	N/A	Does not having individual animal RFIDs cause issues with data collection and feedback?	If so, what are the solutions?
– Report – timely, whether by LDL or direct. Any contact with producer if “critical” disease/condition identified or other escalation	N/A	Immediacy/timeliness of feedback is important as delays can cause harm/loss. Is there a process to notify emergency animal diseases?	If delays, what are the solutions?
B. Producer/advisor sector activities			
Awareness activities targeted (field days, forums, webinars, newsletters, articles, podcasts)	There have been many activities as a legacy of the Pig Health Monitoring Scheme (PHMS) set up in the early 90's.	Apart from the fact sheets described above, is there a library of extension material, and who is responsible for the collections? Is there any evaluation of activities to demonstrate what producers find most useful? It is likely that awareness activities are necessary but not sufficient to achieve practice change/adoption.	Is there a repository of products that can be referenced for this extension and adoption strategy?
Short Term Training Programs and Workshops, incl. electronic learning modules.	Number vs positive evaluation by participants (i.e. effectiveness of activities to stimulate demand)	What training programs & workshops have been completed and who organised/delivered? Are any electronic learning modules available?	What lessons have been learnt about delivery of training programs? Who is responsible for incorporating improvements into new packages?
Long Term Practice Change and capability building, incl. producers learning from other producers/hands on implementation.	Data on number of producers actively requesting	What percentage of pig producers have adopted abattoir surveillance?	If adoption is less than ideal, what is required to achieve better outcomes?

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
	reports and their influence on peers.	Can any producers be nominated as champions to promote practice change?	
Enablers: e.g. tools and calculators.	List and describe tools	Any evidence of the effectiveness of the tools?	Will the development of tools/calculators promote adoption?
Human resource capacity, service providers	<p>Which agencies are actively involved?</p> <ul style="list-style-type: none"> – Govt Depts of Ag/Primary Industries, LLS – Industry peak bodies – Livestock selling agents – Farm supplies firms – Private consultants (vets, general) – Other? 	<p>Have all agencies/service providers been approached?</p> <p>If not, why not? Are they not seen to be relevant?</p> <p>How supportive are they?</p> <p>What has been the feedback from agencies/service providers?</p> <p>What is their capacity to support adoption, incl. number of staff with appropriate training?</p>	What are the human resource capacity gaps and what is required to resolve?

Table 5 Extension and adoption framework - cattle

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
A. Foundational elements (processors) – data collection and sharing			
– Diseases/conditions that can be directly assessed by inspectors (i.e. do not require additional laboratory assessment)	4 H4W fact sheets have been finalised	<p>Agreement and support for a standardised language across all establishments and for use by the broader industry, such as cattle production veterinarians.</p> <p>Current focus on export abattoirs – need to get domestics on board.</p> <p>Customised, plant specific additional data is available to individual establishments.</p> <p>Need to collect de-identified data in a central database for animal health surveillance, market access</p>	<p>Apart from H4W pilot trial abattoirs, are any others collecting and disseminating data? If not, why not?</p> <p>Are domestic-only abattoirs involved? If not, why not?</p> <p>Is the data being stored in a central database? If not, why not?</p>
– Diseases/conditions accurately identified by inspectors/QA staff (noting % of false positives is damaging)	N/A	<p>Has the inclusion in the AMP Australian Meat Processing Training Package, entitled ‘Collect, monitor and analyse animal health data’, been developed and deployed by the Australian Industry and Skills Committee (AISC).</p> <p>What evidence on accuracy is available and is the current level satisfactory?</p>	Who is responsible for an initial assessment of competency and regular verification of their skills?
– Processor generated reports are contextualised – comparisons with own past lines, peers, regions, seasonal and other nuances. No judgement	N/A	Is there sufficient contextualisation in reports to ensure valid comparisons?	What changes to reports by processors are required to improve contextualisation?

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
– Reports available based on individual animal ID or by line	N/A	For beef cattle, are all reports based on individual animal ID?	Any problems of ID system?
– Report – timely, whether by LDL or direct. Any contact with producer if “critical” disease/condition identified or other escalation	N/A	Immediacy/timeliness of feedback is important as delays can cause harm/loss. Is there a process to notify emergency animal diseases?	If delays, what are the solutions?
Awareness activities targeted (field days, forums, webinars, newsletters, articles, podcasts)	Number plus evaluation by participants (i.e. effectiveness of activities to stimulate demand)	Apart from the fact sheets described above, is there a library of extension material, and who is responsible for the collections? Is there any evaluation of activities to demonstrate what producers find most useful? It is likely that awareness activities are necessary but not sufficient to achieve practice change/adoption.	Is there a repository of products that can be referenced for this extension and adoption strategy?
Short Term Training Programs and Workshops, incl. electronic learning modules.	Number vs positive evaluation by participants (i.e. effectiveness of activities to stimulate demand)	What training programs & workshops have been completed and who organised/delivered? Are any electronic learning modules available?	What lessons have been learnt about delivery of training programs? Who is responsible for incorporating improvements into new packages?
Long Term Practice Change and capability building, incl. producers learning from other producers/hands on implementation.	Data on number of producers actively requesting reports and their influence on peers	What percentage of beef producers have adopted abattoir surveillance? Can any producers be nominated as champions to promote practice change?	If adoption is less than ideal, what is required to achieve better outcomes?

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
Enablers: e.g. tools and calculators.	List and describe tools, e.g. MLA web-based tool called DisCo.	Any evidence of the effectiveness of the tools?	Will the development of tools/calculators promote adoption?
Human resource capacity, service providers	<p>Which agencies are actively involved?</p> <ul style="list-style-type: none"> – Govt Depts of Ag/Primary Industries, LLS – Industry peak bodies – Livestock selling agents – Farm supplies firms – Private consultants (vets, general) – Other? 	<p>Have all agencies/service providers been approached?</p> <p>If not, why not? Are they not seen to be relevant?</p> <p>How supportive are they?</p> <p>What has been the feedback from agencies/service providers?</p> <p>What is their capacity to support adoption, incl. number of staff with appropriate training?</p>	What are the human resource capacity gaps and what is required to resolve?

Table 6 Extension and adoption framework - sheep

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
Foundational elements (processors) – data collection and sharing			
– Diseases/conditions that can be directly assessed by inspectors (i.e. do not require additional laboratory assessment)	There are 21 diseases/conditions with fact sheets developed by the NSHMP. Also fact sheets by DPIs, MLA etc.	<p>Ideal to have a standardised language across all establishments and for use by the broader industry, such as sheep production veterinarians/consultants.</p> <p>Current focus is on export abattoirs. Is there a need to get domestics on board?</p> <p>Is there a need to collect de-identified data in a central database for animal health surveillance, market access?</p>	<p>Apart from 10 HSHMP abattoirs, are any others collecting and disseminating data? If not, why not?</p> <p>Is the data being stored in a central database? If not, why not?</p>
– Diseases/conditions accurately identified by inspectors (noting % of false positives is damaging)	N/A	Has the inclusion in the AMP Australian Meat Processing Training Package, entitled 'Collect, monitor and analyse animal health data', been developed and deployed by the Australian Industry and Skills Committee (AISC). What evidence on accuracy is available and is the current level satisfactory?	Who is responsible for an initial assessment of competency and regular verification of their skills?
– Processor generated reports are contextualised – comparisons with own past lines, peers, regions, seasonal and other nuances. No judgement	N/A	Is there sufficient contextualisation in reports to ensure valid comparisons?	What changes to reports by processors are required to improve contextualisation?
– Reports available based on individual animal ID or by line	N/A	For sheep/lambs, reports are mostly mob based because individual animal ID is not mandatory in all states. Does this have an impact on extension and	Is the lack of mandatory individual animal ID likely to limit adoption?

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
		adoption of the technology (recognising that mixed mobs will not be suitable for reporting)?	
– Report – timely, whether by LDL or direct. Any contact with producer if “critical” disease/condition identified or other escalation	N/A	Immediacy/timeliness of feedback is important as delays can cause harm/loss. Is there a process to notify emergency animal diseases?	If delays, what are the solutions?
B. Producer/advisor sector activities			
Awareness activities targeted (field days, forums, webinars, newsletters, articles, podcasts)	There have been a number of activities conducted by DPIs, MLA and animal health companies (e.g. Zoetis).	Apart from the fact sheets described above, is there a library of extension material, and who is responsible for the collections? Is there any evaluation of activities to demonstrate what producers find most useful? It is likely that awareness activities are necessary but not sufficient to achieve practice change/adoption.	Is there a repository of products that can be referenced for this extension and adoption strategy?
Short Term Training Programs and Workshops, incl. electronic learning modules.	Number vs positive evaluation by participants (i.e. effectiveness of activities to stimulate demand)	What training programs & workshops have been completed and who organised/delivered? Are any electronic learning modules available?	What lessons have been learnt about delivery of training programs? Who is responsible for incorporating improvements into new packages?
Long Term Practice Change and capability building, incl. producers learning from other producers/hands on implementation.	Data on number of producers actively requesting reports and their influence on peers	What percentage of sheep producers have adopted abattoir surveillance? Can any producers be nominated as champions to promote practice change?	If adoption is less than ideal, what is required to achieve better outcomes?

Extension/adoption element	Number of aids, events	Issues of importance and whether satisfactory or problematic	If problematic, what approach is available to resolve gaps
Enablers: e.g. tools and calculators.	List and describe tools, e.g. MLA web-based tool called DisCo.	Any evidence of the effectiveness of the tools?	Will the development of tools/calculators promote adoption?
Human resource capacity, service providers	<p>Which agencies are actively involved?</p> <ul style="list-style-type: none"> – Govt Depts of Ag/Primary Industries, LLS – Industry peak bodies – Livestock selling agents – Farm supplies firms – Private consultants (vets, general) – Other? 	<p>Have all agencies/service providers been approached?</p> <p>If not, why not? Are they not seen to be relevant?</p> <p>How supportive are they?</p> <p>What has been the feedback from agencies/service providers?</p> <p>What is their capacity to support adoption, incl. number of staff with appropriate training?</p>	What are the human resource capacity gaps and what is required to resolve?

