final report

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Strategic review of technologies for information management through supply chains

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Abstract

Abattoir feedback to producers has been demonstrated to be a valuable tool for herd and flock improvement. However, despite this there is limited information flow, particularly in the prime lamb industry. This project reviewed available technologies, and explored the the impediments to adoption of feedback enabling technologies.

Technology is not the major limiting factor for improved producer feedback utilisation and subsequent flock / herd improvement. The challenge is how to educate and change the mindset of the peak bodies, government departments and major industry players so they understand the importance of supply chain information standards and as a result want to develop coordinated programs to deliver whole of supply chain based industry efficiency.

Implementation of supply chain information standards across an industry is not a revenue raiser; it is an operating cost reduction methodology through gains in efficiency. In other words, there is a positive indirect value proposition, but there is no direct increase in revenue proposition. This is the primary inhibitor for large scale adoption as it is not seen as a method of generating more revenue.

A common theme throughout previous reviews, and also this review, is the identification of a number of long-term limiting factors that have inhibited the adoption of suitable technology and the related supply chain information systems.

These factors can be summarised as:

1. Lack of understanding by plant management and producers of the value of information provided by supply chain information standards.
2. Lack of commercial drivers.
3. Supply chain participant disinterest.
4. Lack of regulatory drivers
5. Lack of clear industry peak bodies and government policy (DAFF, State DPI) and direction on supply chain information standards, adoption models and timeframes for industry.
6. Lack of adequate telecommunication infrastructure to producers.

Executive summary

Producer feedback, as a major tool for herd quality improvement, has been demonstrated over the last 20 years in many areas of the beef industry, and to a smaller extent in the lamb industry. In a global context Australia's beef industry feedback is unmatched by any other country.

AUS-MEAT's current publication "Guideline to Over-The-Hooks Trading of Livestock", published in 2006, outlines the requirement for feedback to the vendors from AUS-MEAT accredited abattoirs. This guideline also includes a reference to electronic feedback files as an option for feedback to producers.

Reviews of technology for the purpose of supply chain information collection and management have been undertaken many times and by many organisations. Suitable technology is available to deliver the objectives of supply chain information efficiency. This has been demonstrated by meat industry organisations such as Silver Fern Farms (New Zealand), smaller scale projects such as Hillside Abattoir, WA, as well as by other industries (grocery, automotive, etc.).

The benefit-cost has been demonstrated in MLA projects through the increased ability of participating industries to meet commercial requirements, and by disease reduction.

There are a number of suitable on-farm software systems that can import slaughter data feedback from processors and align that with livestock production data. These provide the tools to utilise the processor feedback to achieve livestock improvement.

The industry disease surveillance programs have also undergone reviews of technology options for data capture, as well as benefit-cost analysis.

In addition, the emerging requirements for animal welfare as part of the producer feedback need to be considered in any review of producer feedback.

Industry programs such as the National Livestock Identification System (NLIS), and Meat & Livestock Australia's (MLA) Livestock Data Link (LDL) provide third party feedback to producers. Historically this has been focused on beef. However, the programs are moving to include lamb and sheepmeat.

Specific supply chain programs such as Woolworths World System can provide narrow scope feedback to producers.

A common theme throughout previous reviews, and also this review, is the identification of a number of long-term limiting factors that have inhibited the adoption of suitable technology and the related supply chain information systems. These factors can be summarised as:

1. *Lack of understanding by plant management and producers of the value of information provided by supply chain information standards.*

   Supply chain information solutions in other industries are based on clearly defined and agreed-on supply chain information standards. In simple terms, if trading partners do not use commonly agreed standards, terms and definitions for sharing information, there can be no gain from the supply of information. The grocery industry has followed this model for over 20 years. The major grocery industry players do not compete on supply chain information standards. They agree and sign off on the standards (refer to GS1 www.gs1.org.au for details). This approach ensures that suppliers speak a common language with all the supermarket chains. This is structured so that suppliers load the product specifications, pricing, packaging, etc., into one industry database and all retailers access a single source for all product details (GS1net). In contrast, in the meat industry, even if processors have provided feedback electronically, the data has used different terms, definitions and data delivery methods.

2. *Lack of commercial drivers.*

   There are no direct financial rewards for large scale adoption of supply chain information system solutions. The supply chain participants, in general, will not generate more money for spending up-front or doing the initial work required. Supply chain information standards improve efficiency, which leads to cost reduction. They lower costs by lowering information collection costs and by increasing compliance to specifications. They do not, however, directly generate revenue. Some individual supply chains may have certain objectives and have identified commercial drivers to utilise electronic information along the supply chain, but there is no wide-scale adoption.

3. *Supply chain participant disinterest.*

   As an industry (95,507 sheep producers, 45 sheep abattoirs and 200,000 total LPA registered producers), there are no driving business cases for change across the whole supply chain. Individuals may adopt new technology and innovation for individual business reasons. However, the vast majority do not and will not.

4. *Lack of regulatory drivers.* I

   Industry-wide change must be driven either commercially or by regulation. The evidence to-date in the Australian red meat industry is that regulation has been the only driver to cause industry-wide rapid adoption of change. For example, the adoption of NLIS in the beef industry was driven at a regulatory level and was adopted in a short time frame for a whole-of-industry program. In contrast, Meat Standards Australia (MSA) was a commercially driven adoption model that took a long time and a lot of education to create an industry-wide change.

5. *Lack of clear industry peak bodies and government policy (DAFF, State DPI) and direction on supply chain information standards, adoption models and timeframes for industry.*

   The grocery industry publishes guidelines, business case studies and adoption timeframes for supply chain information standards and compliance. They are able to enforce this compliance by stopping trade agreements: “If you do not comply we will not trade with you”. The red meat industry peak bodies and state / federal government departments have not demonstrated that they have the necessary skills or knowhow to enable the implementation of supply chain information standards. There have been many demonstration projects and a lot of extension material published to provide information to producers and processors. However, these have often been fragmented and lacking a clear published standards-based approach. Historically within the meat industry, wide-scale change has almost always been as a result of regulation or specific customer or market requirements and, to-date that has been lacking when it comes to supply chain information standards implementation.

6. *Lack of adequate telecommunication infrastructure to producers.*

   There are approximately 200,000 producers registered in the LPA system. The vast majority are located in limited telecommunications areas. The lack of high speed, reliable Internet coverage greatly limits the end user's desire to utilise information systems. The common statement from producers is that it is too slow and unreliable to be of value. The NBN (National Broadband Network) has been put forward as a solution to this issue; however, the rollout plan does not indicate that these issues will be addressed in the near future.

In a nutshell:

Technology is not the major limiting factor for improved producer feedback utilisation and subsequent flock / herd improvement. The challenge is how to educate and change the mindset of the peak bodies, government departments and major industry players so they understand the importance of supply chain information standards and want to develop coordinated programs to deliver whole of supply chain based industry efficiency.

Implementation of supply chain information standards across an industry is not a revenue raiser; it is an operating cost reduction methodology through gains in efficiency. In other words, there is a positive indirect value proposition, but there is no direct increase in revenue proposition. This is the primary inhibitor for large scale adoption as it is not seen as a method of generating more revenue.

The historically demonstrated way to facilitate an industry-wide adoption of supply chain information standards is to:

1. Develop and maintain supply chain information standards through the Australian Meat Industry Language and Standards Committee (AMILSC), and
2. Work with a few willing system vendors (so no one vendor gets a commercial advantage) to ensure their product offering includes the supply chain information standards. Once a few system vendors have a solution in place, others will need to follow to be competitive in the market.

The above approach ensures that any producer or processor that installs a new system or an update to a system automatically gets the necessary tools and functions for feedback and other electronic communications systems using the published supply chain information standards.

Summary of the proposed industry adoption model of advanced producer feedback

To achieved industry standardised systems for feedback and electronic communications this report proposes a concept called "advanced producer feedback". An industry adoption model for advanced producer feedback (predominantly for sheep and lamb) has been prepared as a proposal for consideration.

The adoption model follows a pragmatic, scalable approach designed to be compatible with existing processor systems, on-farm software and industry systems.

The heart of the advanced producer feedback model is the use of email as the primary method of sending electronic feedback to producers. The advanced feedback is packaged as electronic data files. The electronic data would be in a defined standard format to ensure compatibility with all participants. For those producers that do not have email, the concept of advanced feedback is not considered applicable. Not having an email address would indicate that the producer does not have the necessary computer system to utilise the feedback data.

The advanced producer feedback model (sheepmeat) supports three distinct levels of detail, based on the capacity of the processors. These levels are:

- Level 1 – limited feedback: body number with weight, sex, fat depth, class. Lot summary with culls / condemns, disease reporting, (MSA data where applicable), other data where recorded by the processor.
- Level 2 – Skid tracking: body number with weight, sex, fat depth, class, dentition, disease reporting. Lot summary with culls / condemns, (MSA data where applicable), other data where recorded by the processor.
- Level 3 – Skid tracking/ Live ID recording: body number with weight, sex, fat depth, class, dentition, disease reporting, as well as the individual animal ID. Lot summary with culls / condemns, (MSA data where applicable), other data where recorded by the processor.

As processors upgrade their respective infrastructure they can move from level 1 through to level 3 - the defined standard format for advanced feedback supports all levels. Working with a few system vendors that have systems in a large number of processors would quickly and efficiently facilitate large-scale industry adoption.

The proposed advanced producer feedback (sheepmeat) defined standard format would be a simple file format to allow for easy importation into on-farm software. The use of email as the method for sending the proposed advanced feedback and the simple file format of the defined standard format would ensure relatively easy integration into existing processor systems.

This approach is also compatible with the MSA Sheepmeat program and would provide the means for electronic data transfer to MSA, for MSA submitted lamb and sheep consignments. Such programs as the National Sheep Health Monitoring project, as well as the MLA LDL program, would greatly benefit from the adoption of the advanced producer feedback (sheepmeat) system. Other industry programs could also easily utilise the advanced producer feedback (sheepmeat) system. This would, however, require industry approval to obtain access to the data.

The steps to implement the advanced producer feedback (sheepmeat) system are:

1. Conduct a demonstration project with some key sheepmeat processors that do MSA lamb processing. These key processors would be shared between two different system vendors (to ensure no perceived MLA bias). The reason for using MSA lamb processing is so the producers are readily known and accessible through the MSA program.
2. Work with an industry program such as the "National Sheep Health Monitoring Project" to provide disease data from the processors. This would be a demonstration of the value to the broader industry in such areas as disease monitoring for export compliance.
3. Publish the results of the demonstration project to industry.
4. Publish the advanced producer feedback (sheepmeat) methodology, including the defined standard format, through the AMILSC as part of the AUS-MEAT over-the-hooks trading guideline.

Once two or three system vendors and a number of processors have the advanced producer feedback (sheepmeat) system in place as a result of the demonstration projects and utilisation by MSA, the rest of industry will rapidly follow. This system vendor commercial pull approach based on published information standards has been demonstrated on numerous occasions. Those system vendors whose product offerings are not compliant with published standards quickly lose market share.

The timeframe for a demonstration project would be six to twelve months with the published results available to industry within that timeframe. This short timeframe can be achieved by careful selection of participants (producers and processors), and systems vendors who are technologically capable and actively involved in industry programs such as MSA.

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IMPORTANT NOTICE

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Numerous organisations and individuals contributed their time and knowledge in the preparation of this review.

A number of the key organisations that provided assistance include:

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- MINTRAC
- MLA
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- Thomas Foods International
- Silver Fern Farms (NZ)
- Thorsys Australia
- Yartoo Software
- Protrace Solutions

1 Overview

1.1 Background

This project has the title:
"Strategic review of the potential technologies that can be applied to data capture and management in beef and lamb supply chains."

As the title indicates, this project is expressly focused on the information systems that facilitate information movement from producers to processors and from processors to producers.

The objective of this project is, firstly, to better understand the available technologies, and then to understand the impediments to the adoption of these technologies.

The problem of reliable collection and integration of data throughout red meat supply chains remains one of the obvious barriers to information management and the provision of feedback for improved decision making. The lack of cost effective, dependable and inclusive data capture systems that allow information flow between participants has been identified as a significant impediment to effective feedback in several reviews, including the recent Lamb Supply Chain and Animal Information RD&E plan, and the Sheep Industry Strategic Plan.

Many projects and reviews have been completed to date. These projects and reviews have directly or indirectly identified a number of impediments to wide-scale adoption of supply chain information systems. This review will compare and contrast what has already been identified in previous reviews. This review will specifically investigate the question of what is needed to cause a mindset change in the current major industry participants (41 major abattoirs, 50 major saleyards and 95,000 sheep producers) so as to overcome these impediments. The review also investigates the various technological aspects of adopting data capture and management in beef and lamb supply chains.

A key element of feedback and data capture is the concept of individual animal identification. This is most often achieved with electrical ear tag technology but may also use other technologies. There are a range of technologies that may have application for data capture and management, such as digital visual images, optical character reading, radio frequency identification, QR codes and hook tracking. However, only a limited number of supply chains have made investments in such systems. This is mainly due to cost, difficulty of implementation, unclear value propositions, complexity and unreliability of the data, and difficulty in recording and using the data as a management tool in their business.

1.2 Project deliverable

The beef and lamb supply chain information systems project deliverable will be a final report that includes:

- A summary of published current and previous industry and commercial projects;
- Current commercially available, meat industry specific, applicable technology;
- Current commercially available, non-meat industry specific, applicable technology;

- Current emerging technology that may have long-term commercial application to the meat industry;
- A summary of the commercial drivers, operational drivers and adoption constraints (regulatory, management, operational and technological) for red meat supply chain information technology and systems;
- A matrix of technology, drivers and constraints;
- An overview model to drive industry adoption.

1.3 Scope

The scope of this project is the review of the abattoir sector of the supply chain with a focus on lamb / sheep processing, as beef processing already demonstrates the ability for effective feedback. This beef feedback has been demonstrated by various projects as well as industry programs such as Meat Standards Australia.

1.4 Project methodology

Conduct desktop and site reviews of the red meat supply chain information collection, processing and feedback technology and systems in Australia. The project report would include a summary of industry commercial and operational drivers, as well as adoption constraints (regulatory, management, operational and technological). The review would include:

- Previous MLA projects;
- Current industry programs;
- State funded projects;
- Projects where the details are in the public domain;
- Published International projects;
- Red meat industry system vendor products and service offerings;
- Site reviews of major sheep and lamb processors (6 nationally), where technology / systems have been installed;
- Interviews with major sheep and lamb processors (12 nationally) to understand current drivers and commercial constraints for adoption of supply chain information systems and technology.

The specific methodology for the project is based on:

- Sourcing and referencing historic and current project reports and other related documentation;
- The development of a number of comparative tables for information collection and processing for the supply chain sectors, technologies, commercial drivers, operational drivers, adoption constraints, historic projects, supply chain information standards and industry programs;
- Analysis and summation of the commercial drivers, operational drivers and adoption constraints for red meat supply chain information technology and systems;
- Development of industry adoption overview models.

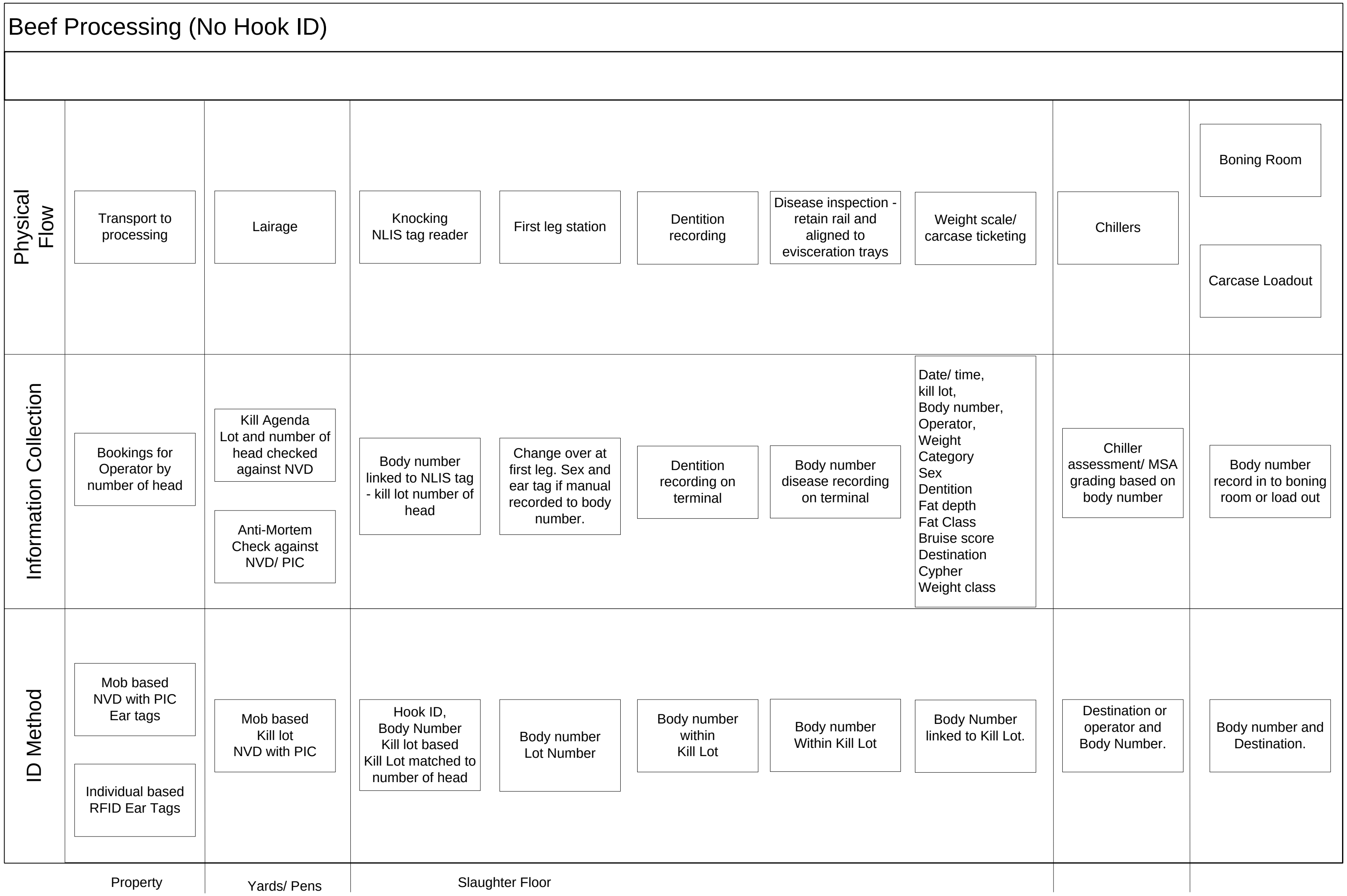
2 Processor information points

There are various information touch points where information is collected. This information may have a domain specific identification. An example would be a body number for a plant, for a chain, for a kill date. There may be additional keys for this information, such as producer, PIC, NVD serial number and cattle individual NLIS IDs.

A series of information flow diagrams for both beef and small stock have been prepared showing the different information flows.

2.1 Typical beef slaughter floor information flows without hook tracking

The typical beef slaughter floor information flows cover the activities from livestock arrival through to carcase ticketing, then chiller assessment (with or without MSA), with the subsequent vendor feedback.



2.2 Typical beef slaughter floor information flows with hook tracking

The typical beef slaughter floor with hook tracking information flows cover the activities from livestock arrival through to carcase ticketing, then chiller assessment (with or without MSA), with the subsequent vendor feedback.

Beef Processing with Hook ID

	Property	Yards/ Pens	Slaughter Floor						
Physical Flow	Transport to processing	Lairage	Knocking NLIS tag reader	First leg station	Dentition recording	Disease inspection - retain rail and aligned to evisceration trays	Weight scale/ carcase ticketing	Chillers	Boning Room Carcase Loadout
Information Collection	Bookings for Operator by number of head	Kill Agenda Lot and number of head checked against NVD Anti-Mortem Check against NVD/ PIC	Hook ID linked to NLIS tag and body number - kill lot number of head – Generate body number	Hook ID change over at first leg. Sex and ear tag if manual recorded	Dentition recording on terminal	Hook ID/ Body number disease recording on terminal	Date/ time, kill lot, Hook ID body number, Operator, Weight Category Sex Dentition Fat depth Fat Class Bruise score Destination Cypher Weight class	Hook ID date and time into chller. Chiller assessment/ MSA grading	Hook ID/ Body number record in to boning room or load out
ID Method	Mob based NVD with PIC Ear tags Individual based RFID Ear Tags	Mob based Kill lot NVD with PIC	Hook ID, Body Number Kill lot based Kill Lot matched to number of head	Hook ID/ body number, RFID Lot Number, ear tags and PIC	Hook ID/ body number within Kill Lot	Hook ID/ body number Kill Lot	Hook ID/ Body Number linked to Kill Lot.	Destination or operator and Hook ID/ Body Number.	Hook ID/ body number and Destination.

2.3 Typical lamb/ sheepmeat slaughter floor information flows without skid tracking

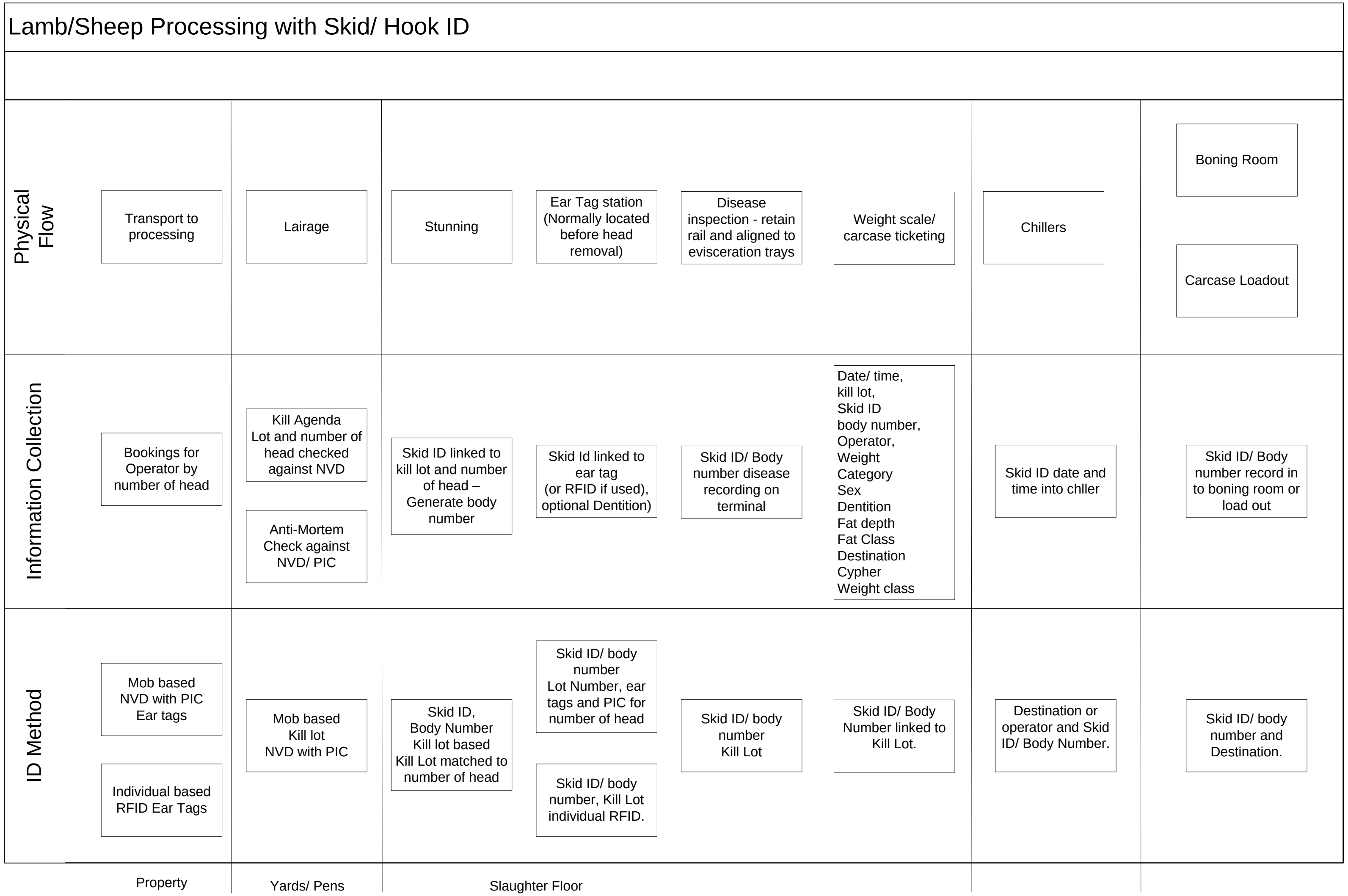
The typical lamb/ sheepmeat slaughter floor information flows cover the activities from livestock arrival through to carcase ticketing with the subsequent vendor feedback.

Lamb/Sheep Processing (No Skid/ Hook ID)

	Property	Yards/ Pens	Slaughter Floor					
Physical Flow	Transport to processing	Lairage	Stunning	Ear Tag station (Normally located before head removal)	Disease inspection - retain rail and aligned to evisceration trays	Weight scale/ carcase ticketing	Chillers	Boning Room Carcase Loadout
Information Collection	Bookings for Operator by number of head	Kill Agenda Lot and number of head checked against NVD Anti-Mortem Check against NVD/ PIC	None – Just cross check kill lot and number of head	Record ear tag (or RFID if used), optional Dentition)	Kill lot based disease recording on paper or electronic	Date/ time, kill lot, body number, Operator, Weight Category Sex Dentition Fat depth Fat Class Destination Cypher Weight class	None	Body number record in to boning room or load out
ID Method	Mob based NVD with PIC Ear tags Individual based RFID Ear Tags	Mob based Kill lot NVD with PIC	Kill lot based Kill Lot matched to number of head	Kill Lot based Lot Number, ear tags and PIC for number of head Kill Lot based individual RFID recorded to lot.	Kill Lot	Body Number linked to Kill Lot.	Destination or operator and Body Number.	Destination or operator and Body Number.

2.4 Typical lamb/ sheepmeat processing information flows with skid tracking

The typical lamb/ sheepmeat slaughter floor with skid tracking information flows cover the activities from livestock arrival through to carcase ticketing with the subsequent vendor feedback.



2.5 Processor feedback options for processors directly to vendors

Processor feedback has, to a large extent been through prescriptive requirements driven through AUS-MEAT over-the-hooks trading. These requirements have been in place for many years and are based on printed reports. The data is individual carcase details for beef, and lot summaries for small stock.

The use of the MSA system for beef created a third party approach to providing feedback directly to producers. NLIS, being mandatory in each state for beef, saw a rapid increase in mandatory processor NLIS data being uploaded to the NLIS database. This provided another option for producers to access processor feedback for beef.

MLA's new LDL program is intended to provide a third party feedback approach that includes detailed analysis tools to provide producers with a better understanding of compliance.

Some processors also provide feedback electronically to producers as an additional service. This includes both beef and lamb / sheepmeat processors for individual carcase details for beef and summary details for lamb / sheepmeat. The format and method for providing this service is up to the individual processors.

The flip side of an increase in feedback options and systems is the need for producers to have both a desire to use this feedback and the necessary tools to interpret the data in order to make operational changes to improve herd / flock performance. Producers having access to feedback without utilisation of the information for better compliance to market requirements is a considerable waste of industry resources.

The ideal situation is one where:

- Processors provide individual carcase details to producers in a standard electronic format, including data for production attributes and details for compliance, disease and supply chain contamination.
- Producers have the necessary infrastructure (Internet access and computer systems) and on-farm software to analyse the information.
- Producers utilise the analysed information to change operational activities to produce livestock that better meet market requirements.

This provision of information services may be achieved by direct feedback from the processors, or through third party providers such as MLA's LDL project, or could be provided by supply chain models such as Woolworths World systems.

The technology for processors to provide feedback electronically to producers is relatively straight-forward and simple to implement. Automated systems are commonly in use for extracting simple data from databases and emailing this data as a formatted email with attached data files. If the producer has not provided a valid email address to the processor, then they would not receive electronic feedback.

The rapid uptake of smart phone technology by producers would require that the formatting of electronic feedback should be targeted at smart mobile devices. This may require some level of summarisation and consolidation of information with click through functionality to suit the small screen formats.

Where the level of detail of the feedback is scaled to fit the operational practices of the processor, and based on agreed industry formats, the process for electronic feedback is readily achievable by small stock processors. There have been a number of demonstration projects, as well as commercially driven adoption of these types of systems, by small stock processors, both nationally and internationally.

Third parties such as the industry programs MSA sheepmeat and MLA LDL could also readily receive electronic data in these formats.

The operational differences in processors mean that the level of feedback data details would vary. In an operational sense there would be three distinct levels of detail, based on the capacity of the processors. These levels are:

- Level 1 – limited feedback: body number with weight, sex, fat depth, class. Lot summary with culls / condemns, disease reporting, (MSA data where applicable), other data where recorded by the processor.
- Level 2 – Skid tracking: body number with weight, sex, fat depth, class, dentition, disease reporting. Lot summary with culls / condemns, (MSA data where applicable), other data where recorded by the processor.
- Level 3 – Skid tracking / Live ID recording: body number with weight, sex, fat depth, class, dentition, disease reporting, as well as the individual animal ID. Lot summary with culls / condemns, (MSA data where applicable), other data where recorded by the processor.

These levels reflect the typical difference in the processors. Most processors in Australia would be level 1;a few are capable of level 2 and very few would be capable of level 3 feedback. However, any proposed industry model must support both the current operational limitations, as well as any future processors' operational progressions. There are processors in other countries, e.g. New Zealand, that operate at the capacity of Level 3 feedback on a continuous basis. The drivers for these processors operating at a Level 3 feedback model are product differentiation in the global market and closed supply chains that then ensure improved product compliance.

For the purpose of this report the term "advanced feedback model (sheepmeat)" has been used to describe this process as it applies to small stock processors.

3 Industry projects and programs

There have been many projects and programs undertaken by industry over many years covering the areas of individual identification (cattle and small stock) through processing, disease recording, electronic feedback and on-farm software.

A summary of the projects and programs has been prepared as part of this report.

3.1 Historic ID tracking through small stock processing project summary

Two of the historic lamb / sheepmeat hook tracking projects have been summarised below. A large scale processor in New Zealand has implemented individual ID based systems that provide detailed producer feedback for commercial reasons; this project is also summarised below. Beef project summaries have not been included as there are many working examples and technology available from system vendors.

3.1.1 Hillside Abattoir (2008)

Hillside Abattoir undertook a project with the assistance of MLA with the aim of demonstrating a system linking live sheep to carcase data via Radio Frequency Identification (RFID) on a traditional (non-inverted) abattoir chain.

Producer feedback on individual animals instead of lot was seen as a critical component for ongoing efficiency and genetic improvements.

The project demonstrated the ability to automatically link individual live sheep RFID ear tags to carcase gambrel RFIDs through the slaughter process.

The benefits to producers include:

- Individual animal feedback is given to the producer when lambs are supplied with RFID ear tags;
- Producers are able to compare different production management regimes for individual animals;
- The identification of superior sires for growth and leanness which can significantly increase gross margin and decrease turn-off time.

The benefits to processors include:

- More effectively monitor the performance of lambs consigned by individual producers;
- Processors can develop preferred supplier networks;
- The supply chain works together to more effectively meet end user requirements;
- Increased traceability.

The principles of the tracking system demonstrated in that project could be adapted to most small animal abattoirs.

There was also potential for RFID to extend traceability into the boning room to allow measurement and prediction of carcase yield and the relative profitability between carcases and cuts on carcases.

3.1.2 Frewstal plant at Stawell (2009)

Frewstal undertook a project with the assistance of a $220,000 grant from the Victorian Department of Primary Industries; the system was commissioned in 2009. Frewstal spent about $40,000 of its own money to get the system working.

Some of the comments from press releases for the project include the following:

> “For electronic tagging and tracking of sheep to be worthwhile there has to be something in it for everyone.”

This is the view of Greg Nicholls, manager of the Frewstal plant at Stawell in Victoria which processes up to 6,200 lambs a day.

> "For this to really work for the sheep industry, everyone has to gain from it," he says.
> "For the farmer who wants to find and cull the ewes that do not perform for him, he can do that."

The system does not provide a cost or time saving for the company now.
In fact, an extra worker is required on the kill chain to test the plastic electronic hooks before placing them in the carcase.

But some overseas markets such as Europe are now demanding traceability from the point of inspection along the kill chain, back to the last property of residence.

Tracking individual sheep carcases through the abattoir kill chain is possible and is happening now. The methods to achieve this vary from processor to processor, however they are most often manual and paper lot-based systems. These system required audit and accreditation. Manual and paper based systems are readily auditable

Despite being a sheep abattoir for the domestic market, Frewstal at Stawell has gone well beyond the requirements and installed an electronic identification system that provides full traceability right through to the chiller room. Their commercial drivers as well as value proposition for the adoption of this system were not able to be identified. One of the proposed benefits was the ability to attract more producers to supply livestock. However, this benefit is negated when industry wide adoption is proposed.

3.1.3 Silver Fern Farms (2013)

At the time of writing this report Silver Fern Farms have implemented RFID for skid tracking in 14 of their 20 slaughter sites to ensure linkage between individual lamb / sheep tags and the plant body number. This linkage occurs from early on the slaughter chain through to boning room, including the health / disease terminal to ensure retains are correctly tracked.

There is also the feature of scanning the skid RFID just before loading in the system, and any RFIDs that do not read are rejected and not used on a carcase.

The RFID tracking system is valuable in obtaining accurate assignment of objective measurement data, such as X-Ray, to the correct carcase. Extensions are in progress to track carcase movements through chillers to provide time / temperature profiles for every carcase, and to use load cells on conveyors to measure weight loss in chillers.

One of the reasons for the successful outcome at Silver Fern Farms with RFID skid tracking was that the team responsible for the development, implementation and maintenance of the system was internal to Silver Fern Farms. This meant that the team had a lot of ‘buy in’ to the project and it was fully integrated with other plant systems. Where RFID skid tracking solutions are supplied by third party organisations as an add-on to existing systems without fully integrating into the plant system there is a high likelihood of limited success.

The commercial drivers for Silver Fern Farms for the adoption of this model are the differentiation in the global market of their products as well as control of the closed supply chains. There is a very close commercial relationship between the producers and the processor. The ability to improve compliance to specification and rapid adjustment to changes in market requirements are expected outcomes of the implemented systems.

3.2 Historic MLA and industry projects related to tracking RFID livestock through processing and feedback

Numerous MLA projects have been undertaken that cover the topic area of technologies for information management through supply chains.

There are a number of MLA project reports available on this topic, including such reports as:

- MLA project A.SCT.0005, June 2007, "Linking live sheep and carcase data via RFID in a Traditional (non- inverted) chain";
- MLA project A.SCT.017, August 2006, "Sharing data on live animal and carcase measurements";
- MLA project P.PIP.0079, August 2006, "Analysis of information flows and implementation of an e-business solution for Killarney Abattoir".

Other industry projects include:

- NSW Sheep Advisory Group, DAFF and Country Fresh Australia, April 2010, "Digital Camera and Optical Recognition for Sheep NLIS"

A summary of the key elements from project reports and other projects has been prepared below.

3.2.1 Review of RFID (EPC) technology for potential use in meat processing and distribution 4th June 2008.

Below is an extract from this report:

Over the last decade, Automated Identification and Data Capture (AIDC) has revolutionised the supply chain management process. The aim of most automated identification and data capture systems is to increase efficiency, reduce data entry / errors and free up staff.

Automated identification and data capture comprises of such systems as optical character recognition (OCR), magnetic stripe (e.g. credit card), biometric, voice recognition, radio frequency identification (RFID) and, of course, the most well-known, bar codes.

While bar codes are widely used in Australian red meat processing and distribution, there is currently limited use of RFID. There are a number of reasons for this, including limited knowledge of the technology, the challenging nature of the processing and distribution environment and uncertainty regarding the cost benefit of the technology.

Due to the interest shown by a number of industry participants, the current project was undertaken to:

- Highlight current processes, products, ID methods and environments, from lairage through to distribution, where RFID might operate;
- Give an overview of generic RFID technology;
- Highlight areas within the processing supply chain and the generic RFID technologies that could be implemented within these areas;
- Define specific testing and performance protocols for RFID technology;
- Outline the future of RFID in the processing supply chain and related recommendations.

Two of the main reasons why red meat industry companies need to take a realistic approach to RFID are the current cost and environmental constraints within which RFID are required to operate. To date, the return on investment from RFID has shown mixed results.

Part of the reason for this is because companies are requiring RFID systems to be 100% accurate in their data read rates. This has been difficult to achieve due to the numerous environmental variables that occur from processing through to distribution.

A RFID system in the right area, for the right reasons, can result in a company gaining a significant return on investment. This project did, however, highlight that, as with any emerging technology, RFID is not a fix-all or a "plug and play" technology. In the right setting RFID can offer a significant return on investment, but as with any technology, used in the wrong setting or for the wrongs reasons, the results may be a costly mistake.

Due to the current lack of scientific investigation, future independent research needs to be based on analytical quantifiable empirical methods. To date, this type of in-depth scientific investigation has been very limited on RFID technology. It remains a difficult process to separate fact from fiction when reviewing the information currently available on RFID technology.

As a result of this RFID technology review the recommendations and findings were:

- Highlight current possible RFID application points, such as hooks, cartons, pallet labels, employees, cutting boards, primal bags, totes and assets, e.g. plant equipment;
- To date, 100% read rates with RFID have been difficult to achieve or maintained;
- Environmental variables in which RFID systems will be required to work have a major impact on whether a system will deliver the required results;
- Empirical research into what type of specific technology is best suited for each stage of processing needs to be conducted e.g. slaughter, chilling, boning, packaging, people, distribution and stock control of consumables such as cartons;
- Industry-wide investigation into implementation of smart labels, and what the possible return on investment could be, on both a company level and whole supply chain level;

- If RFID smart labels are shown to be of value the industry needs to publish the related results. Then, through industry consultation, an action plan needs to be developed that would clear the way for the use of Electronic Product Code compliant smart labels across the industry. This would allow for track forward and track back on an industry-wide scale;
- RFID technology should be empirically compared so that companies can decide which vendor's technologies best suit their applications;
- Continue to review and develop test/performance protocols and publish the related findings;
- MLA needs to publish all relevant empirical studies and allow them to be accessible to all interested parties. This will allow for feedback from a variety of interested parties and therefore help shape future research;
- Publish MLA recommendations associated with RFID relating to all companies along the processing supply chain.

3.2.2 Optical bases technologies used for identification

Numerous industry projects have been conducted over the last 20 years using optical based technologies for identification purposes.

The level of automation for these projects varied greatly from fully machine readable systems through to operator based systems (i.e. hand held scanning technology).

These technologies fall into one or more of the following groups:

- Bar codes (linear or 2D [e.g. QR code]) ear tags for identification of livestock.
- Bar codes (linear or 2D (e.g. QR code]) carcase hooks or skids used for identification of carcases in processing.
- Bar codes (linear) carcase tickets used for identification of carcases after weighing.
- Optical character recognition (OCR) ear tags identification of livestock.
- Optical character recognition (OCR) carcase hooks or skids used for identification of carcases in processing.

Many of these projects demonstrated that certain technologies could operate with varying levels of accuracy and reliability within the meat processing environments.

The rapid rate of technology advancement in the area of optical based technologies applied to other industries will result in rapid performance improvements and cost reduction this this technology. One of the current improvements that is now readily utilised in other industries is the ability to simultaneously read OCR, scan multi-format bar codes and preform image / shape recognition.

However, there has been very limited commercial uptake of these technologies.

3.3 E-Surveillance summary

E-Surveillance projects have been conducted that involve collecting information from processors through specific data capture technology. E-Surveillance follows a similar model to data and information collection to producer feedback. The activities occur at the processing facilities and much of the information collected is suitable for producer feedback.

This approach was used to ensure consistent and known data collection steps and measurement values. The data collected has been summarised for industry reporting and for market access maintenance.

The ideal model for e-Surveillance would be based on the following steps:

- Defining and publishing specific data information standards for:
  - Data to be collected,
  - The location for the collection within the establishment,
  - The measurement to be recorded,
  - The value ranges for the data to be recorded,
  - Validation and reconciliation process for the collected data, and
  - The method for transmission of the validated and collected data;
- Providing the incentives for the processors to implement e-Surveillance data collection and reporting. Realistically, the only way to provide incentives is either by funding (e.g. provide a commercial value for the information to be collected, such as 5 cents per record), or compliance (e.g. make it part of AUS-MEAT accreditation that a processor undertakes e-Surveillance as part of market access);
- Providing industry training for e-Surveillance data collection, both initial training and ongoing competency monitoring.

3.4 Cost-benefit project summary

There are a number of cost-benefits for collection of data and its use, both for e-Surveillance and as producer feedback.

The MLA project P.PIP.0196, “Cost Benefits of e-Surveillance Systems for Animal Health Monitoring” issued in June 2011, showed that 80% of the benefits would be to producers and 20% to processors.

The MLA project P.PSH.0557, “The potential value of individual carcase identification and automated chiller sortation for an Australian lamb processor”, showed a potential realisable opportunity benefit of $2.73 per head. This did not take into account improved producer compliance by herd and flock improvement as a result of disease and other information producer feedback.

The combinations of herd and flock improvement, disease and supply chain contamination reductions, and processor compliance improvements have a multiplier effect on cost benefit of accurate information collection. However, if producers do not action the information provided in producer feedback, the potential industry cost benefit will remain unrealised.

3.5 MSA beef program

The MSA beef program has been in operation for many years and provides producers with online access for their feedback and compliance reporting. The feedback data can be downloaded and imported into on-farm software.

A review of the level of usage for the MSA producer feedback system has shown that, of the 30,000 registrations, 1,153 unique logins for feedback occurred for the period 1st July 2102 to the 1st May 2013. There was a total of 2,800 logins for this period.

This highlights the low participant rates of producers when accessing feedback.

3.6 MSA sheep program

The MSA sheep program is a pathways based program. There are no specific measurements recorded on an animal-by-animal basis, with feedback required for producers. The existing mob-based feedback meets the MSA requirements for feedback.

3.7 NLIS (National Livestock Identification System)

The NLIS program has been operating for a number of years. Beef processing slaughter files are sent to NLIS to populate the NLIS database. Producers can login and access their data. This can be downloaded and imported into on-farm software.

For sheep, the NLIS operates on a mob-basis with limited interaction with processors.

There are a number of industry activities around the potential adoption of RFID or other individual animal identification methods for small stock. The scope of this report does not involve this issue.

Any individual animal identification methods in use would be an attribute of any producer feedback. This might be an RIFD number, or this might be limited to a body number for a kill date for a plant.

3.8 LDL (Livestock Data Link)

The LDL program is a new initiative by MLA to provide analysed information to producers. The data comes through the NLIS system to the LDL reporting system.

The basic requirement for a processor participating within LDL is to provide slaughter data on an individual animal basis to the NLIS database via a Carcase Feedback upload. The interface between NLIS and LDL enables data to be transferred across to LDL for analysis by authorised LDL participants.

For beef processors, slaughter data can be uploaded as part of their daily NLIS reporting process through NLIS Connect (the EasyCheck replacement program), or through their own software interface. If they do not currently upload the full set of slaughter data to NLIS (as this is not a mandatory requirement under the NLIS Business Rules), there may be a requirement for software settings at the processor end to be modified to enable this data to be uploaded to NLIS.

For sheep processors, there is currently some mandatory requirements to upload mob based information to the NLIS database depending on the state or territory, the interfaces that are currently in place for cattle also accommodate sheep slaughter data requirements.

3.9 Third party feedback systems

Woolworths World System is an example of a third party system that imports the data from the processors and prepares an analysed view of the information to the producers. Woolworths does this for the purpose of assisting their supplier to better meet compliance to specifications.

4 Technology summary

The different technologies used for identification and data capture within the meat industry, as well as for other industries, is summarised in this section of the report.

The expanse of the various technologies and their application is so large that this report can only provide a limited summary of what might be applicable to the meat industry, and especially slaughter floor data capture.

There have been many reports conducted within the meat industry over the last several years. Much of the material in this section of this report has been taken from sections of these previous reports. The source reports have been identified in the respective report sections.

4.1 Commercially implemented advanced producer feedback for small stock by processors

There are a number of small stock processing plants in Australia and New Zealand that have implemented systems that provide detailed individual body number (and in some instances individual animal ID) feedback to producers.

One example is WAMMCO that can send detailed producer feedback automatically by email to their producers. This feedback can include detailed disease reporting.

Another example is Silver Fern Farms in New Zealand that have implemented a detailed feedback system using RFID live animal IDs and hook/ skid tracking. Producers can login to get detailed feedback information and link this to on-farm production data.

4.2 RFID

This section has been sourced from the report "MLA, The Red Meat Industry Undergraduate Program 2007/2008 (June 2008), Review of RFID (EPC) Technology for Potential Use in Meat Processing and Distribution"]

4.2.1 Summary of RFID application to indusrty

A typical RFID system consists of tags (encapsulated chip and antenna), readers (and their antennas), middleware, and a backend database that collects and collates all the appropriate data. The data transmitted contains the electronic product code (EPC), or other similar information, which includes various details about the tagged product. A RFID reader (sometimes called an interrogator) interrogates the tags via antennas to either obtain information or transmit information to a tag. Software called savant or middleware is required to control the reader and to collect and filter the information so it can then be passed onto the company's computer network (backend database).

In general, the cost of a RFID system depends on the application, the size of installation, the type of system and many other factors, so it is difficult to give an exact figure. However, the cost of an RFID system can be broken down into four key areas:

- Hardware
- Software
- Service
- Miscellaneous

When enquiring into RFID systems, vendor selection is a very important procedure due to the ever evolving nature of the technology. Vendors can be broken up into three classes: Manufacturers, Original Equipment Manufacturer (OEM) and Implementers.

Prior to the development of standards for tags and readers, companies primarily developed proprietary RFID systems so that readers from one vendor often only read tags from the same vendor. For a long time, and even now to a certain degree, the lack of standards within the RFID industry has been a major sticking point in terms of widespread adoption. However, now, thanks to the ISO and EPCglobal (a subsidiary of GS1), standard RFID systems are becoming more interoperable (both between companies and internationally).

A RFID system can improve on, or complement a bar code system by capturing larger amounts of data and more specific information about items. RFID is not necessarily "better" than bar codes; rather the two are different technologies and have different applications, which sometimes overlap. Two significant differences between bar codes and RFID are:

- bar codes require direct line-of-sight to be read;
- RFID has the ability to uniquely identify each individual product via item specific Electronic Product Codes (EPC).

RFID is a technology that can provide considerable value in a business world where operating costs are often dominated by labour, and in which there is an inability to accurately trace stock in real time. The interest in RFID as a solution to further optimise the supply chain is gathering momentum at an ever increasing pace, with more and more companies announcing trials and mandates to their suppliers.

A word of caution is that, despite publicity to the contrary, RFID is not a “plug and play” technology. Companies need to take time to conduct research and make appropriate decisions based on sound company business strategies which will allow for the maximum return on investment.

4.2.2 Automated ideNtification AND data capture

Over the last decade, automated identification and data capture (AIDC) has revolutionised the supply chain management process. The aim of most automated identification and data capture systems is to increase efficiency, reduce data entry / errors and free up staff. Automated identification and data capture comprises of such systems as optical character recognition (OCR), magnetic stripe (e.g. credit card), biometric, voice recognition, radio frequency identification (RFID) and of course, the most well-known, bar codes.

In recent years a lot of “noise” has been made about RFID and its potentially ground breaking advantages over the bar code system. While it should not be expected that RFID will fully replace bar codes, there is, however, an ever increasing groundswell of interest in RFID and its possible benefits to business. The major drivers behind RFID implementation are retailers such as Wal-Mart and the US Department of Defence (DoD). Owing to the tremendous potential benefits of RFID systems, in June 2003 Wal-Mart announced they would require their top 100 suppliers to tag all pallets and cases they shipped to Wal-Mart distribution centres by January 2005. Despite the mandates by corporations such as Wal-Mart and the DoD, many companies are still worried about the return on investment (ROI) of RFID implementation due to unresolved issues such as cost, standards, tag performance, and security of RFID data transmission.

4.2.3 What is RFID?

RFID was first developed in the 1940s as a way to identify allied and enemy aircraft in World War II. Since then RFID has been applied to a myriad of applications, from clothing, paper documents, toll collection, access control, baggage handling, animal tagging, people monitoring, through to tracing assets / products along a production line. The object of any RFID system is to carry data in transponders, generally known as tags, and to retrieve data by machine-readable means at a suitable time and place to satisfy particular application needs.

Data within a tag may provide identification for an item in manufacture, goods in transit, location, a vehicle, an animal or an individual. RFID tags, unlike bar codes, have the ability to carry additional information such as item specific information (e.g. date of manufacture), or instructions immediately available on reading the tag. Essentially, it's a technology that connects objects to the Internet / Intranet, so they can be tracked. On a larger scale, companies can share data about the movement of products in real time.

There are several methods of identification, but the most common is to store a serial number (e.g. electronic product code) that identifies an object, and perhaps other information, on a microchip that is attached to an antenna (the chip and the antenna together are called a RFID transponder or an RFID tag). The antenna enables the chip to receive and transmit identification information to and from a reader (in a radio frequency format). The reader converts the radio waves received from the RFID tag into digital information that can then be passed on to a backend database.

4.2.4 RFID frequency overview

There are many different RFID technologies in use across many different industries. There is no one technology that provides a simple solution for all applications. All the technologies have limitations due to environmental factors and/ or cost factors.

Band	LF Low Frequency e.g. AM Radio	DF Dual Frequency	HF High Frequency e.g. FM Radio	UHF Ultra High Frequency e.g. mobile phones	Microwave	Smart labels (HF and UHF only)
Frequency	30–300kHz	100kHZ-13MHz	3–30MHz	300 MHz–3GHz	2–30 GHz	–
Typical RFID Frequencies	125–134 kHz	Transmit 125kHz / Receive 6.8MHz	13.56 MHz	433 MHz or 865 – 956MHz	2.45 GHz	433 or 865 – 956MHz or 13.56 MHz
Approximate read range (m=metres)	less than 0.5m	Up to 1.4m	Up to 1.5m	433 MHz = up to 100 metres 865-956 MHz = 0.5 to 5m	Up to 10m	Less than 0.5m or up to 1.5m
Typical data transfer rate (kilobit per Second=kbit/s)	less than 1 kilobit per second (kbit/s)	Up to 125 kbit/s	Approximately 25 kbit/s	approximately 30 kbit/s	Up to 100 kbit/s	Less than 1 or up to 25 kbit/s
Characteristics	Short read range, low data transfer rate, larger tag size, little signal loss	Read range similar to HF, possible high read rates. Can work in environments with metal and liquids	Higher read range, reasonable data rate, small signal loss, good read range in noisy environments, anti-collision	Long range, high data transfer rate, concurrent read of <100 items, cannot penetrate water or metals	Long range, high data transfer rate, very high signal loss	Combines both human readable and RFID data, size, scope of use
Typical use	Animal ID, car immobiliser	Tote boxes, returnable assets	Smart labels, contact-less travel cards, access & security	Specialist animal, baggage handling, tracking, logistics	Vehicle toll, item tracking	Carton and pallet tracking
Tag Cost (AUS)	$3-$20	$3-$10	.50c- $5	.10c -$3	$20-$100	.20c to $2
Multiple tag read rate	None ◄——————————————► Faster					
Ability to read near water or metal	Better ◄——————————————► Worse					
Signal loss due to electromagnetic interference	Worse ◄——————————————► Better					

All costs are Australian dollars and are representative costs only.
[Source: MLA, The Red Meat Industry Undergraduate Program 2007/2008 (June 2008), Review of RFID (EPC Technology for Potential Use in Meat Processing and Distribution]

4.2.5 RFID system overview

The cost and complexity of the RFID systems has been summarised in the following table for four different frequency classes.

<table>
<tr><th>RFID Components</th><th>Function</th><th>Cost LF</th><th>Cost HF</th><th>Cost UHF</th><th>Cost microwave</th></tr>
<tr><td>Tag</td><td>Data carrier</td><td>$3.00 to $20.00</td><td>$1.00 to $3.00</td><td><$1.00</td><td>$10.00 to $100.00</td></tr>
<tr><td>Antenna</td><td>Transmits signals between tags and readers</td><td colspan="4">$10-$10,000</td></tr>
<tr><td>Reader</td><td>Sends and receives data from tags</td><td>$500 -$1000</td><td>$100 - $1000</td><td>$1500- $3500</td><td>$2000 - $10,000</td></tr>
<tr><td>Printer/Encoder</td><td>Encodes data onto smart label</td><td>N/A</td><td>$1,500- $5,000</td><td>$1,500- $5,000</td><td>N/A</td></tr>
<tr><td>Middleware</td><td>Collects and filters data</td><td colspan="4" rowspan="3">$25,000 - $200,000
Dependent on size of RFID system</td></tr>
<tr><td>Hardware</td><td>Turns data into understandable business information</td></tr>
<tr><td>Commissioning/ Integration</td><td>Installation and upkeep of RFID system</td></tr>
</table>

All costs are Australian dollars and are representative costs only.
[Source: MLA, The Red Meat Industry Undergraduate Program 2007/2008 (June 2008), Review of RFID (EPC Technology for Potential Use in Meat Processing and Distribution]

4.2.6 RFID conclusion

The aim of most AIDC systems is to increase efficiency, reduce data entry / errors and free up staff. RFID is allowing companies to, in the right setting, increase such efficiencies. In the process, it saves both time and money through higher quality product / asset tracking in real time. RFID has matured from its introduction in WWII to today's use in areas such as access control, animal tracking and patient care. Over that time it has become one of the more widely used AIDC technologies.

While it seems easy to describe the system as simply involving tags, readers (and their antennas), middleware and a backend database, it has been shown that there are numerous variables involved with each part of the system that need to be taken into account. These range from, but are not limited to, operating frequency, power source, memory capacity and associated standards. It is not an easy process to fully comprehend and therefore it is imperative to take time when investigating how a RFID system works and what system would be most appropriate for your company.

RFID is a technology that can provide considerable value in a business world in which operating costs are often dominated by labour. The interest in RFID as a solution to further optimise the supply chain is gathering momentum at an ever increasing pace, with more and more companies announcing trials and mandates to their suppliers. Much of the clamour in the media about RFID has come as a result of these mandates from such organisations as Wal-Mart and DoD.

RFID technology is not yet widely understood or installed in the supply chain, and cost / return on investment models are far from established. Many companies are therefore now faced with the difficult choice of whether they should be looking at RFID now, or waiting until deployment is more widespread.

For a long time the lack of standards within the RFID industry was a major sticking point in terms of widespread adoption. However, now, thanks to the ISO and EPCglobal standards, RFID systems are becoming more interoperable (both between companies and internationally).

The short-term future of RFID adoption is far from clear due to:

- Considerable hype about its potential cost savings and reach;
- A complex variety of technology and solution vendors;
- An uncertain, ever evolving base of standards set for its use;
- The harsh and ever varying environments in which RFID would be required to operate;
- The reported inability to consistently achieve 100% read rates, and the associated costs;
- The lack of empirical, non-biased research.

However, if there is a process-specific issue or position where RFID is shown to be the right technology for the right application, and implemented in the correct way, it can offer companies a significant return on investment, which in turn allows them to continue to evolve and stay one step ahead of their competitors.

4.2.7 Additional comments on the above summary from the June 2008 MLA report

The technology involved with automated identification and data capture has continued to development since the MLA report in June 2008.

Some of the costs as well as functionality have changed.

RFID technology has not greatly altered since the time of the report.

Image based technology has greatly evolved with the ability to now include image / shape recognition, bar code decoding and optical character recognition simultaneously from one image capture and it real time. The cost of the technology continues to decrease as camera quality and processing power continue to increase. This provides a new opportunity for investigating the use of image capture technology for wider industry applications.

However the fundamental limitation of image based technology is that a clear viewable surface is available. Often ear tags, etc, are covered in covered in mud or other obscuring material. This issue also applies to the image technology where mud, blood or other obscuring material may render the technology in operative. RFID technology can work where the environment is too dirty for image based technology.

4.3 Identification methods for use with data capture for hook tracking

There are numerous technologies that can be applied for identification in the processing sector. Each technology has benefits, as well as limitations. The appropriate technology should be chosen for the applicable tasks. The selection process involves fully understanding the environment for use. An example of this type of consideration is the impact of the cleaning process on RFID IDs that are embedded in hooks. The cleaning process is secondary to the process of using the hooks on rails for tracking carcases. However, the aggressive nature of the cleaning process often damages the RFID devices.

Below is a summary of a number of technologies listing their respective advantages and disadvantages:

Hooks with holes
(Cheapest and oldest technology)

Advantages	**Disadvantages**
No additional hardware costs	Must drill/ machine the holes
Will work even when hooks are cleaned, dropped, bashed etc.	Limited number of ID <10,000
Low operating costs	Requires time to read and accurately position the hook
Works with metal and plastic	
Simple reading technology	
High reliability	

Generic short-distance RFID system with maximum transmission distance of 100 mm. e.g. OMRON V600 (used in automotive manufacturing, robotic assembly lines, computerised manufacturing, automated warehouses, etc.)
(medium cost)

Advantages	Disadvantages
Well-known and well-used technology in other industries	Mounting the tag
Unlimited number of IDs	Chemical and vibration resistant, but will fail with damage
Works with metal and plastic	Consumable costs for replacement tags
Quick reads	Cannot tell if working or not working without a reader. i.e., must read before being used
	Cost per tag

New or specialised RFID system mould in plastic hooks (low frequency [most common for meat industry], high frequency [most common for non-meat industry] and dual frequency) (High cost)

Advantages	Disadvantages
Tag moulded in hook	Must replace all hooks
Not easily susceptible to damage	Chemical and vibration resistant, but will fail with damage
Unlimited number of IDs	Consumable costs for replacement hooks
Quick reads	Cannot tell if working or not working without a reader. i.e., must read before being used
	Only plastic hooks

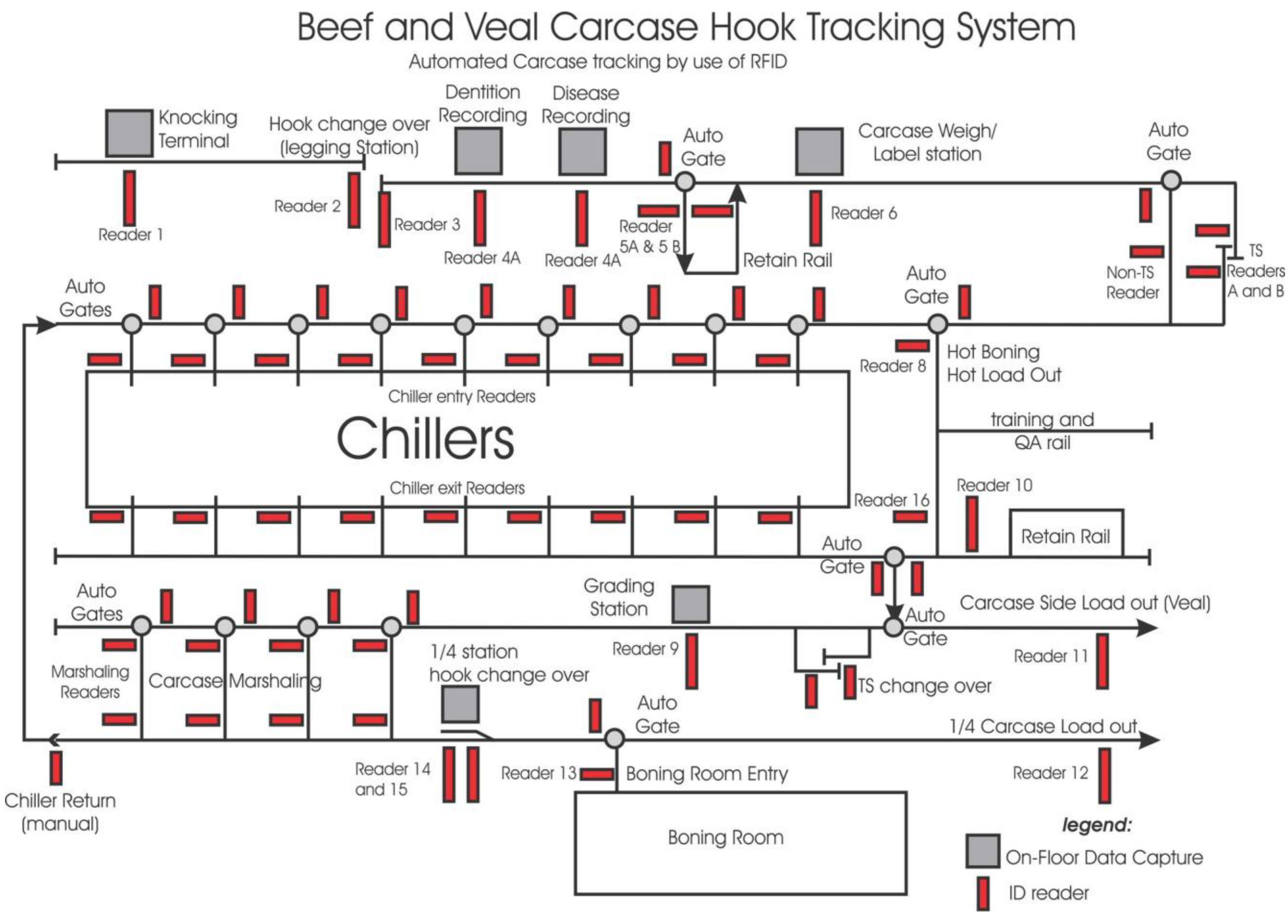
Retro fit existing hook RFID system (low frequency [most common for meat industry], high frequency [most common for non-meat industry] and dual frequency) (High cost)

Advantages	Disadvantages
Uses existing hooks. Works with metal hooks and plastic skids.	Must retro fit all hooks. Must be done very well as poor quality will result in mechanical failure. (This is a common problem.)
Not easily susceptible to damage	Chemical and vibration resistant, but will fail with damage and abuse.
Unlimited number of IDs	Consumable costs for fixing failed hooks
Quick reads	Cannot tell if working or not working without a reader. i.e., must read before being used.

Bar code on hook (low cost technology)

Advantages	**Disadvantages**
No additional hardware costs	Must mark all hooks – Need to be QR code or other 2D code.
Will work even when hooks are cleaned, dropped, bashed etc.	Very Chemical and vibration resistant, but will fail with damage of bar code area
Low operating costs	Requires high contrast to work reliably.
Works with metal and plastic	Cannot tell if working or not working without a reader. i.e., must read before being used.
Simple reading technology	
High reliability	

The diagram below shows an example of the use of hook tracking and the readers that would be required for a beef plant.



4.4 Identification methods for use with data capture for carcases for all applications on plant

There are a number of identification methods used through the processing establishment to identify animal and carcases. The methods for the identification change slightly between beef and sheep. However, the methods here can generally be equally applied.

- Pre-slaughter:
  - Kill Agenda lot number (paper and computer record)
  - NVD (MSA Declaration, NFAS declaration) (paper and computer record)
  - Pen assignment (kill lot ID) (paper record)
  - Property management ear tag (property and/ or Individual ID) (Visual ear tag record and computer record, once entered)
  - NLIS ear tag (individual animal) (Visual and computer record, once entered)
- Knocking:
  - Kill Agenda lot number (paper and computer record)
  - Property management ear tag (property and/ or Individual ID) (visual and computer record)
  - NLIS ear tag (individual animal) (visual and computer record)
  - Body number (computer record link to Kill lot and ear tags)
- Slaughter floor
  - First leg change-over (beef), head removal (small stock), Body number linked to kill lot (computer record with paper tag or other tracking method)
  - Hook individual ID linked to body number and kill lot (computer record linked to body number and kill lot)
  - Carcase ticketing with body number printed at the Carcase scale/ ticketing station. (kill lot linked to body number) (Computer record with visual carcase ticket)
- Chillers
  - Carcase ticket with body number (ticket record and computer record)
  - Hook individual ID linked to body number and kill lot (computer record linked to body number and kill lot)
- Boning Room entry
  - Carcase ticket with body number (ticket record and computer record)
  - Hook individual ID linked to body number and kill lot (computer record linked to body number and kill lot)

4.5 Slaughter floor data capture

The methods for data capture on the slaughter floor have traditionally been harsh environment terminals, located at strategic processing points such as:

- For beef:
  - Knocking (linked to RFID reader when required)
  - First leg / change-over (linked to hook tracking if used)
  - Dentition
  - Evisceration / Disease recording
  - Scale / Carcase ticketing
- For small stock (Lambs, sheep, goat, bobby calves):
  - Head removal / Dentition (linked to hook tracking if used) (RFID read if used)

  - Evisceration / Disease recording
  - Scale / Carcase ticketing

Other technology such as rugged/water proof hand held devices have been utilised in some slaughter floor and many grading applications.

4.6 Producer utilisation of technology and electronic feedback

The technological capability of producers varies greatly. Providing electronic feedback to producers that do not have the capability to receive or process electronic feedback is somewhat pointless.

Identifying those producers that have the necessary systems and skills to utilise electronic feedback has been investigated as part of this review. The process to determine the percentage of producers with technological capability was through four different methods:

- Producer utilisation of on-farm software;
- MSA feedback utilisation;
- LPA register user online purchasing, as well as eFORM utilisation;
- Internet coverage for agricultural sector.

The area of highest rate of technology uptake by producers is that of smart phones. This is likely to be driven through a number of factors, including:

- Heavy marketing campaigns by mobile phone companies;
- Access to Internet through the mobile network, including travelling through areas with coverage;
- Convenience of use, e.g. any time and any place access.

These combined issues of low PC or desktop based technology utilisation and much higher utilisation of smart phones would indicate that any proposed electronic feedback should be focused for smart phone delivery as a primary platform. This mobile platform (e.g. smart phones) provides an easy method of sending advanced electronic feedback to producers. However, the technology does not have the ability to utilise the information without suitable on-farm software.

4.6.1 Producer Interview on Summary about Producer Feedback

The top MSA lamb producers for 2012 were identified and a number of these where contacted for their views on current producer feedback and what they would like to see on producer feedback.

Here are some extracts from the conversations are detailed below:

> *"Not interested in individual animal producer feedback. So long as they meet the 18-24kg weight range. Currently receive individual feedback on reasons for contamination/condemnation. Can see benefit of electronic feedback."*

"Receives individual body number feedback from Midfield and feels this is a waste of time and paper. Would like to receive his summary feedback in an electronic format to upload into on-farm software packages."

"Sells mainly to Australian Lamb Company – They do not support individual feedback so does not see the need for it. He is 68 and runs his business without the use of computers."

"Not interested in individual feedback. They weigh their lambs prior to dispatch so have a pretty good idea of how they are going to perform. Really only interested if they meet the 18-24 kg WW spec. Would like more detailed information on why carcases are condemned or partly condemned due to seeds, etc. Info he receives now is quite vague and does not sufficiently describe the extent of the problem."

The summary from the conversations with the contacted producers varied greatly from no interest at all and not having a computer, through to currently receiving electronic feedback by email and wanting more detail on condemns or partial condemns.

The points in summary for lamb producers are:

- Mob based feedback, not individual feedback.
- Detailed information on disease, contamination and condemns.
- Feedback in electronic format.

4.6.2 On-Farm software

There are a number of suitable on-farm software products in the market for beef and small stock production management. Most have import functions for slaughter data feedback.

The cost for these software products is very low for the level of functionality that they offer. Typically, on-farm software products cost between 10 and 100 times less than commercial software of comparative complexity in other industries. The reason for this disparity is the very low perceived value by producers. Producers in general do not see on-farm software as a necessary and key business tool.

An example is Stockbook from Practical Systems. They offer an annual subscription of their unlimited user and volume version for $790AU. Equivalent software of similar complexity for the mining or construction industry would be in the order of $790AU per month for 4 users, or $9,480AU per year.

The increased use of mobile technology (such as smart phones) will see an increase in the number of phone based on-farm management system to cater for this emerging market.

4.6.3 MSA Beef online feedback utilisation details

An analysis was undertaken on the utilisation of the online MSA feedback system that has been in operation for several years. The analysis covered the period of June 2012 to May 2013.

The detail can be summarised as:

- 9,445 producers sent in consignment to be slaughtered;
- 52,416 unique consignments lots;
- 37.6 is the average number of head per consignment;
- 1,153 unique logins for feedback and benchmarking;
- 2,800 total logins;
- Total producer registrations: 30,000.

The above data indicates that there is a very low uptake of access to the MSA beef feedback online. Only 12.2 % of producers that sent in consignments logged into the MSA Beef online benchmarking system. It appears that only 5.3% of the consignments where viewed through the MSA Beef online benchmarking system.

4.6.4 LPA NVD purchasing patterns

An analysis was done of purchasing patterns by producers of NVD through the LPA system.

The statistics summary for NVD book purchases for the year 2012 are:

- 5 books or more per year = 0.64%
- 2 books or more per year = 8.3%
- 1 book or less per year = 91.7% (review of NVD Book purchases back to 2004.)

This data supports the data from MSA possessing volumes for beef and lamb, as well as the MLA eFORM usage volume.

The key message from the collective data is that less than 5% of producers represent over 50% of the volume and less than 20% of producers represent over 70% of the volume of livestock movements and processing.

The vast majority of producers represent a very small volume of livestock movements and processing. To demonstrate this fact, the table below shows the number of books purchased by each producer in 2012. For example, only one producer bought 100 books in 2012. Decimal places in the “No of Books” column show that less than one book per year was purchased by those producers. For example, 29524 producers bought 0.5 books, or one book every two years.

No of Books	No of Producers
100	1
70	1
60	1
50	2
40	2
30	4
29	1
28	1
26	3
25	3
24	3
22	1
21	1
20	13
19	1
18	3
17	3
16	5
15	6
14	2
13	4
12	16
11	12
10	83
9	21
8	67
7	62
6	236
5	608
4	1,200
3	2,352
2	10,429
1	26,840
0.5	29,524
0.3	24,797
0.25	19,411
0.2	24,630
<.2	42,525
Total orders	182,874

4.6.5 On-Farm technology capability

There are 3 primary barriers to on-farm technology utilisation:

- Computer literacy;
- Reliable and good quality Internet access;
- Desire for change.

If these barriers are not overcome there can be no improvement in providing feedback to producers.

An analysis of producer technology capability was undertaken by reviewing the buying behaviours of producers of NVD books. This analysis looked at those producers that purchased books online and those that purchased books by phone through the help line or via paper orders. There was also a review of the number of producers that used the LPA eDEC to do NVDs electronically. The result of the analysis showed that approximately 4% of the LPA accredited producers (of which there are approximately 200,000) are technologically capable and utilise the on-line option. Furthermore, it must be noted that this 4% generally represented high volume users such as feedlots and larger livestock producers.

The ability to purchase an NVD book online has been available for at least 5 years. The low uptake can be seen as one of the indicators that the barriers to producers embracing information technology have not yet been overcome.

4.6.6 General internet availability status:

The Australian Broadband wired network covers about 96% of the population but only about 4% of the land mass. This means that about 880,000 people do not have coverage. The current exact figures are not readily available due to the current political debate with the NBN (National Broadband Network) program. The NBN is intending to deliver high speed Internet to 98% of the population.

The existing wireless network potentially covers 98% of the population but this is calculated without consideration of coverage black spots. In reality it is closer to 96% of the population. This means about 880,000 people are without coverage.

Most of Australia’s primary producers are in regional areas where broadband coverage is poor, meaning many of the 880,000 people who cannot get good quality broadband are primary producers.

The NBN is intended to provide improved, national high speed Internet coverage. The NBN has a 10 year rollout plan to achieve the national coverage. A number of regional areas are included in the initial three years of the rollout. However, these are limited to the localised areas of these regional centres. The NBN website indicates that for many producers in regional locations they are likely to only be provided with limited wireless or satellite coverage.

4.6.7 User behaviour and technology status:

The above information generally shows that there is a very slow uptake by producers of current information systems.

There appears to be some exceptions to this general rule in the rapid adoption of smart phone technology.

Over the last few years there has been an explosion in the uptake by end users of smart phone and tablet technology. This includes users that have historically not utilised technology. Smart phone growth (replacements of non-smart phones, as well as upgrading existing smart phones) is expected to continue at over 30% per year. The tablet market grew by 330% in 2011 and is expected to continue to grow for the next several years to an estimated 11 million by 2016.

At the end of 2011 there was a 125% mobile phone subscription for the Australian population. This means there were more mobile phone subscriptions than people in Australia. Many of these may be data subscriptions such as Ipads and tablets, as well as wireless devices for notebooks.

What is not known is how much of the technology capability of these smart phones are being utilised by producers that have purchase them.

4.7 System vendors capability for advanced feedback

Three major system vendors where contacted and their capability reviewed in terms of being able to provide advanced feedback electronically (email of PDF and data file) to producers.

All three indicated that their product offering supported providing advanced feedback electronically to producers and that some of their customers had utilised some or all aspects of advanced feedback by email.

Again, this demonstrates that the option to provide advanced feedback is not due to technical limitations.

Working with a number of the system vendors simultaneously to implement advanced producer feedback based on defined and agreed-on standards would quickly ensure many producers were receiving advanced producer feedback.

The approach of working with multiple system vendors simultaneously results in a number of industry benefits:

- There is no exclusivity for one system vendor which stops the system vendor from price gouging;
- High level of industry uptake as many plants will have the ability to provide advance feedback;
- The remaining system vendors will add the functionality to be competitive in the market.

4.8 Producer barriers to adoption summary

There are a number of producer barriers to adoption that need to be addressed. There are a small number of producers that demand and will utilise advanced feedback.

The producer barriers to adoption can be summarised as:

- A few big producers consign the majority of livestock. The vast majority of producers frequently send in lots. This means the vast majority are not in a position to actively utilise advanced feedback;
- Producer uptake of technology is still limited to a minority. Without suitable on-farm software and systems to make sustained herd / flock improvement, and compliance to specifications, advanced producer feedback is of very limited value;
- Producer apathy was evident in the phone interviews with producers. The majority of the top lamb producers (based on number of lamb consigned) who were contacted showed little interest in receiving individual identification based producer feedback.

4.9 Processor barriers to adoption summary

There are a number of processor barriers to industry adoption that need to be addressed for small stock processors. Processors normally adopt change as a response to commercial drivers. Either the important producers to these processors need to demand advanced feedback, or there needs to be a cost reduction or revenue increase to create change. The other major reason for processors to adopt change is regulation. Regulation is not seen as a suitable method for forcing adoption by processors.

The processors' barriers to adoption can be summarised as:

- No, or only a very small direct return of investment for required changes to existing systems;
- No mass demand from producers for advanced electronic feedback;
- Additional labour requirements to collect required information on the slaughter floor locations.

Current work practices for processors, both small stock and beef, are sufficient to meet regulatory requirements as well as internal commercial requirements, such as inventory management and product recalls.

4.10 Technology conclusion

The technology conclusions from the review of the previous projects, emerging technologies and current technologies have shown that there are no technological limitations to implementing improved producer feedback for small stock.

The key technological areas for small stock producer feedback technology relate to:

- Individual animal IDs in the processing plant. Based on:
  - Plant, kill date, chain and body number (all plants have this) links to kill lot linked to producer NVD (base level for detailed producer feedback,
  - Plus (if available) Hook / Skid ID (several plants have this) linked to body number,
  - Plus (if available) individual live animal ID linked to Hook / Skid ID. (Only a few plants have this and only a few producers are using individual animal IDs);

- Methods and systems to collect the data (production data, compliance data, disease data and supply chain contamination data). These systems and methods should be fully integrated as part of the plant slaughter floor information systems and not “tacked on”, so that they are part of the slaughter floor “system vendor’s” commercial software product;
- Information standards for communicating the collected and validated information back to producer and industry.

The limitations to adoption of the technologies at both the processor level and at the producer level are the lack of commercial drivers. If the commercially important producers do not demand improved or additional feedback in electronic format, then processors will not be encouraged to implement such systems. The previous cost-benefit projects that have been conducted have shown that up to 80% of the benefit of improved and additional feedback potentially applies to producers. The return of investment to processors is low and will require a long payback period. This makes the initial capital investment and subsequent ongoing operational costs for such systems very low commercial priority. Other internal processor projects that lower operational costs, improve profitability or increase revenue will take priority.

From the producer perspective, the issue is that the vast majority of producers create very small volumes, and that means that very few producers - less than 5% - may actively utilise advanced producer feedback for flock / herd improvement. However, this 5% is likely to represent close to 50% of the volume of livestock sent to processing.

5 Current commercially available, non-meat industry specific, applicable technology

Other industries have different operational requirements for collecting and providing supply chain information up and down the supply chain. However, there is huge commercial pressure to lower operational costs along most supply chains. A major area of cost reduction is the collecting and passing of information long the supply chain.

The types of supply chain information include:

- Product specification and attributes. This including details like product size, shape, packaging levels, GS1 product codes, labelling details, bar codes (item, carton and pallet level), ordering details, shelf spacing, nutritional information, allergen information, emotive marketing claims (organic, sustainable farming practises, fair wage, free range, eco-friendly), religious claims (kosher, Halal), provenance (traceability), etc. All of this information is uploaded by manufactures to single point industry portals that are accessed by retailers. This acts as a single source for all current information for manufacturers, wholesalers and retailers. Many of the manufacturers and retailers have automated systems to upload and download this information. This high level of automation using a single point to access information provides a huge cost reduction in data entry and error correction.
- Order fulfilment. Order placement by retailers is highly automated. This includes auto-reordering, where the act of a sales causes the reorder process to function. Delivery information from a vendor is automatically sent to the buyer and when

goods are received they are matched to the order and the supplier is paid. There is no invoice in this process.

The above activities are achieved through four fundamental technologies:

- Bar coding of all products, pallets and other logistic units to published global standards. (There is an emerging standards based RFID product technology. This RFID product technology is called EPC [refer to GS1 for details www.gs1.org]).
- Bar code scanning at all data capture points on the supply chain.
- Online centralised industry product specifications published in a standard format.
- Standardised electronic messaging.

5.1 Type of technologies utilised in non-meat industries

The types of technologies utilised outside of the meat industry of automatic identification and data capture fall into two groups:

- Supply chain standards based technologies, and
- In-house based technologies.

The supply chain standards based technologies is summarised in the previous section.

The types of technologies that are utilised in house include:

- Large scale integrated automation - These are the systems that allow all the in-house sub-system to be connected and automated. Most large or complex manufacturing organisations have these types of systems implemented. An example of this type of technology is the integration of text messaging with process automation, where support engines are automatically notified by SMS when a piece of equipment requires maintenance.
- Specialised Robotics – Robotics are utilised in many industries to preform repetitive or physically difficult tasks. Robotics relies on bar code / RFID reading as well as imaging systems.
- Proprietary bar codes (Linear and 2D e.g. QR codes) and bar code scanners – These can't be scanned outside of the company and are used for internal job tracking. They are often located on tote boxes, cartons, pallet, work pieces, tools, equipment, locations and personnel.
- Proprietary RFIDs and RFID scanners – These can't be scanned outside of the company and are used for internal job tracking. They are often located on tote boxes, cartons, pallet, work pieces tools, equipment, locations and personnel.
- Imaging systems – These are a range of emerging technology that incorporates bar code scanning, optical character recognition and shape/ pattern recognition. Typical uses include product QC functions that can:
    - Detect the fill level of a product,
    - The bar code of the product,
    - Batch or use-by date printing (for correct details),
    - Label placement, and
    - Product orientation for placement in the outer carton.

All of the above process may occur simultaneously with one image capture.

5.2 Type of technologies that may be utilised by the meat industry

The meat industry adopts technology as and when it provides both a short and long term commercial benefit. An example is that the utilisation of robotics in the meat industry continues to grow. The utilisation occurs on both the processing areas (slaughter floor, boning room, etc) and logistics (robot carton picking to fill order and palletise the cartons). When a technology is proven to be reliable as well as having a clear commercial benefit, the technology will be implemented.

There are many opportunities across the meat industry from livestock logistics though processing to cold distribution for proven technology to provide clear commercial benefits. Individual organisations evaluate these technologies as they are presented or they become aware of the technology. The often high costs and long implementation times of many technologies result in organisations only implementing technology that provides the largest return on investment.

The utilisation of large scale automation is an area that is rapidly growing in the meat industry. An example is chiller systems that are highly automated and send text messages to plant management and maintenance personnel should any measured parameters be outside of set program limits. Most meat processing plants now contain high speed data networking throughout the plant connecting all the key systems.

Automatic bar code scanning and conveyor systems have been in use in the meat industry for many years.

The use of imaging technology is only starting to have broader use in the meat industry. Some of the robotic systems are now utilising shape recognition technology for controlling the robot. The use of imaging technology for animal identification is an emerging area of application.

The use of RFID for hook tracking and individual animal identification is known and understood. The use of RFID for animal identification is heavily ingrained in the meat industry both are a regulatory level and also at a processor level.

6 Traceability as a driver for adoption for producer feedback

Traceability has been identified is a key driver in many of the previous industry projects. Much of the state regulatory requirements for identification (e.g. NLIS) are also indirect drivers for adoption of producer feedback.

Traceability has two clearly independent drivers:

- Risk mitigation;
- Product quality and product compliance improvement.

Where product quality and product compliance improvement are the drivers for traceability, then producer feedback is necessary. This is to ensure that the required information for improvement and compliance is given to the producer.

However, this approach only has value if the producer has both the ability and the motivation to take process improvement actions based on the provided information.

Market pressure may be a driver for increased level of traceability. These market driver requirements for traceability are often implemented on a commercial basis by individual organisations to access specific markets. Should the market requirements change or the cost for traceability for market entry be too high the organisation will stop the traceability program. This commercially driven requirement is not an industry wide approach.

7 Model to drive industry adoption

For industry to increase its utilisation of producer feedback a number of factors need to be considered. These factors include:

1. Technology to capture relevant data at processors and deliver that as structured feedback to producers;
2. Commercial drivers for technology adoption by processors to capture and provide feedback to producers;
3. Information standards to ensure compatibility and scalability between different operational environments for processors and the producer utilised systems (e.g. on-farm software, smart phones, etc.);
4. Commercial drivers for producers to utilise feedback.

This review has shown that suitable technology is available for data capture at processors, and for delivery of structured feedback to producers. There have been numerous data capture and feedback demonstration projects and operational programs across small stock processors (E.g. MLA project A.SCT.0017). The levels of detail of data captured at the processor for small stock differ, based on the operational systems in use.

There have been no consistently demonstrated revenue-positive commercial drivers for the adoption of increased data capture and feedback systems by the processors. There are many indirect potential benefits; these have been documented in various industry projects (MLA projects P.PSH.0557 and A.SCT.005).

7.1 Producer feedback information types

There are a number of different types of information that can comprise producer feedback.

The information comes from different locations within the processor and at different points in time.

Where over the hooks trading has occurred, certain feedback as specified by AUS-MEAT applies. Where livestock have been purchased in the paddock by a processor there are no requirements to provide AUS-MEAT feedback. However, there may be other programs in place, such as MSA grading, that still requires feedback to the vendor.

The different types of information related to producer feedback can be summarised as:

- Identification information for the lot such as kill date, establishment number, number of head, lot number, vendor code, NVD number and PIC. There can also be individual identification information, if available, such as body number, tag visual ID number and NLIS / RFID ID;
- Animal welfare – This is a new part of feedback that is recorded at lairage and related to the livestock transport and the condition of the livestock at arrival. This issue of animal welfare feedback is likely to become more important with the increased industry focus on animal welfare;
- Slaughter floor – This relates to the diseases / supply chain contaminations identified, and the measurements (dentition, sex, fat class, weight, etc.) taken on the slaughter floor. This can also include anti-mortem condemns and other anti-mortem observations, as well as condemns and part-condemns on the slaughter floor.
- For beef there can be a number of measurements that can be taken in the chiller. These include AUS-MEAT chiller assessment and MSA grading;
- Compliance to company specification (commonly called grids) and price per kilo, as well as any discounts or penalties.

7.2 Advanced producer feedback industry adoption model

The advanced feedback model (sheepmeat) supports three distinct levels of detail, based on the capacity of the processors. These levels are:

- Level 1 – limited feedback: body number with weight, sex, fat depth, class. Lot summary with culls / condemns, disease reporting, (MSA data where applicable), NVD serial number, PIC and other data where recorded by the processor.
- Level 2 – Skid tracking: body number with weight, sex, fat depth, class, dentition, disease reporting. Lot summary with culls / condemns, (MSA data where applicable), NVD serial number, PIC and other data where recorded by the processor.
- Level 3 – Skid tracking / Live ID recording: body number with weight, sex, fat depth, class, dentition, disease reporting as well as the individual animal ID. Lot summary with culls / condemns, (MSA data where applicable), NVD serial number, PIC and other data where recorded by the processor.

The adoption model follows a pragmatic, scalable approach designed to be compatible with existing processor systems, on-farm software and industry systems.

The heart of the advanced producer feedback model is the use of email as the primary method to communicate electronic feedback to producers. The electronic data would be in a defined standard format from all processors to ensure compatibility. For those producers that do not have email, the concept of advanced feedback is not considered applicable. The advanced feedback is packaged as electronic data files. Not having an email address would indicate that the producer does not have the necessary computer system to utilise the feedback data.

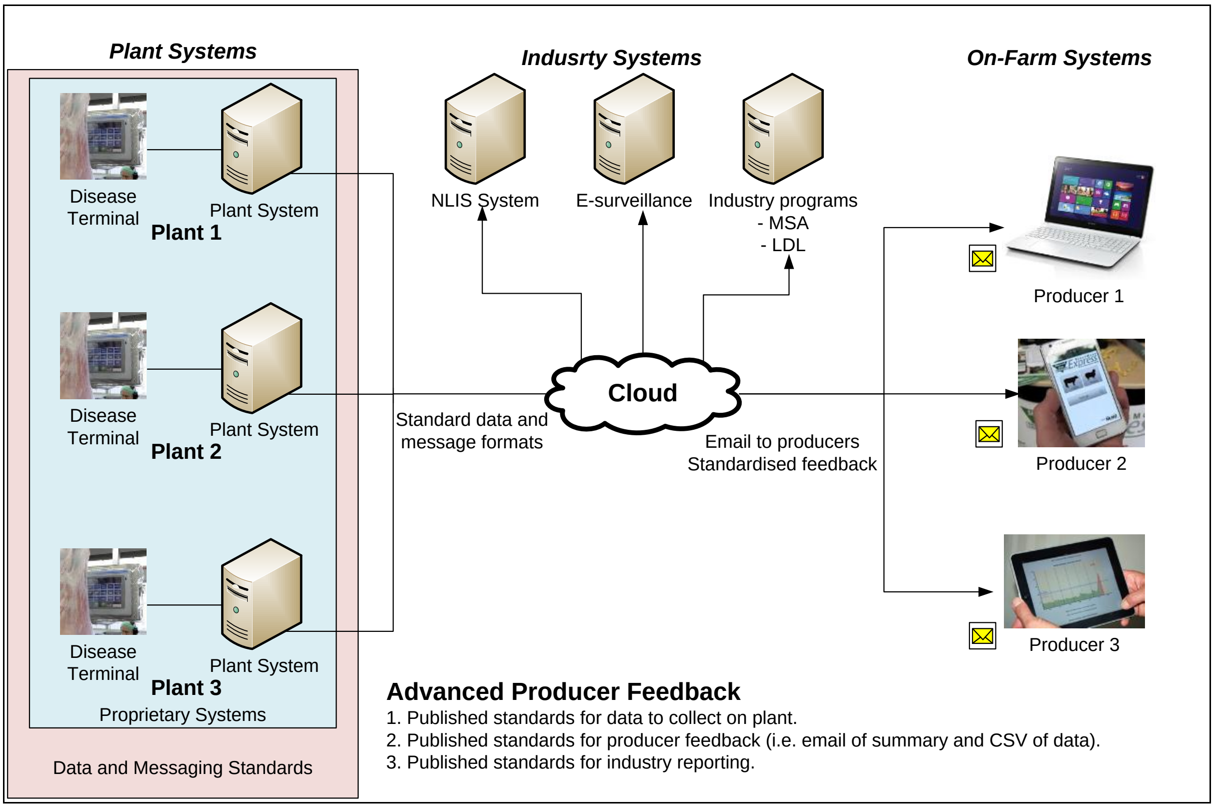
As processors upgrade their respective infrastructure they can move from Level 1 through to Level 3 - the defined standard format for advanced feedback supports all levels.

The proposed advanced feedback (sheepmeat) defined standard format would be a simple file format to allow for easy importation into on-farm software.

The use of email as the method for sending the proposed advanced feedback and the simple file format of the defined standard format would ensure relatively easy integration into existing processor systems.

Working with a few system vendors that have systems in a large number of processors would quickly and efficiently facilitate large scale industry adoption.

This approach is also compatible with the MSA Sheepmeat program and would provide the means for electronic data transfer to MSA for MSA submitted lamb and sheep consignments.



Advanced Producer Feedback Model

Other industry programs could easily utilise the advanced producer feedback (sheepmeat) system. This would, however, require industry approval to obtain access to the data.

Such programs as the National sheep health monitoring project, as well as the MLA LDL program, would greatly benefit from the adoption of the advanced producer feedback (sheepmeat) system.

The steps to implement the advanced producer feedback (sheepmeat) system are:

1. Conduct a demonstration project with some key sheepmeat processors that do MSA lamb processing. These key processors would be shared between two different system vendors (to ensure no perceived MLA bias). The reason for using MSA lamb processing is so the producers are readily known and accessible through the MSA program;

2. Work with an industry program such as the “National sheep health monitoring project” to provide disease data from the processors. This would be a demonstration of the value to the broader industry in such areas as disease monitoring for export compliance;

3. Publish the results of the demonstration project to industry.

4. Publish the advanced feedback (sheepmeat) methodology, including the defined standard format, through the AMILSC as part of the AUS-MEAT over-the-hooks trading guideline.

Once two or more system vendors and a number of processors have the advanced producer feedback (sheepmeat) system in place as a result of the demonstration projects and utilisation by MSA, the rest of industry will rapidly follow.

The timeframe for a demonstration project would be 6 to 12 months with the published results available to industry within that timeframe.

This proposed model is specific information independent. What this means is that as different producer feedback measurements are developed by industry (such as a seed score system) this type of new measurement can be readily added to the advanced feedback system.

Glossary and acronyms

AHA	Animal Health Australia
AMIC	Australian Meat Industry Council
AMPC	Australian Meat Processor Corporation
ANZFRMC	Australia and New Zealand Food Regulation Ministerial Council
AQIS	Australian Quarantine and Inspection Service
Bar code	A printed pattern of parallel lines or bars containing encoded information
BCA	Benefit Cost Analysis
CFB	Carcase feedback (data or file)
EPC	Electronic Product Code. A standard format for a 96-bit code that was developed by the Auto-ID Centre, and refined by EPCglobal. It is designed to enable identification of products down to the unique item level. EPC's have memory allocated for the product manufacturer, product category and the individual item. The benefit of EPC's over traditional bar codes is their ability to be read without line of sight and their ability to track down to the individual item versus at the SKU level.
GS1 Australia	GS1 is a leading global organisation dedicated to the design and implementation of global standards and solutions to improve the efficiency and visibility of supply and demand chains, globally and across sectors. The GS1 System has four key product areas: Bar codes (used to automatically identify things), eCom (electronic business messaging allowing automatic electronic transmission of data), GDSN (Global Data Synchronisation Network which allows partners to have consistent item data in their systems at the same time) and EPCglobal (which uses RFID technology to immediately track an item). The GS1 system of standards is the most widely used supply chain standards system in the world.
HACCP	Hazard Analysis Critical Control Point
Interrogator	an RFID reader
LDL	Livestock Data Link
MLA	Meat & Livestock Australia
NLIS	National Livestock Identification System
NSHMP	National Sheep Health Monitoring Program
NVD	National Vendor Declaration
Over-the-Hooks	Where sheep and farmed goats are sent directly to an abattoir and paid for on a weight and grade basis, post-slaughter
PIC	Property Identification Code. The eight-character alphanumeric code allocated by the relevant State or Territory authority to identify a specific property.
Processor	A person, organisation or company actively engaged in the slaughter of livestock.
Producer	A person, organisation or company actively engaged in raising livestock (including fibre, meat and dairy animals).

RFID	Radio Frequency Identification Device. A method of identifying items uniquely using radio waves. Radio waves do not require line of sight and can pass through materials like cardboard and plastic but not metals and some liquids.
SAFEMEAT	Safe Meat (Australia's Meat Safety System)
SCA	Sheepmeat Council of Australia
Vendor	A person, organisation or company selling an animal

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