Final report

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RFID Traceability of Lamb Carcase from Slaughter to Boning

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Executive Summary

The participant processor is seeking to permanently introduce a radio-frequency identification (RFID) traceability system at its processing plants in Victoria. A RFID system will allow the tracking of a livestock unit from knocking through to the boning room. Currently one of the participants processing sites has installed a single RFID traceability system (**Stage 1**) that tracks a livestock unit from knocking through to the retain rail when its hot carcase weight is collected. This document identifies the value opportunity identified through the installation of a single RFID traceability system (being stage 1) and proposed installation of multiple RFID traceability systems (stage 2) that tracks livestock from knocking to the boning room.

The traceability of lamb carcases from knocking to the boning room allows processors to collect detailed information on each individual carcase and provides an opportunity for the processors to feedback the detailed information to producers.

Methodology

The methodology for the cost benefit analysis was to assess multiple scenarios including the two stages of development as detailed below, compared back to the no traceability baseline:

1. Traceability of carcases from knocking to chilling.
2. Tracking of carcases into the boning room.

The main value propositions for the installation of a lamb traceability system is to increase the feedback to producers and subsequently increase the quality of carcases and offal. The following are the main benefits that the processor could achieve:

- Reduction in work cover premiums.
- Increase in labour productivity.
- Increase lean meat yield (LMY) of carcases.
- Increase offal yields.

It should be noted that in order to achieve these benefits, the following enablers are assumed:

- A DEXA LMY measurement system. The cost of this has been excluded, as it is assumed that this is part of a lamb primal cutter system.
- Value based marketing, whereby LMY measurements are incorporated as price signals to producers.

Results

The ex-ante net benefit of the stage 1 traceability system is estimated at a negative value of -$0.08 per head if current throughput is maintained. This would result in a negative payback period and no financial benefit, however this system is an enabling factor for many larger opportunities. The ex-ante net benefit of the stage 2 traceability system is estimated at $0.38 per head if current throughput is maintained. This would deliver an estimated return on investment of 0.45 years and a net present value of $5,577,928. The primary benefits to the processor are increased LMY value of $0.29 per head and increased labour productivity with

value of $0.12 per head (consistent throughput with reduced labour costs). A further $0.30 per head benefit accrues to the producer from increased LMY.

In addition to the carcase feedback system of both the existing stage 1 traceability system and proposed stage 2 traceability system, they also provide a more robust system for monitoring animal movements for disease traceability.

Contents

Glossary

Term	Description
CBA	Cost Benefit Analysis
CCW	Cold Carcase Weight
DEXA	Dual-energy x-ray absorptiometry
HCW	Hot Carcase weight
LMY	Lean Meat Yield
RFID	Radio-frequency identification
WH&S	Workplace Health & Safety

1 Introduction

The participant processor is seeking to permanently introduce a radio-frequency identification (RFID) traceability system at its processing plants. A RFID system will allow the tracking of a livestock unit from knocking through to the boning room. Currently the plant installed a single RFID traceability system (Stage 1) that tracks a livestock unit from knocking through to the retain rail when its hot carcase weight (HCW) is collected. Installation of this system (Stage 1) enabled some traceability trials and provision of processing data to producers both at an individual animal ID level and mob level. This document identifies the value opportunity identified through the installation of a single RFID traceability system and the proposed installation of multiple RFID traceability systems versus a baseline of no tracking system.

2 Objectives

The objective is to perform a cost benefit analysis of the proposed traceability system for in plant tracking versus a baseline with no tracking system. Specifically the project intends to:

1. Conduct a cost benefit analysis to quantify potential benefits and savings.
2. Identify and quantify a range of additional benefits at a broader level along the supply chain.
3. Review the relative benefits between a mob based and individual animal based identification system in relation to the cost/benefits.

3 Technology Description

A radio-frequency identification system is a wireless communication technology that transfers information between tagged objects and readers. It allows automatic recognition and the unique identification of every object and is a solution for individual traceability where desired. The traceability system (Stage 1) was installed at the participant plant to track the progression of carcases through the slaughter floor. This allows all components of the animal (excluding skins) to be tracked and recorded. The following details the progressive points on the slaughter floor where the carcases are monitored using the RFID software in its current status:

1. Live weight recorded per animal prior to the knocking box.
2. Animals are knocked and traced through the dirty section of the slaughter floor on steel gambles.
3. Once the skin has been removed the carcase numbers are linked to the RFID (grey and purple section of gambles in Figure 1).
4. The offal is then removed and carcases and offal are tracked down the chain, offal defects are entered via touch screen.
5. Retained carcases are scanned when exiting the retain rail, with photos of any defects taken to be provided back to producers.
6. The RFID is scanned when the HCW is collected when the carcase tags are attached.

Figure 1: Carcase gambles used for system, (left) Wedge transponder, (Right) Glass transponder.

The above process is the current system installed, however it is only the first stage of the installation, with an additional RFID scanner proposed to be installed during future developments, hereon referred to as Stage 2. Stage 2 would require the installation of an additional RFID scanner in the participants boning rooms. This would allow the following additional data to be collected:

- Cold carcase weight (CCW).
- Lean meat yield (LMY) through adapting the X-ray scanner to a dual-energy x-ray absorptiometry (DEXA) panel, the panels are already installed as part of automation systems that are currently in use.

4 Methodology

The traceability of lamb carcases from knocking to the boning room allows processors to collect detailed information on each individual carcase and provides an opportunity for the processors to feedback the detailed information to producers. The calculations and costs/benefits are based on a value based marketing approach. The methodology for the cost benefit analysis was to assess multiple scenarios including the two stages of development detailed below:

1. Traceability of carcases from knocking to chilling.
2. Traceability of carcases into the boning room.

The potential benefits of this project are short-term and long-term benefits and are discussed in detail below.

Short-term benefits:

- Labour Savings.
- Throughput efficiencies.
- Reduction in workplace health and safety (WH&S) costs.

Longer-term benefits:

- Reduction in retained carcases.
- Reduction in offal rejections.
- Increased LMY.

The methodology for quantifying the value of the benefits are detailed below.

It should be noted that in order to achieve these benefits, the following enablers are assumed:

- A DEXA LMY measurement system. The cost of this system has been excluded, as it is assumed that this is part of a lamb primal cutter system.
- Value based marketing, whereby LMY measurement are incorporated as price signals to producers.

4.1 Retained Carcases

Carcases which are identified as having contamination and defects are removed from the main rail for trimming as required. These carcases are then trimmed to remove issues prior to having the HCW recorded, resulting in a lost weight for the producer and loss opportunity for the processor. Through identifying the defects of any carcases or part carcases condemned, producers can then work to overcome these problems. The benefits of identifying individual carcases which are retained are as follows:

Processor

- Decreases lost weight of carcases resulting from defects.
- Increases saleable meat through reducing losses.
- Reduced losses when live weight purchased animals are condemned.

Producer

- Increases carcase weight.
- Increases income per head.

These benefits will be affected by the percentages of carcases purchased over the hook and on a live weight basis.

4.2 Offal Rejections

The collection of offal from lamb and mutton carcases contributes to the total value of the carcase, however it is impacted due to defected offal being condemned. Defected offal results in loss of revenue for processors as a result of specific diseases rendering them unfit for human consumption. In circumstances where animals are purchased through a service kill or direct from the producer the potential revenue for offal sales is in addition to carcase sales, therefore the impact of offal rejections results in a lost opportunity to the processor.

The installation of the carcase tracking system allows producers to be provided with feedback on diseases detected in carcases, which would also be decreasing the profits of the producer as well. The following details the method used to calculate the cost to producers and processors of lost production.

Processors

- Percentage of offal collected compared to total collectable offal.
- Value of offal per carcase.
- Cost associated with condemned offal.

Producer

- Cost of lost production resulting from sub-clinical diseases.
- Cost of treatments.
- Expected benefits resulting from decreased disease levels in production systems.
- These costs have been obtained from the report by Lane et al (2015).

The factors which have been included in the calculations which could alter the result obtained are as follows:

1. The benefits will not be realised immediately as it will take time for producers to modify their treatment protocols to decrease the occurrences of sub-clinical disease in their herds.
2. The benefit has only been associated with the proportion of livestock purchased over the hook.

4.3 Lean Meat Yield

The value opportunity for LMY has been conducted using data from the project by Greenleaf Enterprises (2010) about the potential value of individual carcase identification. This project used the percentage estimation increase of LMY by 0.41% per annum and calculated the estimated benefit per carcase over 5 years. The LMY percentage used was extrapolated specifically for study sites utilising existing plant infrastructure. The following are the main drivers which will affect the distribution of benefits between the producer and processor:

Producer

- Producer bonus for specific LMY.
- Carcase weight of animals produced.

Processor

- Increased LMY.
- Variation in carcase weight.
- $/kg of LMY.

4.4 Operating and WH&S Costs

The operational and WH&S data collected was as follows:

- Staffing levels per shift.
- Cost per hour for staff.
- WH&S claim costs over the last 10 years.
- Power costs.
- Maintenance costs.
- Consumable costs associated with printing tags.

These costs have been used to identify the current average operating costs and calculate the subsequent average operating costs after the installation of a stage 1 and stage 2 RFID traceability system.

4.5 Fixed Model Drivers

To establish the dollar value per head of each of the costs and benefits, the following production numbers were used (refer *Table 1*). This table summarises the estimated performance for the manual operation as a base line and the ability of the automated system when compared to the manual process. Both of these scenarios are detailed further in sections 4.5.1, 4.5.2.

Table 1: Calculation used for determining production volume base line

Operation speeds			
	Manual	Traceability System - Stage 1	Traceability System - Stage 2
Carcases / min	9.00	9.00	9.00
Carcases / Statn./hr	540	540	540
Carcases / day	8640	8640	8640
Annual days	240	240	240
Annual # of hd	2,073,600	2,073,600	2,073,600

4.5.1 Manual Process

The manual tracking process limited the ability to track individual carcases. This system only allowed for group tracking (mob) of carcases without the ability to record and provide feedback on offal defects.

4.5.2 Traceability System – Stage 1

The stage 1 process has been installed to allow for individual carcase tracking from knocking to the end of the slaughter floor. It allows for traceability of carcases and offal defects to be supplied as feedback to producers.

4.5.3 Traceability System – Stage 2

The stage 2 installation involves the introduction of RDIF scanners prior to entering the boning room. This would then enable feedback to producers on the LMY of carcases processed as well as offal defects and therefore is likely to provide longer term benefits to the industry.

5 Results and Discussion

The main value propositions for the installation of a lamb traceability system is to increase the feedback to producers and subsequently increase quality of carcases and offal. The following are the main benefits that the processor could achieve:

- Reduction in work cover premiums.
- Increase in labour productivity.
- Increase LMY of carcases.
- Increase offal yields.

The cost savings and benefits are discussed in more detail below.

5.1 Labour Savings (Reduced Staff)

Labour savings provide benefits in two areas as a direct result of the stage 2 traceability system:

- Reduction in staff numbers.
- Reduction in cost of labour per kilogram processed (includes decreased number of staff BUT maintained throughput).

5.1.1 Reduction in staff numbers

Table 2 shows the number of staff required in each position of the boning and packing rooms per day for the manual process, stage 1 traceability system and stage 2 traceability system. With the proposed stage 2 traceability system, two FTE staff members are saved whilst maintaining the current throughput.

The potential labour savings is estimated to be $0.12 per head based on reducing FTE employees by two people and maintaining throughput efficiency. Depending on the specifics of the plant including their throughput, the actual labour savings could vary from $0.00 (stage 1) to $0.12 (stage 2) per head.

Table 2: Labour requirements for boning and slaughter floors.

Labour Savings per day			
	Number labour units required per day		
Task	Manual	Traceability System - Stage 1	Traceability System - Stage 2
Slaughter floor	55	55	54
Chillers	5	5	5
Boning Room	60	60	59
	0	0	0
Total FTE's required	120	120	118
Total FTE's saved		-	2
Saving per head		$0.00	$0.12

The labour costs associated with the labour saving shown in Table 2 can be seen in Table 3, below.

Table 3: Manning of processing room.

Increased throughput through the room			Manual	Traceability System - Stage 1	Traceability System - Stage 2
Average daily hd			8640	8640	8640
Hd/annum			2,073,600	2,073,600	2,073,600
Average kg			22	22	22
Total Kg boned per day			190,080	190,080	190,080
Boning room cost / hour			$3,823	$3,823	$3,823
Boning room cost / day			$61,160	$61,160	$61,160
Labour cost \ per kg to bone			$0.32	$0.32	0.321761364
Labour cost \ per hd to bone			$7.08	$7.08	$7.08
Labour productivity savings/ head			**$0.00**	**$0.00**	**$0.00**
Task	**Rate / hour**	**WW Loading** 35.00%	**Number labour units per shift - Manual Process (Note - this is gross of labour savings - based on No. of Head above)**		
Slaughter floor	$23.10	$31.19	55	55	55
Chillers	$35.00	$47.25	5	5	5
Boning Room	$23.10	$31.19	60	60	60
		$0.00			
Total FTE's required			120.0	120.0	120.0

5.1.1 Increased Productivity

There has been no increase in productivity product (average daily head) associated with the installation of stage 1 or stage 2 of the traceability system.

5.2 Value of Increased Lean Meat Yield

RFID technology is an enabling technology and depending on the systems/infrastructure currently utilised by a processing plant, the RFID technology can enable increased potential from existing infrastructure. At the plant, installing the stage 2 traceability system enables the potential of the already installed DEXA panel to be realised by enabling individual animal feedback to the producer which would result in an increased LMY.

The potential value from increased LMY from the stage 2 traceability system is significant for both the processor and producer. Providing feedback to producers on LMY% on a mob level basis would allow for a higher level of meat recovery per carcases and guide genetic selection of carcases for increased yields. However, if the producer has the capability to receive individual animal basis, the values detailed below could further improve.

Additionally, the stage 2 traceability system allows for direct feedback to the producer on either an individual animal or mob basis allowing for selection of particular traits which could achieve an average annual improvement of value of 0.41% over five years providing an average benefit of $5.4 million to industry (Greenleaf Enterprises, 2010). The average annual improvement percentage is calculated based on costs from diseases and a conservative uptake of feedback from producers. The potential benefit can only be realised if the producer utilises the feedback provided by the processing plant, with potential significant benefits for the producer and processor.

Table 4: Red Meat Yield benefits through increasing value for lambs with a higher LMY (Greenleaf Enterprises, 2010).

Excerpt from Sheep Value Chain Study			
Annual Production			18,000,000
Average value of LMY/kg (Sep 07 to April 08)			$ 8.31
Hot Carcase weight			22
		Processor	**Producer**
Allocation of Net Benefit		60%	40%
Lean Yield Improvement (LMY R2 = 0.45)		$AUD	$AUD
Year 1	0.00%	$ -	$ -
Year 2	0.30%	$ 5,923,368	$ 3,948,912
Year 3	0.45%	$ 8,885,052	$ 5,923,368
Year 4	0.60%	$ 11,846,736	$ 7,897,824
Year 5	0.70%	$ 13,821,192	$ 9,214,128
Total Improvement	2.05%	$ 40,476,348	$ 26,984,232
Average Annual improvement over 5 years	0.41%	$ 8,095,270	$ 5,396,846
Annual Improvement / hd		$ 0.45	$ 0.30
Total Annual Improvement per hd			$ 0.75
Lamb processing further than bone in primal (This indicates how much of the yield increase will result in realisable)		65%	100%
Realisable Value of increased yield / head /pa		$ 0.29	$ 0.30
Realisable Annual Value to Industry			**$ 10,658,772**
Premium Payable			
Allocation of Net Yield Benefit		**Processor**	**Producer**
Realisable value of increased yield (TOTAL Flock)		**$ 0.29**	**$ 0.30**
Percentage of Livestock Supply Receiving Premium		15%	
Breakeven increase payable (Annual/Carcase)		$ 1.95	$ 2.00
Breakeven increase payable (Annual/Kg)		$ 0.089	$ 0.091

5.3 Reduced offal rejections

The stage 2 traceability system will reduce offal rejections, however the value to be realised by the processor is minimal with no value to be realised by the producer. The stage 2 traceability system allows for direct feedback to the producer on an individual animal basis allowing for remedial management of diseases which could achieve an average annual improvement value of 0.41% of condemned offal over five years. This is based on liver fluke only, the potential value could be higher when considering all offal from the carcase. The average annual improvement percentage is calculated based on costs from diseases and a conservative uptake of feedback from producers. There is no value to be realised by the producer from reduced offal rejection, however it is plausible that processes will value stock that have a lower track record of condemned offal which will be tracked. The annual improvement averaged over five years is 0.41% which equates to $42,941 based on current data for the plant.

Table 5: Offal rejections benefit resulting from decrease in offal being condemned (Data obtained from: (Lane et al, 2015; Sentance, 2011).

Offal rejection benefits			
Annual Production			18,000,000
Hot Carcase weight			22.00
Percentage of carcases Liver			
Average offal % of carcase	2.24%		
Live offal per sheep (kg)	0.49		
Assumptions		Processor	Producer
Lost income from Condemned liver		$ 0.02	
Production cost			$ 7.08
Total cost to production			$ 0.57
		Processor	**Producer**
Offal Condemnation	Decrease in liver condemnations	$AUD	$AUD
Year 1	0.00%	$ -	$ -
Year 2	0.30%	$ 835	$ 30,586
Year 3	0.45%	$ 1,252	$ 45,878
Year 4	0.60%	$ 1,669	$ 61,171
Year 5	0.70%	$ 1,947	$ 71,366
Total Improvement	2.05%	$ 5,703	$ 209,002
Average Annual improvement over 5 years	0.41%	$ 1,141	$ 41,800
Annual Improvement / hd		$ 0.000	$ 0.002
Realisable Annual Value to Industry			**$ 42,941**

5.4 WH&S

The main WH&S benefits from the stage 2 traceability system are reduced WH&S premiums. This reduction in premiums has been included in the labour savings (see Table 2).

5.5 Operational Costs

Table 6 shows the total cost of the equipment Including both capital and operational costs. Real costs will be site specific to every application particularly installation costs. The Stage 2 system has an increased capital cost to that of the Stage 1 , however the additional equipment would enable a reduction in the operation costs due to a reduced reliance on carcase tags being used for company boned lambs. However this will only be possible if the RFID system becomes more robust and operate without issue.

Table 6: Estimated capital and operating costs of traceability system

Capital Cost	Manual		Traceability System - Stage 1		Traceability System - Stage 2	
	Cost	Life span	Cost	Life span	Cost	Life span
Capital Cost of the Equipment			$350,000	10	$350,000	10
Capital Cost for Stage 2				10	$15,000	10
Other Capital install				10		10
Total			**$350,000**		**$365,000**	
Service maintenance	Manual		Traceability System - Stage		Traceability System - Stage	
	Units	Cost	Units	Cost	Units	Cost
Estimated - COSTS						
Electricity		$0.22 /KWH		$0.22 /KWH	6.00 KW	$0.22 /KWH
Maintenance labour (Daily)		$103,680 /Yr		$116,680 /Yr		$13,000 /Yr
Maintenance labour (Preventative)		$0 /Yr		$8,250 /Yr		$8,250 /Yr
Maintenance labour (Breakdown)		$0 /Yr		$0 /Yr		$0 /Yr
Maintenance labour (Training)		$0 /Yr		$0 /Yr		$0 /Yr
Operational		**$103,680**		**$124,930**		**$26,319**
Maintenance		**$0**		**$0**		**$0**
Annual Sub Total (excluding major overhaul costs)		**$103,680**		**$124,930**		**$26,319**
Combined Total: (cap ex + operating)						
Total Annual Estimated Expenses	Hours	Cost	Hours	Cost	Hours	Cost
Expected downtime hours per year	0	0.00 /Yr	0	0.00 /Yr	0	0.00 /Yr

	Manual		Traceability System - Stage		Traceability System - Stage	
Detailed maintenance activities	Cost	Period	Cost	Period	Cost	Period
Replacements Gambals			$ 13,000	Yearly	$ 13,000	Yearly
General repairs			$ 8,250	Yearly	$ 8,250	Yearly
Carcase Tags	$ 103,680	Yearly	$ 103,680	Yearly		

5.5.1 Capital Costs

Equipment purchase price is based on prices supplied by the manufacturer. Installation costs will be site specific, and will depend largely on the footprint available within the existing plant. Infrastructure upgrades may be required at some plants and an allowance has been provided in the model for site specific numbers to be included. The capital cost per head processed will reduce as the total annual number of head processed increases.

5.5.2 Maintenance and Service Costs

Maintenance and service costs are also supplied by the equipment manufacturer. Maintenance costs are additional running costs that the plant will incur with the installation of the equipment and include components such as parts and labour. The service contract covers ongoing service and maintenance of the system. The assumption is made that these costs will be a “per head cost” and for this reason no reduction in these costs is seen with increasing production.

5.5.3 Risk of Down Time

To estimate the cost of down time for an average installation, an allowance is made for one occurrence per week where the stoppages associated with the equipment would cause the entire room to be at a standstill for 15 minutes. The same labour cost used for calculating increases in labour efficiency (Table 6) is used to calculate the cost of down time. The amount of weekly down time is an adjustable figure found on the “Costs” sheet of the model.

5.6 Cost Benefit Analysis

5.6.1 Summary of Performance Measures

The source of benefits all come from increased LMY and labour savings. The summary results in *Table 7* demonstrate the performance of the ex-ante at the current throughput with the improved LMY and reduced labour costs that can be realised from the stage 2 traceability system. The net benefit of the stage 2 traceability system is estimated at $0.38 per head if current throughput is maintained. This would deliver an estimated return on investment of 0.45 years and a net present value of $5,577,321. The benefit of the stage 1 traceability is negative and therefore offers no economic benefit. Installation of the stage 1 traceability system has a negative net present value compared to the baseline of no tracking system, however it is an enabling technology.

Table 7: Summary of benefits.

SUMMARY PERFORMANCE MEASURES		
	Traceability System - Stage 1	Traceability System - Stage 2
Hd / annum	2,073,600	2,073,600
Production increase with equipment	0.00%	1.69%
	Avg.	Avg.
Capital cost (pmt option, upfront)	$350,000	$365,000
Gross return Per head	$0.00	$0.41
Total costs Per head	$0.08	$0.03
Net Benefit Per head	($0.08)	$0.38
Annual Net Benefit for the plant	-$ 159,799	$ 783,321
Annual Net Benefit for the ex cap	-$ 124,799	$ 819,821
Pay back (years)	-2.80	0.45
Net Present Value of investment	($349,077)	$5,577,928

5.6.2 Breakdown Benefit Drivers

The main benefits of the stage 2 traceability system are increased value from improved LMY and increased labour productivity as a result of reduced labour whilst maintaining throughput. The contribution of each individual benefit is summarised in *Figure 2* and *Table 8*.

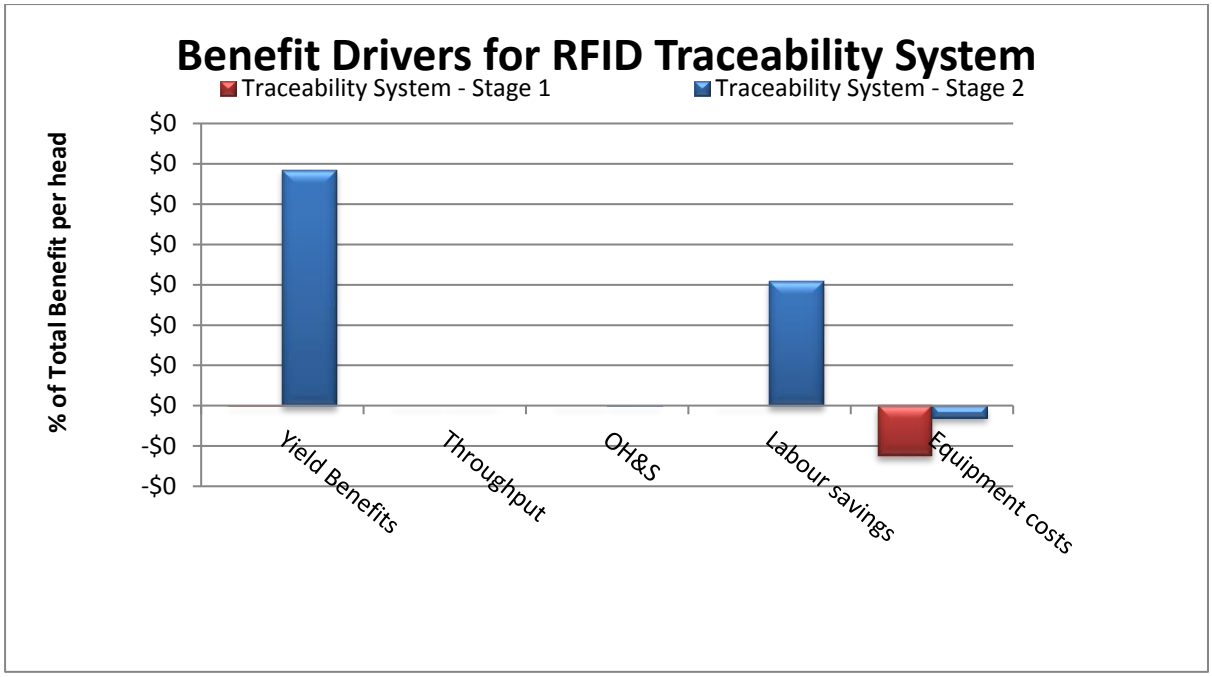

Figure 2: Summary of benefits expected to be delivered from the installation of the traceability system

Table 8: Breakdown of benefits and costs by area expected as a result of the installation of the system.

Benefit Drivers for System		
	Traceability System - Stage 1	Traceability System - Stage 2
	$/ hd	$/ hd
Processing	-$0.06	$0.10
Product value	$0.00	$0.29
	-$0.06	**$0.40**
Yield Benefits	$0.00	$0.29
Throughput	$0.00	$0.00
OH&S	$0.00	$0.00
Labour savings	$0.00	$0.12
Equipment costs	-$0.06	-$0.01
	-$0.06	**$0.40**

5.6.3 Summary Performance Measures

Increases in labour productivity have been observed with similar types of machines in other processing plants. The expected increase in labour productivity is summarised in *Table 9*. The first scenario assumes no room modifications and reflects the increase in throughput by having a consistent flow through the room. The likely increase will be around 1.69% in the second scenario which is due to the reduction in labour requirements whilst maintaining throughput.

Table 9: Summary of benefits for the installation of the traceability system.

SUMMARY PERFORMANCE MEASURES		
	Traceability System - Stage 1	Traceability System - Stage 2
Hd / annum	2,073,600	2,073,600
Production increase with equipment	0.00%	1.69%

A summary of the range in costs and benefits for each scenario are included in *Table 10* below.

Table 10: Ex-ante costs and benefits breakdown for the current throughput and increased throughput.

COST - BENEFIT ANALYSIS OF SYSTEM		
	Traceability System - Stage 1	Traceability System - Stage 2
Benefit summary	$/hd Avg.	$/hd Avg.
$ Accuracy Benefit per head	$0.00	$0.29
$ Technique Benefit per head	$0.00	$0.00
$ Labour Benefit per head	$0.00	$0.12
$ Overall Benefit per head	**$0.00**	**$0.41**
** Cost is reported as the inaccuracy from target specification OR as the difference between Manual vs. Auto costs*		
COST ASSOCIATED WITH OPERATING SYSTEM		
	$/hd	$/hd
Capital cost	$0.02	$0.02
Maintenance	$0.00	$0.00
Operation	$0.06	$0.01
Risk of mechanical failure	$0.00	$0.00
Total cost per head	$0.08	$0.03
Total cost per head (EX CAP)	$0.06	$0.01

5.6.4 Total Net Benefit

Table 11 shows the range in value associated with each cost of processing. The cost is calculated as any loss from the maximum potential benefit. Presenting the figures this way in the detailed section of the model demonstrates the total costs involved and highlights areas where future savings could be generated.

Table 11: Summary results of individual savings associated with lamb traceability.

TOTAL BENEFIT			
		Traceability System - Stage 1	**Traceability System - Stage 2**
Benefit summary		$/hd From	$/hd From
1. Value opportunity	Boning Optimisation	$0.00	$0.00
	Lean Meat Yield Increases	$0.00	$0.29
	Offal Production Increase	$0.00	$0.00
2. Throughput benefit		$0.00	$0.00
3. OH&S benefit		$0.00	$0.00
4. Labour benefit		$0.00	$0.12
Equipment costs	**Maintenance**	$0.00	$0.00
	Operation	-$0.06	-$0.01
	Risk of failure	$0.00	$0.00
	$ Benefit per head	**-$0.06**	**$0.40**
$ Annual Benefit overall plant		**-$124,799**	**$819,821**

5.6.5 Comparative Costs Breakdown

Figure 3 shows the difference in cost between the systems. Thickness of the box in the graph represents the upper and lower variation in value based on performance variation captured in the data.

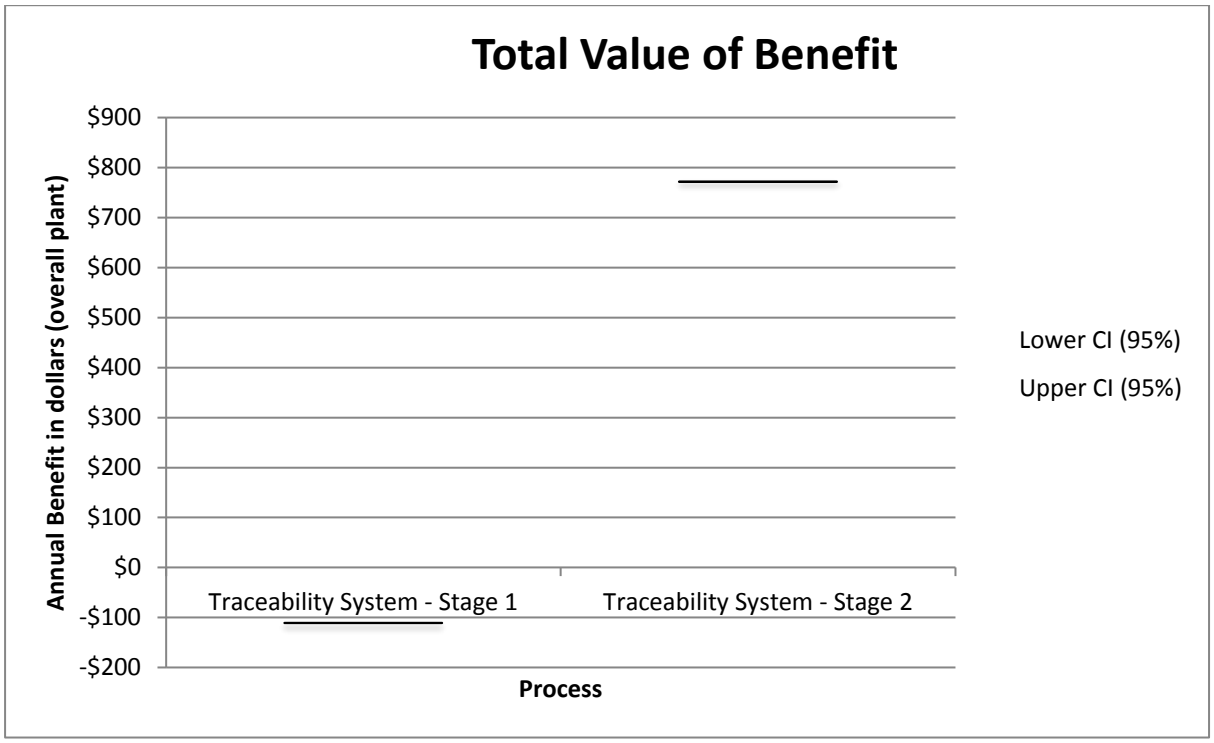

Figure 3: Graphical representation of losses captured in Table 11 showing value of the benefit expected through using the automated systems.

6 Key Findings

The installation of the current stage 1 traceability system has a negative payback period, however it is an enabling factor for many larger opportunities. Opportunities include disease and parasite traceability and enable the industry to increase production. Installation of the stage 2 traceability system has a positive and short-term payback period with benefits for both the processor and producer. The stage 2 traceability system advances the ability to track carcases throughout the slaughter floor and boning room which has many opportunities that benefit industry, including enhancing the feedback of carcases measurements on an individual carcase level and mob base level. The primary benefits are increased lean meat yield and increased labour productivity (consistent throughput with reduced labour).

The ex-ante net benefit of the stage 1 traceability system is estimated at a negative value of -$0.08 per head if current throughput is maintained. This would result in a negative payback period and no financial benefit. The ex-ante net benefit of the stage 2 traceability system is estimated at $0.38 per head if current throughput is maintained. This would deliver an estimated return on investment of 0.45 years and a net present value of $5,577,928. The primary benefits to the processor are increased lean meat yield $0.29 per head and increased labour productivity of $0.12 per head (consistent throughput with reduced labour costs). A further $0.30 per head benefit accrues to the producer from increased lean meat yield.

In addition to the carcase feedback system of both the existing stage 1 traceability system and proposed stage 2 traceability system, they also provide a more robust system for monitoring animal movements for disease traceability.

7 Appendix

7.1 List of Tables

7.2 List of Figures

8 References

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