LiveCorp Submission

Review of Australian Standards for the Export of Livestock (ASEL) – Stage 1

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LIVECORP

THE AUSTRALIAN LIVESTOCK EXPORT CORPORATION

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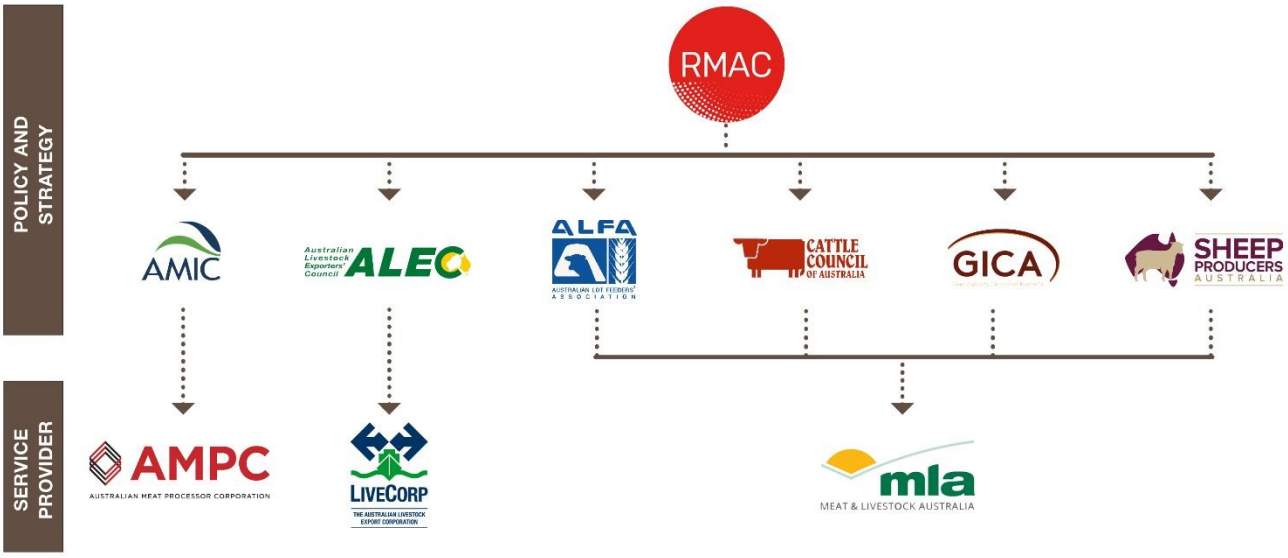
LiveCorp and its activities

The Australian Livestock Export Corporation Limited (LiveCorp) is a not-for-profit industry body funded through statutory levies collected on the live export of sheep, goats and beef cattle, and a voluntary levy collected on live dairy cattle exports. LiveCorp is one of the 15 Australian rural Research and Development Corporations (RDCs).

LiveCorp is the only RDC focused solely on the livestock export industry and it works hard to achieve the right kind of change for industry by supporting exporters with their compliance and animal welfare requirements. LiveCorp delivers this by investing in research, development and extension (RD&E) and provide technical and marketing services and support to enhance the productivity, sustainability and competitiveness of the livestock export industry. LiveCorp works across several program areas, often in close consultation with other industry stakeholders including the Australian Government, to continuously improve animal welfare, regulation, market access and supply chain efficiency. LiveCorp does not engage in agri-political activity.

LiveCorp works in partnership with other RDCs, industry bodies and research providers to achieve strategic outcomes for the industry and leverage higher returns for investments that demonstrate value for money for livestock exporters. In recognition of the benefit of livestock exports to businesses throughout the entire supply chain, including producers, much of LiveCorp's investment occurs in partnership with Meat and Livestock Australia (MLA), through the joint Livestock Export Program (LEP). The partnership with MLA to deliver the LEP is widely recognised as the most efficient mechanism for delivering RD&E and in-market technical support.



Australian Standards for the Export of Livestock (ASEL)

ASEL is a vital document that has played a key role in ensuring good animal welfare outcomes during the preparation and transport of livestock during livestock export. Ensuring that it continues to be up to date, fit for purpose and based on scientific research is essential to support continued improvements in animal welfare outcomes and enabling the continued sustainability, profitability and global competitiveness of the trade.

It is also important to recognise that ASEL is not the only driver of animal welfare, and individual exporters and others in the supply chain have made significant improvements. This includes investments in infrastructure (e.g. vessels, registered premises), adoption of innovation and technology, record keeping and analysis, implementation of research and more. Other factors have also been important – including changes to the types of livestock exported (e.g. in response to shifts in the wool flock or overseas customers preferences), associated

regulations (e.g. Marine Order 43) and the introduction of improved regulatory approaches (particularly Approved Arrangements).

As a result, mortality rates have shown a progressive decrease over the past 20 years – as shown in the graphs below (Figures 1, 2 and 3).

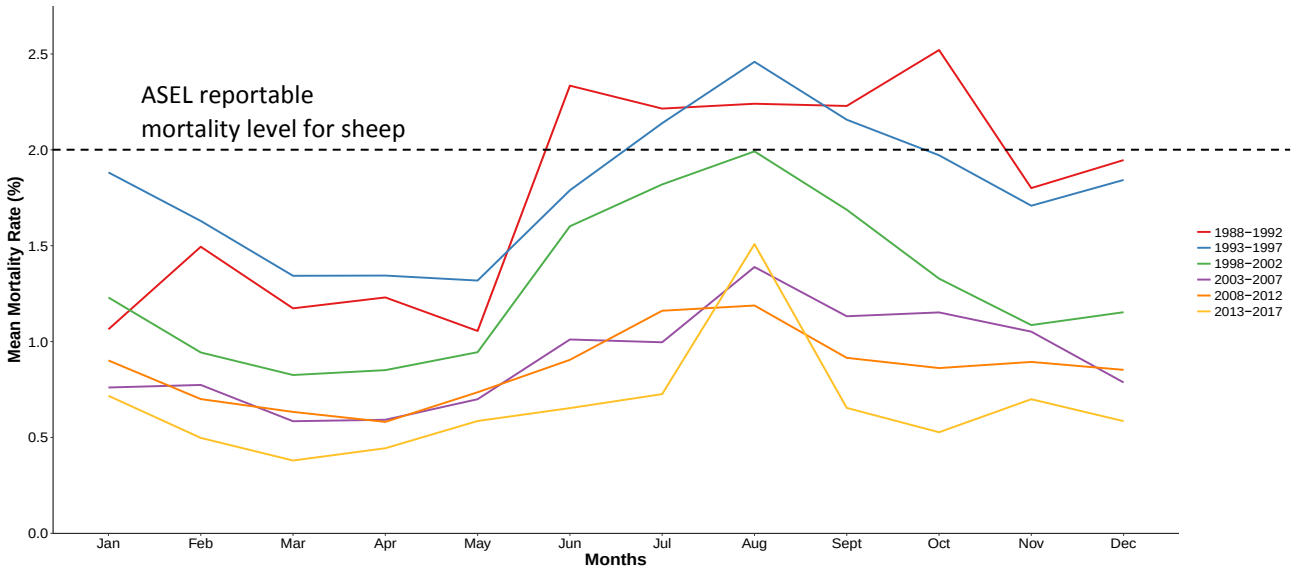


Figure 1. Performance of sheep exports by period (1995-2017)

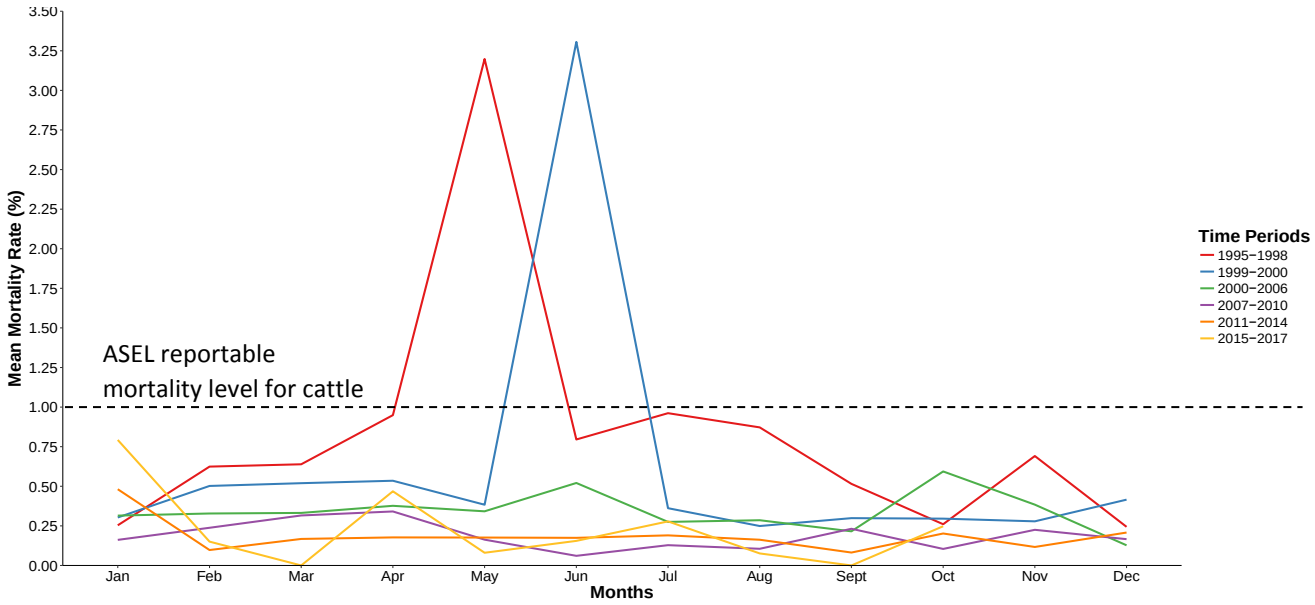


Figure 2. Performance of cattle exports by period (1995-2017)

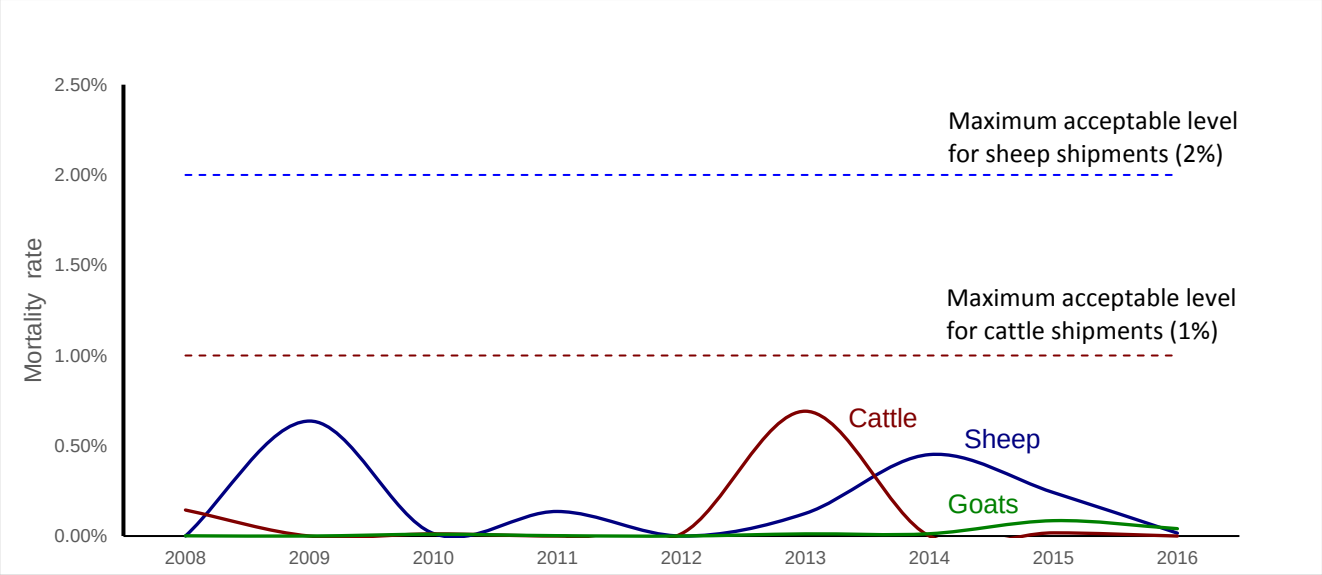


Figure 3. Livestock mortality by air transport 2008 – 2016.

Export Standards for Australian Livestock

LiveCorp would like to acknowledge the significant work undertaken by the Department of Agriculture and Water Resources (the department) to improve the format and structure of the new Export Standards for Australian Livestock (ESAL). The new outcomes focused format targets the regulation on the key risk areas while providing an element of flexibility for exporters to meet the standards in the best way for their business. The level of duplication has been significantly reduced both throughout the document, as well as with other regulatory animal welfare standards and guidelines. This appears to have substantially improved the useability, efficiency and effectiveness of the document.

Noting that this review intended not to alter the meaning of the requirements within ESAL from those within ASEL v2.3, LiveCorp has noted some minor comments for consideration by the department (provided at **Appendix 1**).

LiveCorp / MLA Research, Development and Extension (RD&E) Program

The LEP Research, Development and Extension (RD&E) Program is the primary mechanism for undertaking RD&E activities for the livestock export industry. The RD&E Program is focused on three key strategies:

1. Improve animal health and welfare outcomes across the supply chain;
2. Improve supply chain efficiency and regulatory performance; and
3. Enhance market access conditions for existing and new markets.

The most significant area of investment for the RD&E Program is the delivery of animal health and welfare improvements, which receives 71% of the annual RD&E Program budget. Supply chain efficiency and regulatory performance receives 17% and market access receives 12% (Figures 4 and 5). This allocation across program areas has not fluctuated significantly over the years.

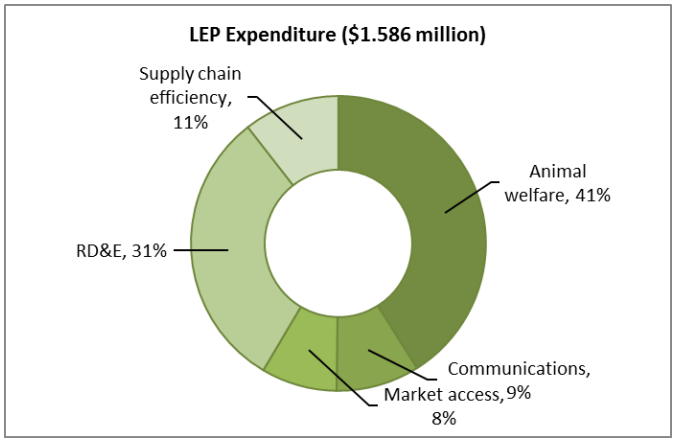


Figure 4. LEP expenditure 2016-17.

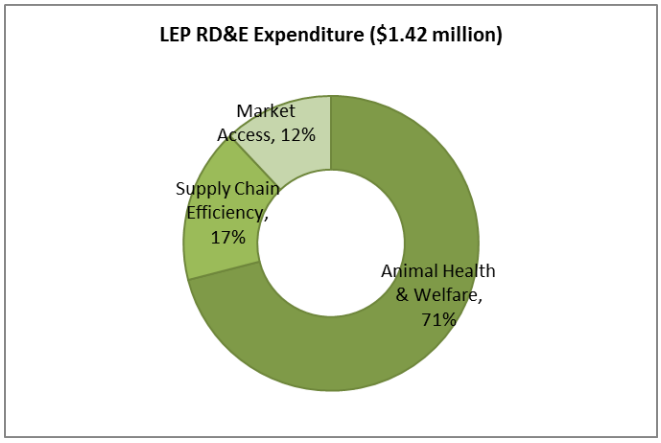


Figure 5. LEP RD&E expenditure 2016-17

The RD&E Program targets research to progressively identify, understand and seek to resolve key animal welfare risks, market access issues and supply chain inefficiencies. This is achieved through investment in projects to gather and analyse data, build knowledge, increase productivity and fill gaps in understanding, as well as to develop, trial and implement practical extension outputs.

The RD&E Program has processes and procedures in place to prioritise areas of research (issues) and ensure a balanced portfolio of RD&E activities is delivered. This includes:

- Identifying short, medium and longer-term projects for funding based on their respective merit and alignment with industry priorities, government priorities and LiveCorp's Strategic Plan;
- Addressing current gaps in the existing research portfolio;
- Increasing industry return on research investment;
- Focusing on industry benefit and the adoption of research outputs;
- Fostering high-quality, relevant research which delivers benefits across multiple timeframes; and
- Increasing industry participation in research, development and adoption activities.

LiveCorp looks forward to making its R&D available and providing any support needed to the ASEL Review Technical Advisory Committee to inform its considerations during the ASEL Review. LiveCorp R&D provides findings and information specific to the livestock export industry, which can play an important role in helping to determine what changes may be needed to meet the expectations and requirements of the Australian Government, the livestock export industry and the Australian community.

For this purpose, LiveCorp has included in its submission a full list of relevant past, current and planned R&D projects conducted by LiveCorp / MLA (**Appendix 2**). For ease of access, LiveCorp will provide the Committee Secretariat with copies of the key research reports (these can also be downloaded from the LiveCorp website – at www.livecorp.com.au).

LiveCorp would also welcome the opportunity to present any of its research to the Technical Advisory Committee / department, or discuss priority areas for future LEP research that could help inform the ASEL Review.

Australian Accredited Veterinarian consultation and engagement

In 2016, LiveCorp conducted a consultation and workshop process with Australian Accredited Veterinarians (AAVs) at the request of ALEC.

The workshop resulted in the exchange of diverse views in a constructive and respectful manner and attracted significant engagement and interest from AAVs who showed a keen appetite for R&D in particular.

Following the consultation project, LiveCorp has been working to address issues identified by the AAVs. These include developing terms of reference and progressing research projects such as shipboard fodder and veterinary kit requirements (discussed below).

LiveCorp has also developed an ongoing program of engagement with AAVs to advise them on progress on key items, update them on industry issues and exchange ideas and outcomes in the R&D space. This includes a bi-annual electronic newsletter update tailored specifically to AAVs and an annual AAV RD&E Forum (last held in November 2017 alongside the LIVEXchange Conference). LiveCorp considers AAVs to be critical extension agents for R&D, and future RD&E Forums will continue to facilitate constructive exchanges on research ideas.

A final report of the 2016 AAV Workshop project and the key outcomes and issues / priorities identified will be provided to the Review Secretariat for the information of the ASEL Review Technical Advisory Committee.

Long term / key areas of LEP research and development

Stocking density

Stocking density has a critical influence over the welfare of livestock exported from Australia and is one of the primary determinants over the productivity / profitability of the trade. However, it is a complex area with many factors interacting from an animal, infrastructure and journey perspective to influence the likely risks and outcomes.

One of the primary theories used internationally to calculate stocking densities is allometric equations – and in part, it is used within the current ASEL. The allometric equation – $(A)=kW^{2/3}$ (where W is weight and k is a constant / coefficient) – provides the means to determine space requirements for an individual animal with the most important factor, the coefficient, applied.

The most commonly accepted K-coefficients are for individual animals performing static activities (standing, lying). However, the K-coefficient for groups of animals, or for determining the space required to perform active / behavioural functions, is less clear / accepted and needs to be determined by research and evidence particular to the situation.

However, of the research conducted internationally, much of it has been in intensive housing (particularly pigs and poultry) and land transport – which do not accurately represent the livestock export scenario (which is an activity requiring safe transport outcomes (provision of animal needs rather than production outcomes). Further, even within the livestock export industry there is significant diversity amongst the species and types of shipments that occur – and hence the requirements that may be needed. For example, voyages in 2017 ranged from three days to 39 days with an average of around 12 days (e.g. 1-5 days = 9% of voyages, 6-10 days = 45%, 11-15 days = 20%, 16-20 days = 14%, 21-25 days = 7%, 26-30 days = 3%, 30+ days = 2 %).

With this in mind, there are a range of things that need to be considered in determining an appropriate K-coefficent including:

- The type of animal and its state;
- The extent of packing that is appropriate – what is acceptable based on research, evidence, observation and judgment;
- The type of journey – what activity is required during the voyage, what risks need to be managed.

A K-coefficient also needs to take into account the interactions between livestock and their ability to time share space to perform activities. This requires practical evidence, rather than simply multiplying the space required for one animal.

It is also important to recognise that while theoretical models – such as allometric equations – are useful tools in determining stocking densities they do not replace practical evidence and must be informed by assessments of the outcomes achieved in the actual export situations.

A number of key projects conducted by the LEP are relevant in this regard and which LiveCorp would be pleased to provide further summaries of if required during the ASEL review process:

- *Quantitative assessment of cattle behaviours on-board livestock ships* – this project analysed video footage of a shipment to the Middle East. It aimed to provide an informed estimate of what proportion of time animals spend performing certain basic behaviours on-board;
- *Refining Stocking Densities* – this project assessed a range of welfare and performance indicators for two long haul sheep and one short haul cattle shipments against the following stocking densities – ASEL, ASEL + 10 per cent (or the space provided using an allometric K-coefficient of 0.027, whichever was greater), and ASEL - 10 per cent.

Of particular relevance to the above, is a project that has been scoped and developed by LiveCorp / MLA and a University partner to conduct detailed research into stocking densities to support the ASEL review. This project, entitled *Effects of stocking density on behaviour and group dynamics of cattle and sheep exposed to differing export conditions,* will look at quantifying the extent and cause of variation in response to differences in stocking density for sheep and cattle and how it affects the distribution, behaviour, welfare and performance of livestock. It will include land based studies and on-board trials and data collection.

Bedding and the on-board environment

Better understanding and managing the on-board environment is a priority area for LEP R&D to ensure exporters have the information needed to pursue continued improvements to the welfare and comfort of animals during export.

Key components in managing the on-board environment is to minimise abrasions / lameness, manure / pad degradation, potentially harmful emissions (such as ammonia) and slipping. However, the factors that contribute to each of these issues are complex and multi-faceted. The following table outlines some of the variables identified as influencing the on-board environment:

Abrasions/lameness	**Manure / pad degradation**	**Harmful emissions**	**Slipping**
Sheep vs cattle vs type of cattle	Ventilation	Sheep vs cattle (vs type of cattle?)	Vessel flooring
Size and pregnancy	Wet bulb temperature	Ventilation	Vessel design
Flooring	Sheep vs cattle vs type of cattle	Wet bulb temperature	Loading / handling
Maintenance of pad (as per next column)	Length of voyage	Deck type (open / closed)	
Feed availability	Stocking densities	Diet	
Stocking densities	Bedding management (wash-downs / sawdust)	Bedding mgmt. (wash-downs / sawdust)	
Aggression	Poor drainage	Stocking densities	
Loading / handling			

The range of factors that affect bedding and the on-board environment were further highlighted through the AAV Workshop in 2016. At this workshop, AAVs reiterated that sawdust was mainly related to managing abrasions and strategic use. They also noted that flooring and feed availability were as important to achieving good outcomes in this regard. However, there was no consensus, and reasonably strong pushback, on any increase or extension in the current bedding volumes.

A range of research has been conducted in this space (outlined in **Appendix 2**), and in 2016 a literature review was completed through the LEP – *Bedding management and air quality on livestock vessels, a literature review* – to assess the current scientific knowledge and to guide future R&D focused on continued improvement.

At the completion of this literature review, the LEP commenced the development of terms of reference and the establishment of a project to scientifically analyse the relationships between the different variables affecting bedding and the on-board environment (particularly ammonia) as well as identify ways to effectively estimate and mitigate risks. This project is a significant LEP investment and is nearing commencement.

HotStuff

HotStuff is a predictive heat stress risk assessment model developed by the LEP in 2003. It was designed by engineers and has been subject to independent review and validation. It has also been continually updated since its implementation to reflect the best available science.

HotStuff combines over a decade worth of naval and land-based weather data, vessel configuration, voyage and livestock data to generate heat stress risk estimates and determine the maximum stocking density of sheep and cattle on individual voyages to the Middle East. The software is designed based on estimating the space allowances required to ensure that the heat stress risk is reduced below a 2% chance of a 5% mortality (as identified in ASEL v2.3). It also has the ability to estimate the heat stress risk based on historical weather data for both open and closed vessel configurations, as well as for vessels in transit or docked in port.

While it is impossible to single out a sole cause, since the implementation of HotStuff there has been a significant reduction in livestock mortality rates (Figures 1 and 2). The introduction of ASEL, changes to Marine Order 43, improvements in vessels, management practices and changes to the livestock types exported are all likely to have played a part.

Livestock mortality rates for cattle and sheep have consistently remained below 2.0% and 1.0%, respectively, for over ten years. For example, the implementation of HotStuff has particularly meant that heat stress is no longer the primary cause of mortality for cattle exported to the Middle East, as confirmed through a long term data collection in LEP project *Identifying the causes of mortality in cattle exported to the Middle East* (see page 10). This project found that Bovine Respiratory Disease is now the primary cause of mortality for cattle exported to the Middle East, and management strategies (such as vaccination and backgrounding) are targeting this risk.

Sheep exports to the Middle East have also seen improvements in mortalities, although the influence of salmonella and inanition (the primary causes of mortality for sheep, which peak at the same period as heat stress risk) is much greater. The RD&E Program has long term projects into salmonella and inanition including the development of a salmonella vaccine (see page 11).

As noted previously, HotStuff is subject to continual updates and review and a new version – HotStuff 5.0 – is currently undergoing final testing and will include a platform upgrade to ensure that the software is compatible

with multiple computer operating systems. A validation project is also nearing completion and its results will inform a broader review and update of HotStuff.

LiveCorp would like to extend the offer to meet with the ASEL Review Technical Advisory Committee and / or its Secretariat, to explain, demonstrate and discuss HotStuff if it would be of benefit. In addition, LiveCorp will provide the latest report on HotStuff version 5, together with its addendum (which provides detail on the calculations behind the HotStuff model).

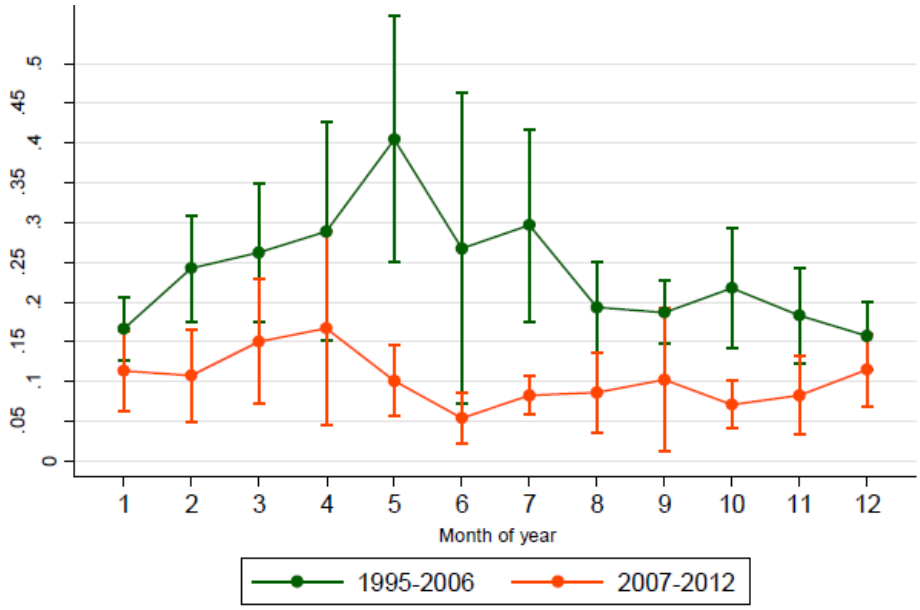


Figure 6. Mortalities from exports of southern cattle to the Middle East from 1995 – 2012.

Other key LEP R&D

- Long haul cattle exports – The LEP RD&E Program completed a long term research project – *Identifying the causes of mortality in cattle exported to the Middle East* (Perkins *et al*., 2015) – to better understand the current risk factors for mortality during livestock export. The project had a number of components, including recording the on-board causes of mortalities on long-haul voyages and assessments of Bovine Respiratory Disease along the supply chain. The report found that mortality rates over the previous 17 years had significantly declined, and that heat stress was no longer the primary cause of mortality for cattle exported to the Middle East (BRD being the primary cause).

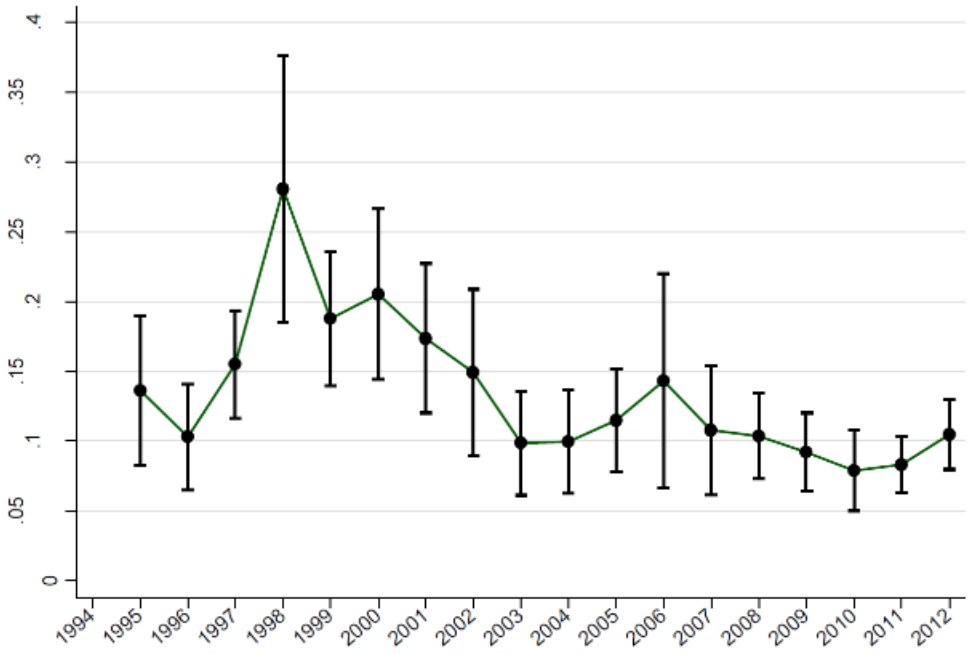


Figure 7. Mortality expressed as a percentage of cattle loaded per year from 6443 voyages over the period of 1995-2012 (bars represent 95% confidence levels).

- Salmonella / inanition – LEP R&D has shown that inanition and salmonellosis are the most common causes of mortality in exported sheep. The LEP has conducted significant research to better understand the interaction between these conditions and minimise the risks that they present during livestock export. The timeline of this research is outlined in detail in the LiveCorp Research Development and Extension Summer 2017 Update (available here www.livecorp.com.au/LC/files/1a/1ad610aa-67c0-4489-88fa-d67e9e50e867.pdf). Most recently, there have been two core projects underway in this space being:

  Development of a Salmonella vaccine

  After investigating the causal pathways and potential management approaches to disrupt shedding / exposure / susceptibility (many of which are currently utilised), industry decided to proceed on the long process of developing a vaccine to manage Salmonella. The process to date has proceeded comparably to other vaccine developments and although taking many years, each stage has shown positive results.

  The industry is now in the process of importing a DAM attenuated *S. Typhimurium* as a modified live vaccine. This process requires a number of core steps, firstly that the vaccine strain be imported from the United States of America to Australia and undergo Australian Government inspection. Once the vaccine has been imported, it is anticipated that a commercial partner to the LEP will then produce the vaccine at levels to provide for safety and efficacy testing to be completed in sheep. Currently, safety studies and large field studies are scheduled for late 2018, with commercial availability of the vaccine – pending further success with trials and approvals – around 2021.

  Strategies to reduce inanition

  In 2010, the LEP RD&E Program initiated a project to explore strategies to assist in reducing the incidence of inanition in sheep. In the project, sheep were monitored at a pre-embarkation feedlot in Western Australia using RFID tags and specially-designed tracking antenna to determine the time spent at feed and water troughs. On average, it took five days in the feedlot for more than 95% of animals to be

spending an adequate time at the feed trough. The overall mortality of the monitored sheep was 0.85%, with 61.4% of mortalities being due to Salmonella or inanition.

The project also trialled a number of feeding strategies to determine if they sped up the process of feed transition. The strategies tested in sheds were adding oats over pellets and the provision of chaff. Additionally, the project also compared sheep in sheds fed with pellets to sheep in a paddock with pellets and in a paddock fed with hay and pellets. In general, the feeding strategies tested at the feedlot did not appear to increase acceptance and consumption of the pellets.

The project was largely completed in 2017 and outlined some best practice guidelines for pre-embarkation treatment of sheep to minimise the incidence of inanition and Salmonella. These guidelines were produced into a best practice fact sheet. The project is due for completion this year, after being extended to allow for the trialling of further feeding strategies to mitigate risk.

LiveCorp will provide the draft report and best practice guidelines to the ASEL Review Technical Advisory Committee Secretariat (noting that further trials are underway to inform the findings on feeding strategies).

- Air transport – Livestock export by air has consistently delivered very low mortalities and provided a safe means of moving animals around the world. Nevertheless, the LEP has invested in a range of projects to support the air export industry to continuously improve, including:

  Livestock Air Transport Safety Assessment (LATSA)

  The LEP developed LATSA to provide a tool for exporters to assess the risks associated with air shipments. In 2011, through an LEP project – *Upgrade of LATSA software* – version 2.0 of LATSA was developed. The software assesses the ventilation capacity of aircraft and their ability to safely dissipate generated heat, moisture and carbon dioxide.

  Best practice crate design for live export by air

  This project was developed primarily to provide a best practice document for stock crate design. Recommendation was also made for a self-regulation system for stock crate design and manufacture to ensure a high quality of stock crates used within the livestock export industry.

  Stockpersons manual for export of livestock by air

  This project is nearing completion and will be released shortly. It provides a step-by-step guide for stockpersons, exporters and others in the supply chain to assist them in the safe completion of each stage of the export process from planning of a consignment to managing stock in the destination country, noting that every consignment is unique and will require tailored activities. Tips, tools and benchmarks have been included to give specific best practice advice, as well as clearly outlining the compulsory regulatory standards under ASEL.

  Within crate ventilation during air export

  The conditions on an aircraft can be quite different to those on a vessel and it is important that these are well understood to maintain and continue to improve welfare outcomes. As such, this project has built upon previous LEP research, to collect and analyse data on the aircraft environment – in particular this project aimed to monitor and assess carbon dioxide, ammonia, temperature and humidity (and their relationship to ventilation). The initial focus of this project has been short-haul flights, as these are the

most common type of export. Long-haul flights may be targeted for data collection at a later stage, depending on availability.

When completed, the report will provide a clearer picture of the on-board conditions and outline recommendations to support ongoing improvements. A key component of this will likely be to review and update LATSA. While this project was aimed for earlier completion, it has now been extended to ensure that a statistically relevant data set can be collected and to enable trialling of potential best practice approaches. The project is now expected to be completed later in 2018.

- Animal welfare indicators – The aim of the project – *Development and assessment of animal welfare indicators - Quantifying welfare improvements in the live export industry* – was to identify internationally accepted and current indicators of animal welfare for cattle, sheep and goats that could be used at each point along the livestock export supply chain. To identify these indicators, the project conducted a literature review of standards and regulations, as well as a stakeholder survey. The survey of over 900 people from the community, animal welfare groups and the industry found a high level of agreement in the perception and importance of animal welfare. Based on this work, to date the project has identified 54 indicators. Twenty of these are currently monitored by industry.

  A number of the potential indicators are now in the process of being piloted throughout the supply chain and should ultimately result in a method to benchmark performance and identify areas of improvement using an integrated welfare assessment.

- National Livestock Export Industry Sheep, Cattle and Goat Transport Performance Report – This report is produced annually and provides a comprehensive analysis of the performance of the livestock export industry in terms of mortality levels of sheep, cattle and goats exported by sea and air from Australia. It includes a breakdown of mortality trends by ship, species, time of year, load ports and major destinations.

- AAV priorities – In line with priorities identified by AAVs at an AAV Workshop in 2016 and RD&E Forum in 2017, two key R&D projects were commenced:
  - Fodder: AAVs identified that there were a range of areas in ASEL relating to fodder that would benefit from review. As such, the LEP tendered, and has now commenced, a project looking at shipboard fodder requirements, including pellet specifications and feed volumes. The project will also conduct a review of pellet manufacture and handling systems to identify ways to minimise pellets 'fines' (which can cause management and welfare issues on-board).
  - On-board veterinary drug use: The LEP has tendered to commence research to review and provide recommendations in relation to the on-board use of veterinary drugs. This project will use a consultative group of AAVs to guide the process and will consider several different areas including:
    - Review common shipboard diseases, diagnosis & treatments and the associated skills / competencies required to manage those diseases;
    - Assess the capacity of stock people to treat and manage the diseases commonly faced during export;
    - Develop best practice drug use resources;
    - Review the ASEL vet kit requirements; and
    - Explore mechanisms to improve treatment recording methods.

Other resources / useful links

- 2017 LEP Research and Development Updates – are available on the LiveCorp website www.livecorp.com.au/research-development/about-r-d
- LEP R&D reports – LEP research reports can be accessed via the LiveCorp website (www.livecorp.com.au/research-development/report) and key research reports will be provided to the ASEL Review Technical Committee Secretariat.
- 360˚ and conventional footage of livestock preparation and loading – this footage of cattle or sheep preparation and loading onto a livestock vessel is available to watch on the LiveCorp YouTube channel www.youtube.com/channel/UCGtp5P8stHcg5ymsW-GrEeA

Appendix 1. Comments on proposed ESAL

Number	Proposed ESAL	LiveCorp comment
1.	References to 'unless approved otherwise by the Australian Government' for certain requirements have been removed in the proposed ESAL.	The proposed ESAL appears to reflect a change in policy direction from ASEL v2.3 which provides flexibility and the possibility for departmental discretion on certain matters. LiveCorp understood that Approved Arrangements provide an avenue for greater flexibility and suggest consideration of including an overarching statement to caveat the whole document for example, 'unless approved otherwise by the Australian Government' would be an important amendment.
2.		We suggest including a definition for 'clear days' in Registered Premises.
3.	1A.1.2 Inspection for export by air c) once loaded, immediately prior to the departure of the aircraft.	We understand that inspection once an air consignment has been loaded is not always possible.
4.	1A.3.2 Rejection criteria – Cattle d) (i) female breeder cattle must not be more than 220 days pregnant….	The specification of 220 days is not consistent with the requirements of 250 days in the testing criteria.
5.	2A.2 a) (v) the quantity of feed available should meet at least the minimum daily feed requirements, which are: B. Sheep and goats – 2 per cent of their bodyweight per day for sheep younger than 4 tooth and 2 per cent of their bodyweight per day for 4 tooth or older, of a quality feed able to meet daily maintenance requirements.	We note that no specification has been made regarding the feed volume requirements for goats.
6.	Appendix C, Table #7 – Stocking density requirements in registered premises	We note that both hold times specified for cattle or camels are inclusive of 30 days (e.g. '30 days or less' and '30 days or more').

Appendix 2. LiveCorp / MLA research and development projects (1999 –)

Air transport

Code	Project Title	Summary	Finish Date
W.LIV.0261	Best practice design of crates for livestock export by air	This project was developed to provide two mechanisms to benefit the air export segment of the livestock export industry. The report details the developed best practice document for stock crate design together with recommendations for a system of self-regulation of stock crate design and manufacture to ensure the quality of stock crates.	20/07/2009
W.LIV.0269	Upgrade of LATSA software	This report details the development of version 2 of the Livestock Air Transport Safety Assessment (LATSA) software that provides estimates of environmental hold conditions for a diverse range of livestock exported in freighter and passenger aircraft from Australia. The software provided the industry with a reasonably flexible and accurate model that can be used to predict key outcomes on-board flights transporting livestock.	15/06/2012
W.LIV.0283	LATSA 2.1 Monitoring and validating model	The information used to predict heat, moisture and carbon dioxide production inside an aircraft hold is however based on theoretical data. Little real time data exists for the environments that are being modelled. The purpose of this project was to validate the predictions of the LATSA 2.0 software through the acquisition of real time data.	1/05/2013
W.LIV.0289	Within Crate Ventilation on board aircraft	This project was initiated to improve the data incorporated into the Live Air Transport Risk Assessment (LATSA) model. The aim of the project is to monitor and assess the ventilation conditions (Carbon dioxide, ammonia, temperature and relative humidity) within animal crates during air transport with a primary focus on short-haul flights. Single, double and triple-tier crates for relevant species (cattle, goats and/or sheep) have been investigated and the report will provide recommendations to optimise the welfare outcomes of animals during air export journeys.	ONGOING

Animal welfare and welfare management

Code	Project Title	Summary	Finish Date
LIVE.0104A	Influence of pre-delivery management on livestock performance: Desk top study	This project examined the effect of livestock management during the pre-embarkation on animal performance throughout the remainder of the export process with a specific focus on management at the farm of origin to discharge at registered premises for both sheep and cattle. The desktop study incorporated a review of literature and industry standards together with a survey and identified key on-farm and transport factors associated with morbidity and mortality of livestock within the industry.	1/02/2001
LIVE.0204	Identifying current best practice in the export of young cattle to Israel	This study examined the outcomes of 26 voyages of calves to Israel during 1999 and 2000 and summarises key observations and makes recommendations to improve the management of calves during the export process.	1/05/2001
LIVE.0208	The Best Practice Management of Pregnant Dairy Cattle on Long Haul Voyages	This study assessed the management practices of pregnant dairy cattle on vessels exported from Australia.	1/03/2002
LIVE.0301	Management of pre-delivery stress in live export steers	This project aimed to understand the effects of stress in transported cattle and attempted to minimise those effects by the use of novel oral supplements, fed prior to transportation. The report outlined new techniques for investigating the physiological responses of cattle to stress and quantified some of the physiological responses of cattle to transportation and handing stress and identified a novel prophylactic treatment that may aid in reducing the effects of stress in cattle.	31/10/2003
LIVE.0121	Investigating options to modify the aggressive behaviour of entire cattle, sheep and goats and the potential impacts on market acceptance and animal productivity	The objectives of the project were to identify and quantify the livestock export market preference for entire males and the basis of this preference (e.g. lean meat or cultural requirements) and to identify options for Australia to supply entire males whilst improving animal welfare and considering market sensitivities, production and commercial implications. The report outlines options available for the modification of behaviour patterns to minimise aggression of entire male livestock and highlights areas for further research	30/09/2005

LIVE.0120	Identifying live animal condition scores	A review was conducted to identify the systems used around the world to assess the condition score of livestock and determine the most appropriate systems for the Australian livestock export industry that recognises animals that are too lean or too fat to travel. The report details the most appropriate, simple, well-described 5-score systems for deer, alpacas, goats, sheep, camels and buffaloes and highlights the need to develop appropriate cut-off points for cattle to describe minimum condition, particularly in tropical breeds.	30/11/2005
LIVE.0222 V3	Developing alternative methods of measuring animal welfare on ships.	This report describes the results of a study to identify potential welfare indicators for sheep and cattle transported by ship and amassed at pre-export assembly depots that can be used to measure less extreme welfare events. The analysis of a computer-based questionnaire identified seven welfare indicators, four of which were already in use.	3/11/2006
LIVE.0325	Identifying knowledge gaps and research priorities to assist the live export industry to continually improve best practice	The scope of this project was very broad and included the identification of demonstrative knowledge and application gaps as well as the assessment of the R&D program's capacity to materially assist the industry to achieve its goals. The report outlines a matrix to systematically address industry practices within the livestock export process and identified inconsistencies between industry guidelines and the research recommendations, parts and activities within the supply chain where formal or widely accepted guidelines do not exist and also identified and prioritised R&D requirements to support existing practices and guidelines.	14/12/2006
B.LIV.0242	Assessing the welfare and feeding behaviour of horned and polled sheep and cattle during live export	This report provides an overview of the behaviour, welfare and management of sheep and cattle with and without horns and the mixing or segregation of horned and polled livestock during sea voyages.	14/03/2007
W.LIV.0251	Quantitative assessment of cattle behaviours on board livestock ships	The objective of this study was to utilise video footage of cattle taken as part of the previous project entitled 'Assessing the welfare and feeding behaviour of horn and polled sheep and cattle during export' to make an informed estimation as to the proportion of the day animals spend performing certain basic behaviours. The report details common behaviours exhibited during a voyage of cattle.	28/02/2009

W.LIV.0130	Preparation of goats for export	This project has sought to review the current practices and performance of the live goat export industry following the previous project entitled 'Minimising mortality risks during export of live goats by sea from Australia'. The project was conducted at a time when the greater majority of goat exports are by air rather than long-haul exports by sea. The report details knowledge gaps and prioritises research to address identified issues and outlined a developed 'best practice' guide for the preparation of goats for export.	31/03/2009
W.LIV.0131	Linking pre export factors to post-delivery performance in cattle exported from northern Australia to Indonesia	This report provides findings from a pilot study involving collection and information from consignments of cattle on export vessels travelling from Darwin to Indonesia. The study was designed to test assumptions and methodologies for data collection in order to determine the feasibility of a subsequent larger study. The report details the findings of two voyages and a range of factors important in the design of a larger project.	30/09/2010
W.LIV.0171	Review of sheep pre embarkation inspection procedures	This report describes inspection and rejection procedures that may occur between the vendor property and port for live sheep exports from ports in South Australia, Victoria and Western Australia. The current systems are believed to be compliant with all requirements as stipulated in the ASEL and the Export Control (Animals) Order 2004. The report suggests that the current Fremantle wharf inspection procedures be retained as the final individual animal inspection procedure and that consideration be given to trialling this system in South Australia and Victoria.	20/08/2012
W.LIV.0170	Performance data collection	This project has involved consideration of the current and likely future regulatory environments, external drivers, and current industry practices in relation to collection and management of data on animal health and welfare outcomes across the livestock export supply chain.	1/09/2013
W.LIV.0159	Preparation of rangeland goats for live export	This project sought to address these priorities with the aim of minimising the risks and barriers associated with long haul shipment of goats. The project objectives were as follows: 1. Develop industry guidelines for pre export and on board management of domesticated goats for long haul voyages. 2. Based on experimental research outcomes define a domestication management process for wild undomesticated goats so as to achieve successful long haul shipment by sea. 3. Develop and validate a quality assurance program for long haul goat shipments.	2/10/2015

W.LIV.3030	Optimising stunning methods for halal livestock processing	Consultation with MLA representatives in overseas markets, particularly Indonesia, was carried out in order to understand key technical issues affecting acceptance of non-penetrating percussive stunning. The outcomes of this consultation was used to set a context against which a stocktake review of published literature on stunning was carried out in order to identify key knowledge gaps and provide recommendations as to industry and research actions that could be carried out to address some technical and perceived barriers to adoption of stunning in overseas markets for Australian livestock.	30/10/2015
W.LIV.3032	Development and assessment of livestock welfare indicators for the livestock export industry	The monitoring and assessment of animal welfare throughout the livestock export process is essential to demonstrate care, the desire for continuous improvement and a sustainable future for industry. However, animal welfare is complex and multifaceted and it is therefore critical that valid, reliable and practical indicators are identified to underpin monitoring and assessment. The aim of the project was to identify internationally accepted and current indicators of animal welfare for cattle, sheep and goats that could be used at each point along the livestock export supply chain. To identify these indicators, the project conducted a literature review of standards and regulations, as well as a stakeholder survey.	15/05/2016
W.LIV.3042	Dairy export industry Stocktake Phase Two	Australian dairy cattle exported live must be well cared for, during export and after arrival overseas. This stocktake is a desktop review of the animal welfare risks and risk management of Australian dairy cattle exports in the last five years	15/06/2016
W.LIV.0186	Standards and performance benchmarking of the Livestock export industry	Whilst continuously improving animal welfare is a key priority for the livestock export industry, prior to this project the monitoring and reporting of animal welfare throughout the livestock export process was limited to a narrow lens of on-board mortality and non-compliances with ESCAS. Neither of these measures accurately depict the scale of industry effort and commitment to animal welfare throughout the livestock export supply chain to effectively support continuous improvement. As a result, the community's perception of the trade is limited to a narrow prism of isolated but often brutal and unacceptable incidents of animal cruelty. The project to date has compared the welfare standards of the Australian livestock export industry throughout the supply chain against Australian domestic standards and international live export competitors.	ONGOING

W.LIV.3047	Animal Welfare Indicators Pilot for the Live Export Industry Supply Chain	Develop, in conjunction with current reporting requirements, a comprehensive recording Welfare Dashboard to gather data relevant to animal welfare throughout the live export chain. Determine the practical requirements for data collection for the Welfare Dashboard (time taken at each point, frequency of data points, number of animals sampled, storage and transfer of data, use of paper	ONGOING

Bedding ammonia and the on-board environment

Code	Project Title	Summary	Finish Date
SBMR.002	Shipboard Ventilation Project	The study reviewed and summarised the available literature in order to collect current knowledge and guide shipboard work. The work then moved shipboard with a research veterinarian accompanying six voyages between Australia and the Middle East, making observations and recording parameters as guided by the study engineering team. Each voyage gave new information, either due to the vessel design, the livestock type and history, or the voyage conditions. The study produced a number of practical findings not only on the immediate topic of ventilation efficacy but also covering other livestock parameters and effects of some management activities (e.g. wash-down, course alteration).	1/07/2001
SBMR.002A	Investigation of ventilation efficacy on livestock vessels	This study incorporated a review of the current knowledge and shipboard processes of ventilation in cattle and involved six long haul voyages of cattle transported from Australia to the Middle East. The report found wet bulb temperature to be an important index of cattle comfort and identified the need to update ventilations outlined in AMSA MO43.	1/07/2001
LIVE.0218	Determining critical atmospheric ammonia levels for cattle, sheep and goats - a literature review	The report details a literature review of the effects of atmospheric ammonia production on animal health and performance in livestock ships and feedlots and recommends the critical level of atmospheric ammonia for livestock being transported by sea be set at 25 ppm. The report also identifies the need for on-board monitoring of ammonia levels and areas where further research is required.	15/03/2003
LIVE.0213B	Investigating odour from partly loaded sheep vessels	This study was undertaken as part of the project entitled 'Investigations into Reducing Odour Emissions from Partly Loaded Sheep Vessels while in Port'. The report outlines the findings of an indoor feeding trial designed to evaluate the effectiveness of four dietary treatments and five bedding additives in reducing ammonia and odour from sheep faeces and urine.	30/04/2003
LIVE.0202	Decreasing Shipboard Ammonia Levels	This study was undertaken to investigate reducing on-board ammonia levels through manipulating the nutritional composition of the diets of cattle. A series of feeding experiments were conducted to understand the effects of diet on animal performance, urinary nitrogen excretion and urinary pH. The reported details the effect of high ammonium levels of cattle health and recommends diet compositions to reduce ammonium levels.	30/06/2003

LIVE.0211	Practical ventilation measures for livestock vessels	This study was undertaken as a result of the report "Investigation of ventilation efficacy on livestock vessels" that identified the need for practical measures to be identified to improve ventilation and/or reduce the cost of ventilation on livestock vessels.	30/06/2003
LIVE.0213A	Investigations into Reducing Odour Emissions from Partly Loaded Sheep Vessels while in Port	As a result of complaints about odour emissions from livestock vessels in port, this study was commissioned to identify practical and cost-effective methods of reducing odour from partly loaded sheep vessel when in port. The report comprises a literature review and the benchmarking of baseline emission rates and outlines recommendations to reduce odour emissions of vessels when in port.	30/06/2003
LIVE.0212	Investigation of Ventilation Efficacy on Live Sheep Vessels	This study/project was undertaken to investigate the ventilation effects of specific vessels carrying sheep and goats from Australia following the completion of 'Shipboard Ventilation Project' that mainly focused upon ventilation efficacy on cattle vessels. The report presents risk management options in the shipment of sheep, lambs and goats and provides options for heat stress management planning.	31/08/2003
LIVE.0223	Pilot monitoring of shipboard environmental conditions and animal performance	This project involved the use of temperature, relative humidity, ammonia level, wind speed and direction sensors on livestock vessels transporting sheep and cattle to the Middle East to more accurately record and store details of environmental conditions. A major outcome of the project was a database of environmental information and livestock performance that was available to validate/ re-calibrate the 'Hot stuff' modelling software.	29/10/2004
W.LIV.0254	Management of Bedding during the Livestock Export Process	In this study, the management of bedding on livestock export ships was reviewed and current practices were evaluated against existing literature from the intensive dairy, beef and equine industries and recommendations and guidelines for the management of bedding for cattle and sheep during the export of livestock by sea were developed. The report also identifies areas where further research, development and extension opportunities exist.	31/03/2009
W.LIV.0290	Managing on board environmental conditions	An extensive literature review of bedding management and air quality on livestock export vessels was undertaken and best practice management recommendations were developed. The review is divided into three sections focusing on air quality and environmental monitoring (temperature, pad moisture and emissions), bedding management (management strategies and ventilation), and the issue of reporting (advances in environmental monitoring technology)	31/08/2016

PROPOSED	Trials to understand factors influencing pad moisture and ammonia emissions in livestock faecal pads and the effect of interventions	The purpose of these studies will be to develop and validate a clear understanding of the interactions of the different factors and how they affect cattle and sheep pads and influence outcomes, and how different interventions influence these factors and outcomes. A key output will be the ability to understand and predict pad moisture, ammonia issues and the likely effect of interventions during voyages using a consistent methodology, equations or other measure.	PROPOSED

Diseases, syndromes, conditions and management

Code	Project Title	Summary	Finish Date
SBMR.004	Shipboard mortality study - phase 2	This study was undertaken as a result of the recommendations from the report "Research into cattle deaths and illness during sea" published in 1999 that identified the need for further investigation to determine the cause(s) of cattle deaths and illness during sea transport from Australia to the Middle East. This report further identifies factors that contribute to illness and death and makes recommendations to reduce morbidity and mortality of cattle during sea voyages. The study identified heat stress/ventilation and pneumonia from pasteurellosis as two major causes of illness and death and supported the findings of the previous report that a larger number of detailed necropsies to determine the cause(s) of cattle deaths during sea transport are essential.	10/09/1999
LIVE.0101	Controlling scabby mouth in the live sheep trade	Scabby mouth is a common disease found in all sheep-raising countries, the disease rarely causes problems of economic significance in Australia, and is usually not observed by producers. This study was undertaken to establish the effectiveness of a vaccination in controlling scabby mouth in live sheep trade. The report found single vaccination at lamb marking resulted in low levels of scabby mouth at discharge in the Middle East whilst two vaccinations (the second administered shortly before export) resulted in negligible levels and concludes that scabby mouth is no longer an issue of concern in most Middle Eastern markets.	1/05/2000
LIVE.102	Best practice standards for the preparation & husbandry of cattle for transport from Australia	This report outlines the best practices recommendations for the preparation and husbandry of cattle transported by sea on long haul voyages from Australia. The recommendations were designed to be read in conjunction with the Live Export Assurance Program (LEAP) Rules and Standards (December 1999), the Shipboard Management Programs Stockman's Handbook and the Australian Standards for the Export of Livestock (ASEL).	1/05/2000
SBMR.004A	Investigation of Cattle Deaths and Illness during Sea Transport from Australia Voyage 4	This study was undertaken as a result of the recommendations from the reports "Research into cattle deaths and illness during sea" and "Shipboard mortality study - phase 2" published in 1999 that identified the need for further investigation to determine the cause(s) of cattle deaths and illness during sea transportation. The aim of the study was to improve the welfare of cattle during sea transport.	5/09/2001

LIVE.0113	Ringworm in Live Export Dairy Cattle	This study was undertaken in response to incidences of ringworm in dairy cattle exported to China that resulted in economic losses for exporters and had the potential to disrupt the export of dairy cattle to China.	31/10/2002
LIVE.0217	Investigating premature lactation in pregnant dairy females	This study was commissioned following the shipment of a consignment of dairy heifers that reported a high prevalence of heifers with distension of the mammary gland during a sea voyage. The report outlines the causes of udder distension that include feed and hormonal factors and outlines preventative measures as well as treatment measures for the condition.	25/02/2003
LIVE.0111	Evaluation and cost/benefit analysis of Rhinogard® vaccine in preventing Bovine Respiratory Disease in export cattle	This report provides an overview of bovine respiratory disease (BRD), including the causes and impact of the disease and evaluates the vaccine (Rhinogard®). The report also outlines practice pre-shipment preparation, as well as on-board and post-arrival management of cattle.	31/07/2003
LIVE.0118	Investigating Bluetongue Virus Persistence in Sheep	This project was conducted to verify recent results published by United Kingdom researchers suggesting that bluetongue virus (BTV) could persist in the skin of infected sheep and subsequent midge feeding could then induce virus replication. Acceptance that BTV does not persist in the skin of animals should allow the movement of seropositive animals to bluetongue sensitive markets provided the animals are located in an area without current bluetongue activity for an accepted period prior to export.	31/01/2004
LIVE.0114	Best Practice in the Use of Veterinary Chemicals and Drugs in Exporting Livestock	This manual was designed for exporters, managers of live export assembly depots, Masters and Chief Officers of livestock ships, and stockmen working with cattle, sheep or goats exported live from Australia. The manual include; The 'best-practice' use of veterinary drugs and chemicals – storage, record keeping, off-label use etc., a list of common veterinary drug uses for live export cattle, sheep and goats and a description of recommended injection techniques.	30/12/2004
LIVE.0125	Evaluation of Diagnostic Assays for Chlamydophila abortus in Australian Export Sheep	The project was undertaken to compare the performance of the Complement Fixation Test (CFT) and ELISA test for the quantification of Chlamydophila abortus antibodies in sheep. The report identified that ELISA gave the most repeatable and reproducible results in the detection of the Chlamydophila abortus antibody with equivalent sensitivity and higher specificity to the CFT and thus recommends replacing the CFT with ELISA.	15/03/2007

B.LIV.0245	Revision of Veterinary Drug Manual for Livestock Export	The report details the process undertaken in the review and revision of the Veterinary Drug Manual for Livestock Export to ensure it was as accurate and up to date as possible. Each drug was individually checked for registration status, availability, recommended use, meat withholding period and export slaughter interval (ESI) if this data was available. Drugs were then removed or updated accordingly. New drugs were added after searching by category to check for new and recent product registrations.	15/02/2008
B.LIV.0248	Respiratory disease of export cattle	This report outlines the findings of the literature review and industry consultation process related to feedlot Bovine Respiratory Disease (BRD). The report also outlines recommendations for future R&D to examine morbidity and mortality in cattle undergoing live export from Fremantle to the Middle East.	30/09/2008
W.LIV.0361	Detection, identification and treatment of ovine pink eye	Infectious Ovine Keratoconjunctivitis (IOK), Pink Eye, has a significant impact on rejection rates of sheep for live export and thus the feedlot and live export industries in Western Australia. The study aimed to determine the flora and sensitivity to antibiotics of eyes from sheep showing clinical signs of IOK.	20/06/2010
W.LIV.0162	Veterinary management of reject livestock	A small proportion of livestock are identified as being unfit to load onto ships during pre-embarkation inspections. These animals are identified as sick, injured, weak or physiologically unsuited for transport and must be managed optimally to ensure welfare is not unduly compromised. A manual was produced that will assist in standardising the approaches to treatment and management of these animals.	31/07/2011
W.LIV.0278	Live Export Veterinary Disease Handbook	This project has developed a Live Export Veterinary Handbook in electronic format, suitable for dissemination as either a printed Handbook or as an electronic file. The Handbook is intended to serve as a concise reference source of practical information focused on conditions likely to be experienced across the live export supply chain, with a particular focus on the steps from arrival at an assembly feedlot in Australia to discharge at a destination port in an overseas country. The Handbook is intended to be used by veterinarians and stockpersons and any other individual with responsibility for animal health and welfare during the export supply chain.	7/08/2011

W.LIV.0280	Management of premature lactation in dairy cattle	This study was undertaken to investigate the risk factors that lead to the occurrence of premature lactation in dairy heifers. The report details the findings of a literature review and survey of experience personnel and recommends that further research is conducted to elucidate the presence and persistence of zearalenone in export pellets and the occurrence of premature lactation in exported heifers are documented.	30/09/2011
W.LIV.0161	Veterinary disease investigation course	This project successfully produced a set of training materials and a framework (training schedule and list of activities) that can be used as a resource for future training courses for stockpersons or veterinarians. The project delivered two training courses to veterinarians associated with the export industry, using the materials and resources developed for this purpose. The project also produced a professionally filmed and edited training DVD that provides step-by-step instruction in how to perform a comprehensive necropsy, as well as a variety of additional relevant topics, including personal safety and biosecurity and management of necropsy equipment. The project developed materials and a DVD as resources for the industry to use in the future.	31/01/2012
W.LIV.0275	Investigating incidence of scabby mouth	This project reviewed the scabby mouth vaccination protocols in place for sheep travelling to Middle East markets. The study recommends that, subject to the approval by appropriate authorities, a single vaccination strategy be considered to replace the current double vaccination strategy. The study concluded that the development of a killed or virulent field strain vaccine administered intramuscularly or subcutaneously would have immediate industry application and that the industry monitors any developments in this regard.	22/02/2012
W.LIV.0163	Ovine pink eye treatment strategies	A small proportion of livestock are identified as being unfit to load onto ships during pre-embarkation inspections. These animals are identified as sick, injured, weak or physiologically unsuited for transport and must be managed optimally to ensure welfare is not unduly compromised. A manual was produced that will assist in standardising the approaches to treatment and management of these animals. The cheapest and easiest way of treating of sheep with IOK (Grade 3 and below) in pre-embarkation feedlots is with OTC medicated pellets, for at least 5 days.	30/04/2013

W.LIV.0286	Premature Lactation in exported Dairy Cattle - Further Research	The risk factors that lead to the occurrence of premature lactation are poorly understood. A review of the available literature has been conducted previously, as well as an informal survey of personnel experienced in the long-haul transportation of dairy cattle. This indicated that exposure of exported dairy heifers to mycotoxins such as zearalenone in pelleted ship rations could be a plausible explanation for the occurrence of premature lactation in such animals.	15/03/2015
W.LIV.0180	App development - veterinary handbook for the Live export industry	This project developed an app for the Veterinary Handbook which includes s information on the diagnosis, treatment and prevention of associated syndromes and diseases in cattle, sheep and goats. The app is available for $3.99 on the iTunes and google play stores	30/09/2016
W.LIV.0173	A review of black organs (acquired visceral melanosis) in livestock	The purpose of the review (W.Liv.0173) was to: (a) provide an up-to-date authoritative reference document that might be used if AVM became a trade or food safety issue. For example, a credible reference stating that AVM causes no ill-effect to the animal (thought to be true) or that black livers are favoured eating by Falkland Islanders (anecdotally reported), may well allay some of the food safety/disease concerns in a trade crisis. (b) Identify steps for further research to determine cause, cure or safety as a food. (c) Establish contacts with people in Australia and internationally that have experience of, or investigated the condition, who might help piece together the cause or cure. (d) Determine if the condition seen in other countries is likely to be the same as the one occurring in Australia or something different.	ONGOING
W.LIV.0181	Pinkeye on Long Haul Cattle Voyages	The objectives of this project are to review current literature and gather epidemiological data from recent outbreaks. They also aim to identify microorganisms associated with the current syndrome and develop strategies for prevention	ONGOING
W.LIV.0188	Update of the Veterinary Handbook for Cattle, Sheep & Goats	The Veterinary Handbook app and website includes information on the diagnosis, treatment and prevention of associated syndromes and diseases in cattle, sheep and goats. The planned update to the app will occur in two phases. The first, will see a significant update of the content of the handbook and the second phase will introduce a suite of photos to help identify syndromes and diseases.	ONGOING
PROPOSED	Shipboard drug use and resource package	This project has been initiated to assess the ASEL requirements for veterinary equipment and drugs. Additionally the project will develop resources on best practice drug use and treatment recording.	PROPOSED

HotStuff

Code	Project Title	Summary	Finish Date
LIVE.0116	Development of a Heat Stress Risk Management Model	The report outlines the data analysis, mathematical modelling and software development of 'HS' known as 'HotStuff' the program that is used to estimate the risk of mortality due to heat stress in livestock decks on voyages from Australia to the Middle East.	7/05/2003
LIVE.0230B	Independent advice on jetting inclusion in the HS model	The purpose was to study the final report on the development of the HS heat stress risk management model, attend a meeting on the most recent version of the HS model and review proposals from two different consultants to include an allowance for jetting to individual ship pens in the HS model.	25/02/2005
LIVE.0226	HS software further development to take version 2.2 to version 2.3	During the use of HS heat stress risk management software versions 2.1 and earlier, users identified additional features of the software that would improve its usability and effectiveness. Some of the features fell within the original scope of the development contract for the HS software (Live.116) and were included in HS version 2.2. A number of other features outside the scope of Live.116 were identified as being high priority items, ensuring that the needs of the software users continued to be met. These items were targeted for inclusion in HS version 2.3.	10/03/2005
LIVE.0234	Potential benefits of jetting to the 'Heat Stress' model	The study evaluated the potential benefits of including the effects of 'jetting' into the 'Hot stuff' (HS) model in place of the pen air turnover (PAT) parameter. Jetting refers to a component of the ships ventilation where a controlled and measurable air velocity is directed across a specified area. The report determined the typical velocity ratio of an average pen and compared the use of a velocity ratio and the standard PAT within the HS model.	29/04/2005
LIVE.0228	Upgrade of biological assumptions and parameters used in the HS risk management model version 2.3.	The overall objective of this project was to update and validate the animal parameters in the 'Hot stuff' model released in 2001. The report found additional data sets were consistent with the original heat stress data applied in the HS software and recommended a slight change to the heat stress threshold, mortality limit and coat factor for Bos taurus dairy (Friesian) cattle.	17/05/2006

B.LIV.0240	Assessing a method of incorporating jetting in the HS model and its commercial implications	This study was undertaken to further understand the effects of 'jetting' of a particular pen or deck might affect the heat stress risk for livestock in accordance with the recommendations of the report entitled 'Potential benefits of jetting to the HS model'. The report details how a normalised jetting factor may be incorporated into the 'Hot stuff' model to consider the effects of jetting and outlines the information required and the possible animal welfare and commercial outcomes.	29/01/2007
W.LIV.0264	Review of the Livestock Export Heat Stress Risk Assessment Model (HotStuff)	The aim of this study was to undertake a comprehensive review of the scientific basis of the core elements (animal physiology, engineering, climatology and statistics) that underpin the HotStuff model The report includes the panel's conclusion that the methodology and assumptions underpinning the HotStuff model are sound, reasonable and supported by scientific literature and further recommendations that aim to either engender greater confidence in the technical elements of the model or potentially improve the model's accuracy in the future.	31/01/2009
B.LIV.0249	HotStuff Version 3.0 Revision of the heat stress risk assessment methodology to properly incorporate risk of heat stress while at port	This study extends the existing methodology to address this issue. Risk estimates for both the sailing and discharge components of the voyage are incorporated in the revised methodology as well as the functionality for the separate treatment of each Middle Eastern port and for voyages discharging at multiple ports. As part of the study, the software has been moved to a more up-to-date development environment and updated to incorporate the new methodology, improve a range of features and fix a number of problems with the previous version.	30/06/2009
W.LIV.0277	HotStuff Version 4.0 – Revised methodology and additional ports	The 'HotStuff' software for the assessment of heat stress risk on livestock voyages west from Australia has been revised, updated and expanded. The primary changes are: • the addition of ports in the Mediterannean, the Black Sea, West Africa and Russia route • inclusion of port risk as a parallel assessment of the risk during the discharge phase (actually introduced at Version 3)options via the Suez Canal or West Africa • inclusion of more voyage weather data and reanalysis of all voyage and port data • removal of the hard-coded limit of 5 knots on the assumed effective crosswind while sailing • updating the software programming environment (Version 4 to 5).	15/06/2014

Heat stress

Code	Project Title	Summary	Finish Date
LIVE.0104B	Use of electrolytes to alleviate stress: Desk top study	The study reviewed the scientific literature and live export industry practices in relation to electrolyte supplementation of sheep and cattle during sea transportation as a result of the previous studies 'Investigation of ventilation efficacy on livestock vessels". The report identifies sea transport stress factors and considers the benefits of electrolyte supplementation in treating physiological clinical effects of the stress factors.	1/02/2001
LIVE.0209	Physiology of Heat Stress in Cattle and Sheep	This study was undertaken to define the physiology of clinical heat stress in cattle and sheep within an animal house through monitoring changes in body temperature, feed and water intake, respiratory and heart rates, and acid-base and electrolyte balance. The report details the findings of the experiments and assisted in the definition of the heat stress threshold for Bos taurus and Bos indicus heifers, Merino wethers and Awassi rams.	31/10/2002
LIVE.0210	Physiology of heat stress in cattle and sheep and the efficacy of electrolyte replacement therapy (Consultation with Murdoch University on LIVE.0209)	This consultancy was conducted with Murdoch University on Live.0209. Exploring the physiology of heat stress in cattle and sheep and the efficacy of electrolyte replacement therapy	31/10/2002
LIVE.0219	Wetting of Cattle to Alleviate Heat Stress on Ships	This study investigated the benefit of wetting heat stressed cattle by measuring the body temperature, respiration rate, feed intake and live weight change of cattle. The study found wetting cattle, using warm salt water reduced rectal temperature, respiration rate and panting score, increased cattle comfort, and did not result in worsening of the micro-climate.	31/08/2003
LIVE.0209B	Physiology of Heat Stress in Cattle & Sheep (Stage 2)- Efficacy of an Electrolyte Replacement Therapy and High Roughage Diet	The physiology of clinical heat stress in cattle and sheep was defined under experimental animal house conditions, considering particularly the physiological and biochemical changes that affect electrolyte balance in the animals, with a view to formulating appropriate supplementation of electrolytes. Changes in body temperature, feed and water intake, respiratory and heart rates, and acid-base and electrolyte balance were measured. An electrolyte supplement was proposed on the basis of measured changes in the cattle, and tested with positive results on urine pH indicating improved buffering capacity, and a body weight advantage.	30/11/2003

LIVE.0224 V1	Electrolyte supplementation of export cattle and further investigations in the heat stress threshold of sheep and dairy cattle	This study was conducted in an attempt to repeat the findings of the previous project entitled 'Physiology of Heat Stress in Cattle and Sheep' that reported a weight advantage of cattle supplemented with water based electrolytes. The project aimed to measure any animal performance and/or welfare benefits to cattle and sheep during and post electrolyte replacement therapy. The report found no evidence that conclusively supported the supplementation of electrolytes on board livestock vessels. However, the study identified heat stress thresholds for heavy rams, withers, ram lambs, and pregnant Friesian heifers.	27/02/2006
LIVE.010	Production of communication materials- wetting cattle heat stress tips & tools	This project developed tips and tools fact sheets to assist stockpersons, accredited seminarians and exporters understand appropriate use of wetting as a heat stress management technique	15/05/2006
B.LIV.0247	Respiratory heat and moisture generation	The aim of this project was to recommend values for respiratory exchange and heat production of deer and goats that are appropriate for use in a project aimed at determining the ventilation requirements during transport via aircraft. A literature search was conducted and recommendations made for carbon dioxide production, oxygen consumption, heat production, evaporative water loss and loss of water in urine and faeces for various sexes of goats and deer of various physiological states.	15/12/2008
W.LIV.0191	Environmental and heat risk assessment for live export holding facilities in NT	This project seeks to a) Ascertain the environmental risks associated with live export facilities in northern Australia and provide mitigation and management recommendations b) Ascertain the risks associated with heat stress in live export facilities operating in northern Australia, including an assessment of HLI and AHL utilising collected weather data, and provide mitigation and management recommendations.	ONGOING

Markets and trade

Code	Project Title	Summary	Finish Date
LIVE.103	Saudi Arabia Live Sheep Trade Resumption Trial	This report provides an overview of issues that emerged during the third and fourth live sheep export trial shipments to Saudi Arabia. As the two consignments involved the same vessel, exporter and load ports, and many of the issues are the same, they are discussed together.	1/09/2000
LIVE.0105	Quality assurance for live goats exports to Saudi Arabia	This study reviewed the market opportunity for the export of live goats to Saudi Arabia and involved the observed of four trail shipments (12,773 goats) to Saudi Arabia in early 2001. The study identified the areas of risk associated with the export of goats on long haul voyages that included; diseases on-board and highlighted the need to adapt feral goats prior to shipment.	1/06/2001
LIVE.109	Addressing future market concerns on HGP usage	This study identifies and prioritises the options the Australian live cattle export industry has in responding to the requirements of importing countries in relation to HGP treatment of cattle shipped from Australia. From this is developed a set of short, medium and long term strategies for the industry to address current and possible future market concerns relating to HGP usage.	1/11/2001
LIVE.0317	Developing a livestock export market outlook service	The study was commissioned by the Livestock Export Program (LEP) to provide access to accurate, independent and timely market intelligence to assist producers servicing the live export market to both; maximise profitability in the short to medium term, and to plan for the future. A report template for the cattle and sheep/goats export industries was developed to assist the communication and information sources were established to assist with the forecasting. The market forecasting service looks to identify movements in export volumes, market specifications, live cattle export prices and key currencies over the medium term (one year forward).	13/06/2006
LIVE.0314	Updating the value of the livestock export industry to Australia	This study provides a quantitative and qualitative assessment of the value of the livestock export industry to the Australian economy and the regional communities where the industry is conducted. It also includes an assessment of the impact a closure of live trade would have on the livestock industry across Australia.	20/06/2006

LIVE.0326	Assessing the value of the livestock export trade to regional Australia	This report describes and quantifies the contribution of the livestock export industry to producers and economies in regions that are highly reliant on the livestock export trade. These designated regions are the Northern Territory (cattle), Western Australia (southern sheep and cattle), Western Australia (northern cattle), Queensland (cattle) and Victoria (dairy cattle).	26/02/2007
B.LIV.0340	Live Export Market Reporting Service	The project aimed to develop an outlook reporting service for livestock export industry across the major destinations for Australian cattle, sheep and goats. The service was designed to provide independent reporting of current market conditions and an analysis of the medium-term outlook of livestock export markets as well as improve communication of industry in-market issues, market dynamics and aid in improving industry decision making.	31/01/2008
W.LIV.0360	Review of the Livestock Export Market Outlook Reports	An assessment of the success and value of Market Outlook reports prepared by ProFarmer and funded by the Livestock Export Program (LEP) was undertaken. The report assesses the outcome of the previous report entitled 'Developing a livestock export market outlook service'. The report details the findings of a survey and key recommendations to further improve the report format and content.	31/08/2008
W.LIV.0156	Economic value of the live export industry	As part of an ongoing assessment of the contribution of the live export industry to the Australian livestock industries and the wider economy by LiveCorp and Meat and Livestock Australia (MLA), the CIE was engaged to update and provide an independent and comprehensive assessment of the value of the live export industry	31/07/2010
W.LIV.0179	Benefit cost analysis of live camel exports	This document is an analysis of the economics of live camel export. It describes the live export supply chain; provides an assessment of the suitability of the current Cattle and Buffalo ESCAS checklist for the live export of slaughter camels; and includes an economic benefit cost analysis of Australian live camel supply. On balance, modest economic returns and substantial risks limit the attractiveness of investment in Australian live camel exports.	14/02/2014
W.LIV.3019	Dairy export industry review	Part one of this project has identified information gaps and areas for future market research that are required for developing a more detailed understanding of important trading relationships which will shape the future of the Australian dairy trade. Part two of this research identifies that Australia exports dairy cattle to a large number (15) of countries across the globe.	30/11/2014
W.LIV.0189	Competitiveness of the Australian Livestock Export Industry	This research involves a detailed analysis of the competitiveness of the Australian livestock export industry, both from the perspective of trends in	15/06/2016

		international markets, and from developments in Australian livestock production sectors. The research provides the livestock export sector with a detailed review of its current competitiveness, and identifies strategic initiatives that may enhance its competitiveness in the future.	
W.LIV.3049	Capacity constraints and inefficiencies in the live export supply chain process	This project will provide the Australian livestock industry and related stakeholders with a capacity to inform infrastructure investments and make strategic and tactical investments that reduce the economic impact of bottlenecks and capacity constraints from supply chain disruptions	ONGOING

Mortality and performance studies

Code	Project Title	Summary	Finish Date
LIVE.0206	National Mortality Recording System for Export	This report summarised sheep and cattle mortalities during sea transport form Australia during 2001. The report is the first of subsequent annual mortality reports of the livestock export industry that evaluates mortalities based upon species, port of loading, destination, season and vessel and allows trends to be monitored over time.	31/07/2002
LIVE.0215	Minimising mortality risks during export of live goats by sea from Australia	This report outlines risks associated with high mortality rates of goats during sea voyages from Australia. The report identifies the most important risks for mortalities, risk management principles and the recommended management practices of gats on-ship.	31/01/2003
LIVE.0216	Mortality and morbidity risk factors for livestock during sea transport from Australia	This study analysed the existing causes of mortality and morbidity of cattle, sheep and goats within the livestock export industry. The report outlines causes of morbidity and mortality of livestock prior to loading as well as during voyages and includes; the cause of death and contributing factors, the port of loading, season (time of year) and species. The major cause of death in sheep and goats was salmonellosis and inanition and heat stroke in cattle.	31/03/2003
LIVE.0214	National livestock export industry shipboard performance report 2002	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2002 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/05/2003
LIVE.0220	National livestock export industry shipboard performance report 2003	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2003 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/08/2003
LIVE.0225	National livestock export industry shipboard performance report 2004	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2004 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/04/2005
LIVE.0235	National mortality recording system for the live sheep, goat and cattle export industries	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2005 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	1/07/2006
B.LIV.0241	National livestock export industry shipboard performance report 2006	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2007 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/04/2007

LIVE.0123	Investigating mortality in sheep and lambs exported through Adelaide and Portland.	The objective of this project was to determine the rate, causes and predisposing factors of mortality for live export sheep as well as the relative mortality risk for different lines of sheep. The project tracked Australian sheep exported in 24 shipments between September 2005 and June 2008, from farm of origin to port of discharge. The report identified the most common causes of mortality and other associated risk factors and details recommendations for reducing mortality.	1/12/2007
B.LIV.0246	National livestock export industry shipboard performance report 2007	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2007 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/05/2008
W.LIV.0260	National livestock export industry shipboard performance report 2008	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2008 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/06/2009
W.LIV.0270	National livestock export industry shipboard performance report 2009	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2009 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/06/2010
W.LIV.0279	National livestock export industry shipboard performance report 2010	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2010 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	1/06/2011
W.LIV.0281	Live export mortality report 2011	The objective of this project was to summarise the performance of the livestock export industry in terms of mortality levels of sheep, cattle and goats exported by sea from Australia during 2011.	30/06/2012
W.LIV.0285	Live export mortality report 2012	The objective of this project was to summarise the performance of the livestock export industry in terms of mortality levels of sheep, cattle and goats exported by sea and air from Australia during 2012	7/10/2013
W.LIV.0252	Identifying the causes of mortality in cattle exported to the Middle East	This project originated from concerns over mortalities in cattle exported from Australia to the Middle East that had been attributed to respiratory disease. The findings from this project will contribute to development of mitigation strategies to reduce respiratory disease risk during export. The success of this project offers lessons for future projects that can be implemented for industry benefit.	30/08/2014
W.LIV.0288	2013 shipboard mortality report	The objective of this project was to summarise the performance of the livestock export industry in terms of mortality levels of sheep, cattle and goats exported by sea and air from Australia during 2014.	30/06/2015

W.LIV.0293	Upgrading the Shipboard Mortality Database	The annual national livestock export industry performance reports have become a highly valued industry output, summarising information obtained from Ship Master's Reports by calendar year and describing mortality for sheep, cattle and goats. For 30 years data have been collected into a custom database - the Shipboard Mortality DataBase (SMDB) - to ensure robust storage and exported into statistical and spreadsheet programs for analyses and generation of plots and summary statistics. This project involved the development of a modern database architecture that can house historic SMDB data and that can serve as an ongoing resource to allow collation of data for the generation of the annual performance reports, and provide a foundation for automated real-time reporting, should the industry choose to add this capacity.	30/06/2016
W.LIV.0291	Live export industry transport mortality report 2016	This report provides summary information about mortalities in sheep and cattle during sea transport from Australia in 2016 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	30/06/2017
W.LIV.0295	Shipboard Mortality Data Base (SMDB) Version Two Upgrade	To answer the question of whether or not the SMDB can provide greater value for the industry and government by enhanced useability.	ONGOING
W.LIV.0297	2017 & 2018 Live Export Industry Annual Mortality Report	These reports will provide summary information about mortalities in sheep and cattle during sea transport from Australia in 2017 and 2018 to allow industry, government and others to monitor mortality trends in the live sheep and cattle trades.	ONGOING

Regulation

Code	Project Title	Summary	Finish Date
LIVE.0117	Review of Australian Livestock Export Standards	The aim of the study was to review the existing Livestock Export Accreditation Program (LEAP) rules and standards and their administration to enable consistent compliance with agreed animal health and welfare outcomes. The review makes innovative recommendations in a range of areas, including opportunities for continuous improvement, the management of animal health and welfare risks, the management of incidents, and achievement of compliance through accreditation and auditing processes.	31/08/2003
LIVE.0316	World livestock export standards	This study compared and contrasted the livestock export standards applied in all countries that participate significantly in the livestock export trade. The study was undertaken for benchmarking of livestock export standards. The report found there are no formal systems in place in other countries that would add significantly to the effectiveness of the Australian livestock export standards and from this point of view, our standards should be considered 'high quality' and not requiring immediate or drastic revision.	29/01/2007
W.LIV.0284	Review of ASEL Scoping Study - Export of sheep from southern ports to the Middle East in winter months	This report provides a review of the current ASEL and regulatory framework with a particular focus on preparation of sheep for export from southern ports in the Australian winter months. It also incorporates assessment of government reports from investigations of reportable mortality events since 2006. The report makes recommendations concerning areas where the current standards may be changed to improve clarity and purpose and suggestions where further research may be implemented to both identify risk mitigation strategies for major risks and inform further refinement of standards.	9/04/2013
W.LIV.3036	LGAP Communications strategy plan development	A communications strategy has been developed to support and guide all communication throughout the development process for LGAP. The strategy includes communication channels to align with an implementation plan timetable for the communication strategy. Key stakeholder groups have been identified along with key value propositions and key messaging for each stakeholder group.	31/05/2015
W.LIV.3027	Global assurance for the Livestock export industry	This project developed a Global assurance programme for use by the Australian livestock export industry.	30/04/2016

W.LIV.3037	LGAP ITS	This project developed an information and technology system for the Livestock Global Assurance Program (LGAP). It was developed to streamline the function of LGAP and to ensure a website	30/07/2016

Stocking densities

Code	Project Title	Summary	Finish Date
B.LIV.0244	Stocking density in cattle shipments and animal health and performance - an assessment of existing data	This report assessed the potential use of data collected by live cattle exporting companies in observational studies and controlled trials to assess effects of varying stocking densities on indicators of welfare. The aim of the study was to assess whether such data can be used for research purposes and the report identified limitations of using such data for research purposes.	31/12/2007
W.LIV.0253	Refining stocking densities	Project undertaken to assess effects of stocking densities on welfare outcomes during sea transport. Was concluded that the ASEL space allowances for the stock classes investigated are appropriate on animal welfare grounds. However, the suggested benefits of a small increase above the ASEL space allowance, particularly during the critical early stages of a voyage, are worthy of further consideration and evaluation.	31/01/2012
PROPOSED	Effects of stocking density on behaviour and group dynamics of cattle and sheep in confined housing	This project will assess the functionality of space provided to penned cattle and sheep and how the use of space and behaviour by animals' changes as stocking density is modified. The goal is to determine whether there i9s value in modifying ASEL stocking density standards for welfare or performance reasons.	PROPOSED

Salmonella and inanition

Code	Project Title	ary	Finish Date
LIVE.0112	Salmonellosis control and best-practice in live sheep export feedlots	This study provides an overview of sheep feedlotting and the problem of salmonellosis within the Australian live export industry. The report outlines why the problem is occurring and long-term strategies to reduce the incidence of salmonellosis.	30/06/2002
LIVE.007B	Preparation of a business plan on aromatic salmonella vaccine for sheep	This document is a business plan for the registration of the aromatic attenuated salmonella vaccine for the live sheep trade and was prepared to inform stakeholders of the costs and benefits of vaccine registration and assist with commercial negotiations between the vaccines manufacturer and the industry.	8/07/2004
LIVE.0243	Inanition in sheep- a literature review	A review of the relevant literature related to the inappetence of sheep was conducted and factors that can influence feed intake were noted and methods to alleviate inappetence were reviewed and potential projects to investigate the issue were recommended.	31/08/2007
LIVE.0119A	Supporting the registration of a aro-attenuated Salmonella vaccine	This activity has been supported by MLA to assist the Manager Northern Production Research in the development of a project to register an aro-attenuated Salmonella vaccine for use within the sheep industry.	12/02/2008
W.LIV.0133	Determining the feasibility of developing an ovine Salmonella vaccine	This project assessed the economic feasibility of developing a Salmonella vaccine for use in Australian sheep. The report details a literature review and a benefit-cost analysis that found the vaccination would be economically viable, based on a positive net present value (NPV) of returns over 10 years.	31/03/2009
W.LIV.0132	Investigating the relationship between Salmonella-inanition and property of origin	This report provides a review of current knowledge concerning salmonellosis and inanition as causes of mortality in live export sheep and the potential associations between mortality and farm-level risk factors. The report then identifies several activities aimed at developing capacity to monitor, investigate and improve health and welfare outcomes in export sheep.	31/05/2009
W.LIV.0175	Importation of Dam attenuated S. Typhimurium as a modified live vaccine for adult ruminants	The first stages of this project include the application for importation of the vaccine construct and application for an in vivo usage permit. Once the vaccine has been imported into Australia, it is anticipated that an industry partner will then produce the vaccine in bulk such that safety and efficacy testing can be initiated in sheep using the new, reformulated construct in a commercial formulation to achieve vaccine registration.	3/03/2017

W.LIV.0168	DNA Adenine Methylase (DAM) attenuated salmonella vaccine	The overall goal of the project is to develop a commercial modified live salmonella vaccine that will be administered in drinking water to allow mass medication of animals at the point of entry into export facilities and will provide rapid protection. The biological material developed in the United states is in the process of being returned to Australia. Once it arrives, large animal studies will be initiated with an industry partner via MLA's Donor Company. The aim is to have a commercially available vaccine by 2020-21.	ONGOING
W.LIV.0142	Strategies to reduce inanition in sheep	This project will produce a set of best practice guidelines for the pre-embarkation treatment of sheep that aim to minimise the impact of salmonella/inanition on the Australian sheep export industry...	ONGOING

Training and associated manuals

Code	Project Title	Summary	Finish Date
LIVE.124	Developing an "Is it fit to export?" guide	The 'Is it fit to export?' guide was designed to complement the Australian Standards for the Export of Livestock (ASEL) as a field guide to assist in the maintenance of high standards of animal health and welfare by illustrating some types of animal that should not be supplied for export.	30/09/2006
B.LIV.0128	Producers guides to assist in preparation of livestock for export	Building on success of 'Is it fit to export?' guide, produce easy to follow guides for producers outlining what is required to prepare cattle and sheep for export, including a checklist.	1/09/2007
B.LIV.0356	Training Gap Analysis	This project involved the review of all six sections of the Standard for the Export of Livestock (version 2.1) together with the Export Control (Animal) Orders (2004) and the Export of Livestock to Saudi Arabia Order (2005) to identify competency requirements and then examine how those requirements may be met.	30/06/2008
W.LIV.0160	Construction of competency units for stockman training course	The purpose of this project was to have the current stockman training course formally recognised and approved under the Australian Qualification Training Framework (AQTF). The project broke down the current stockman training course into skills and knowledge competency units. Competency units not already registered in the AQTF have been developed and submitted to the Australian Agri-Foods Skills Council for Government.	31/05/2011
W.LIV.0399	Sheep and goat Standard Operating Procedures	The purpose of this project was to develop a series of SOPs for the slaughter of sheep and goats to complement the documents produced for cattle. SOPs have been developed by gathering existing guidelines, standards, job descriptions and process information. The SOPs have been implemented in market.	14/10/2011
W.LIV.3001	Development of supply chain procedures checklist for sheep and goats	This project produced an MLA Supply Chain Procedures Checklist template for sheep and goat supply chains. Compliance with this checklist will help ensure compliance with the performance measures and targets identified in the DAFF Animal Welfare Performance Targets and Measurements Checklist.	14/10/2011
W.LIV.3003	Cattle work instructions	In order to help comply with the regulatory framework in July 2011 standard operating procedures (SOPs) were developed for the slaughter of cattle in overseas markets. In addition to the SOPs, a designed and constructed a prototype mark 4 cattle restraining box has been developed and with it a set of SOPS specifically related to the routine use and operation of the equipment.	10/02/2012

W.LIV.3012	Development of work instructions for sheep and goats	In order to help comply with the regulatory framework in July 2011 standard operating procedures (SOPs) were developed for the slaughter of cattle in overseas markets (W.LIV.0388). These SOPs are currently being implemented in Indonesian supply chains. In addition to the cattle SOPs, project W.LIV.0399 introduced a series of SOPs for the slaughter of sheep and goats. The purpose of this project was to develop effective and practical work instructions (WIs) to supplement the published SOPs for sheep and goats.	5/06/2012
W.LIV.3002	Development of live export training program	An in-market detailed and practical modular training program has been developed that can be implemented and delivered in-market for each of the supply chain elements for Australian cattle, sheep and goats exported live to overseas markets.	4/04/2013
W.LIV.0392	DVD training - On board livestock management	The purpose of this project was to develop and produce instructional DVD training material which can be used as an aid in training ship's crew and stockman on the management, handling and husbandry of Australian cattle and sheep on board livestock vessels.	30/05/2013
W.LIV.3034	Translation of LEP training materials	The Live Export Industry has witnessed the opening of Thailand, signing of an FTA with China and Cambodia is now also open. Therefore resources have been translated ready for use in the LEP training program into Thai, Cambodian Khmer, Mandarin and Hebrew.	31/03/2015
W.LIV.0292	LiveCorp Stockperson's Course Review	A review was conducted into the Stockperson's Course to reassess presentation and course materials. The review updated the materials in line with new research and industry developments.	30/06/2016
W.LIV.0192	Development of a manual for the best practice design of quarantine premises and associated biosecurity management plans	To review biosecurity, quarantine, environment, animal welfare and other relevant regulations, customer requirements and operational obligations for the planning, establishment and operation of livestock export Registered and Approved Premises. To develop a Reference Manual and a suite of best practice materials to provide greater clarity and support to the livestock export industry to comply with regulation and biosecurity requirements.	ONGOING

Other research

Code	Project Title	Summary	Finish Date
LIVE.0106	Automatic counting of sheep final report	The study evaluated technologies for automatically counting live sheep as they are loaded on and off ships. The technologies investigated included machine vision, radio frequency tags, and races capable of counting singular sheep mechanically. An automated system must be accurate, cost-effective and efficient. The report found a mechanical system to be the most accurate and affordable option to be further developed, tested and trailed.	1/06/2001
LIVE.0205	Water consumption on cattle ships	This survey was undertaken to obtain objective data about water use of cattle exported from Australia a result of a preliminary analysis that identified the water consumption of cattle was affected by the type and class of cattle as well as ship design. The report evaluated data from 87 shipments of cattle and found minimum water requirements should be set as a percentage of bodyweight and the use of troughs and drinker bowls was found to affect water consumption.	1/12/2001
LIVE.0221	Characteristics and Volume of Effluent Produced by Livestock Vessels	The report details the findings of a desktop study that investigated the nature, composition and volume of effluent produced by livestock ships. The report also compared effluent originating from livestock vessels with effluent from passenger ships. The report assisted in the development of the specific effluent handling and disposal practices for livestock carriers	30/06/2004
B.LIV.0126	Review of effluent spillage and animal welfare during livestock transport: a discussion paper	The objectives of this project was to summarise current knowledge and opinion from stakeholders regarding livestock effluent spillage, livestock limb protrusion from livestock transport vehicles (road and rail) and provide recommendations to improve these issues.	31/03/2009
W.LIV.0256	Review of fodder quality and quantity in the live export industry	The key objectives of the study were to assess the suitability of fodder specifications in ASEL and evaluate their ability to ensure that industry best practice continues to be delivered in terms of feeding efficiency, economic performance and animal welfare. The report outlines several recommendation that include; modifications to the guidelines for shipping pellet formulation, feed provisioning and the supply of additional roughage for cattle on long haul voyages.	30/06/2009

W.LIV.0352	Undertaking a Life Cycle Assessment for livestock export industry	The purpose of the study was to undertake a Life Cycle Assessment for Australian live sheep and cattle export supply chains, to provide benchmarks for global warming, water and energy use, and eutrophication. The report provides the live export industry with a comprehensive benchmark of its environmental performance and enables the industry to explore options for improving their environmental impact and investigate the environmental outcome of alternate commercial scenarios for supplying markets.	31/08/2010
W.LIV.0185	Governance of the implementation of the social license to operate industry reform	The purpose of this project has been to implement a range of activities based on the agreed industry "Future proofing for Profitability" Industry Reform Strategy. The Industry Reform Program consists of 3 strategic activities: Define industry vision, governance and indicators, Demonstrate actions to meet social acceptance & Earn public trust.	19/01/2015
LIVE.321	Risk management tools for industry	This project will develop tools for industry to use which combine risk management with the prescriptive approach contained in the industry standards. The process will have to be piloted with AQIS supervision	-
W.LIV.0298	Identifying opportunities for continued improvements to the on-board live export feed ration	Review the previous research and standards relating to fodder quality and quality within the Australian livestock export industry, consider and document why the recommendations from the previous research were not adopted. Review any material relating to pellet manufacturing and/or pellet handling systems that has relevance to the Australian livestock export industry with a view reducing and/or assuring against pellet 'fines'.	ONGOING
PROPOSED	Automated sheep counting	This project will focus on an automated video based counting system in an open area (e.g. vessel, saleyard or loading ramp). The software platform will perform the analysis on detecting and tracking of sheep for counting.	PROPOSED