



**LIVECORP**  
THE AUSTRALIAN LIVESTOCK  
EXPORT CORPORATION



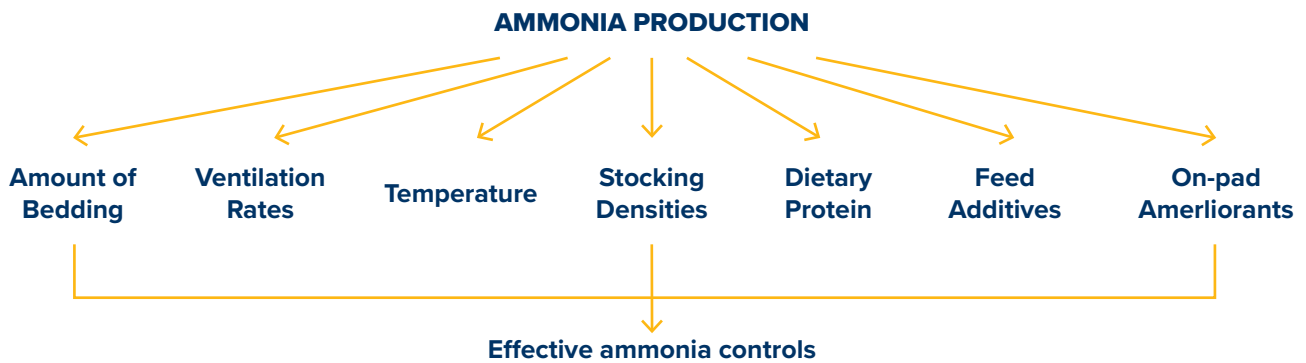
## RESEARCH SUMMARY

# Livestock Export Program & University of New England Project Partnership

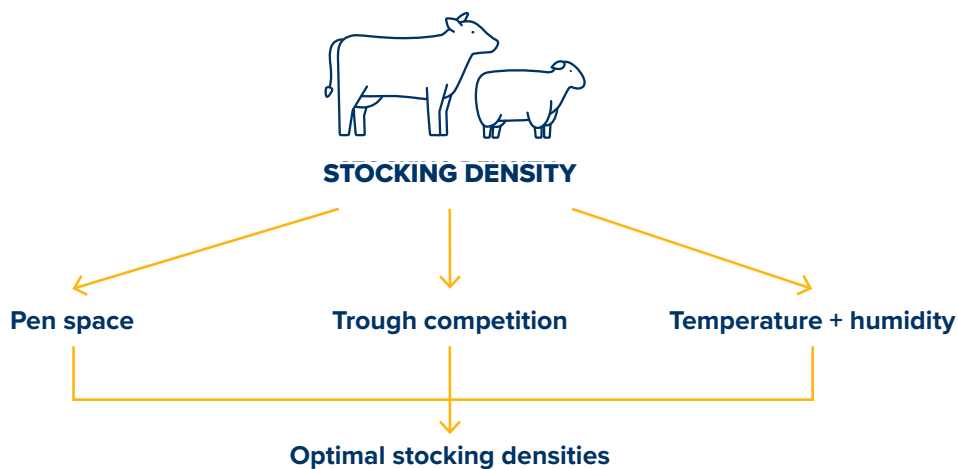


Providing the science behind recommendations on stocking density, bedding and ammonia for live cattle and sheep export voyages

## Factors influencing ammonia production



## Factors influencing stocking density



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### CONTACT

LiveCorp  
PO Box 1174  
North Sydney, NSW 2059  
[www.livecorp.com.au](http://www.livecorp.com.au)

Meat & Livestock Australia  
PO Box 1961  
North Sydney NSW 2059  
[www.mla.com.au](http://www.mla.com.au)

### THE LIVESTOCK EXPORT PROGRAM

The livestock export supply chain directly benefits both producers and licensed exporters. LiveCorp & Meat & Livestock Australia (MLA), as the relevant research and development corporations, run a joint program known as the Livestock Export Program (LEP) to ensure that all stakeholders benefit from industry research.

The LEP RD&E Program focuses on strategic investment to:

- Improve animal health and welfare outcomes across the supply chain
- Improve supply chain efficiency and regulatory performance
- Enhance market access conditions for existing and new markets

LiveCorp and MLA acknowledge the contribution from the Commonwealth of Australia to research and development undertaken in the LEP RD&E Program.

## BACKGROUND

Effectively managing stocking density, bedding, and the amount of ammonia in the air are all part of achieving good animal welfare outcomes during the export of livestock. In many ways, these three factors are interdependent. They also have the potential to impact both the social licence and profitability of live sheep and cattle exports.

Stocking densities and bedding requirements on livestock export vessels are determined by strict regulations and were identified as critical issues during a review of the Australian Standards for the Export of Livestock (ASEL).

However, there are opportunities to further the understanding of the impact of stocking density on behaviour, how animals use the space provided, or how it affects their overall health and wellbeing – particularly in livestock export, an extended form of livestock transport. The interaction between the quantity of space provided and the quality of that

space, including climatic conditions and access to resources such as feed, is also unknown.

In addition, there is limited scientific evidence behind the bedding rates outlined in ASEL or the relationship between these bedding rates, airflow/ventilation, environmental conditions, management practices and the production of ammonia.

Therefore, a strategic partnership has been established between the Livestock Export Program (LEP) and the University of New England (UNE) to take a holistic, rigorous approach to research and development (R&D) in these critical areas.

Conducted over four years, the research will lead to a scientifically robust understanding of the links between livestock welfare, bedding and ammonia management, and stocking density during the livestock export process.

It will provide industry with a greater understanding of the factors influencing outcomes and the potential approaches and interventions available to identify and manage conditions. The science will also help to inform discussions about appropriate regulation in these areas under ASEL.

Land-based trials will be used to identify and quantify relationships and influences within the complex causal web that exists between stocking density, bedding and environmental conditions (including ammonia). Most importantly, researchers will take the preliminary findings onto livestock export vessels to validate and test them in real-world scenarios and ensure commercial relevance.

The R&D collaboration commenced in late 2019. The LEP is providing \$1.2 million in funding, with UNE providing significant in-kind contributions of nearly \$1 million in salaries and student allocations.

The Partnership is supported by a skills-based working group which provides advice on project methodology to ensure the design reflects commercial operating conditions and the needs of the industry.

The working group works with the team at UNE to consider factors such as the breed of animals, where to source them, the conditioning they should receive (for instance, to ensure they are acclimatised before any trial begins to environmental conditions similar to where consignments would be sourced at a particular time of year), length of experimental period to be similar to the length of a voyage, type of feed to be provided, appropriate stocking densities to trial, bedding types and amount to be tested. This aims to ensure the research

is better aligned and relevant to the on-the-ground challenges and practical implementation, addresses priority areas of concern and provides robust, high-integrity results.

The working group is comprised of an independent Chair; exporters; veterinarians; specialist scientists; representatives from the Australian Government Department of Agriculture, Water and the Environment, LiveCorp and MLA; and an independent technical scientific advisor from the Livestock Export R&D Advisory Committee (LERDAC).

## WHAT ARE THE BENEFITS?

A greater understanding of the interaction between factors such as stocking density, ventilation, the condition of livestock pens, and animal welfare will support decision-making by industry and the regulator.

The evidence the Partnership collects will help to understand the influences on manure pad moisture and ammonia concentrations during voyages and the impact of various interventions, such as the application of on-pad treatments. This will support better management and improvements to the health and welfare of sheep and cattle on export vessels.

It will also enable the industry to make scientifically supported recommendations on stocking densities and bedding and ammonia management for incorporation into future refinements of ASEL.

The conditions on livestock export vessels, including the physical environment and air quality, are an area of interest to many in the community and continual improvement will help demonstrate the industry's animal welfare focus.

## WHAT ARE THE TRIALS?

Multiple trials will be carried out over the four years of the Partnership, holistically addressing a complex scientific issue. Each trial has been adapted to allow the isolation of variables and replicate conditions in the livestock export industry as closely as possible within the constraints of a lab environment. In some cases, specialist equipment and infrastructure have been developed to support these trials.

Trials will be carried out on land initially, to enable rigorous, controlled replication. For example, climate-controlled chambers are being used to simulate multiple sets of environmental conditions experienced by livestock during voyages. In addition, specialty microchambers have been developed to monitor ammonia emissions from bedding and manure.

The results will then be validated on livestock export vessels to ensure that the findings and recommendations stand up in practice and can be implemented in a commercial setting.

### Impacts of stocking density

There is much to be gained from strengthening evidence to underpin current stocking densities used in livestock export. The Partnership will provide a better understanding of the behaviour of sheep and cattle under different stocking densities, which will provide evidence on levels and approaches that support the effective management of animal welfare within a sea transport environment.

A series of land-based trials will examine how both sheep and cattle use space and how this can change under different climatic conditions and with the restriction of different resources. For example, the amount of time spent standing, lying and eating; and their behaviour with more and less space at feed and water troughs.

The results will then be tested and validated on livestock export vessels under commercial conditions.

### Impacts of bedding and ammonia

Managing the condition of bedding provided on vessels and the amount of ammonia in the air from urine and manure is an important part of achieving effective animal welfare, health and performance outcomes.

The bedding used for cattle on long-haul voyages (journeys over ten days) from Australia usually consists of sawdust or rice hulls. The decks are washed out periodically during a voyage, to remove any build-up of manure and urine. The primary aim of the bedding is to minimise the incidence of lameness and skin abrasions and to control moisture in the manure pad. It also helps to maintain lower levels of ammonia, minimise the amount of manure sticking to animals' coats and reduce the moisture in the air.

Sheep manure is much drier and forms a firm pad and, as a result, does not need to be washed out during a voyage.

The Partnership aims to support the industry to continue to improve the health and wellbeing of sheep and cattle on vessels by identifying and better understanding the risks, influencing factors, and management interventions that affect pad moisture and ammonia concentrations during voyages.

Trials will be conducted with sheep and cattle housed in large, enclosed transparent chambers that capture and analyse ammonia, methane and other gasses produced by the animals and the manure pad. Lab-based trials will also be conducted with manure in incubators.

Animal-based and lab-based trials will investigate how air ammonia and pad condition are affected by variables such as the amount of bedding provided, airflow and air exchange rates across the livestock pens, temperature and humidity, stocking density, animal diets, washdowns, and the interactions between these variables.

The results will create a body of evidence and practical knowledge on the factors that influence pad moisture and ammonia and their weightings and guide the development of practical recommendations for the industry on the dietary, airflow, and bedding management practices required to best manage pad moisture and reduce on-board ammonia accumulation. These findings will be validated later, on commercial voyages.

## WHY CONDUCT TRIALS ON LAND IN CONTROLLED ENVIRONMENTS?

Multiple trials involving both sheep and cattle are being carried out on land to enable rigorous, controlled replication of trials. The findings will be validated on livestock export vessels during actual voyages.

Conducting trials in controlled/laboratory settings on land in the first instance allows researchers to isolate and investigate one or more of the many interrelated factors contributing to animal welfare outcomes on a livestock export vessel.

It enables researchers to better identify and quantify the impact of a particular variable. This is an integral part of the research process and will ensure recommendations on stocking density, bedding and ammonia for live cattle and sheep export voyages are robust and deliver meaningful and actionable outcomes for industry.