



# AMPC

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ANNUAL REPORT  
TO MEMBERS  
2014-15

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**AUSTRALIAN MEAT PROCESSOR CORPORATION LTD**

This Annual Report to Members provides an overview of Australian Meat Processor Corporation (AMPC) Programs, Program Streams and Projects conducted in the 2014-15 financial year. This Annual Report to Members is a companion document to the Audited Financial Report.



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# CHAIRMAN'S YEAR IN REVIEW

**STEPHEN KELLY**  
CHAIRMAN, AMPC

The Australian red meat processing sector has experienced another record year, with slaughter numbers for both cattle and lamb increasing substantially from 2014.

Seasonal conditions were challenging for producers with dry or drought conditions in Northern New South Wales, and South East and Central West Queensland resulting in significant turnoffs of cattle. Moderate to below-average rainfall in Western Victoria, South-East South Australia and southern parts of Western Australia created difficult conditions for sheep and lamb producers.

This year, the Australian Meat Processor Corporation appointed a new Chief Executive Officer, David Lind, to replace Michelle Edge, who resigned in September 2014. David, who was employed by AMPC as Business Manager, was identified by an executive search process as the most suitably skilled executive to lead the company forward. David has a wealth of experience and skills in innovation and company management across a diverse number of businesses. The AMPC Board is committed to ensuring that we have the right resources in place to enable AMPC management to achieve its objectives and further develop our industry for the benefit of members.

The ongoing escalation in slaughter numbers in the financial year resulted in a 6.6% increase in revenues from statutory levies and another operating surplus for the Company. That situation will however change as there is expected to be a substantial fall in income via the levy stream in the next two to three years. The Company is in a good financial position to withstand this change and maintain both Core and Joint Program expenditures. AMPC will continue to ensure that levies paid by our members are used effectively for the benefit of industry.

AMPC is responsible for the delivery of Research, Development & Extension (RD&E) activities on behalf of its members, and this year has seen further development of projects that were conceived and implemented through our Core Program. This program uses processor levies matched with government funds to invest in initiatives that improve member competitiveness on a global basis and provide long-term benefits throughout the supply chain. AMPC will continue to fund the development of meat processing applications, food hygiene and quality control that is essential to the business of AMPC members.

Another major area of investment for both AMPC and Meat & Livestock Australia (MLA) is the Joint Program that

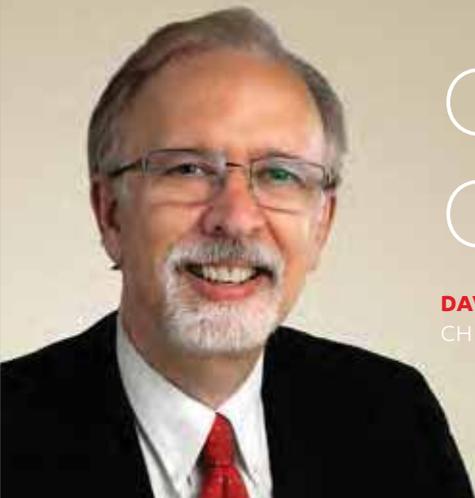
covers supply chain activities such as marketing, market access, food safety and integrity systems. Industry integrity programs (e.g. the National Livestock Identification Scheme [NLIS] and SafeMeat) and development costs associated with initiatives such as the electronic National Vendor Declarations (eNVDs) scheme have all received AMPC funding since inception and are integral to maintaining customer confidence in the industry's products. AMPC also invests substantial funds in food safety systems and the promotion of beef and lamb across a broad range of global markets, in addition to a considerable investment in domestic marketing.

Market access remains a key priority for AMPC and its members and this year a dedicated AMPC Trade Director was appointed, with responsibilities for technical market access issues in response to priorities set by an industry committee: the Industry Market Access Advisory Committee (IMAAC).

IMAAC is a joint initiative between AMPC and the Australian Meat Industry Council (AMIC). The committee coordinates its activities with government and other key industry stakeholders. Improving market access is essential for the long-term sustainability of our industry and to ensure we remain competitive with other global exporters.

I would like to recognise the support AMPC receives through the federal Department of Agriculture and the Australian Government, which is essential in developing the programs required by the red meat processing sector and in ensuring the long-term viability of all stakeholders in the Australian red meat and livestock industry.

Finally, I thank my fellow Directors, our Company Secretary, management and staff for their strong support of our industry and our company during the past 12 months.



# CHIEF EXECUTIVE OFFICER'S YEAR IN REVIEW

**DAVID LIND**  
CHIEF EXECUTIVE OFFICER

AMPC's mission is to operate as a high-performance, commercially focused innovation management company delivering industry outcomes that improve profitability at the business level, productivity at the industry level and sustainability at the national level.

To enable that mission, AMPC management with the approval of the Board has embarked on a significant re-engineering of the Company and its operations following transfer of core processing management responsibility from MLA to AMPC. The AMPC of today and tomorrow is, and will be, a substantially different organisation to the one of the past. The guiding principle in this evolution is to continuously improve AMPC's service to members and to deliver sustainable benefits for industry and the broader Australian community.

During the financial year, AMPC continued to make substantial progress in Core Program operational performance following the transfer of program management responsibility from MLA. The prior financial year was a transition year in that regard but in 2014-15, AMPC became fully responsible for the development of its Core Program portfolio, including project contracting and management, and the communication of project outputs.

To facilitate that process there are five Core Programs, each with a dedicated Program Manager:

1. Technology & Processing
2. Environment & Sustainability
3. Food Safety, Product Integrity & Meat Science
4. Implementation, Extension & Education
5. Industry Improvement & Economic Analysis.

Details of Core Program activities in this Annual Report to Members are presented by Program, Program Stream and Project. Project details are summarised in terms of a Project overview, Project outputs and benefits to industry. Particular Projects of interest are highlighted with relevant comments and inputs from researchers.

The Portfolio Development Process (PDP) that generates the annual portfolio has continued to deliver the required results. Based on an expanded engagement and communications program, with both domestic and international providers, more than 325 Preliminary Research Proposals (PRPs) were received in the annual call. This enabled the selection of a high-quality Core Program portfolio and significant industry engagement through the Program Advisory Committees (PACs). Contract & Project Management Process (CPM) performance metrics were maintained throughout the year.

To continue to improve PDP and CPM operational outcomes, as well as financial and other management metrics, the company has implemented new Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) tools. The transition and cutover was managed well and the new platforms will form a basis for continuous business improvement.

Research, development and extension highlights during the year have included the continuing uptake by processors of anaerobic digestion technologies, especially covered anaerobic lagoons (CALs) that improve wastewater treatment, enable energy and nutrient recovery from organic waste and reduce odour. Around 14 CALs have been installed at abattoirs across Australia, producing significant volumes of biogas. This technology is now being extended to in-vessel anaerobic digestion.

Another adoption highlight has been the ongoing progress with small stock automation. AMPC has been an important co-investor in the development and adoption of a range of processing automation, semi-automation, manual assist and WHS improvement technologies. While solutions have been investigated and developed for sheep/lamb, beef and goat, the development of automation has been most successful in sheep/lamb processing. Automated solutions have been developed, trialled and adapted to replace manual slaughter and dressing tasks including: Y-cut, pelt removal, brisket cut, evisceration, vacuum sanitation, kidney fat removal, hock tipping and neck washing. In addition, automated and semi-automated solutions now exist for nearly all conceivable bone-in small stock cutting tasks, including fully automated solutions to small stock carcass break-up for 3-way, 6-way, forequarter, middle and hindquarter cuts, and machine solutions to further break-up tasks, including rack barrel, loin, shoulder and chine bone removal. This has been a substantial achievement for the industry.

AMPC has recently introduced a new Strategic Communications Strategy that has been approved by the Board. This strategy involves broadening the range and quality of member and other key stakeholder communication channels. It includes initiatives such as an AMPC Events Program of AMPC Webinars, Network Meetings, AMPC Videos, AMPC Workshops and Seminars. A new website and mobile platform will be launched in the new financial year together with targeted member communications based on CRM user preferences. This revised Annual Report to Members format is a part of that initiative, and we welcome feedback on it.

Finally, I would like to thank our members, the Board and staff of AMPC for their continued commitment and support. It is an exciting time for both the industry and AMPC, and the company will continue to focus on delivering industry outcomes that provide maximum benefit for the red meat processing sector and Australia as a whole.

# AUSTRALIAN GOVERNMENT RESEARCH, DEVELOPMENT AND EXTENSION FRAMEWORK

AMPC has a range of mechanisms for identifying RD&E and marketing priorities for investment through its Portfolio Development Process (PDP). Through the PDP, AMPC facilitates industry consultative committees, known as Program Advisory Committees (PACs), which provide strategic and technical input on priorities for investment in the five Core Programs. Representatives from industry and other key stakeholders participate in this consultation process to ensure the needs of the industry and the Australian community are addressed.

AMPC works with the Australian Government to ensure effective alignment and delivery of industry and Government priorities and the integration of RD&E activities that benefit industry and the broader community. That alignment occurs through the Meat Industry Strategic Plan (MISP) and the National and Rural Research and Development priorities, as shown in the accompanying table:

NATIONAL RESEARCH PRIORITIES	RURAL R&D PRIORITIES	AMPC STRATEGIC INITIATIVES	AMPC PROGRAMS
<b>Promoting and maintaining good health</b> through strengthening Australia's social and economic fabric and preventive healthcare (healthy food production).	<b>Productivity and adding value</b> Improving the productivity and profitability of existing industries and supporting the development of viable new industries.	1,2 and 4	1, 3 and 6
	<b>Supply chain and markets</b> Better understand and respond to domestic and international markets and consumer requirements and improve the flow of such information through the whole supply chain, including to consumers.	1,2 and 4	1 and 6
<b>An environmentally sustainable Australia</b>	<b>Natural resource management</b> Support effective management of Australia's natural resources to ensure primary industries are economically and environmentally sustainable.	3 and 5	2 and 3
	<b>Climate variability and climate change</b> Build resilience to climate variability and adapt to and mitigate the effects of climate change.	3 and 5	1 and 2
<b>Safeguarding Australia</b>	<b>Biosecurity</b> Protect Australia's community, primary industries and environment from biosecurity threats.	3 and 5	2 and 6

SUPPORTING RURAL RESEARCH AND DEVELOPMENT PRIORITIES			
Frontier technologies for building and transforming Australian industries	<b>Innovation skills</b> Improve the skills to undertake research and apply its findings.	6	4
	<b>Technology</b> Promote the development of new and existing technologies.	2, 3 and 4	1, 2, 3, 4 and 6

The Australian Government has recently implemented new Science and Research Priorities, which will replace the National Research Priorities outlined on page 6.

The Science and Research Priorities are:

- Food
- Soil and water
- Transport
- Cybersecurity
- Energy
- Resources
- Advanced manufacturing
- Environmental change
- Health.

The Science and Research Priorities will be incorporated into AMPC’s planning through the year and will be reported in the 2016-17 Annual Operating Plan.

### Australian Government RD&E Priorities for Agriculture

As part of the outcomes of the Agricultural Competitiveness White Paper, the Australian Government has implemented farmer-oriented priorities to target rural RD&E funding.

The new priorities are:

- **advanced technology**, to enhance innovation of products, processes and practices across the food and fibre supply chains through technologies such as robotics, digitisation, big data, genetics and precision agriculture
- **biosecurity**, to improve understanding and evidence of pest and disease pathways to help direct biosecurity resources to their best uses, minimising biosecurity threats and improving market access for primary producers
- **soil, water and managing natural resources**, to manage soil health, improve water use efficiency and certainty of supply, sustainably develop new production areas and improve resilience to climate events and impacts
- **adoption of R&D**, focusing on flexible delivery of extension services that meet primary producers’ needs and recognising the growing role of private service delivery.

These new Australian Government RD&E priorities for agriculture are consistent with the national Science and Research Priorities announced on 26 May 2015. The national priorities align areas of research excellence with Australia’s comparative advantages, including food, soil and water, and environmental change.

The Australian Government RD&E priorities for agriculture will be incorporated into AMPC’s planning through the year and will be reported in the 2016-17 Annual Operating Plan.



# CROSS-SECTORAL COLLABORATION

AMPC engages with the Australian Government, its processor membership base, MLA and other organisations in the red meat industry. This ensures that processor levy funds are appropriately and effectively invested to deliver maximum impact.

The Company is committed to working with its stakeholders to use levy funds as efficiently as possible. It leverages its investments through co-investment and collaboration. One component of AMPC's expenditure involves co-investment with MLA in Joint Program activities. This partnership leverages services to the industry and the entire supply chain, while avoiding the duplication of capability and resources. AMPC collaborates with MLA and other RDCs through Rural R&D for Profit Program submissions and other programs.

AMPC works closely with the Australian Meat Industry Council (AMIC), the peak industry council and advisory body for the red meat processing industry. This relationship ensures that needs and issues identified by AMIC's processing members are considered in RD&E activities. This relationship was enhanced in 2014-15 through the formation

of the joint AMPC: AMIC Industry Market Access Advisory Committee (IMAAC) to deal with significant technical barriers to trade issues.

AMPC continues to work with the Meat Industry Training and Advisory Council (MINTRAC). Extension activities are critical to the effective uptake of RD&E investments in the industry. AMPC has a strong track record of ensuring processors adopt RD&E and other AMPC-funded outputs.

AMPC will continue to develop strategic partnerships and alliances with other organisations that have complementary capabilities and service delivery assets. These organisations include universities, government agencies, research and development corporations (RDCs), research institutes, the CSIRO, Cooperative Research Centres (CRCs) and other industry providers, both in Australia and overseas. Numerous collaborations at the Project, Program and organisational level extend across state, national and international boundaries. Further information on relationships between AMPC and other organisations can be found at [www.ampc.com.au](http://www.ampc.com.au).



# OTHER MATTERS

## **Intellectual Property Management & Commercialisation**

Following the transition of Core Program management from MLA to AMPC, the company negotiates AMPC ownership of Intellectual Property (Project IP) and access to Background IP within the terms of AMPC agreements with providers. Usually, AMPC will own Project IP if there is no substantial project co-investment by the provider and Background IP is minimal. However, each agreement is negotiated on its own merits.

Commercialisation rights are generally not negotiated at the outset of a research agreement, although such rights can be considered in special circumstances. Given that AMPC is building an IP portfolio based on Project IP and access to Background IP, it has been decided that AMPC will manage commercialisation in its own right for Core Program projects with minimal legacy IP. Currently, under the Relationship Agreement, those rights are held by MLA. Accordingly, the Relationship Agreement will be varied to accommodate AMPC acquisition and management of commercialisation rights.

The guiding principle by which AMPC will manage both IP and commercialisation is to deliver maximum benefit to members and the broader Australian community.

## **Joint ventures and subsidiaries**

AMPC did not establish any subsidiaries or joint ventures during 2014-15.

## **Directions and significant matters notified to AMPC by the Minister**

AMPC did not receive any directions or significant notifications from the Minister during 2014-15.



# INDUSTRY SNAPSHOT AND RESEARCH CONTEXT 2014-15

The Australian red meat industry reached new heights in 2014-15, with record production and slaughter levels recorded by both the lamb and beef sectors. Total off-farm value of the sheep and beef industries was \$23.2 billion, with the goat industry reaching around \$268 million (ABS/GTA). About \$21.6 billion of that value – or 1.2% of Australia’s total GDP – was contributed by the red meat processing sector.

## Beef

It is estimated that the total off-farm value of the beef industry was \$18.2 billion, up 20% from the previous financial year.

Growth was underpinned by:

- record turnoff and strong international demand, which saw beef export values lift 41% year-on-year to just over \$9 billion (ABS/GTA)
- record slaughter of 9.4 million head of adult cattle for 2014-15, equating to 2.62 million tonnes (carcase weight) of beef (ABS)
- relatively stable domestic retail value of beef, which was up 1.8% at \$7.8 billion.

## Australian Beef Production



Tonnes Carcase Weight

SOURCE: Australian Bureau of Statistics



### Lamb and mutton

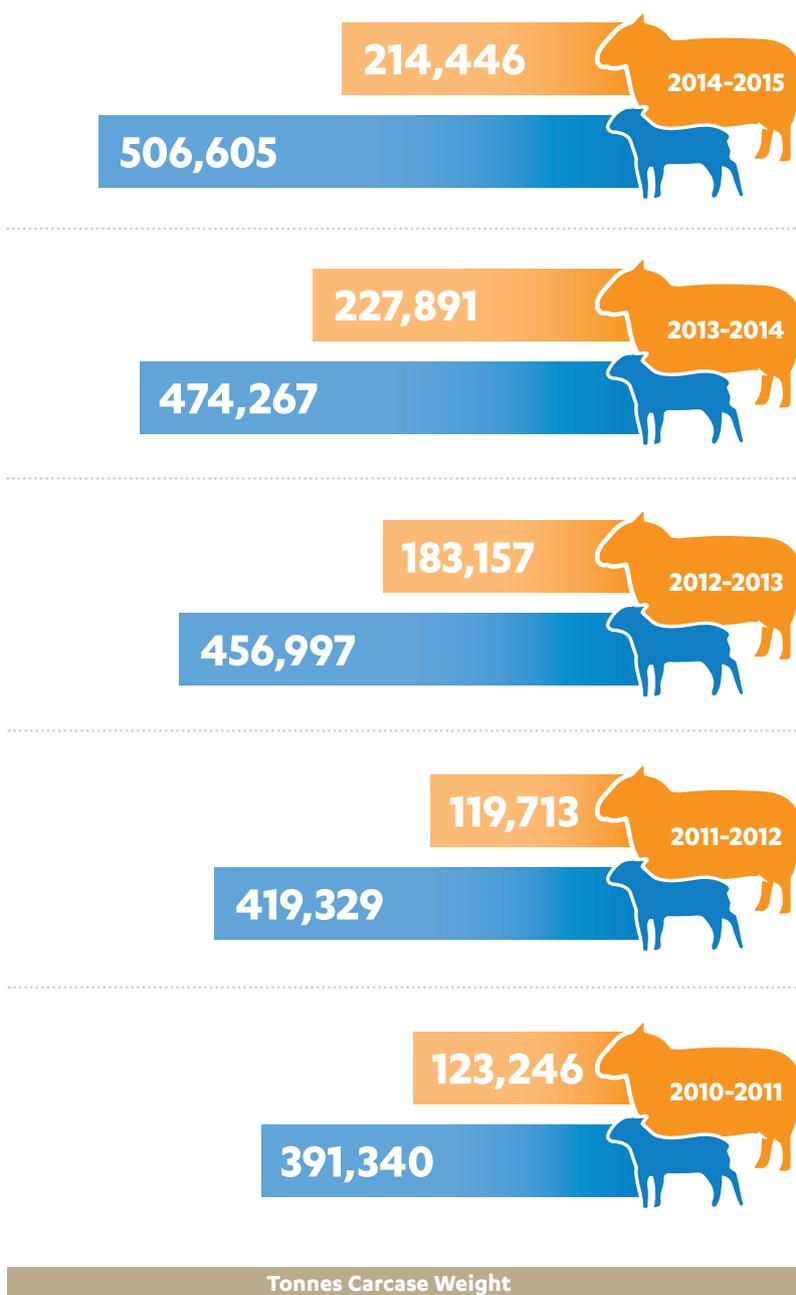
The total off-farm value of the sheepmeat industry in 2014-15 was about \$5 billion, up 13% year-on-year.

Key factors in the growth were:

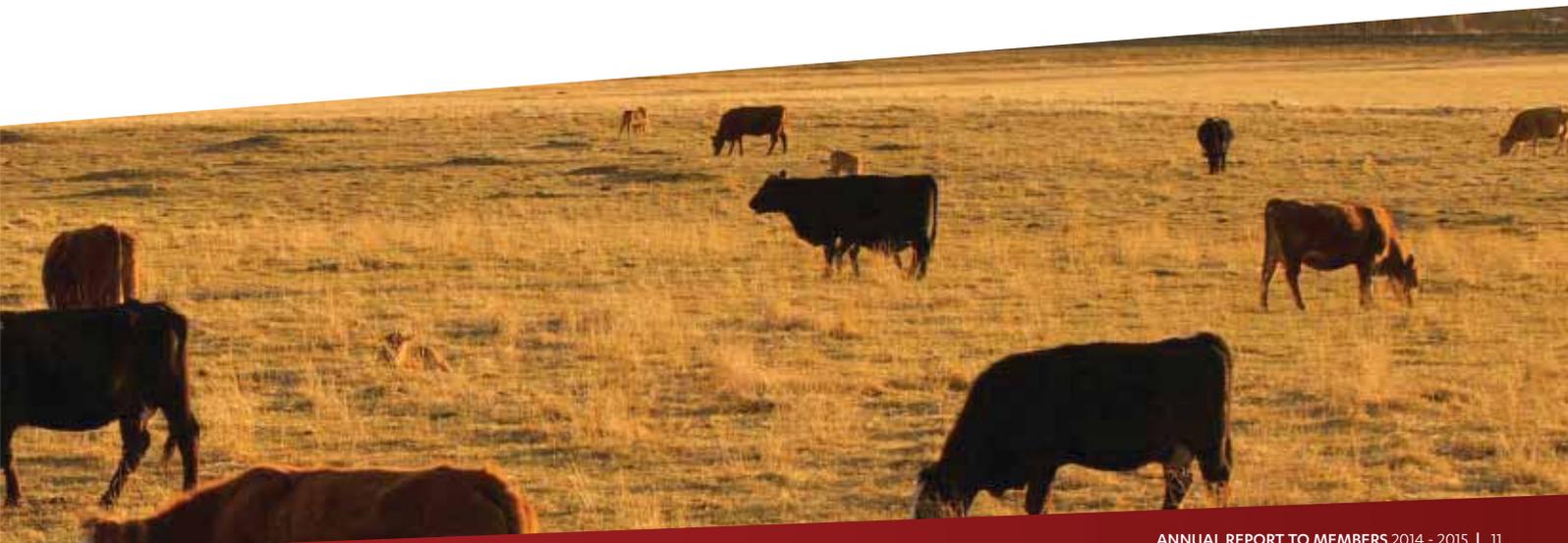
- high slaughter levels and strong demand, which saw lamb export values increase 16% year-on-year to \$1.8 billion in 2014-15 (ABS/GTA)
- record fiscal year lamb slaughter of 22.86 million head, producing 506,605 tonnes carcass weight of lamb (ABS)
- sheep slaughter reaching nine million head during 2014-15, producing 214,446 tonnes carcass weight of mutton (ABS)
- mutton export values lifting 7% to \$824 million
- retail value of lamb up 10% domestically (\$2 billion in sales) and mutton up 28% (\$71 million in sales).

**Value adding:** The combined value of Australian co-product exports (hides, skins, offal and rendered product) was \$2.4 billion, up 4% year-on-year as a result of higher slaughter numbers and the weaker dollar.

### Australian Sheepmeat Production



SOURCE: Australian Bureau of Statistics



## Outlook

**Beef:** Projections are for a decline in beef exports for the 2016 calendar year after three consecutive years of record exports. Adult cattle slaughter is forecast to decrease 13% year-on-year to 7.8 million head in 2016. (This will still be above the 10-year average of 7.7 million prior to the records of 2013 and 2014.) Even with the return of more favourable seasonal conditions, herd rebuilding will take some time and adult cattle slaughter is expected to bottom out at about 6.9 million head in 2017.

**Lamb and mutton:** In response to forecast production and slaughter decline, lamb exports are forecast to decrease 6% in 2016, coming off a record export year. Mutton exports will also contract, largely as a result of decreased slaughter following two high years. Mutton exports in 2016 are expected to decline 11% year-on-year. As the market evolves, it is expected lamb exports will return to 265,000 tonnes shipped weight by 2019, on the back of strong global demand.

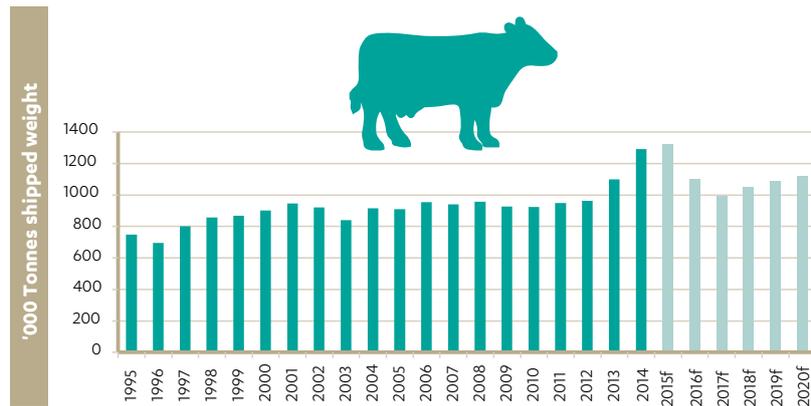
**The challenge:** The continued evolution and increasing complexity of livestock markets – driven by climate variability, economic factors, trade negotiations, changing eating habits and the decline of domestic consumption – means the processing sector needs to look to innovative solutions.

Australia’s red meat sector is driven to grow its reputation as an efficient, world-leading supplier of high-quality, safe, clean and green solutions to meet a growing global appetite for protein.

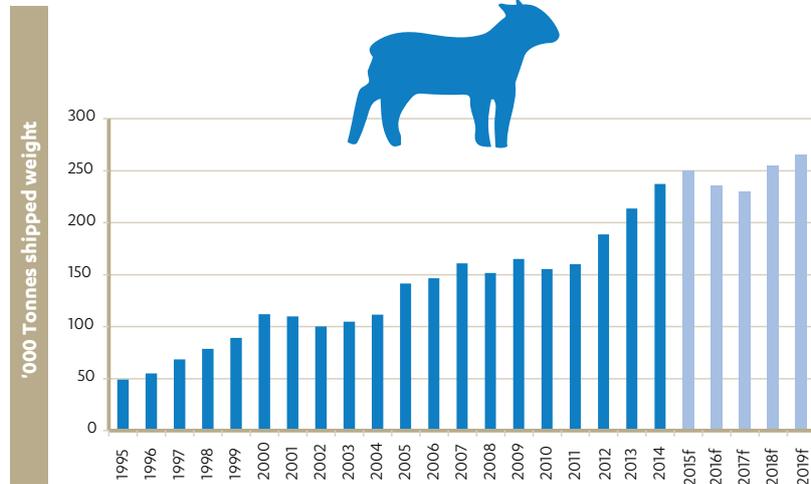
Underpinning this reputation will be research and development that provides solutions to challenges such as labour efficiency, processor profitability, product integrity and environmental sustainability. Read how your industry is investing in these areas in the following section.

*SOURCE: The forecast data in this report was obtained from the MLA Australian Cattle Industry Projections 2015 and the MLA Australian Sheep Industry Projections 2015.*

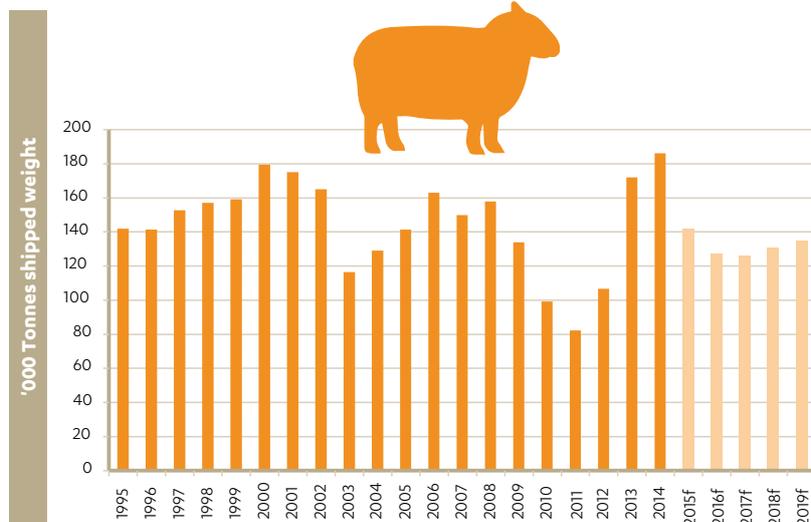
### Australian beef exports



### Australian lamb exports



### Australian mutton exports



*SOURCE: Department of Agriculture*



# AMPC PROGRAM STRUCTURE – FINANCIAL YEAR 2014-15

## CORE PROGRAM

### PROGRAMS

#### 1. TECHNOLOGY & PROCESSING

#### 2. ENVIRONMENT & SUSTAINABILITY

#### 3. FOOD SAFETY, PRODUCT INTEGRITY & MEAT SCIENCE

### PROGRAM SUMMARY

Processing technologies that improve efficiency; reduce the cost of production and facilitate improved value capture

Technologies that improve red meat processing industry sustainability with regard to environmental, economic and social outcomes

Technologies that enable high standards of food safety, product integrity and improved eating quality

### PROGRAM STREAMS

- › Increasing Productivity
- › Improved Carcase Measurement
- › New Meat Products
- › Improved Material Handling Systems

- › Energy Efficiency Systems
- › On Site Energy Generation
- › Water Harvesting & Conservation
- › Solid Waste Management
- › Liquid Waste Management

- › Food Safety
- › Product Integrity
- › Meat Sensing & Measurement
- › Meat Packaging
- › Meat Quality Improvement
- › Meat Storage & Colour
- › Animal Welfare

### PROGRAM EXAMPLES

- › Automation & Robotics
- › Manual Assist Technologies
- › Vision & Sensing Systems

- › Energy Efficiency
- › Water & Waste Treatment
- › Processing Sustainability

- › Real Time Pathogen Detection
- › Improved Packaging Technologies
- › Novel Processing Interventions

## JOINT PROGRAM

### 4. IMPLEMENTATION, EXTENSION & EDUCATION

The effective translation and communication of R&D outputs to stakeholders and the support of key training initiatives

- › Innovative Processes & Employees
- › Upskilling of Process Engineers
- › Attraction/Retention of Employees
- › Professional Development
- › Training & Extension Services

- › Engagement Network
- › Marcom (reports, snapshots etc.)
- › Capability Development Reviews
- › Scholarship & Training

### 5. INDUSTRY IMPROVEMENT & ECONOMIC ANALYSIS

New Program for FY 2014-15

Industry analysis, evaluation of the impact of AMPC investments and mechanisms to improve industry performance

- › New Program for FY 2014-15

- › New Program for FY 2014-15

- › New Program for FY 2014-15

### MARKET ACCESS MARKETING, FOOD SAFETY AND INTEGRITY SYSTEMS

Marketing and market access initiatives that provide growth opportunities in both domestic and international markets.

Technologies that enable high standards of food safety and product integrity.

- › Market Access
- › Marketing
- › Food Safety and Integrity Systems

- › ChAFTA
- › IMAAC

# PROGRAM 1

## Technology and Processing

### About the Program

The objective of the Technology and Processing Program is to develop processing technologies that improve efficiency, reduce the cost of production and facilitate improved value capture.



The program operates across four program streams:



Program  
Stream 1

#### Increasing Productivity

Productivity growth and the ability to respond quickly to changing economic conditions are essential to maintain industry competitiveness. Innovation and capability development are recognised across industry as underpinning productivity gains. This stream focuses on developing and implementing new products, processes and innovative technological solutions to improve business productivity and sustainability.



Program  
Stream 2

#### Improved Carcass Measurement

This stream focuses on research into the automatic measurement of key carcass characteristics in situ and on line in order to drive automation and increase processing efficiency and productivity. Multiple technologies are being investigated for different measurement targets. Many of the technologies under evaluation have the potential to be used as visioning and sensing devices to drive higher levels of automation.



Program  
Stream 3

#### New Meat Products

The focus of this stream is to align new product innovation with the needs of customers and trading partners. It specifically focuses on helping industry identify market opportunities for lower-value meat cuts and co-products, as well as developing a capability to access novel markets and value chains, and create advanced technologies that maximise value.



Program  
Stream 4

#### Improved Material Handling Systems

Automated and robotics systems can reduce the number of operators required to perform material handling tasks and can deliver significant productivity gains in improved throughput, reduced product damage and loss, and enhanced product traceability. This stream focuses on building an effective portfolio of R&D investments in product handling. The portfolio consists of analysis and benchmarking of industry needs, identification of technological challenges and development of appropriate solutions.

## RESEARCH SNAPSHOT:

# PICK AND PACK AUTOMATION A STEP CLOSER

New technology with the 'smarts' to identify primal cuts of vacuum-packed meat is showing promise for automating labour-intensive 'pick-and-pack' operations in processing facilities.

The system, developed by AMPC's Technology and Processing Program, was put to the test earlier this year.

Mechatronic engineers from Strategic Engineering used a two-dimensional (2D) industrial high-definition camera operating in tandem with a three-dimensional (3D) camera and associated software to sense and identify vacuum-packed primal cuts of meat.

The first camera detects and decodes a quick response (QR) code to identify the type of vacuum-packed primal cut, while the second camera produces a 3D digital image of the cut. Associated analysis software then processes data from both cameras to calculate the dimensions, position and orientation of the primal cut in real time.

Project leader Richard Aplin, Managing Director of Strategic Engineering, said the hardware and software was selected because it enabled data about the vacuum-packed primal cuts to be collected and processed fast enough to meet the speed and load density of typical conveyor belts.

"In the future, the data would be supplied to an industrial robot programmed to pick up vacuum-packed primal cuts of meat from the conveyor belt and place them into cartons," Mr Aplin said.

Strategic Engineering carried out in-house and on-site performance and reliability tests using ideal and realistic conditions to verify the accuracy and capability of the proposed hardware and software solution. The final system was trialled on-site at a plant in Queensland.

"Our results showed a range of QR-codes – 20x20 millimetres in size at a distance of 1.2 metres – could be reliably read and located with the hardware and software tested," Mr Aplin said.

"The system could determine 3D meat segment locations, orientations and dimensions (length, width and height) with an acceptable level of precision at  $\pm 7\text{mm}$ ," he added.

The software developed through this project is the key first step in creating a robust, automated pick-and-pack system for the red meat industry.

AMPC hopes to modify the system tested on vacuum-packed primal cuts to produce a reliable and cost-saving solution for automating the picking and packing of 'naked' primal cuts.

John McGuren, AMPC Program Manager for Technology and Processing, said the development of a sensing system for vacuum-packed primal cuts of meat opened the way for a potentially rapid progression to a similar system for identifying 'naked' cuts of meat prior to packaging.

"Due to the random and variable nature of primal cuts of meat – and therefore the technical complexities involved in identifying and locating them – there is no complete solution available that is capable of assessing naked primal cuts in high detail and in real time," Mr McGuren said.

"With modification and improvement of the hardware and software components tested successfully on vacuum-packed primal cuts of meat, we are keen to progress our research and develop a system for identifying and then customising the robotic movements needed to label and package naked cuts of meat. The ability to identify meat cuts before they are placed into packaging would be important in maximising the productivity gains from automation of the primal cut pick-and-pack process," he added.

AMPC is waiting on the outcome of research by MLA into alternative technology for 'naked meat' picking and packing before taking this work to the next stage.

## BENEFITS

- Technology to recognise and locate vacuum-packed primal cuts of meat travelling along a conveyor belt has been developed
- Tests showed an acceptable level of speed and accuracy
- Data could drive an industrial robot, enabling the labour-intensive task of packing meat into cartons to be automated.





**Program Stream**  
Increasing Productivity

**Vision and Sensing System Integration (2014/1026)**

**Project overview**

This project investigated current red meat processing technologies, processes and practices to evaluate opportunities for sensing, automation and business optimisation from other industries.

**Project outcome**

Study sites showed quite different levels of organisation, automation, visual management, IT usage and people management. Significant opportunities for process optimisation were identified in the boning room, packaging and dispatch and in the processing of side value streams. A benchmarking approach to business optimisation is a prerequisite for specific sensing and automation systems.

**Benefit for industry**

A range of opportunities and possible approaches were identified that would enhance process and business optimisation. More in-depth VSM (Value Stream Mapping) is needed to identify specific projects that demonstrate the most attractive return on investment.

**COMPLETE**

**Butchers Glove - Technical Feasibility Assessment (2013/5032)**

**Project overview**

This project aimed to verify the Butcher’s Glove preliminary design concepts and methodologies developed through a previous project, and to undertake further development and materials testing.

**Project outcome**

The research indicated that the glove concept is technically feasible. A number of materials and manufacturing techniques were identified as suitable for high, medium and low volume production. A range of samples were sourced and preliminary testing was completed. Further quantitative testing is recommended to verify performance.

**Benefit for industry**

The protective glove concepts have a protective exterior physical barrier and incorporate features to promote comfort and compliance. Primarily, the glove wearer is given increased safety by the cut resistance of the outer layer and is able to maintain productivity as a result of a flexible inner ‘membrane’.

**COMPLETE**



**Program Stream**  
Increasing Productivity

### Collaborative Robot System (2014/1008)

#### Project overview

This project involved a desktop review of collaborative robot applications in other industries and an assessment of the feasibility of potential collaborative robot applications within the red meat industry. It also determined the value and feasibility of collaborative robot trials for meat processing tasks.

#### Project outcome

Collaborative robot applications in the red meat industry depend on future research and adaptation. Many of the tasks are too complex to be handled by the current level of collaborative robot technology. However, where the sensing technologies are available and the industry standards are accounted for, collaborative robots may be more suitable than a modern industrial robot. This would need to be determined on a case-by-case basis.

#### Benefit for industry

The project identified potential benefits that collaborative robots could provide through integration into existing processes. Collaborative robots may not require the installation of as many auxiliary components, such as sensor hardware and safety systems (e.g. cell guarding), as traditional robots. Also, they are more easily and intuitively reprogrammable by non-technical staff. It may be possible to install collaborative robots onto existing stations on production lines with no or minimal additional control, sensory or safety systems.

COMPLETE

### Automated Meat Recovery off Featherbones (2014/1005)

#### Project overview

This project examined the potential for mechanical recovery of meat from beef featherbones to increase yield and to create concepts with the possibility for further development.

#### Project outcome

The project identified two generic options for the featherbone removal mechanism. One relies on the individual identification of each featherbone and operates on each one in turn; the other is an *en masse* approach that does not require individual featherbone identification. Any method that pinpoints and acts on each featherbone individually will employ sensing and manipulator technologies that will be complex and expensive (or employ a manual operator).

#### Benefit for industry

Even if a workable featherbone prising-off method was developed, it would require a dexterous and flexible handling mechanism, such as a robot. From the body of implementation experience, a Robot Cell that used X-ray detection and a 6-axes robot to carry out programmable movements would cost \$400,000 to \$500,000 (after the prototype development). As none of these ideas present an attractive ROI, investigations have been terminated with this minimal expenditure Stage 1 assessment study.

COMPLETE



**Program Stream**  
Increasing Productivity

**Hook-Assist CBA and Feasibility for Future Modifications (2013/5008)**

**Project overview**

This project captured learnings from industry trials of the Hook-Assist prototype and gained an understanding of issues faced in its adoption by processors. It looked at what is required to resolve these issues.

**Project outcome**

The Hook-Assist technology requires an investment in re-design to enable trials before planned commercialisation activities. In order to get the prototype to commercial operation will require low-cost rewiring to fix waterproofing and maintenance issues but that will not address shortcomings of the short swing arm. Another option is a higher-cost redesign involving a complete rebuild. Twelve months of commercial trials will be needed, most likely requiring further refinement of the base technology platform.

**Benefit for industry**

The development of the Hook-Assist prototype provided a window into cobotic technology and its potential benefits, but has also revealed the challenges of bringing this new technology to full commercial viability. This project has identified a number of areas of investigation to address challenges and opportunities and to underpin recommendations on how to proceed with the technology.

**COMPLETE**

**Beef Spinal Cord Removal Stage 2 Process Risks and Benefits (2013/5043)**

**Project overview**

This project sought to provide confidence that High Pressure Water and Vacuum (HPWV) provides adequate benefits for beef spinal cord removal whilst ensuring the process does not introduce new and unmanageable risks. The project investigated potential cost and process benefits and risks associated with the action of HPWV and the development of an automated solution.

**Project outcome**

Positive trial results suggest that the process of HPWV is a viable method for removing the spinal cord from beef carcasses. Results were considered superior to manual spinal cord removal processes in terms of final product presentation and the lack of unintended or unwanted potential process risks.

**Benefit for industry**

The tooling used to achieve these results has the potential to be incorporated into a fully automated robotic spinal cord removal solution for beef carcasses. A fully automated solution would offer labour savings and could form an important part of the eventual replacement of manual beef processing tasks in an integrated automated processing chain.

**COMPLETE**



**Program Stream**  
Increasing Productivity

**Review of Manual Assist Technology Developments and Solutions (3000/5085)**

**Project overview**

The project undertook an evidence-based strategy development program to identify tasks that would benefit from manual assist solution development.

**Project outcome**

The project identified a number of areas that would benefit from either the application of existing manual assist solutions or the development of new manual assist solutions.

**Benefit for industry**

This investigation showed there are a range of possible solutions that could be developed to assist manual tasks in beef and lamb processing facilities. Opportunities were identified for R&D into why existing systems are not adopted, and into concepts and enabling platforms from other industries that could be applied in the meat processing sector.

**COMPLETE**

**Lamb Aitchboning Manual Assist (2014/1055)**

**Project overview**

This project will develop a manual assist device for lamb hindquarter boning.

**Project outcome**

The intention of the device that is developed is to allow the boner freedom to concentrate on boning technique in the most ergonomic manner in order to improve labour utilisation and promote increased yield.

**Benefit for industry**

A manual assist device for lamb hindquarter boning would significantly improve labour utilisation, productivity, product quality and yield outcomes for Australian red meat processors.

**IN PROGRESS**

RESEARCH SNAPSHOT:

# UNDERSTANDING THE WHYS AND HOWS

Issues experienced during the commercial-scale operation of robotics in lamb processing have been ironed out by an AMPC-funded project, opening up the way for the uptake of the technology in Australia.

The Intelligent Y-Cutter has been under development for many years. It operated in the 98% success rate range during production testing in Australia and New Zealand but, when trialled at commercial speeds, this level of operation could only be maintained through continuous tuning.

AMPC-funded research has helped to improve fault diagnosis and to implement machine modifications, making the Y-Cutter more attractive to industry, where system failures of just 1% – 2% can limit adoption.

AMPC Program Manager for Technology and Processing John McGuren said next generation automation would only be taken up by processors if it provided solutions that either matched or exceeded current practice for speed, accuracy, reliability and product quality, while delivering increased productivity.

The Intelligent Y-Cutter was designed specifically to make the initial Y-cuts in preparation for the removal of pelts and was intended to replace the manual process usually conducted by two or three operators. Operating in trials at 8.5 carcasses/minute, the Y-Cutter offered labour savings; greater productivity; consistent quality of carcase dressing; reduced

workplace injuries; and improved hygiene.

The Australian Lamb Company (ALC), an export and domestic processor based at Colac, Victoria, co-invested with AMPC in the facilitated adoption of an Intelligent Y-Cutter as part of a move into more robotic processing. A similar trial installation took place with a New Zealand processor.

“It ended up sitting in the corner because it just wasn’t reliable enough,” ALC Innovation Manager Murray Miller said. “In the interim, we had returned to two labour units, who were capable of eight carcasses a minute.”

Rather than writing the machine off, ALC partnered with AMPC to develop and trial the technology and address system design and operation weaknesses.

Technology support to the project was provided by the original developers of the technology, New Zealand-based Callaghan Innovation, and the Australian company Machinery Automation and Robotics.

“A key feature of the research was the incorporation of a new real-time camera-based monitoring and fault diagnosis system, which collects multiple channels of video footage and combines it with machine parameter and user/output figures to create a greater depth of data to help determine machine faults,” Mr McGuren said.

“This enhanced fault diagnosis capability will have broader applications in improving the reliability and performance of similar robotic systems, helping to address a key barrier to wider adoption by processors,” he added.

The new knowledge has led to ALC recommissioning the Y-cutter, initially in a modified manner. Currently, it is being trialled to create the cut on one leg, while an employee creates the other cut – maintaining an output of eight carcasses/minute.

“We’ve learnt a lot during this latest research and one of the main outcomes is that, due to more video monitoring of the Y-cutter, diagnosis of problems is much faster,” Mr Miller said.

“Although having the machines on the floor leads to lower operator numbers, you need to ensure you have employees adequately trained in the technical side of things for maintaining and fault finding in the machines,” he added.

ALC also uses a robotic kidney fat sucker, an automated pallet stacker, a standard rotary hide puller and automated primal cut technology.

“Our company is glad the industry is prepared to persist with getting this technology right. It’s a steep learning curve and this support has really lifted our confidence,” Mr Miller said.

John McGuren said the project had substantially addressed a number of key barriers to the potential for wider adoption of the Y-cutter and other similar automation technologies in Australia.

**BENEFITS**

- Barriers to wider adoption of the Y-Cutter are being overcome
- Improved diagnostics of technical issues
- Growing confidence will increase use of automation technologies.



*Intelligent Y-Cutter*



**Program Stream**  
Improved Carcase Measurement

**X-Ray OCM Bone, Fat & Muscle Trials (2014/1065 (A.TEC.0124))**

**Project overview**

This project will investigate the use of high-definition (HD) X-ray technology for Objective Carcase Measurement (OCM).

**Project outcome**

Trials will be conducted to determine whether HD X-ray technology can determine cutting lines for beef automation and can deliver OCM of bone, fat and muscle.

**Benefit for industry**

OCM technologies under investigation have the potential to be used as visioning and sensing devices for automation. Initial reviews of HD X-ray technologies that are proven and suitable for automation indicate a potential to provide OCM of Bone + Fat + Muscle and possibly additional OCM characteristics. Being able to use one X-ray system as a platform for automation and OCM will provide a major step in sensing automation.

**IN PROGRESS**

**Beef and Lamb OCM with CT In Situ Further Development (2014/1057 (A.TEC.0123))**

**Project overview**

This project will develop and demonstrate Australian CT algorithms for various supply chain objective measurement uses, including eating quality, food safety inspection and advanced automation. It will investigate the use of Computed Tomography (X-ray CT) as an Objective Carcase Measurement (OCM) tool.

**Project outcome**

Trials will be conducted using a CT unit installed in-line at a meat processing plant to develop and demonstrate Australian CT algorithms for various supply chain objective measurement uses.

**Benefit for industry**

In addition to driving cost-effective automation solutions, X-ray technology can provide eating quality, food safety inspection and supply chain information. This project will develop draft eating quality, food safety, advanced automation and supply chain information algorithms for Australian beef and lamb, and will demonstrate how advanced CT images can enable the next step in lamb and beef processing automation.

**IN PROGRESS**



## Program Stream New Meat Products

### Automated Preparation of French Dressed Ribs (2014/1006)

#### Project overview

This project aimed to create a practical and cost-effective machine concept for the automated French dressing of lamb ribs. The current process is a manual one, which requires operators to use a knife to cut and scrape the meat off the ribs in each rack, leading to high labour content and costs.

#### Project outcome

This project demonstrated potential for the development of an effective robot cell for the Frenching of lamb rib racks. To be commercially viable, the solution would need to achieve acceptable throughput rates of entire rib racks and be cost-effective on a labour replacement basis. Based on the outcomes of this investigation, the next stage of the project aims to refine the performance and design specifications for the robotic cell.

#### Benefit for industry

Previous R&D has investigated options to semi-automate or automate French racking without using water as the primary process. Some disadvantages of water-based French rack systems are that they need manual loading and valuable intercostal meat is not retained. These shortcomings would be avoided by a fully automated robotic solution.

COMPLETE



**Program Stream**  
New Meat Products

**Mechanical Ovine French Racking (2014/1038)**

**Project overview**

The objective of this project is to develop a mechanical device for the French dressing of lamb ribs.

**Project outcome**

The project will investigate a design concept to create a practical and cost-effective machine for the French dressing of lamb ribs that does not require the use of water. It aims to produce a compact device without the need for sophisticated sensing systems. The process will not be fully automated, so will require an operator to place the product in the machine and initiate the process cycle, which will then perform the task and eject the product.

**Benefit for industry**

Water-based French rack machines are increasingly being used by Australian processors; however, they have some limitations with respect to manual loading, not allowing for the recovery of valuable intercostal meat and requiring high water use, which increases the load on wastewater treatment systems. A mechanical-based solution would alleviate many of these limitations.

**IN PROGRESS**

**X-Ray Lamb Frenching (2014/1056)**

**Project overview**

The objective of this project is to develop a fully automated system for the French dressing of lamb ribs.

**Project outcome**

Various projects in the past have attempted to semi-automate or automate the lamb French racking process. A key limitation for proposed automated solutions has been the lack of a sensing/vision system to guide the device. This project will investigate X-ray sensing to develop an automated solution for producing French lamb racks without the downside of current water Frenching solutions.

**Benefit for industry**

An automated, mechanical-based solution would alleviate many of the limitations of the water-based French rack machines used by processors. The water-based machines involve a manual component and do not allow for intercostal meat to be recovered during the racking process. They also involve high water usage.

**IN PROGRESS**



## Program Stream

### Improved Material Handling System

#### Pick & Pack - End Effector Gripper Development (2014/1010)

##### Project overview

This project aimed to design, build and trial a concept Primal Cut Gripper system suitable for robotic adaption to an automated robotic primal and meat cut 'pick and place' system.

##### Project outcome

A vacuum primal cut gripper system was designed and built, and trials were conducted using a robot, a conveyor and a vacuum system. The vacuum gripper was able to pick up both large and small Cryovaced primal cuts and accurately place and stack them into cartons at high speed and acceleration using a six axis robot.

##### Benefit for industry

Primal cut picking and packing is a labour intensive and largely manual step in the meat packing process. The introduction of automated/robotic solutions could reduce the number of operators required to perform picking and packing tasks and significantly increase operational productivity.

COMPLETE

#### Current Practice & Innovations in Meat Packaging (2014/1046)

##### Project overview

This project reviewed current practice and innovations in meat packaging, including active packaging, intelligent packaging, edible coatings/films, biodegradable packaging and nanomaterial packaging.

##### Project outcome

The review demonstrated great potential for innovations in food packaging. However, each packaging technology has strengths and weaknesses when considered for specific red meat applications, and these will need to be addressed by future research. Simple traditional packing will increasingly be replaced with multi-functional packaging that includes biodegradable, active and intelligent functions.

##### Benefit for industry

The review provided useful and up-to-date information on the selection of appropriate packaging materials, methods/conditions and storage environments, and identified areas of future R&D. Key product characteristics affecting stability, environmental conditions and consumer packaging expectations must all be taken into consideration in developing successful meat packaging systems. A sustainable packaging solution can only be achieved if it is socially responsible, economically viable and environmentally sound.

COMPLETE



## Program Stream

### Improved Material Handling System

#### Value of On-Line Measures - a Processor Perspective (2013/2007 (A.MQA.0015))

##### Project overview

The adoption of objective online technologies has been low among Australian red meat processors. This project aimed to provide greater understanding of Australian processors' views on the value of online measurement technologies and what processors think of current and future options.

##### Project outcome

Based on processor consultation, key traits for online measurement technologies were identified for each species (cattle: meat colour, tenderness; sheep: tenderness, pH, age, meat colour, GR and SMY%; goat: lean meat, fat, carcass conformation and meat colour). The responses indicate support for online measurement technologies, with 80% of processors saying that online objective grading systems have a role today, and 88% seeing a role in the future.

##### Benefit for industry

Much can be learned from the implementation of previous online measurement technologies in terms of commercialisation and adoption strategies. The development and adoption of objective online measurement technologies is challenging and complex. However, it has the potential to provide whole-of-industry benefits and needs continued support coupled with new approaches to enhance adoption.

COMPLETE

#### Enhancing Meat Measurement Approaches (2013/2003 (A.MQA.0013))

##### Project overview

This project evaluated the application of bioimpedance and synchrotron technologies on the identification of primal composition and muscle characteristics of shortloin and topside in lambs and sheep, compared to traditional laboratory methods.

##### Project outcome

The study has shown that SAXS and bioimpedance technologies could become powerful research tools to determine structural components and composition of muscle relating to meat eating quality traits. It predicted the differences in actin/myosin spacing and fat distribution between positions within a muscle and between seasons. Future study is needed to evaluate the use of synchrotron technology in predicting components influencing eating quality traits between muscles within an animal and from different growth stages.

##### Benefit for industry

Tenderness (texture), juiciness and flavour indirectly influence consumer choice when purchasing lamb. Classical measures of traits, such as Warner Bratzler shear force – a proxy for tenderness – are destructive of samples and not applicable to on-line measurement. There is no available technology for non-destructive, cost-effective in-line measurement of these traits. This project has demonstrated the potential for SAXS and bioimpedance technologies to help fill that important processing technology gap.

COMPLETE



Program Stream  
Improved Material Handling System

**Innovations in Meat Packaging Technology -  
A Review (2014/1042)**

**Project overview**

This project outlined current and future trends in meat packaging technology by reviewing available scientific literature and relevant patents, with a focus on smart packaging to improve product quality, shelf-life and monitoring.

**Project outcome**

This review suggests innovative meat packaging is required to match consumer-driven packaging demands for improved safety, product quality, traceability, convenience, shelf-life, environmental impacts and integrity. These requirements are within the scope of smart packaging. A review of patents showed many inventions with applications to smart packaging already exist. However, validation and testing of these technologies within meat packaging applications is essential to increase confidence and adoption.

**Benefit for industry**

The project has helped identify scope for investment into meat packaging technology by the review of trends, available patents and technologies. Smart packaging offers effective advantages to all stakeholders involved with meat processing, retailing and consuming. It appears likely that smart packaging technologies for muscle-based food products will soon become commonplace.

COMPLETE

**Meat Lumping – Beef Quarters (Phase 1) (2013/5022)**

**Project overview**

This project will develop a mechanised transport device to replace manual handling of meat carcasses.

**Project outcome**

The project will undertake concept design and prototype development of a mechanised transport device to replace manual handling of meat carcasses. The prototype will be trialled at meat processing facilities to establish a proof of concept prior to further development.

**Benefit for industry**

Beef quarters are largely manually moved around, often by loading onto and off overhead rails. A mechanised device will greatly assist in reducing the physical effort required to move and transport carcasses.

IN PROGRESS



**Program Stream**  
Improved Material Handling System

**Ultrasonic Measurement of Tenderness of Vacuum Packaged Beef (2014/1045)**

**Project overview**

This project aims to develop a proof-of-concept ultrasound system for beef tenderness measurement.

**Project outcome**

A proof-of-concept prototype ultrasound system for beef tenderness measurement.

**Benefit for industry**

Beef tenderness is a key perceived measure of meat quality for consumers and a value measure for processors. There is no available technology for non-destructive, cost-effective in-line measurement of tenderness. This project seeks to fill that important processing technology gap.

**IN PROGRESS**

**Container Loading Pilot Installation (2014/1011)**

**Project overview**

This project aims to develop an automated container loading system for cartoned meat.

**Project outcome**

The project will develop a prototype automated container loading system for on-site pilot trials at a meat processing plant.

**Benefit for industry**

The loading of meat cartons into shipping containers is largely a manual process. The successful development of an automated solution for this task offers significant advantages with respect to reduced labour requirements, increased productivity, improved product traceability and reduced product damage.

**IN PROGRESS**



# PROGRAM 2

## Environment and Sustainability

### About the Program

The objective of the Environment and Sustainability Program is to develop technologies that improve industry sustainability in terms of environmental, economic and social outcomes.



The program operates across five program streams:



Program  
Stream 1

#### Energy Efficiency Systems

Red meat processing requires significant amounts of energy, usually derived from the grid (electricity or gas), liquefied petroleum gas, coal, or oil/diesel. Energy is a major input and expense, as well as a source of greenhouse gas emissions. Major energy-consuming activities include refrigeration and the production of steam and hot water. Less significant amounts of energy are used for processes such as lighting, ventilation, compressed air systems, motors and pumps. Energy usage across processing sites varies widely due to factors such as the age and size of plants, processing configurations, and the species processed (i.e. beef or sheep).

This stream focuses on generating innovative concepts and processes to reduce energy consumption at site level (i.e. total energy consumption), as well as the energy intensity of red meat processing operations (i.e. energy consumed per unit of output).



Program  
Stream 2

#### On Site Energy Generating Systems

Increasingly, red meat processing facilities are exploring how to utilise available on-site energy sources instead of relying on energy supplied externally. Drivers include rising energy prices, continued advancements in renewable energy technology, a desire for increased energy security and independence, and an ambition to enhance the industry's clean and green image by reducing greenhouse gas emissions.

This stream focuses on technologies that enable facilities to harness available on-site energy sources, such as methane (from solid and liquid waste treatment systems), solid biofuels (from paunch waste, sludge, or manure), liquid biofuels (from tallow), solar energy, geothermal energy and wind energy.



Program  
Stream 3

#### Water Harvesting & Conservation Systems

Water is primarily used in red meat processing to ensure food safety and hygiene during operations. The primary sources are mains water (town or bore) or nearby water bodies (rivers, dams, etc). Constraints such as availability and cost are forcing processing plants to reduce consumption and consider new sources. However, current food safety requirements, particularly for export registered facilities, limit water recycling.

This stream focuses on technologies that will deliver a reliable, safe and affordable supply of water to red meat processing operations. These include water harvesting (i.e. use of alternative water sources such as rainwater and geothermal systems), reuse (i.e. reuse of water captured within the facility before it is sent to the wastewater system) and recycling (i.e. treating and recycling wastewater for non-potable uses such as cattle wash). The need to ensure food safety standards are maintained is factored into all research activities.



Program Stream 4

**Solid Waste Management Systems**

Red meat processing produces a range of organic and inorganic solid wastes, including fats, oils, greases, manure, paunch, and sludge, as well as plastics and inorganic compounds. The majority of waste solids are organic in nature and are recycled by rendering and composting processes, or through reuse in land rehabilitation schemes. The disposal of solid waste can be costly, so processing facilities are keen to reduce waste production and consider alternative treatment and recovery options. This includes energy recovery (solid and liquid biofuels), nutrient recovery (nitrogen, phosphorus and potassium), composting and vermiculture, bioactives for pharmaceuticals and nutraceuticals, and ingredients for biodegradable plastics and food products.

This stream focuses on technologies to reduce, reuse, recycle and dispose of organic and inorganic solid waste in a way that minimises the impact on the environment, decreases waste management costs, and generates additional revenue streams through product recovery.



Program Stream 4

**Liquid Waste Management Systems**

Red meat processing plants generate large quantities of wastewater that require varying levels of treatment before disposal to land or waterways. Sources of wastewater include stockyards, slaughter areas, offal processing areas and rendering processes. Depending on plant configuration, these sources can result in varying amounts of blood, fat, manure, meat, paunch and detergents entering the wastewater treatment system if not captured at the source and diverted into the solid waste treatment system. Wastewater constituents contain varying amounts of organic materials (such as nitrogen, phosphorus, salt, etc), micro-organisms, and minor traces of chemicals (from cleaning processes) and heavy metals. Red meat processing wastewater can generate methane, which is a valuable energy source and a greenhouse gas. The primary option available to the processing sector in reducing greenhouse gas emissions is generating energy on site through methane capture and use.

This stream focuses on technologies affecting liquid waste reduction, reuse, recycling and disposal in order to reduce the impact on the environment, reduce waste management costs, and generate additional revenue streams through product recovery. Product recovery can be in a number of forms, including energy (methane) recovery, nutrient (nitrogen, phosphorus and potassium) recovery, bioactives and ingredients for biodegradable plastics and food products.



## RESEARCH SNAPSHOT:

# AMPC RESEARCH PAVES THE WAY FOR CREDITING INCOME FROM CARBON CREDITS

Australian meat processors have several opportunities to improve their plant efficiencies while reaping income from carbon credits under the Federal Government's Emissions Reduction Fund (ERF).

The objective of the ERF is to help achieve Australia's 2020 emissions reduction target. The Government has provided \$2.55 billion to establish the ERF, with further funding to be considered in future budgets.

AMPC has funded Corporate Carbon to identify areas of opportunity for the red meat processing industry under the ERF and contributed to the development of two ERF approved methodologies, paving the way for processors to lower their emissions and participate in the carbon market.

"We identified two methodologies – waste water management, particularly the use of methane capture, and energy efficiency," said Corporate Carbon consultant Matthew Warnken. The two methodologies include the *Carbon Credits (Carbon Farming Initiative—Domestic, Commercial and Industrial Wastewater) Methodology Determination 2015* and the *Carbon Credits (Carbon Farming Initiative—Industrial Electricity and Fuel Efficiency) Methodology Determination 2015*.

Mr Warnken said the biggest challenge for processors was engaging with the detail of the ERF, particularly the methodology requirements to ensure project approval.

"There is certainly a level of complexity to the methodologies, particularly how the calculations are done, showing eligibility and substantiating carbon saving estimates," he said. "However, once the process is understood, it's relatively smooth sailing," he added.

"There has been one auction so far and the only price in the marketplace at present is \$13.95/unit, which was set at the last auction," said Mr Warnken. The next Australian Carbon Credit Unit (ACCU) auction is scheduled for 4 – 5 November and there is likely to be further auctions going forward.

"For some companies, the income from carbon credits won't be anything stellar, however, it could mean the difference to a project's feasibility and enable delivery of productivity improvements in the future," he said. AMPC Program Manager for Environment and Sustainability Doug McNicholl said the research identified the greenhouse gas abatement activities that a red meat processing facility could voluntarily undertake to generate carbon credits and earn revenue under the ERF.

"The research shows that methane capture and combustion, via flaring or reuse for heat and/or power production, presents the greatest opportunity for the red meat

processing industry under the ERF," Mr McNicholl said.

For further information about the ERF, please refer to [www.environment.gov.au/climate-change/emissions-reduction-fund/about](http://www.environment.gov.au/climate-change/emissions-reduction-fund/about)

## BENEFITS

- Carbon credit opportunities under the ERF
- Methodologies identified to suit processors
- Pathways to participate in ERF auctions identified.



## Program Stream

### Energy Efficiency Systems

#### Energy Efficient Lighting Options and Review of Lighting Standards for Abattoirs (2014/1025)

##### Project overview

This project involved a review of lighting and lighting control technology. The review identified opportunities to improve energy efficiency in lighting systems at abattoirs; reduce lighting operating costs by improving maintenance; and increase workplace productivity from improved amenity.

##### Project outcome

The research identified various lighting energy efficiency initiatives and quantified the effects that maintenance and light quality can have on energy consumption.

Lighting efficiency upgrades at meat processing facilities have typically concentrated on bulk luminaire and lamp replacements, and used the annual energy savings of a specific site as a measure of success. The project determined the best criteria for comparing energy efficiency improvements would be to calculate the annual kWh reduction/m<sup>2</sup>/100 lux.

##### Benefit for industry

The report is a useful reference for lighting projects. The research showed that converting manual switching to automated, occupancy-based lighting presented the best financial payback and upgrading to LED-based lighting can also provide good paybacks. New lighting installation design should use the performance of the new luminaires and meet recommended lighting levels set by Australian Standard 1680. Separate metering of lighting circuits to monitor the impact of lighting improvements on energy consumption is recommended.

COMPLETE

#### Water Chemistry Control to Minimise Degradation of Heating Equipment at Abattoirs (2014/1018)

##### Project overview

This project considered the background on the many issues faced in boiler systems and provided details of some of the available treatment options. A case study highlighted cost savings achievable through changes to boiler water chemistry and boiler system operation.

##### Project outcome

Insights revealed by the research included:

- All volatile treatments (AVTs) for high-pressure boilers are not suitable for food-grade applications.
- Regulator-approved food-safe amines must be used for condensate line treatment.
- Feedwater tanks should be operated at the highest possible temperature to lower oxygen content, so less oxygen scavenging chemicals are required.
- Chelants have reduced blowdown rates, so they may be more energy efficient, but are not suitable if feedwater hardness is too high.
- The addition of polymers is recommended with phosphate or chelant treatment.

##### Benefit for industry

Plant engineers can utilise the findings to help evaluate current or future maintenance options. The report provides members with a greater knowledge of their water chemistry and corrosion control options and provides information which would enable them to better protect high-cost utilities equipment and piping elements at their processing sites.

COMPLETE



**Program Stream**  
Energy Efficiency Systems

**Energy Management Workshops & Webinars (2014/1017)**

**Project overview**

This project involved the development and delivery of presentations and training material relating to energy efficiency, renewable energy and energy storage in red meat processing; and energy and climate change policy, regulations, and programs (including funding assistance packages) relevant to red meat processing facilities.

**Project outcome**

The presentations were delivered at two workshops, which were well attended. As part of the extension process, environment-specific Units of Competency within the Australian Meat Industry Training Package were identified and reviewed to ensure that the research outcomes become embedded into the training process at both operator and managerial levels.

**Benefit for industry**

This project has given industry personnel the opportunity to learn about the research undertaken as part of AMPC's R&D activities over the past three years. The delivery of presentations at existing network meetings was well supported by industry members, with feedback showing there is substantial interest in the continuation of these extension activities. Further workshops will be offered in the 2015-16 financial year.

**WORKSHOP SLIDES COMPLETED**



**Program Stream**  
On site Energy Generating Systems

**Renewable Energy Options for Off-Grid Red Meat Processing Facilities (2013/3010)**

**Project overview**

This project investigated the feasibility of making a facility energy self-sufficient using low and zero-carbon energy sources available on-site, nearby or through off-setting arrangements. It involved a literature review and three desktop case studies.

**Project outcome**

Solar photovoltaic and bioenergy options were found to be the most economical renewable energy technologies to deploy at abattoirs. However, the grid connection agreement is a major obstacle to becoming independent of the grid. Energy storage is a major factor in being able to become 'grid independent' and the market in Australia is underdeveloped. However, a full range of options is expected within the next few years.

**Benefit for industry**

Abattoirs that are able to generate their own energy will protect themselves from energy price fluctuations and possible mains supply disruptions. This report provides industry with an insight into the technical opportunities that are available to enable off-grid energy production at red meat processing facilities.

**COMPLETE**

RESEARCH SNAPSHOT:

# THE ANMBR – A WASTEWATER SYSTEM WITH BENEFITS

The next generation in wastewater treatment technology has been identified by AMPC-funded research into Anaerobic Membrane Bioreactors (AnMBRs).

AnMBR technology has the potential to eclipse incumbent technology, such as covered anaerobic lagoons (CALs), due to greater biogas capture, cleaner effluent free of suspended solids and improved nutrient recovery capabilities.

The research involved AnMBR technology that has been established and trialled at two locations – alongside existing CALs.

The research found the following benefits of AnMBR technology:

- 20, and up to 100, times larger loading rates than the CALs
- higher-quality effluent
- higher biogas capture
- greater odour reduction
- greater potential for nutrient recovery
- ability to function without primary treatment of wastewater
- removes the concern of CAL cover degradation.

Dr Paul Jensen, Senior Research Fellow from the Advanced Water Management Centre (AWMC) at the University of Queensland, said the AnMBR technology could produce energy and be combined with a nutrient extraction technology for recovery of phosphorus (P) and nitrogen (N) from the wastewater.

Initially, the AnMBR trial unit was not optimised for nutrient recovery. However, improvements throughout the trial resulted in 90% of N and 80% of P being recovered. Around 20% of the P was retained in AnMBR sludge and 70% was recovered as struvite (a P fertiliser in the form of a crystallised powder). As a result less than 10% of P remained in the wastewater.

“The area of nutrient recovery needs further experimentation, however, the opportunity to create a renewable fertiliser resource is exciting,” Dr Jensen said.

“This research promotes partnerships across the agricultural sector, with fertiliser produced at slaughterhouses filling niche opportunities, such as the supply of local agricultural industries.”

Dr Jensen explained that the AnMBR with struvite crystallisation can extract enough P fertiliser from the wastewater generated from processing one beef carcase/day, to meet the annual needs of one hectare of agricultural production.

“For example, an abattoir processing 600 cattle/day could support 600ha of agricultural land/year, plus the capture of methane from the AnMBR could be used to offset fossil fuels at the abattoir. Put another way, one megalitre of wastewater would produce about 500kg of struvite fertiliser and around 3,000m<sup>3</sup> of methane, which could potentially produce about 100GJ of heat energy (biogas),” Dr Jensen said.

AMPC’s Program Manager for Environment and Sustainability, Doug McNicholl, said initial interest in the AnMBR came from the fact it appeared to be smaller and more efficient, despite initially being more expensive than CAL technology.

AnMBRs are more costly to install than CALs at present, however, product recovery is improved and cost benefit analysis suggests payback periods are comparable, especially when the technology is coupled with nutrient recovery.

“The research shows that an AnMBR can offer a simple financial payback period of just under four years, compared with three years for a CAL,” Mr McNicholl said.

“This technology is not new to the wastewater treatment industry. However, it hasn’t been adopted by Australian red meat processors due to some technical and financial unknowns about its ability to treat abattoir wastewater.”

The research will now move to optimising the design and exploring how aspects of AnMBR and the nutrient recovery process could be incorporated into new, or existing, wastewater management systems.

“The technologies are a modular design and can be utilised together or separately in existing systems. We are also working with the Grains Research Development Corporation on commercialising the struvite product as a crop fertiliser,” Dr Jensen said.

## BENEFITS

Compared with CAL technology, AnMBR technology offers the ability to:

- operate under higher loading rates
- improve effluent quality
- increase biogas capture and nutrient recovery
- use significantly less space



*Anaerobic Membrane Bioreactor, University of Queensland*



## Program Stream

### Water Harvesting & Conservation Systems

#### Environmental Performance Review (2013/5047)

##### Project overview

This project continues a series of environmental performance reviews of the red meat processing industry and presents results for the 2013-14 financial year. The methods are broadly comparable with previous studies, but includes steps to adjust for variation in animal mix and processes undertaken (i.e. whether rendering was conducted).

##### Project outcome

Overall, the red meat processing industry has achieved gains in all of the six key areas of environmental concern. Highlights include:

- a modest improvement in water use efficiency, with average industry performance reaching 8.6 kL/t HSCW (cattle equivalents)
- a 27% improvement in energy use efficiency since the 2008-09 survey, with an average industry performance of 3005 MJ/t HSCW
- a 22% improvement in greenhouse gas emissions intensity since the 2008-09 survey, with average industry performance of 432 kg CO<sub>2</sub>e/t HSCW
- Solid waste sent to landfill has almost halved since 2008-09, with average industry performance of 5.9 kg/t HSCW

##### Benefit for industry

This project has provided an updated environmental performance benchmark that industry can use to further increase energy and water efficiencies. Red meat processing businesses can benchmark their performance against an industry average and set strategic priorities for environmental improvement.

COMPLETE

#### Steam Sterilisation of Viscera Trays (2013/9118 (A.ENV.0136))

##### Project overview

This project investigated the use of steam sterilisation of viscera tray surfaces through the redesign of the existing 82.5°C hot water spray sterilisation system to accept steam sterilisation as an alternative.

##### Project outcome

The redesigned steam injection system was unable to produce steam to meet the trial requirements. A second trial used a gas cooker and trays to ensure the steam reached the sanitation temperature of 82.5 °C at a distance of 140mm. The required temperature is 82°C and so the results are satisfactory for organoleptic sanitising. Microbiological post sampling and visual assessments showed almost 100% elimination of bacteria.

##### Benefit for industry

This trial showed the effectiveness of steam technology in achieving sanitation results equivalent to those of the 82°C water sanitation method currently used throughout the industry. Due to the observations from this study, the host plant changed the first cold rinse from potable town water to a chlorinated bore water source, reducing water and heating costs.

COMPLETE



**Program Stream**  
Solid Waste Management Systems

**Cost Benefit Analysis of Dewatering Abattoir Sludge Using Three-Way Decanters for the Australian Meat Processing Industry (2014/1019)**

**Project overview**

This process and cost-benefit analysis reviewed the use of three-way decanters for managing waste water treatment sludge. Case study reports involved three Australian sites that recently installed three-way decanters. The final report presents the process review, case studies and an illustrative cost-benefit analysis based on inputs from one of the sites.

**Project outcome**

The decanter systems work most effectively when the sludge is pre-heated. This approach also facilitates cooling of the clarified waste water, allowing it be recycled through the DAF or combined with the bulk waste water flow. The high feed temperature required for decanter operation also results in a degree of pasteurisation of the sludge.

**Benefit for industry**

This project confirms the commercial viability of three-way decanter technology in treating red meat processing wastewater. The case studies provide an overview of successful applications of the technology and are valuable resources for other processors considering the technology.

COMPLETE

**Development and Implementation of Environmental Short-Course for Abattoir staff (2014/1014)**

**Project overview**

This project involved the development and delivery of presentations and training material relating to wastewater treatment system operation and water efficiency in red meat processing.

**Project outcome**

The two workshops were well attended. Environment-specific Units of Competency within the Australian Meat Industry Training Package were identified and reviewed to ensure that the research outcomes become embedded into the training process at both operator and managerial levels.

**Benefit for industry**

This project has helped distribute research findings from R&D undertaken by AMPC in the past three years. The delivery of presentations at existing network meetings gave the wider meat processing industry an opportunity to be exposed to current industry research and outcomes.

The feedback from these well-supported activities indicated there is significant interest in further extension activities, and more workshops are planned for the 2015-16 financial year.

COMPLETE



**Program Stream**  
Solid Waste Management Systems

**Environmental Community of Practice (2014/1015)**

**Project overview**

This project developed and delivered a series of educational workshops for abattoir personnel responsible for a number of key areas of environmental management. The workshops were facilitated by MINTRAC and delivered by representatives from The Ecoefficiency Group Pty Ltd, Energetics, AMPC, Corporate Carbon Advisory and All Energy Pty Ltd.

This project involved contracts with MINTRAC (project 2014/1015), Ecoefficiency Group (project 2014/1014), and Energetics (project 2014/1017) for the development, coordination and delivery of the workshops.

**Project outcome**

The two workshops were well attended. Environment-specific Units of Competency within the Australian Meat Industry Training Package were identified and reviewed to ensure that the research outcomes become embedded into the training process at both operator and managerial levels.

**Benefit for industry**

This project has improved the dissemination of R&D undertaken by AMPC in the past three years with research outcomes presented at existing network meetings.

The presentations were strongly supported by industry and feedback indicates there is strong interest in continued extension activities in the environmental arena. Further workshops are planned for the 2015-16 financial year.

**WORKSHOP SLIDES COMPLETED**

**Robust Membrane Systems for Enhanced Primary Treatment and Energy Recovery of Abattoir Waste Water (2013/5024)**

**Project overview**

This project aimed to determine if membranes are a viable alternative to dissolved air flotation (DAF) for treating abattoir wastewater and to examine the technical and economic viability of heat recovery from abattoir wastewater using membrane technology.

**Project outcome**

The first milestone of the project has been completed. It included a literature review of membrane technology as a replacement for DAF technology and a cost benefit analysis. The milestone report is under review to determine if the project will progress to the laboratory demonstration stage.

**Benefit for industry**

If proven feasible, membrane technology would dramatically improve the effectiveness of primary treatment of abattoir wastewater and improve recovery opportunities for resources such as tallow.

**IN PROGRESS**

RESEARCH SNAPSHOT:

# SAFETY GUIDELINES FOR BIOGAS SYSTEMS

A significant increase in investment in biogas systems at abattoirs has created the need for robust safety guidelines to cover biogas capture, storage and combustion.

The Australian meat processing industry has embraced biogas production and capture. At the beginning of 2015 almost 15 new biogas capture and reuse systems had been installed at abattoirs across Australia.

Biogas capture and reuse technology has helped abattoirs improve environmental outcomes by eliminating odour emissions, improving wastewater treatment, reducing greenhouse emissions, and generating energy from wastewater. This has resulted in a reduced reliance on energy sources derived from fossil fuels.

AMPC Program Manager for Environment and Sustainability Doug McNicholl said that biogas capture and reuse was becoming increasingly common at Australian abattoirs and these guidelines provide a useful reference for AMPC members.

“The development of the guidelines represents a proactive stance by the industry in ensuring the identification of hazards and mitigation of the risks associated with biogas capture, storage and combustion,” Mr McNicholl said.

Dr Mike Johns, of John Environmental, was engaged to lead the development of the guidelines. Biogas is made up of

combustible methane gas, Dr Johns said, so the guidelines had to focus closely on best practice management for reduction of hazards such as fire.

“We called in a leading fire and risk assessment expert, Professor Ian Cameron from Daesim Technologies, to ensure we covered all the angles. Professor Cameron has worked on fire and safety issues with sectors as diverse as oil and gas, radiation, dangerous chemical storage and logistics, and chemical production. He brought the latest in risk assessment and hazard analysis to the guidelines,” he said.

“Many of Australia’s largest red meat processing plants have installed covered anaerobic lagoons (CALs) and it is important to ensure the safe design and operation of this technology,” he added.

The guidelines, which include a risk and hazard assessment, cover general information, design and construction of biogas facilities, commissioning, operation and maintenance, and environmental protection.

Members can download the Guidelines from the Member’s section of the AMPC website, [www.ampc.com.au](http://www.ampc.com.au)

## BENEFITS

- A guideline for safe management of biogas
- Risk and hazard assessment template
- Regulation index for each State and Territory.



Biogas system



Program Stream  
Solid Waste Management Systems

**CBA of Torrefaction Technology (2013/5015)**

**Project overview**

A cost-benefit analysis (CBA) reviewed the value of torrefaction of waste streams from the meat processing (specifically paunch, manure and anaerobic digester sludge).

**Project outcome**

The commercial viability of the torrefaction process is highly dependent on both the cost of delivering energy to the process and the value that could be realised from the torrefied material. The payback period varied from three to 19 years, depending on the output generated from the process.

**Benefit for industry**

Torrefaction is a viable process for converting paunch, manure and anaerobic digester sludge into outputs including Biochar and fertiliser. The economics of the process are attractive for sites with favourable conditions.

COMPLETE



Program Stream  
Liquid Waste Management Systems

**Energy Management Workshops & Webinars (2014/1017)**

**Project overview**

High Rate Aerobic Treatment Combined with Anaerobic Digestion and Annamox Year 3 (2013/4006)

**Project outcome**

This project investigated a new system to treat meat processing wastewater that incorporates a high-rate sequencing batch reactor (SBR) process to remove C and nutrients; an anaerobic digestion (AD) process to stabilise the production of sludge and bioenergy (methane); and an anaerobic ammonium oxidation (anammox) process to eliminate residual nitrogen (N).

**Project outcome**

Overall, this is a very compact and highly efficient treatment option for processing the wastewater created by red meat processing. It may reduce overall space requirements by more than 90% compared with current anaerobic lagoon and BNR technologies, and could achieve a considerable net energy output by reducing aerobic oxidation and increasing methane production.

**Benefit for industry**

This solution enables more effective capture of energy and nutrients using equipment that requires far less space. It will be a genuine option for processors who are land constrained and are able to realise the benefits of the recovered energy and nutrients from their wastewater.

COMPLETE



**Program Stream**  
Liquid Waste Management Systems

**Nutrient Recovery from Paunch and CAL Lagoon Effluent – An Extension of the Current Project (Year 2) (2013/4007)**

**Project overview**

This project was an extension of the previous project 'A.ENV.0154: Nutrient recovery from paunch and dissolved-air floatation (DAF) sludge digestate'. It further examined the requirements for wastewater filtration, struvite precipitation and product recovery from the digester technology at a red meat processing facility (Site A). As part of the project extension, additional phosphorus recovery trials were conducted on a crusted anaerobic lagoon at a second site (Site B).

**Project outcome**

Cost-benefit analysis (CBA) demonstrated that the payback period for the struvite crystallisation plant could be about 7.8 years. This could reduce to 2.7 years if savings in trade waste fees from reduced nutrient discharge were considered. The CBA of P recovery processes is highly dependent on both mitigation of waste disposal fees and the value of the nutrient product.

**Benefit for industry**

This technology presents an opportunity to convert nutrients in abattoir wastewater into saleable fertiliser. Market development analysis for the recovered nutrient product is a critical step towards ensuring the fertiliser market exists and the predicted value is accurate. Additional market research and field trials are planned to assess struvite as a renewal fertiliser and confirm its market value.

**COMPLETE**

**Review of Trickling Filter Technology for Treating Abattoir Waste (2014/1016)**

**Project overview**

This project involved a literature review of Trickling Filtration (TF) technology as a biological treatment technology that potentially represents a simple, reliable and low-cost way to remove organic waste from abattoir wastewater.

**Project outcome**

The trickling filter system has a number of significant advantages compared to activated sludge. Despite this, there are few trickling filter applications in Australia catering for abattoirs. The trickling filter is potentially viable for the red meat industry (downstream of the DAF and/or anaerobic systems, and partially replacing activated sludge or aerated pond).

**Benefit for industry**

The TF process offers a significant reduction in energy requirements compared to activated sludge systems. If high BOD or TN reductions are required, a combined TF-AS system could be adopted.

**COMPLETE**



Program Stream  
Liquid Waste Management Systems

**Review of Wastewater Treatment Chemicals and Organic Chemistry Alternatives for Abattoir Effluent (2014/1044)**

**Project overview**

This project involved a literature review of scientific journals, conference publications and industry reports to identify the most suitable conventional and alternative chemicals for treating abattoir wastewater. It included categorising chemicals based on cost, efficiency and overall environmental impact.

**Project outcome**

The literature review revealed that a combination of ferric chloride and chitosan has shown a positive impact on treatment systems involving biological treatment and biogas generation, which is important for sites that operate anaerobic digestion processes with biogas recovery.

The cost of treating a cubic metre of wastewater with alum, ferric sulphate, ferric sulphate plus ascorbyl palmitate, and ferric chloride plus chitosan was found to be around 0.1, 0.2, 0.4 and 0.055 \$/m<sup>3</sup> respectively.

**Benefit for industry**

The project has provided a review of, and recommendations for, the use of chemicals and natural coagulants to treat abattoir wastewater. Uptake of these recommendations will address significant challenges and contribute to the economic sustainability of treatments, as illustrated by the operational costs of non-optimal effluent management. If adopted, natural coagulants will improve the environmental performance of the sector.

COMPLETE

**Integrated Agri-Industrial Wastewater Treatment and Nutrient Recovery (Yr 3) (2013/5018)**

**Project overview**

This project focused on the development and optimisation of AnMBR technology for the red meat processing industry. Anaerobic Membrane Bioreactor (AnMBR) technology uses membranes to retain almost all suspended solids within the process, and can be used for energy and nutrient recovery from abattoir wastewater.

**Project outcome**

Economic comparisons showed the payback of an AnMBR was comparable to a CAL, however, it remains comparatively high when using the design parameters in this project. Operating costs of an AnMBR show improved revenue compared to a CAL based on improved energy and the nutrient recovery. There are additional benefits, such as reduced footprint and improved environmental performance that are specific to each processing facility.

**Benefit for industry**

AnMBR technology represents an attractive alternative to lagoons, due to its smaller footprint, excellent effluent quality, high tolerance to load variations, and an ability to produce a solids-free effluent for the purpose of reuse. R&D is in the final stages and this technology is ready for commercial-scale trials.

COMPLETE



**Program Stream**  
Liquid Waste Management Systems

**Fellowship – Wastewater R&D in the meat processing industry (2013/4008)**

**Project overview**

This AMPC Fellowship aimed to build capability and provide scientific support in relation to defined research activities in the Australian Red Meat Processing Industry. The Fellowship was held by Dr Paul Jensen at The University of Queensland with support from other researchers at UQ. The Fellowship was built around wastewater and resource recovery projects.

**Project outcome**

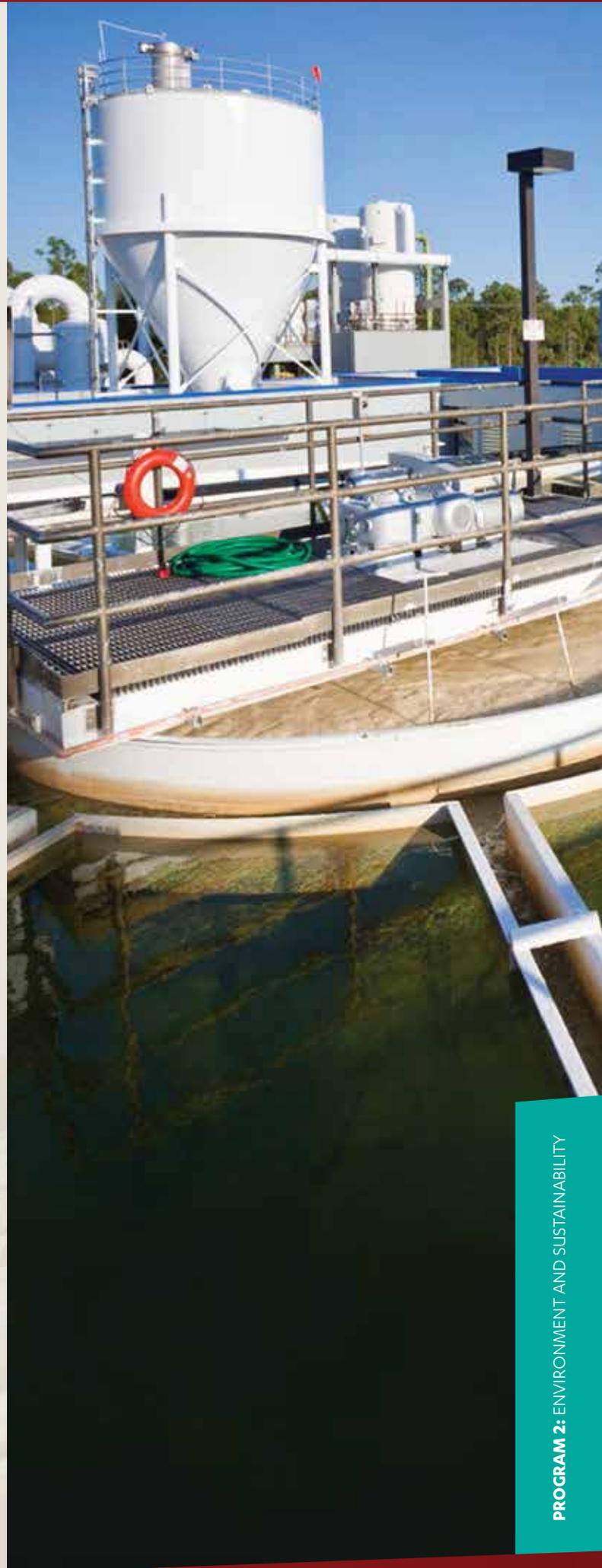
The following R&D activities were undertaken:

- Review of technologies for treatment of slaughterhouse wastewater.
- Development of technology selection tools to assist processors with evaluating waste handling options.
- Conduct basic feasibility assessments at three red meat processing facilities as case studies.
- A more detailed case study and feasibility assessment, including sensitivity testing for each technology evaluated.
- An industry support program where Fellowship personnel (particularly Dr Jensen) were available to undertake specific R&D activities.

**Benefit for industry**

Dr Jensen and his research team have been an invaluable resource for the red meat processing industry. The technology selection tool is a great decision-making tool for plant operators and the industry support program has enabled Dr Jensen and his team to share their learnings with a large number of processors.

**COMPLETE**



# PROGRAM 3

## **Food Safety, Product Integrity and Meat Science**

### **About the Program**

**The objective of the Food Safety, Product Integrity and Meat Science Program is to develop technologies that enable high standards of food safety, product integrity and eating quality.**



The program operates across seven program streams:



Program  
Stream 1

#### Food Safety

Food safety is a non-negotiable aspect of red meat production. This stream focuses on technologies and tools that ensure industry has an ability to validate, demonstrate, understand and manage responses to food safety issues. This stream includes technologies that improve current food safety systems and ensures that the Australian red meat processing industry is responsive to global food safety requirements.



Program  
Stream 2

#### Animal Welfare

Export markets and global consumers demand that the processing industry provide evidence of high standards of animal welfare. The Australian red meat processing industry needs to continue to ensure that animal welfare standards are regularly reviewed, and are widely disseminated and implemented. Reportable outcomes are required to maintain market access. This stream focuses on refining animal welfare measures and practices in livestock handling and slaughter, determining how these practices relate to meat quality and establishing performance measures that can be communicated to government and trading partners.



Program  
Stream 3

#### Product Integrity in the Supply Chain

This stream focuses on the development of an overall product integrity framework by which Australian red meat is produced. The framework includes traceability, management of biosecurity and disease threats, animal health and welfare measures, and overall meat processing quality standards. The aim is to enhance product integrity standards and quality assurance, and to maintain a world-leading traceability system.



Program  
Stream 4

#### Meat Sensing and Measurement Systems

The ability to produce consistent high-quality red meat requires mechanisms to monitor, evaluate and respond to products that do not meet specifications (pH, tenderness, colour, intramuscular fat, etc). This stream focuses on the development and validation of new sensing and measurement technologies (especially online systems) and understanding their barriers to adoption. This stream also informs Technology and Processing Program Stream 2: Improved Carcase Measurement in developing an integrated carcase measurement technology that covers the measurement of composition (lean, fat and bone), structure (to inform automated cutting lines), meat quality measurements, cut product recognition and detection of contamination and disease.



Program Stream 5

**Meat Packaging Systems**

Global standards and regulations for fresh meat hygiene and safety are becoming more stringent, and retailers are demanding more cost-effective ways to extend shelf life and display products on the shelf in the most attractive manner. Improved meat packaging is one approach to achieving that outcome. This stream focuses on the further optimisation of current packaging technologies, e.g. vacuum packaging, overwrap and modified atmosphere packaging, and developing new packaging solutions that enable functional and cost-effective options to be taken up by industry, e.g. active packaging, intelligent packaging and labelling, novel films, and biodegradable packaging.



Program Stream 6

**Meat Quality Improvement**

Meat processors want to maximise value to customers and increase the demand for red meat and red meat products. This is best achieved by consistently delivering high quality to customers and consumers. Meat quality depends on a combination of functional characteristics, such as tenderness, intramuscular fat and flavours, which all have an impact on the consumer's perception of eating quality. This stream focuses on understanding the key variables affecting quality, and developing processing and sensing technologies that can further enhance both quality and consistency.



Program Stream 7

**Meat Storage and Colour**

The requirements of retail display demands that meat products fit an acceptable colour profile and have an adequate shelf life. Factors that affect meat shelf life and colour include microbial populations, processing technologies and temperature (freezing and chilling). This stream's focus is to provide guidelines and technologies that optimise colour stability and shelf life for different meat products and markets.



## RESEARCH SNAPSHOT:

RAPID BACTERIA DETECTION  
NOW AVAILABLE

Diagnostic technology used in medicine and the dairy industry has been taken up by the meat processing sector to develop a faster, more cost-effective meat pathogen test.

Matrix Assisted Laser Desorption Ionisation Time of Flight (MALDI TOF) mass spectrometry and metabolomics technologies to detect bacteria have been adapted for the meat industry in the research undertaken by Swinburne University of Technology, in Victoria.

The AMPC-funded project is targeting early identification of *Salmonella*, *Escherichia coli* O157:H7 and *Listeria*.

"MALDI TOF mass spectrometry is capable of detecting a broad range of pathogens within a fraction of the time and at a fraction of the cost involved under other methods," said Ravi Hegde, AMPC Program Manager for Food Safety, Product Integrity and Meat Science.

Project leader Professor Enzo Palombo said the novel aspect of this approach has involved 'training' the instrument to identify micro-organisms specific to beef. "Meat is a complex product as it contains a range of 'good' and 'bad' microbes. Identifying *Salmonella*, *E. coli* and *Listeria* in red meat is like finding a needle in a haystack," he said.

Researchers have taken the MALDI TOF technology (commonly used in clinical diagnostics) and successfully applied it to the dairy industry to identify harmful microbes in milk and other products.

This has laid the foundation for the red meat processing sector, providing an alternative to current culture-based diagnostic testing, which can take 5-7 days for a confirmed positive detection.

Researchers used a technique called 'selective enrichment' to isolate each target organism in a culture. Then, during the MALDI TOF process, a laser is fired onto the sample which ionises it. The ions move through a vacuum and their speed and rate of movement is measured. Different microbes travel at different speeds and rates, creating a unique pattern that is compared against a database to identify components in the sample.

"Our method cuts time from sampling to a result to just 24-30 hours," Professor Palombo said.

"This is critical for the food industry, where it is not always possible or realistic to store perishable products until test results are received," he added.

A positive pathogen detection requires costly product recalls, not to mention the negative impact on consumer confidence. As food safety concerns have demonstrated, impacts can flow on to a wide range of products – not just the ones involved.

"Australia's export partners have strict regulations for the quality and safety of red meat. For example, red meat sent to the United States must be free from a certain strain of *E. coli* (O157:H7), so using the MALDI TOF test would enable processors to determine if this strain is present.

The more we know, the better we can inform our supply chain partners," said Professor Palombo.

Another advantage of the technology is its universal application. Currently, processors send red meat samples for a range of diagnostic tests but the MALDI TOF system has the ability to identify multiple bacteria.

Compared to more advanced molecular or biosensor-based methods, which are expensive and require a high level of user skills, the MALDI TOF method is designed to fit within current testing facilities and could cost processors around \$1-\$2 a test.

The technology has a high capital cost (about \$150,000 per instrument) but reduced labour inputs combined with high throughput could potentially deliver a return on investment within 12 months.

In parallel with the MALDI TOF work, the team is developing metabolomics profiles of meat samples using gas and liquid chromatography. This could underpin the development of a rapid test that can be applied on site to identify if a sample does or does not contain a contaminant, as a precursor to more thorough analysis.

## BENEFITS

- Test results known in 1-2 days
- A universal and cost-effective meat pathogen test
- Reliable



Program Stream  
Food Safety

**Small Stock Interventions - Assessing the Effectiveness of a Carcase Hot Water Decontamination Cabinet in Small Stock Processing (3000/5124)**

**Project overview**

The objective of this project was to assess the effectiveness of the hot water small stock intervention cabinet developed and trialled under project 3000/5125 in removing visual defects. The overall final project report covering the trial (project 3000/5125), microbiological assessment (project 3000/5121) and macro-assessment (this project).

**Project outcome**

The decontamination unit was generally effective in removing loose faecal pellets, fibre (wool or hair) and dust, though not all (and notably hair from goats). However, embedded and adhered faecal material, spillage and frank stains/smears remained or were only partially removed with visual evidence of the original contamination clearly obvious.

**Benefit for industry**

The intervention did not increase throughput capacity for the plant, however it reduced labour for trimming, increased yield due to less trimming, eliminated manual washing, removed minor defects and reduced micro-organism count. This technology reduces the risk of point-of-entry rejections into the United States for small stock.

**COMPLETE**

**Meat Hygiene Assessment Webinar and Flip Charts (2013/1058)**

**Project overview**

In recent years, 'port of entry' red meat inspection has become more stringent and there have been more issues with physical contamination of both carcasses and carton meat. Even low level contamination is unacceptable to trading partners.

**Project outcome**

The project has funded the development of a webinar highlighting the importance of the detection of 'zero tolerance' contamination prior to exporting carcass and carton meat. The webinar aims to increase industry's awareness of the need to train staff to identify such contamination. A series of educational flipcharts that provide examples of zero-tolerance contaminants has been produced. The flipcharts provide a useful training resource for meat hygiene assessment staff and trimmers.

**Benefit for industry**

The webinar and flipchart resources have been released. The webinar teaches processing staff the nature and importance of detecting and removing zero-tolerance contamination. The series of flipcharts are a useful training resource for meat hygiene assessment staff and trimmers.

**COMPLETE**



Program Stream  
Food Safety

### Trial of a decontamination unit for Small Stock (3000/5125)

#### Project overview

A stainless steel wash cabinet was installed on the small stock processing floor post evisceration, prior to quality control (QC) trimming and before primary inspection. Small stock carcasses passed through this cabinet to remove minor defects such as wool/hide dust, wool, hair and zero tolerances for contamination by faeces, ingesta and milk (smaller than 20mm).

#### Project outcome

Further design of the unit may be necessary for adoption at higher-speed establishments. The unit does not replace the current need for visual examinations of carcasses and piece meats to confirm compliance with the zero tolerance policy.

#### Benefit for industry

The intervention did not increase throughput capacity for the plant, however it reduced labour for trimming, increased yield due to less trimming, eliminated manual washing, removed minor defects and reduced micro-organism counts. This technology reduces the risk of point-of-entry rejections into the United States for small stock.

COMPLETE

### Small Stock Interventions - Microbiological Assessment and Validation of Hot Water Wash Cabinet (3000/5121)

#### Project overview

This project involved the collection of the temperature and microbiological data for the validation of the small stock hot water treatment cabinet that was developed and trialled under project 3000/5125.

#### Project outcome

Hot water treatment had no negative impacts on carcass microbial counts. Reductions in bacterial load for coliform and *E. coli* were achieved by the hot water spray wash cabinet and overnight air chilling. However, the combination of these two treatments was not an elimination step for bacterial contamination.

#### Benefit for industry

This intervention did not increase throughput capacity for the plant, however it reduced labour for trimming, increased yield due to less trimming, eliminated manual washing, removed minor defects and reduced micro-organism counts. This technology reduces the risk of point-of-entry rejections into the United States for small stock.

COMPLETE



Program Stream  
Food Safety

### Metagenomic Analysis to Explore the Mechanisms of Carcase Contamination (2014/1066 (G.MFS.0327))

#### Project overview

This project will examine the microbial contamination of carcasses using metagenomics, and will focus on the transmission of pathogens from hides to carcasses in the processing plant through aerosols. The project will develop air sampling methods for aerosol collection in processing plants, surface swab carcasses and hides, and undertake metagenomic and microbial count analysis to characterise the mechanisms of microbial transfer from hides to carcasses.

#### Project outcome

The research findings will increase member's knowledge and understanding of the mechanisms that cause microbial transfer from hides to carcasses.

A better understanding of where microbes that contaminate the carcase come from and how they get onto the carcase could result in procedural changes that reduce contamination during processing.

#### Benefit for industry

Reduced carcase contamination in processing plants will help ensure safe and high-quality products for consumers, increased consumption, and increased nutrition and health outcomes for consumers.

IN PROGRESS

### Rapid Detection of Meat Pathogens using MALDI-TOF Mass Spectrometry and Metabolomics (2014/1049)

#### Project overview

This project consists of a literature review focused on current testing methods used in the detection of pathogens in red meat products, and the evaluation of MALDI-TOF MS (matrix assisted laser desorption ionisation time of flight mass spectrometry) and metabolomics to detect red meat pathogens.

The project will explore the ability of metabolomic approaches (using readily available techniques such as gas and liquid chromatography and MS) to detect low molecular weight metabolites as biomarkers for pathogen identification.

#### Project outcome

The literature review provided a detailed evaluation of current pathogen test methods used in the food industry, particularly for *Salmonella enterica*, *Escherichia coli* O157:H7 and *Listeria monocytogenes*. It assessed the current techniques and highlighted how the proposed technologies may overcome current limitations. The project has validated detection using MALDI-TOF MS of the three red meat pathogens of interest using different culture media and developed a detection scheme from selective broths containing spiked red meat samples.

#### Benefit for industry

Australia has a reputation for high standards of hygiene and food safety in red meat production. Food industries face a continual challenge of monitoring and controlling the prevalence of pathogens in red meat products. The project findings will help develop faster and lower cost methods to monitor pathogens, investigating techniques that will be able to detect and identify pathogens within a day.

IN PROGRESS



Program Stream  
Animal Welfare

**A Systematic Review of Novel Approaches for the Measurement of Pain in Animals (3000/5134) (Cross RDC Animal Welfare)**

**Project overview**

This project systematically reviewed novel approaches to measuring pain in livestock (initially focusing on pigs). The project was developed within the National Animal Welfare RD&E Committee in late 2013, with support from industry bodies present on this Committee (including AMPC).

**Project outcome**

The review outcome will be a list of potential targets for measuring pain in animals. These can be used for follow-up studies as a proof of concept in pigs and other animals. This will benefit researchers working in animal welfare science and may enable experiments to use better markers for pain both to measure routine interventions, and to test analgesic drugs.

**Benefit for industry**

Pain in animals is an area of concern to consumers and can dramatically affect the welfare of animals. This project has the potential to provide better means of measuring pain to assess whether or not pain is present following a procedure. Such measures can be used to test new analgesic agents. This project represents a proactive stance by Australian livestock industries in their objective to improve animal welfare outcomes, and remain a leader in the field.

IN PROGRESS

**National Animal Biosecurity RD&E Strategy Implementation Project (3000/5111) (Cross RDC Animal Welfare)**

**Project overview**

Under this multiparty project agreement, Animal Health Australia (AHA) is providing secretariat and project management services to support the implementation of a National Animal Biosecurity RD&E Strategy, as well as project support, including investigation, analysis, administration and communication.

**Project outcome**

This strategy aims to benefit livestock industries, including the red meat industry and supply chain, by encouraging greater collaboration and promotion of continuous improvement in animal biosecurity. A key achievement from the first year of implementation was the National Animal Biosecurity RD&E Forum, held in Melbourne during February 2015. This inaugural event brought representatives from livestock industries, governments and universities together to discuss animal biosecurity issues and national RD&E priorities.

**Benefit for industry**

The strategy establishes the future direction for animal biosecurity RD&E in livestock industries to ensure investments, resources and outcomes are used efficiently, effectively and collaboratively to reduce capability gaps, fragmentation and duplication.

IN PROGRESS

## RESEARCH SNAPSHOT:

## TAKING THE GUESSWORK OUT OF CARCASS MEASUREMENT

X-rays, probes and cameras that measure profit-making carcass attributes will be in the processing toolbox of the future.

AMPC is a key investor in the Sheep CRC which leads research into new technologies to estimate lean meat yield and eating quality.

“The Sheep CRC Meat Science Program has the potential to transform the entire sheep meat industry, delivering benefits across the supply chain, in terms of improved carcass value,” said Ravi Hegde, AMPC Program Manager for Food Safety, Product Integrity and Meat Science.

Murdoch University’s Professor David Pethick, who heads up the Sheep CRC’s quality-based sheep meat value chains program, said carcass yield and quality had a profound effect on profitability at every stage of the supply chain. “The amount of lean meat that can be boned out from a carcass is a key factor determining production efficiency and reduced wastage,” he said.

“With an estimated 30% of lamb carcasses failing to meet optimal specifications, processors are wasting time trimming excess fat and losing value for downgraded carcasses. Identifying appropriate in-plant lean meat yield measurement technologies could increase value by up to \$10 per lamb carcass,” Professor Pethick said.

“Another important factor is to achieve a balance between carcass yield and eating quality. To keep lamb as an elite consumer-focused product we need to maintain both carcass yield and eating quality in the form of intramuscular fat (IMF),” he added.

Visual and manual carcass assessments can be variable, so the research is looking at measurement tools which can be retrofitted to existing automated technologies or used in isolation, to provide reliable and consistent measurements at commercial processing speeds in small and large plants.

The new measurement systems include:

- **Dual Emission X-ray Analysis (DEXA):** Working with commercial partner Scott Technology, researchers modified the 2D x-ray technology used in the LEAP™ primal cutting system into a dual energy system (as is used in the medical industry). Experiments demonstrated much more accurate predictions for carcass composition and fat distribution, which will provide objective measurements for lean meat yield and cut weight prediction.
- **Impedance probes:** Trials included modifying the Danish-developed Carometec Fat O’Meter (used in the pork industry) to measure the GR site and replace current manual assessments. Researchers are also trialling a Carometec near infrared probe to see if it can estimate IMF, a key eating quality trait.
- **Hyperspectral Camera:** This technology takes photos across the eye muscle in rapid succession at nine wave lengths to capture visible and infrared images that provide an accurate picture of eye muscle composition. It is also being tested as a measure for IMF. However, as this technology works best on a cut surface (cold grading) it will require some adaptations to be practical with current processing practices.

The sheep for this research are sourced from the Resource Flock which is managed by the University of New England at Armidale, NSW, and by the Department of Agriculture and Food WA at Katanning, WA. Research from commercial scale trials at participant processing plants will be available to the processing industry.

“This research program will not only lead to more carcasses conforming to retail specifications and reduced wastage, but will also provide processors with metrics to make business decisions,” Professor Pethick said.

“Information can also guide producers’ on-farm decisions about genetics and management to meet market specifications.”

Drawing on this research, methods for predicting carcass quality and yield will be developed into a new cuts-based grading system.

## BENEFITS TO INDUSTRY

- Measurement technologies that could increase value by up to \$10 per lamb carcass
- Improved feedback to producers that could underpin value-based trading
- Higher proportion of carcasses conforming to processor/retail specifications and less wastage from trimming excess fat.



CT Scanning of lamb carcasses at the Murdoch University CT Unit, Murdoch, WA.



## Program Stream

### Meat Sensing & Measurement Systems

#### Automated Visual Inspection and Preparation of Live Animals for Meat Processing (2014/1041)

##### Project overview

The first stage of this project will focus on reviewing existing technologies for the automated visual inspection and cleaning of live animals, and finding feasible solutions for the preparation of animals for slaughter. The second stage will develop automated detection of animal contamination in lairage and design a high throughput cleaning station to prepare animals in situ.

##### Project outcome

The project will develop prototype models of an automated visual inspection technology and a flexible robotic cleaning station to clean the animals of possible faecal contamination and the external hygiene of hides. This technology will be able to rapidly communicate with inspection outcomes and lead to decisions on cleaning/marketing of animals in real-time and with a throughput of at least 10 animals per minute.

##### Benefit for industry

Industry benefits will be in the form of reduced cleaning costs and effective cleaning leading to reduced carcass contamination and market benefits. There will be benefits in food safety and quality, and animal welfare.

IN PROGRESS

#### IR thermography and RFID for detection of stress in lairage (2014/1063 (A.MQA.0019))

##### Project overview

This project will develop a system for the automated identification of animals with disease or trauma (e.g. bruising and inflammation) and those that are 'at risk' or under stress (e.g. from overheating, handling, transport and dehydration). It will scope automated drafting of at-risk animals through interconnectivity of infra-red thermography (IRT) camera, radio frequency identification (RFID) readers, and data management and processing. The project will demonstrate the relationships between IRT of a range of animal-based measurements and carcass characteristics.

##### Project outcome

Stage 1 will establish that IRT can detect animals 'at risk' using surface temperature of the body and eyes. Stage 2 will combine IRT with RFID reader panels placed in strategic locations at abattoirs to read National Livestock Identification System (NLIS) ear tags and thus identify individual animals and groups. At-risk individuals and groups can then be segregated for veterinary examination, treatment or rest periods.

##### Benefit for industry

Distressed or diseased animals present risks to productivity and animal welfare. The project will increase understanding of the relationships between animal physiological status (stress and health) during lairage and meat quality to improve management decisions in commercial abattoirs. The project will improve consumer and public confidence in the treatment of animals in abattoirs.

IN PROGRESS



**Program Stream**  
Meat Sensing & Measurement Systems

**Development & Validation of a Probe to Measure Meat Quality (PhD) (2013/9501 (A.MQA.0002))**

**Project overview**

Raman spectroscopy is an optic-based technology that uses scattering of light to provide information on the chemical composition of matter. Unlike near infra-red spectroscopy, Raman spectroscopy is not affected by varying water content and is therefore suited to the measurement of meat and muscle foods. Building on earlier work, the project will evaluate a hand-held Raman spectroscopic probe to predict tenderness and other quality traits in lamb meat.

**Project outcome**

The project will use the Raman probe to collect spectra at 25 minutes, 24 hours and 5 days post mortem. It will then investigate the relationship between the spectra and meat quality characteristics such as shear force values, pH, cooking loss, purge, colour, sarcomere length, particle size, intramuscular fat levels and major fatty acid group concentrations using partial least squares.

**Benefit for industry**

Carcass assessment is a continuing challenge for red meat processors, as lamb carcasses are still commonly assessed for market suitability on only weight, sex and fat score. While informative for meat yield, these attributes are variable and may not be indicative of eating quality characteristics, such as tenderness. If successful, the project will simplify meat quality measurements in a non-invasive and cost effective manner.

IN PROGRESS



**Program Stream**  
Meat Quality Improvement

**Sheep CRC Extension (5 year) (1000/0006) Joint/MLA managed**

**Project overview**

AMPC co-invests with other partners in the Sheep CRC Program. The Sheep CRC Meat Science Program seeks to develop new knowledge and technology to underpin lean meat yield (LMY) improvements in high-quality lamb and sheep meat for domestic and international consumers. Working along the supply chain, the project aims to increase lean meat yield, eating quality and nutritional value of lamb meat to consumers.

**Project outcome**

The project will develop underpinning platforms to measure and value LMY and eating quality, and validate a range of measurement technologies. These include a modification of a device to measure the GR site; high-resolution hyperspectral camera imaging to determine fat depth, eye muscle area and intramuscular fat; an intramuscular fat probe; and modifications of the 2D X-ray system into a dual energy X-ray absorptiometry (DEXA) technology.

**Benefit for industry**

The project will assist processing plants quantify the economic value of implementing processing changes to enhance LMY and eating quality, and to capture their benefits. This will result in improvements in boning decisions, enhancements in producer feedback and superior lean meat carcasses.

Identifying appropriate in-plant LMY measurement technologies could increase value by up to \$10.00 per lamb carcass, depending on the ease and degree of fabrication or retro-fitting to existing processing plants.

IN PROGRESS



**Program Stream**  
Meat Quality Improvement

**Optimising Meat Quality & Functionality through Novel Processing Interventions (2013/5040 (A.TMC.0002))**

**Project overview**

This project will investigate technologies such as ultrasound and pulsed electric field (PEF), focusing on tenderising meat of low value or accelerating tenderisation in high-value cuts from 'tough' animals. The project will also examine technologies for the development of ready-to-eat (RTE) meat products. It will model the effect of the process on meat quality traits, undertake a process-cost analysis of targeted technologies, and incorporate new disciplines into meat science (confocal microscopy, mathematics and process engineering).

**Project outcome**

The project will identify processing technologies that improve meat quality and develop RTE meat products. It will increase processing options for meat supply chains, increase the value and utilisation of the whole carcass, and enhance meat industry capability in new technologies through value adding.

**Benefit for industry**

The project will improve the industry's knowledge, understanding and capacity in technological interventions for meat tenderisation, their cost effectiveness and overall industry value. Improved meat quality will increase the value of under-utilised low value cuts; reduced storage time for tenderisation will cut costs; and the development of new product lines for food service and RTE will boost consumption.

**IN PROGRESS**

**Muscle Structure & Water Retention in Fresh & Cooked Meat Products (2013/5009 (A.TMC.0001))**

**Project overview**

This project will investigate the basic mechanisms responsible for fluid loss during storage and meat cooking, and the relative importance of each structural change that occurs. It will look at interventions to manipulate these mechanisms and explore the effect of cooking temperature on protein density, cook loss and shear force.

**Project outcome**

The project will increase understanding of the structural basis of meat that is responsible for cook loss and how to manipulate it. The information will add to existing knowledge and enable beef processors to predict product performance. This will result in reduced purge in fresh meat, reduced water loss during transport and cooking, improved prediction of quality and an increase in cuts that are tender and juicy.

**Benefit for industry**

Since meat is sold on a weight basis, weight loss represents an economic loss. The project will develop interventions to minimise water loss during storage and cooking, with consequent economic benefits to the industry. The project will also enhance industry capacity to predict quality and quality assurance, resulting in improved meat quality and financial outcomes.

**IN PROGRESS**



Program Stream  
Meat Quality Improvement

**The Influence of Pre-Slaughter Stress on Meat Quality and Carcase Yield of Prime Lambs (2013/9504 (A.MQA.0004))**

**Project overview**

This project will investigate the role of chronic stress (such as dehydration and extended curfews) and acute stress (handling up to stunning) on meat quality and carcase yield in prime lambs. It will measure stress indicators in blood and urine and relate them to meat tenderness, colour and carcase yield, including meat moisture and drip. The project will use a wide range of lamb genetics and production systems from the Sheep CRC Information Nucleus.

**Project outcome**

There is limited data on the impact of acute and chronic pre-slaughter stress on lamb meat quality and carcase yield. The research will provide a better understanding of plasma constituents which reflect stress, dehydration, feed deprivation and tissue mobilisation, and also of correlations between muscle fatigue, meat quality and carcase yield measures.

**Benefit for industry**

Fasting beyond 12 hours and dehydration result in carcase weight losses of 1% and 2.5% per hour, respectively. The project will provide a better understanding of the cause and effect relationships between industry practices and meat quality. The results will improve industry practices for animal handling during transport and lairage, which will improve meat quality and carcase yield in lambs.

IN PROGRESS

**Relationship between fear of Humans, Temperament and Handling Pre-Slaughter on Lamb Welfare and Meat Quality (3000/5091)**

**Project overview**

Pre-slaughter stress, both acute and chronic, is known to affect animal welfare and meat quality. There is limited knowledge on the relative importance of handling and other animal factors in abattoirs on pre-slaughter stress and meat quality. This project will determine the relationship between animal welfare (in terms of stress and behaviour); animal characteristics (such as genetics, temperament and fear of humans); pre-slaughter handling and meat quality.

**Project outcome**

Reducing animal fear and stress would improve productivity, both in terms of efficient energy use and improved carcase quality. The research involves recording animal behaviour in response to pre-slaughter handling, and collecting blood samples immediately post slaughter to measure stress, metabolic state, hydration, muscular exhaustion, and bruising. It will examine the relationships between stockperson attitudes and behaviour, animal behavioural responses to handling and stress behaviours immediately prior to slaughter.

**Benefit for industry**

The project will improve member's understanding of the importance of pre-slaughter handling and its effect on meat quality. This will improve animal management, resulting in increased welfare and higher meat quality both of which will strengthen industry's reputation as a responsible high-quality producer.

IN PROGRESS

## RESEARCH SNAPSHOT:

## TAKING CONTROL OF MEAT COLOUR

CSIRO researchers are 'seeing red' with an AMPC co-funded project that takes a new approach to meat colour.

"This project has the potential to offer a transformative solution to the meat industry," said Ravi Hegde, AMPC Program Manager for Food Safety, Product Integrity and Meat Science.

Dark cutting is the term used for meat that does not bloom or brighten when it is cut and exposed to air. It is generally caused by pre-slaughter factors (on-farm or during transport or lairage), and can be costly to the supply chain.

Carcasses are downgraded if they fail to meet colour compliance criteria (such as for Meat Standards Australia grading), causing economic loss to processors and producers. Consumers perceive the bright red colour of normal fresh or packaged meat as indicating freshness, so dark meat is associated with reduced shelf life, resulting in lost value for processors, producers, and retailers.

In the first year of the three-year strategic project, researchers from CSIRO Food and Nutrition Flagship surveyed 15 processors across the country to assess the real cost of dark meat colour.

"The cost was previously thought to be around \$75 million a year," said muscle biochemist Joanne Hughes, who is completing her PhD on the project. "However, the survey showed dark cutting beef could cost the industry up to \$500 million a year." Project leader Dr Aarti Tobin, from

CSIRO Food and Nutrition Flagship, said the red colour of fresh meat was caused by the pigment (mainly myoglobin) and the reflectance of light, which appears as brightness. Previous meat colour research has focused on factors affecting pigmentation, but Dr Tobin said this project took a novel approach to the role of muscle structure.

"When structural changes occur to muscle during rigor mortis, it impacts the light scattering and therefore the colour of meat," she explained. "We found that reducing the pH of muscle fibres reduced muscle fibre width and increased meat brightness, whereas high pH levels increased fibre widths and decreased brightness."

"The message for the processing industry is that, in addition to myoglobin, muscle structure also has an impact on meat colour. Our trials show that altering pH impacts on muscle structure, which in turn affects light scattering, and therefore the perception of meat brightness or colour. The challenge is for processors to promote the best possible muscle structure to achieve optimum meat colour, so CSIRO and AMPC are working with the processing industry to find solutions that are market focused." Dr Tobin added.

Electrical stimulation is used to manage carcass colour and eating quality, but over-stimulation can lead to a deterioration in sensory attributes, so the project assesses other post-mortem intervention strategies that can be used by processors to optimise the structure of the muscle and meat colour without compromising eating quality.

As different interventions will suit different companies, the project has developed a cost-benefit analysis

tool so processors can evaluate which strategy best suits their business. For example, processing plants with sufficient chiller space can hold carcasses for longer periods between slaughter and grading.

"Our research shows there is an 8% incidence of dark cutting when a carcass is graded 15 hours post-mortem," Ms Hughes said. "Extending the time between slaughter and grading to 30 hours reduces the chance of dark meat colour to 3%." She said the aim was to allow full rigor to occur before grading so the muscle reached its final or ultimate pH, and colour was stabilised.

The project could underpin the development of a predictive model for processors to assess if a carcass would lead to dark cutting. "It's about giving processors more control about how they handle carcasses to promote favourable meat colour and maintain product value," Dr Tobin said.

## BENEFITS TO INDUSTRY

- Retail acceptability enhanced
- Improved eating quality, as very dark meat can have variable tenderness
- Potential to reduce an estimated \$500 million annual cost to industry





Program Stream  
Meat Storage and Colour

**Causes and contributing factors to dark cutting – current trends and future directions (2014/1060)**

**Project overview**

Dark cutting is a significant issue in the red meat industry, affecting around 10% of beef and 15% of sheep carcasses, which results in the discounting of carcasses and consequent economic loss. This project involves a literature review of the contributing factors and causes of dark cutting in cattle and sheep, and the development of recommendations for managing dark cutting at the processing level.

**Project outcome**

Dark cutting has been extensively studied and associations have been established with various production practices, and a wide range of on and off-farm factors. The links between muscle glycogen and meat colour, and between muscle pH and colour are not well established, and may warrant additional research. There is also a need for non-invasive prediction of dark cutting.

**Benefit for industry**

The project will improve member's knowledge of dark cutting and develop recommendations on industry practices leading to the management of dark cutting at the processor level. A reduced incidence of dark cutting will improve meat quality and increase consumption, resulting in financial benefits to the industry.

IN PROGRESS

**Identifying storage thresholds in frozen and chilled meat (2014/1048)**

**Project overview**

Understanding the effects of long-duration storage on the integrity of red meat products is imperative, as failure poses considerable public health risks and economic consequences. This project will investigate the long-term effects of freezing following an extensive chill period on lamb and beef meat quality and safety, and will develop thresholds indicative of freeze duration and meat quality.

**Project outcome**

This project has a lamb and a beef component. The lamb component has five chilling and six freezing periods, while the beef component has four chilling and six freezing periods. The research will involve samples being randomly assigned to each of the chilling and freezing periods and analysed after completing the required periods. Data analysis continues throughout the research period.

**Benefit for industry**

There have been instances of 'accidental freezing' of vacuum packaged meat following a prolonged chill period and the effects of this on meat quality have been questioned; particularly, the influence on lipid and protein oxidation, which compromise meat integrity. The project investigates storage thresholds and quality impacts and the project findings will help Australian industry expand market access, increasing financial outcomes.

IN PROGRESS



Program Stream  
Meat Storage and Colour

**Improving Beef Colour at Grading (2013/3005 (A.TMC.0003))**

**Project overview**

This project seeks to improve members' understanding of the role of muscle structure in determining beef meat colour, and to investigate strategies to manipulate muscle structure to improve muscle colour, through pre- or post-rigour interventions. It will investigate the influence of the rate of pH decline and ultimate pH on muscle structure and light scattering. It will also explore processing technologies and other inventions to manipulate muscle structure to improve beef colour at grading.

**Project outcome**

Muscle structure affects meat colour and myoglobin. Altering pH affects muscle structure, which in turn affects light scattering, and therefore the perception of meat brightness or colour. The project will assess post-mortem intervention strategies other than electrical stimulation that can be used by processors to optimise the structure of the muscle and achieve optimum meat colour without compromising eating quality.

**Benefit for industry**

Dark cutting costs the industry millions of dollars. Reduced carcass downgrades will improve financial outcomes to processors. There will be further benefits in terms of improved eating quality and enhanced retail acceptability resulting in improved consumption.

IN PROGRESS

**The Effect of Processing Technologies on Microbial Populations Impacting the Shelf Life of Meat (2013/5041 (A.TMC.0004))**

**Project overview**

This project will evaluate the impact of processing technologies on microorganisms and the shelf life of red meat. It will look at the effects of processing technologies such as pulsed electric field (PEF) and ultrasound, focusing on the mechanisms by which they affect the spoilage microorganisms. This understanding will help design technologies for greater efficacy. This work will be undertaken as a PhD project.

**Project outcome**

This project will develop the tools and methodology to understand the molecular and genetic mechanisms that enable spoilage microorganisms to survive innovative processing conditions, and it will investigate their impacts on subsequent survival and shelf life. Such tools can be used to study the mechanisms of inactivation or resistance of other processing technologies for improving meat quality.

**Benefit for industry**

This project will increase the range of tools and techniques for microbial inactivation, resulting in improved food safety and longer shelf-life in red meat. This will enhance the industry's capacity to effectively manage food safety and will improve its reputation as a high-quality producer, leading to greater financial benefits.

IN PROGRESS



Program Stream  
Meat Storage and Colour

**Enhancing Retail Colour Stability and Shelf Life of Lamb Meat (PhD) (2013/3003 (A.MQA.0014))**

**Project overview**

This project aims to improve lamb meat colour stability and shelf life through animal nutrition and management. This will include high levels of antioxidants in the finisher diets to reduce the negative impacts of heat stress on lambs. The retail colour stability and shelf life achieved will be compared under different levels of dietary antioxidants in lamb diets – both grain-based and pasture systems – under heat stress and thermoneutral conditions during finishing, transportation and in lairage.

**Project outcome**

The stability of meat colour is affected by on-farm, processing and retail display practices. This project will demonstrate the impacts of heat stress on blood lipid metabolites and antioxidant potential in live animals and on the colour of fresh and stored lamb meat, and how this can be changed by dietary antioxidants. The findings will increase member's understanding of animal management strategies for nutrition, transportation and lairage, and the effect on meat quality.

**Benefit for industry**

The project findings will provide improved lamb nutrition management strategies to improve retail colour stability and shelf life. This will enhance industry's capacity to effectively manage meat quality and in turn its reputation as a producer of high quality product.

IN PROGRESS

**Manipulating Processing Conditions to Enhance Lamb Meat Colour Stability (2013/9508 (A.MQA.0008))**

**Project overview**

This project seeks to improve colour stability in lamb meat using a supply chain approach. It will determine the relationships between oxygen consumption, bloom depth and colour during retail display, and will identify processing techniques to control oxygen consumption rate and help manipulate bloom depth and colour. Meat managed through the supply chain will be placed in retail outlets and measured for colour, bloom depth, shelf life and sale time.

**Project outcome**

It will demonstrate that bloom depth can be changed with processing conditions and that manipulating bloom depth is a way to improve colour stability during retail display. The project will demonstrate the retail improvement to the supply chain, which will assist with industry uptake of findings.

**Benefit for industry**

Benefits for industry will be in the form of increased shelf-life of lamb meat, resulting in improved financial outcomes. At the retail level, shelf life improvement will mean less discounting and less wastage. At the export level, there will be improved market access, leading to better industry outcomes.

IN PROGRESS



**Program Stream**  
Meat Quality Improvement

**Meat quality from dielectrically stunned cattle  
(2013/5034 (G.PAW.0009))**

**Project overview**

Religious slaughter requires that animals are healthy and uninjured at the time of the slaughter. Many stunning methods used in modern commercial slaughter are unsuitable because the animals could be considered injured or would not recover from the stun. This project trialed a new electromagnetic energy delivery system called Diathermic Syncope® (DTS). The DTS system was compared to the captive bolt system on heifers.

**Project outcome**

The project validated the DTS application in cattle and determined the optimum application levels in a commercial setting. The results showed that DTS can induce a state of insensibility of a sufficient duration to allow for the humane slaughter through exsanguination. No evidence of distress was observed, indicating that the process was painless. Meat quality parameters in DTS carcasses did not differ from captive bolt carcasses.

**Benefit for industry**

The project findings can potentially result in the use of DTS as a stunning method appropriate for the humane slaughtering of cattle. This helps industry meet normal market requirements as well as those of specific communities requiring religious slaughtering, while continuing to address animal welfare requirements.

**COMPLETED**



# PROGRAM 4

## **Implementation, Extension and Education**

### **About the Program**

**The objective of the Implementation, Extension and Education Program is to provide effective translation and communication of R&D outputs to stakeholders and to support key training initiatives.**



The program operates across five program streams:

 <p>Program Stream 1</p>	<p><b>Developing Innovative Processes and Employees</b></p> <p>This stream focuses on developing innovative capabilities within the red meat processing sector and its personnel. Innovative employees are needed to accelerate the introduction of new technologies and ensure Australia remains a global leader in red meat processing. Key to the continual development of those employees is the industry's capacity to absorb technologies and identify the training, education and capability gaps within industry.</p>
 <p>Program Stream 2</p>	<p><b>Upskilling of Processing Engineers</b></p> <p>Industry process engineering capability is a key factor in increasing red meat sector processing efficiency. Rapid technological change has led to the need for a review and analysis of process engineering technological capability and training requirements. Maintenance engineers need to remain up-to-date with the skill sets required to service and maintain the continually evolving automation, sensing and information technologies. This stream aims to deliver priority training pathways to build the required capabilities. Critical to its success will be the effective extension of R&amp;D outcomes through industry engineering networks.</p>
 <p>Program Stream 3</p>	<p><b>Attraction, Acquisition and Retention of Skilled Employees</b></p> <p>The attraction and retention of labour is an ongoing concern within the red meat processing industry. Many companies are committed to providing accredited training and career pathways, support for skilled migrants, and emphasise workforce planning and education. However, there is a lack of data on the mobility of personnel within the sector and strategies that might be adopted to improve the industry's attractiveness. This stream focuses on factors influencing the acquisition and retention of meat industry personnel and stakeholders' perceptions of employment within the industry.</p>
 <p>Program Stream 4</p>	<p><b>Professional Development of Meat Industry Personnel</b></p> <p>With constantly changing operating and regulatory requirements within the red meat processing industry, employee professional development and training is an ongoing requirement. An investment in professional development is important for personnel operating at the plant level through to researchers undertaking R&amp;D for the benefit of industry in the long term. This stream focuses on programs that address the industry's current and future priorities. Additionally, the stream provides investment for research scholarships in areas such as meat science, technology and automation, environmental sustainability and market access.</p>
 <p>Program Stream 5</p>	<p><b>Delivery of Priority Training and Extension Services</b></p> <p>The value of R&amp;D is only delivered when outcomes are taken up and successfully implemented by industry. AMPC continues to support the implementation of red meat processing adoption strategies to realise the full benefit of R&amp;D extension/ education investments. This stream aims to develop new extension programs and networks that will facilitate the delivery of R&amp;D outcomes to meat processing personnel. It also supports the development of new, innovative and engaging extension platforms that can further increase the accessibility of research information and advice.</p>

RESEARCH SNAPSHOT:

# MEETING THE CHALLENGES FACED BY MAINTENANCE ENGINEERING PERSONNEL

Maintenance engineering personnel, who are being increasingly stretched by the demands of new and more complex processing technology, will benefit from the proposed training pathways delivered by an industry-driven research project.

Justin Roach, AMPC Program Manager for Implementation, Extension and Education said the transition to a more automated processing line, alongside ongoing competition for skilled staff in regional areas, meant the industry was facing a potential capability shortage.

“Maintenance engineers – with their trades base and strong industry experience – have served the industry well, but it’s becoming increasingly difficult for them,” Mr Roach said.

“The introduction of complex new technologies, such as X-ray guided cutting, robotics and more automation in general, requires new skills as well as combinations of skills across trades – competencies that only a few people in Australia may have,” he added.

Justin said the project aimed to help meat processing plants meet these new challenges by developing training pathways for maintenance engineers to continue to develop their skills throughout their careers.

## Shifting focus

The project was managed by consultant Margaret Tayar, who brought a wealth of industry

experience to the role, including 10 years as the first CEO of the National Meat Industry Training Advisory Council Limited (MINTRAC).

“In this project, we’ve focused on how maintenance staff can continue to gain the skills they need throughout their careers, whether they have no formal qualifications or are trade or university qualified,” said Ms Tayar.

“The industry has a broad range of opportunities in maintenance engineering across areas, such as mechanical and electrical engineering, refrigeration, telecommunications, environment and project management. Skills requirements are becoming increasingly complex across trades areas, such as robotics, that may require skills in areas such as pneumatics, hydraulics and PLCs,” she added.

Margaret said one of the challenges had been to offer training across all of the industry maintenance areas. This led to a proposal for a new ‘certificate’ training pathway through the MINTRAC-managed Meat Industry Training Package, in addition to trade and university options.

This would provide continuing training and development opportunities in Certificate II–IV in Meat Processing, with maintenance engineering majors providing skills in core meat industry and maintenance engineering areas, and total flexibility in selecting maintenance engineering electives across all areas required in the industry.

The project outcomes have been compiled into practical guides for the industry. These guides are:

- A guide to maintenance engineering competencies and training options that sets out

continuing professional development opportunities for trades’ assistants, trades’ and university qualified staff.

- A workforce planning guide that helps maintenance engineering managers plan their staffing so that they have the people they need to do the work.
- A recruitment and retention guide to help attract, develop and retain maintenance engineering staff.

“The main value of the project has been identifying training development pathways for maintenance staff, whether they are trade or university qualified, or have no formal qualifications in maintenance,” Ms Tayar said.

“Additional work needs to be conducted to ensure all the training options are available to maintenance staff and the industry can continue to meet its maintenance engineering needs into the future,” she added.

## BENEFITS

- Proposed training pathways for the continuing development of maintenance engineering personnel, to meet current and future industry needs
- Three industry guides:
  - > A guide to maintenance engineering competencies and training options
  - > A workforce planning guide to help align maintenance engineering resources with plant needs
  - > A recruitment and retention guide to help attract, develop and retain maintenance engineering staff.



**PROGRAM 4:** IMPLEMENTATION,  
EXTENSION AND EDUCATION



## Program Stream

Developing innovative processes and employees

### Feasibility study and provisional business case to assess the scope and potential for establishing and operating a world class Red Meat Processing Innovation Centre of Excellence in Australia (2014/1031)

#### Project overview

The rate at which the processing sector adopts innovations and improved technologies affects the competitiveness of the Australian red meat industry. There are diverse barriers to, and drivers of, adoption within operational sites across the country. This project aims to determine how world leading innovation can be introduced more effectively into the red meat processing sector to increase the efficiency and sustainability of Australian businesses.

#### Project outcome

This study investigated the feasibility of a Red Meat Processing Innovation Centre of Excellence in Australia to:

- mitigate, pool and share risk in testing new innovation and technologies
- develop an economic understanding of the relative benefits of developing, implementing and managing new technologies across the whole value chain
- identify the shared interests and incentives that would categorise the nature of the proposed Centre's activities.

#### Benefit for industry

The outcomes of this study will discuss the viability of potential models and provide recommendations for the feasibility for a Red Meat Processing Innovation Centre of Excellence within Australia.

COMPLETE

### Red Meat Processing Industry Capability Audit (2013/5103)

#### Project overview

This capability audit and gap analysis of research, development and extension (RD&E) providers for the red meat processing sector will assist AMPC and stakeholders to determine current and future red meat processing priorities and capability needs. The project covers industry as well as research providers.

#### Project outcome

A survey of more than 70 researchers and 30 individuals in meat processing companies revealed a depth and breadth of RD&E capability consistent with AMPC RD&E priorities. Areas where potential capability gaps have been identified include:

- animal welfare and animal science
- meat science
- industrial engineering and automation technologies.

#### Benefit for industry

This research identified a number of ways to address capability gaps into the future. These include increased investment in cadetships and scholarships, additional longer-term 'disruptive research' programs, and consideration of centres of excellence to deliver AMPC research priorities.

COMPLETE



**Program Stream**  
Upskilling of processing engineers

**Development of Appropriate Refrigeration Training for the Meat Processing Industry (2014/1024)**

**Project overview**

Plant operators need to have comprehensive training to ensure the safe and effective operation of the ammonia refrigeration system. This project examined the meat processing industry's requirements to address an identified training capability gap and potential WHS hazard.

**Project outcome**

Through this project, industry now has access to:

- a detailed course format for the delivery of the Skill Set UEES00085 *Refrigeration-Air Conditioning - Operate Ammonia Refrigeration Plant*
- a mechanism to deliver the course as an accredited program anywhere in Australia
- a set of presenter's notes, including PowerPoint slides
- access to comprehensive student texts from the Refrigeration Engineers and Technicians Association (RETA) in the United States.

**Benefit for industry**

As a follow-on from this project, these materials will be validated at a Train-the-Trainer program and piloted with industry.

Qualified and well-trained refrigeration system operators ensure systems operate efficiently and minimise the chances of accidental leaks and spills.

**COMPLETE**



**Program Stream**  
Attraction, acquisition and retention of skilled employees

**Investigation into influencing factors for human resource retention, acquisition and selection in the red meat processing industry (2014/1002)**

**Project overview**

This project sought to assess the factors influencing the attraction, selection and retention of personnel in the red meat processing industry. It aimed to identify the key issues and provide recommendations that should help the industry in these areas, with an associated increase in operating efficiency.

**Project outcome**

A range of recommendations were identified that aimed at improving the attraction and retention of employees in the sector, including:

- improving the community perceptions of the industry through targeted communications and marketing
- partnering new employees with mentors to instil a team work mentality
- providing upskilling and career pathway information to new employees as soon as practicable.

**Benefit for industry**

AMPC intends to more effectively target its communications about job opportunities and career pathways. It will undertake projects to develop training resources to support the professional development of mentors who can support new employees entering the industry.

**COMPLETE**



**Program Stream**  
Professional development of meat industry personnel

**Meat Processing Industry Professional Development Program (2014/1020)**

**Project overview**

The Meat Processing Industry Professional Development Program provides accredited courses and general purpose workshops to extend the latest R&D to meat industry personnel and industry trainers in order for them to gain the skills and knowledge required to implement practice change.

**Project outcome**

During 2014-15, 14 courses were run, with 193 participants, plus one demonstration course. A further 21 professional development events have been held in association with other projects.

The following professional development courses were offered to industry throughout 2014-15:

- Electrical stimulation maintenance training
- Animal welfare auditing
- Assessing effective stunning
- Emergency disease recognition and response
- Request-for-Permit validation training
- NLIS training
- Low-stress livestock handling
- Animal welfare officer skillset.

**Benefit for industry**

The program is critical to providing timely training on topical issues within industry. The transition from an industry-funded professional development program into ongoing industry training programs can be seen with the Animal Welfare Officer Skill Set and the Assess Effective Stunning programs, which are now predominantly being offered by RTOs as part of their standard training options.

**COMPLETE**

**Intercollegiate Meat Judging Competition (2013/9209)**

**Project overview**

AMPC has been a major sponsor of the Australian Intercollegiate Meat Judging Association (ICMJ) since 2004. The ICMJ enables students to enhance their knowledge base and expands the network of young meat industry representatives that will represent and drive the Australian meat industry.

**Project outcome**

In 2015, more than 130 students from 11 Australian Universities and four international teams from the United States, Japan, South Korea and Indonesia competed for the Roy McDonald Shield, sponsored by MLA. The students were supported by 35 coaches accompanying the various teams. The overall winner of the event was the Oklahoma State University team.

**Benefit for industry**

The ICMJ Program plays an important role in maintaining and increasing capability of industry personnel within the red meat processing sector. It is a proven forum that raises awareness of career opportunities in the red meat sector and exposes students to market-leading innovation associated with the Australian industry. Many past students of the ICMJ Program have progressed into research and leadership roles within industry.

**COMPLETE**

## RESEARCH SNAPSHOT:

## RESEARCH SETS BENCHMARK FOR INNOVATION DRIVER

Helping meat processors become more competitive and remaining viable in an increasingly challenging global environment was the aim of this project funded by AMPC and undertaken by research organisations Greenleaf Enterprises and Well-Founded Consultancy.

In particular, the project sought to measure the industry's ability to be competitive by determining how successfully it encourages innovation among its workforce.

"The red meat processing industry has always been filled with ingenious people who can run plants with limited expenditure," said Phil Green, Project Manager from Greenleaf Enterprises.

"Due to its high-cost, low-margin structure, it has also been very process driven and has had to excel at repetitive, task-focused operations to survive. This has not created an atmosphere conducive to transformational innovation. These days, with the industry and the world changing rapidly due to factors like technology, market access and consumer trends, new capabilities are needed to keep up," he added.

Among these new capabilities, and a key driver of innovation, is 'absorptive capacity'.

Absorptive capacity has three elements:

- **Exploratory learning:** scanning and acquiring new knowledge

external to a business, e.g. a production manager learning about an innovative new process at a training workshop

- **Transformative learning:** assimilating new knowledge, e.g. the production manager tells his team about the innovative process and gets their ideas on how it could be used to make the business more competitive
- **Exploitative learning:** integrating new knowledge, e.g. the team works together to integrate the innovative practice into their existing processes.

According to Mr Green, the first and last elements of absorptive capacity have come into conflict in the real-world processing environment.

"Exploratory, creative capabilities are antagonistic to the more transactional, exploitative capabilities. In the past, meat processing companies have had to excel at transactional, or task-focused, operations to succeed. But companies that adopt exploratory new ideas more efficiently and integrate them in their businesses faster will be the innovative leaders of the future," he said.

The project aimed to benchmark the industry's current absorptive capacity, identify the barriers and drivers for innovation, and develop future initiatives AMPC can undertake to grow from that benchmark.

Researchers worked with five red meat processors, utilising surveys, interviews and focus groups. They found the companies were engaging in some 'exploratory learning activities', however, the amount and type was limited to just a few areas. They also found businesses were

utilising a narrow range of assimilation processes, such as team meetings, to transform their new knowledge into processes and ignoring newer, digital approaches. The findings showed some companies were proactive in building employees' innovation capability while others were not.

The recommendations for increasing absorptive capacity in the industry included:

- Increased collaboration with universities and researchers, as well as collaborative information-sharing between the red meat industry and aligned manufacturing industries.
- Further engagement with the digital economy through increasing digital approaches to knowledge acquisition, assimilation, learning and development.
- Continued investment in capability-building initiatives to encourage industry personnel to operationalise innovation within their workplace.

Justin Roach, AMPC Program Manager for Implementation, Extension and Education said the recommendations were already in the process of being implemented.

"AMPC is implementing a scholarship program that will run from vocational education through to PhD and Masters' studies," Mr Roach said.

"On the university side, we want to help develop the next generation of industry researchers, and from a vocational education viewpoint we want to upskill and maintain capable employees who are already taking the industry forward through innovation," he added.

Plans are also in place to redevelop AMPC's website in 2016, making it more user-friendly and interactive. In addition, AMPC is developing an online training and learning platform.

Finally, AMPC is looking to develop practical innovation training programs to challenge the way personnel think about industry issues.

#### **BENEFITS**

- An understanding of, and recommendations to increase, the industry's absorptive capacity
- Scholarship program to develop future red meat researchers and upskill innovative employees
- Plans to harness benefits of the digital economy through redeveloped AMPC website.





### Program Stream

Professional development of meat industry personnel

#### Researching and Developing a Meat Industry Workforce Development Plan (2014/1023)

##### Project overview

This project developed a Meat Industry Workforce Development Plan for 2015 to 2019. The project aimed to identify potential skills shortfalls for the industry during this five-year period and, at the same time, identify the causes and a strategy to address this shortfall.

##### Project outcome

The plan has identified job forecast demands to 2019 as well as likely training requirement changes associated with these jobs. A range of recommendations have also been identified for supporting workforce development planning including:

- continued advocacy for red meat industry traineeships and apprenticeships
- stronger relationships being fostered with secondary schools
- increased investment in programs to enhance the capabilities of human resource personnel.

##### Benefit for industry

The plan will ensure key challenges associated with future industry capability and training gaps are addressed. At the enterprise level, the plan will assist red meat processing businesses to:

- attract a wider pool of workers
- develop career pathways and succession plans
- review work systems and job roles
- use workplace flexibility to enhance productivity and retention
- create a culture of innovation and sustainability.

COMPLETE

#### 2015 ABARES Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry (2014/1032)

##### Project overview

The ABARES Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry supports young people in the pursuit of innovative scientific ideas that will deliver long-term benefits for Australia's Rural Industries. Since 2008, AMPC has partnered with ABARES to provide a scholarship and ongoing academic support for students wishing to undertake studies focused on the red meat processing industry.

##### Project outcome

The award for 2015 was presented to Jessica Tan from the South Australian Research and Development Institute. Jessica will map the presence of *E. coli* contamination on Australian beef carcasses to identify hot spots where the bacteria are more likely to be found.

##### Benefit for industry

*E. coli* contamination represents a huge cost to the Australian beef export industry. Since June 2012, there have been at least 691 potential detections of shiga toxin producing *E. coli* with an estimated cost of between \$1.4 and \$1.7 million, purely to confirm the presence of the bacteria. Jessica's research will provide processors with additional information to not only make informed decisions about the best place to test for bacteria but also to minimise the risk of *E. coli* contamination in the first place.

COMPLETE



**Program Stream**  
Professional development of meat industry personnel

**Australian Rural Leadership Program – Course 22 (2014/1034)**

**Project overview**

The Australian Rural Leadership Program (ARLP) is an annual scholarship-based program with a national, competitive selection process. It creates a network of leaders with compassion and commitment, strategic thinking and negotiation skills, and the foresight to influence communities, industries and policy-makers into the future.

**Project outcome**

AMPC has invested in industry leaders through the Australian Rural Leadership Program (ARLP) for many years. The AMPC-funded ARLP scholar for 2015 is James Lord, Owner/Director of the Huon Valley Meat Co. James is an eighth- generation Tasmanian who has operated a small processing facility south of Hobart since 2011. He has forged strong relations with producers and has developed his business to focus on the supply of premium beef products to customers across Australia.

**Benefit for industry**

Investment in industry personnel through the ARLP ensures that highly capable personnel are encouraged to broaden their leadership capabilities and lead the red meat processing industry into the future. AMPC considers that industry personnel undertaking the ARLP will help secure the ongoing R&D capacity for industry, and develop the leadership capacity to address future challenges. Most previous AMPC scholarship recipients have progressed into key leadership roles within industry.

**COMPLETE**

**Collaborative Primary Industries Health and Safety Partnership Program (2013/5045)**

**Project overview**

The Primary Industries Health and Safety Partnership (PIHSP) is committed to achieving significant WHS benefits by developing research projects and initiatives that address primary-industry wide issues.

**Project outcome**

AMPC and its members have explored barriers and facilitators associated with WHS implementation in the meat processing industry and brain-stormed strategies to address these barriers. This project has identified initiatives within other primary industries to encourage further buy-in to WHS initiatives that can be utilised by the red meat processing industry. A synthesis of WHS research will give an industry-wide view of focus areas and gaps in WHS research.

**Benefit for industry**

WHS is a key issue across all primary industries. This partnership enables AMPC to work with industry partners to leverage and build on WHS initiatives that have been implemented across other industries.

**ONGOING**



**Program Stream**

Delivery of priority training needs & extension services

**Equivalence mapping of mandated training with major overseas markets (2014/1030)**

**Project overview**

This project surveyed the training requirements mandated or recommended in our principal markets by regulators, assurance schemes and corporate customers. It was followed by a review of the training programs delivered overseas to meet these requirements and the mapping of these programs against accredited training delivered here in Australia.

**Project outcome**

This project has produced a guide that processing businesses can use to provide auditors or reviewers with evidence of their compliance with mandated training or comparable training in competing export nations. Meat industry training requirements were examined in the following major markets:

- United Kingdom and the European Union
- United States
- Brazil
- New Zealand
- Canada.

Mandated or comparable training requirements were also examined in a number of emerging international markets including:

- China
- Russia
- South Korea
- Japan.

**Benefit for industry**

The project findings enable processors to demonstrate how they meet mandated training requirements when reviewed by overseas regulators or audited by assurance schemes or corporate customers. Additionally, gaps that have been identified in the suite of accredited training available in Australia can now be addressed through the development of appropriate Units of Competency and provision of train-the-trainer programs.

**COMPLETE**

# RESEARCH SNAPSHOT: THE VALUE OF NETWORKING

Industry demand for rapid access to innovation from research and development (R&D) prompted AMPC to support a range of extension networks to drive change.

In 2014-15, in partnership with the National Meat Industry Training Advisory Council (MINTRAC), AMPC held the:

- Meat Inspection and Quality Assurance Network
- Meat Industry Training Network
- Meat Industry Environment Managers Network
- Meat Industry Engineering Network.

MINTRAC CEO Jenny Kroonstuiver described the networks as ‘communities of practice’ because they brought together researchers, regulators, industry personnel and trainers to discuss and evaluate issues and new technologies in the context of individual meat processing operations.

AMPC’s Program Manager for Implementation, Extension & Education, Justin Roach, said the four networks were critical for ensuring innovative research outcomes were taken up by industry.

“During the past 12 months, our networks have been an effective vehicle for extending R&D outcomes and working through regulatory changes and information important to the red meat processing industry,” he said.

In 2014-15, 16 Meat Inspection and Quality Assurance (MIQA) Network meetings were held across Australia, with members in Tasmania and Northern Territory having the opportunity to participate for the first time.

The MIQA Network caters for meat industry employees who need to understand and manage the quality and food safety environment in which Australian meat processors operate.

Participants discussed the practical implications of changing quality assurance obligations and their training needs. This enabled training packages to be developed to better meet regulatory, customer and

importing country requirements. The meetings also provided advice into the revised national qualifications for meat inspection.

A highlight was the development and implementation of an accredited Unit of Competency and training program, which ensures that industry personnel who raise Requests for Permits to prepare Health Certificates understand the processes and assurances underpinning the documents.

Fourteen Meat Industry Training Network meetings were held in 2014-15, giving human resource personnel, meat industry trainers, state training authority workers, auditors and members of state-based training advisory boards the chance to hear about processing and operational innovations, ongoing research and new regulations.

The meetings were instrumental in allowing participants to develop and approve new training qualifications in response to innovation, industry issues and concerns. In particular, they provided advice and guidance into the national review of the Australian Meat Industry Training Package.



In 2014-15, the Meat Industry Environment Managers Network was restarted to help industry take up research outcomes from the AMPC's Environment and Sustainability Program. Workshops were delivered in Queensland and NSW with associated site visits. In addition, presentations and short courses were delivered at state meetings with content focused on:

- wastewater treatment and water efficiency
- energy efficiency, renewable energy and energy storage
- energy and climate change policy.

Also in 2014-15, the Meat Industry Engineering Network was established to extend the results of AMPC-supported research in processing technology and automation. Three meetings were held to allow engineering personnel, researchers, regulators and trainers to hear about products and processes that improve operational and processing efficiency. Examples of topics discussed at these meetings included robotics, processing aides, automation, handsaw technologies, ammonia

refrigeration and steam generation efficiency. Also addressed were new training initiatives and qualifications for maintenance engineering managers.

MINTRAC's Ms Kroonstuiver said the networks were effective because they delivered innovation and support directly to the people responsible for implementing new regulations or technologies.

Mr Roach agreed, adding that ongoing up-skilling of all personnel was important for the competitiveness and sustainability of the red meat industry.

"Now, through the addition of our environment managers and engineers networks, AMPC is extending its research and development outcomes and support to more people than ever before," he said.

**BENEFITS**

- Research and development outcomes communicated to industry
- Information about changes to legislation and regulation distributed
- Improved dialogue and collaboration between industry personnel
- Enhanced industry skills and knowledge.





**Program Stream**

Delivery of priority training needs & extension services

**Service agreement for the provision of professional extension services and consultancy (2014/1003)**

**Project overview**

This agreement, which describes the extension services partnership between AMPC and MINTRAC, sought to ensure:

- timely and comprehensive dissemination of research and development outcomes to appropriate industry personnel
- the uptake and integration of key research and development outcomes in industry
- that research and development outcomes are integrated into the industry’s accredited training system
- the ongoing availability and provision of timely and accurate advice to industry personnel.

**Project outcome**

The project has ensured that:

- industry has been well represented on education and training matters
- career advice and extension resources have been developed to support the attraction, acquisition and retention of personnel
- the Meat Industry Training Package has remained current
- training opportunities have been identified and promoted to industry.

**Benefit for industry**

The extension services partnership has ensured the industry has been well represented on education and training matters associated with the Australian Meat Industry Training Package. The partnership has continued to provide support to companies on regulatory and legislative issues affecting industry and has been critical in ensuring the timely promotion and delivery of professional development activities.

**COMPLETE**

**Encouraging plant uptake of industry RD&E outcomes by training plant personnel in the selection, assessment, internal marketing and development of an implementation plan for an RD&E output on plant (2014/1027)**

**Project overview**

This project aims to make it as easy as possible for industry personnel to gain the skills they need to implement an R&D outcome in their own enterprise. It provides practical training and support, tailored to meet their needs.

**Project outcome**

An e-learning program has been developed that will help Project Managers apply a systematic approach to planning, implementing and managing projects. The e-learning program takes participants through the stages in the design phase of project management, supported by industry experience. The participants compile the components of project management documentation for their own projects.

**Benefit for industry**

This resource will help industry address barriers to adoption of innovation. In the process of undertaking the e-learning program, those enrolled in the program with an RTO may gain a credit for the ‘Design complex projects’ unit, which may be counted as an elective unit in the Diploma or Advanced Diploma of Meat Processing.

**COMPLETE**



### Program Stream

Delivery of priority training needs  
& extension services

#### Facilitation of the QCMPA Network (2014/1035)

##### Project overview

The Queensland Country Meat Processors Association (QCMPA) represents small meat processing and retailing operations in rural towns throughout Queensland. QCMPA members play a critical role in providing red meat processing and butchery services to regional and remote communities in Queensland.

##### Project outcome

AMPC, in collaboration with AMIC and MLA, supports events for the 43 members of the QCMPA to extend the latest R&D outcomes to industry. AMPC's support helps QCMPA ensure changes to meat processing and retailing legislation, food safety laws and associated regulations do not adversely affect its members. It achieves this through active interface with government departments and food safety regulators.

##### Benefit for industry

Each year, members from across the State are able to meet and discuss solutions to problems and to enhance their technical knowledge of the meat processing and retailing industry. An integral part of the workshops are the inspection tours of meat processing facilities, research laboratories and state of the art retail premises. The tours provide members with innovative R&D ideas to implement in their own businesses.

COMPLETE

#### Review and update of the MTM11 Australian meat industry training package and assessment materials (2013/1060)

##### Project overview

As part of the continuous improvement of the Australian Meat Industry Training Package (MTM11) and following submissions from industry to have new training units developed, a full review of the training package and assessment materials was undertaken.

##### Project outcome

The review and update of the Australian Meat industry Training Package is now complete. Fifty-seven sets of Training and Assessment materials have undergone a formal technical review by external groups or contracted individuals. The remainder have been reviewed internally by MINTRAC staff, with reference to external authorities where the need arose.

##### Benefit for industry

Maintaining the currency of the training package and its associated resources has been a critical factor in enabling the industry to ensure effective, widespread, consistent, timely and ongoing dissemination of research and technology outcomes. These materials have been made available to meat processing enterprises and Registered Training Organisations (RTO's) at a relatively low cost, which has encouraged a 100% uptake and usage of the materials, thus ensuring consistency of delivery and assessment across the industry.

COMPLETE

# PROGRAM 5

## **Industry Improvement and Economic Analysis**

### **About the Program**

**The objective of the Industry Improvement and Economic Analysis program is to evaluate the impact of AMPC investments and mechanisms to improve industry performance.**

This is a new program that was initiated in Q3/4 FY2014-15. Projects in this portfolio will commence in FY2015-16.

The program operates across five program streams:



Program Stream 1

**Industry Improvement Analysis**

This stream involves investments in research and analysis that are designed to improve the overall performance of the Australian meat processing industry by comparison to its global competitors. It includes competitiveness analysis and benchmarking studies that identify and quantify those economic factors where improvements can best be made. Studies should include mechanisms to increase productivity and profitability and improve industry sustainability. At a more granular level analyses might consider the economic factors associated with regulatory compliance, industry marketing, energy policy and carbon emissions, infrastructure investment, workforce management and innovation policy.



Program Stream 2

**Strategic Communications**

As AMPC emerges in its role as a key funder and manager of red meat processing related RD&E and marketing, there is a need for improved AMPC visibility and the development of strategic communications with key stakeholder groups. There is a strong message the industry can promote in terms of its critical relationship within both agriculture and manufacturing and its representation in regional Australia.

This stream covers strategic marketing communications based on a medium term plan to substantially lift the profile and recognition levels of AMPC with government and other key influencers. It does not include day to day marketing communications at the project level.



Program Stream 3

**Economic Analysis**

AMPC is obliged to conduct a number of economic analyses at the program or program stream level as part of the SFA. Historically, this analysis was managed by MLA. However that data (as published in the ongoing MLA Evaluation Series) has often been confounded with information not available to AMPC and was often only presented at a high level. It has therefore been of limited use to members in terms of the impact of AMPC investments in delivering meat processing outcomes. As AMPC assumes greater control of the management of its investment portfolio it will be in a better position to accurately evaluate program information investments. It is proposed that AMPC develops a selection of economic analysis tool appropriate to this task and not rely on the CRRDC generic cost benefit analysis methodology alone.

This stream will initiate and manage an integrated portfolio of economic evaluation projects.



**Program Stream 4**

**Industry Wide System Improvement**

Notwithstanding the fact that the industry is divided into competing companies, there is a case to consider mechanisms by which the whole of the Australian meat processing sector might become more competitive through industry wide system improvement. One example might be the utilisation of common IT platforms in selected areas or platforms that can use a common portal for information flow to reduce compliance costs. There may be areas where the reputation of the whole industry is as critical to business success in export markets as the performance of individual companies alone. This includes supply chain issues associated with shipping information, food safety etc. These areas need to be identified and a whole of industry approach adopted.

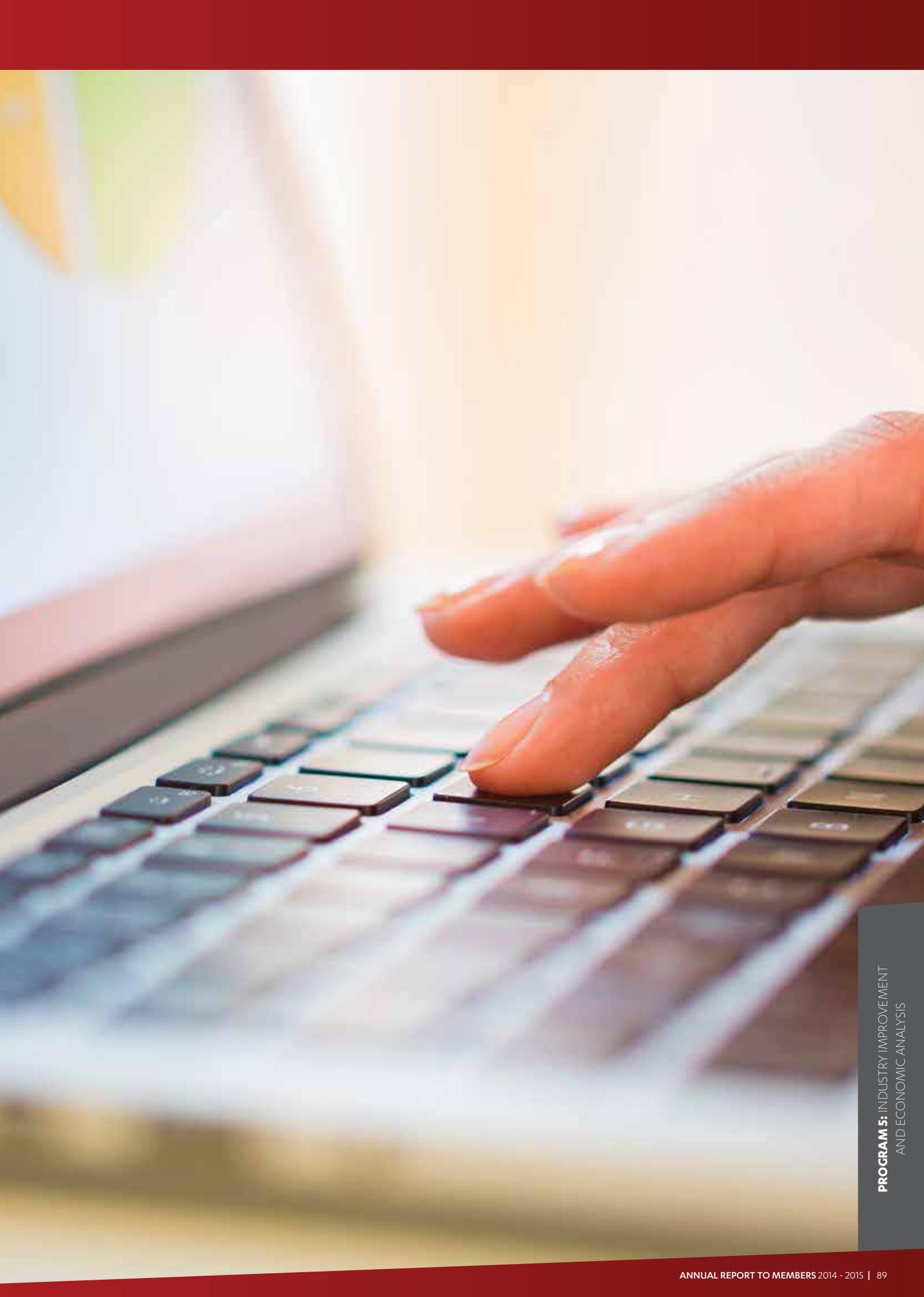


**Program Stream 5**

**Global and Australian Industry Data and Statistics**

MLA provides a raft of economic data for the producer sector, much of which is collected from publicly available third party sources such as ABS and ABARES. Given its proprietary nature it may be more difficult to access relevant industry data for the Australian and global meat processing industry but it should be possible to provide more information to members than is currently the case. It is proposed that this stream, utilising the new website platform, deliver timely and accurate processing related data and statistical analysis both from Australia and around the world.





# PROGRAM 6

## **Joint Program: Market Access, Marketing, Food Safety and Integrity Systems**

### **About the Program**

**In association with MLA, AMPC invests in supply chain activities that enhance market access, improve marketing communications and further develop food safety and integrity systems.**

*MLA manages market access and marketing activities in the Joint Program. However, AMPC invests separately in and manages the Technical Market Access Program, which deals with specific non-tariff barrier issues of greatest concern to industry from within the Core Program.*



The program operates across four program streams:



**Program Stream 1**

**Market Access**

Australia's red meat exports face access restrictions in many overseas markets. Global trade liberalisation and improvements in technical market-access conditions are key focus areas of industry efforts to create opportunities for growth, development and diversification. The industry invests in research and consultation, and assists diplomatic activities and advocacy in pursuit of commercial and economic gains by removing or reducing impediments to trade. This stream builds on industry positions and advocacy to tackle trade barriers.



**Program Stream 2**

**Marketing**

Through this stream, MLA develops and delivers market insights, and promotes beef and lamb domestically and internationally, through advertising campaigns and highlighting Australia's integrity systems.



**Program Stream 3**

**Food Safety**

Food safety systems and quality assurance are vital for all sectors of the red meat industry. This stream conducts scientific research to ensure food safety systems are at the leading edge of knowledge and practice. It supports the development of food safety and quality assurance systems.



**Program Stream 4**

**Integrity Systems**

This stream invests in meat and livestock integrity systems such as NLIS and its associated capability development.

## Program Stream 1: Market Access (MLA: AMPC)

The Market Access Program (MAP) is jointly funded by AMPC and producer levies. It is underpinned by a strong working relationship between the RDCs, peak industry councils and the Australian Government to deliver a 'whole of industry' collaborative effort.

During 2014-15, the MAP invested \$7.4 million to support industry and government efforts and to maintain and liberalise export markets, including \$3.4 million of AMPC contributions on behalf of

the processing sector. The MAP incorporated high-level Australia-based trade reform advocacy as well as intelligence gathering, trade liberalisation positioning and alliance building in key export markets.

The MAP's priority during 2014-15 was to capitalise on the potential industry benefits arising from free trade agreements (FTAs) with trading partners. This included advocating for a timely implementation of both the Korea-Australia FTA and the

Japan-Australia Economic Partnership Agreement and positioning the red meat industry for a favourable outcome from the China-Australia Free Trade Agreement negotiations.

The FTAs listed below have the potential to deliver an additional \$20.0 billion in export value to the industry over the next 20 years. Red meat was one of only a handful of agricultural sectors to benefit from all three FTAs.





## Program Stream

### Market Access

#### Korea Australia FTA (KAFTA)

##### Project Summary

KAFTA delivered immediate benefits in Australia's third largest volume beef export market and growing sheepmeat market when it came into force during December 2014. Importantly, KAFTA lowered the previous 8.0% tariff differential between Australian and United States beef to no greater than 5.4% during the phased 15-year tariff elimination period.

IN PROGRESS

#### China Australia FTA (ChAFTA)

##### Project Summary

Upon entry into force, ChAFTA will initiate significant improvements to current access arrangements for the Australian red meat and co-products sector. ChAFTA negotiations concluded on 17 November 2014 and delivered on MAP priorities by lifting all import tariffs on our products over various implementation timeframes.

IN PROGRESS

#### Japan Australia EPA (JAEPA)

##### Project Summary

JAEPA came into force in January 2015, providing Australian beef with a clear tariff advantage in Japan over other imported beef suppliers. While not eliminating beef tariffs, it is hoped that the JAEPA will be the forerunner of further liberalisation of the imported beef market in Japan. Industry continues to seek the elimination of Japanese tariffs on our products, particularly via the Trans-Pacific Partnership negotiations.

IN PROGRESS

#### Other

##### Project Summary

- Trans-Pacific Partnership negotiations (potential gains are on offer in Canada, Mexico and Peru)
- Australia-India Comprehensive Economic Cooperation Agreement (provides an opportunity for improved sheepmeat access)
- Australia-Gulf Co-operation Council FTA
- Indonesia-Australia Comprehensive Economic Partnership Agreement
- Regional Comprehensive Economic Partnership trade talks (involving the 10 ASEAN countries plus Australia, China, Japan, India, Korea and New Zealand).

Industry has also prepared submissions to government on the value of an enhanced bilateral trade partnership with the European Union (EU). This complements work to ensure Australia continues to have access, on a non-discriminatory basis, to the EU high-quality grain-fed beef quota.

IN PROGRESS

## AMPC Market Access (Core Program)

During 2014-15, AMPC appointed a Trade Director of Technical Market Access to assist industry tackle numerous non-tariff barriers (NTBs) affecting Australia’s red meat trade. The Trade Director’s initial focus is on China and the Middle East – two regions identified in industry’s research as having impediments that generate significant trade distorting impacts.

The role of the AMPC Trade Director (TD) is to develop and implement strategies and tactics that maintain and improve technical market access for beef, sheep and goat meat exports by addressing specific NTBs. The TD is also responsible for developing and maintaining working relationships with the Australian Government, red meat industry organisations and red meat exporters.

In 2014-15, under the leadership of the Industry Market Access Advisory Committee (IMAAC), the TD began work on the following priority projects:



Program Stream  
Market Access

### Chilled Meat to China

#### Project Summary

This project will establish an industry standard and deliver in-market activities aimed at increasing chilled meat exports to China.

IN PROGRESS

### Manufacturing beef to Egypt

#### Project Summary

The project aims to encourage Egyptian authorities to remove the piece size restriction on manufacturing beef (a minimum 2 kg).

IN PROGRESS





**Program Stream**  
Market Access

**Shelf life restrictions in the Gulf Cooperation Council (GCC) countries**

**Project Summary**

This project will explore options and deliver in-market activities that aim to influence Middle Eastern regulators to accept a longer shelf life for Australian vacuum-packed chilled meat, based on scientific research.

IN PROGRESS

**Establishment listing restrictions to China and other key**

**Project Summary**

This project will formulate an industry position on the listing of Australian export plants accepted by overseas trading partners. It aims to influence overseas regulators to accept Australia's system in its entirety as the basis for market access listing.

IN PROGRESS

**Document legalisation into the GCC countries**

**Project Summary**

This project aims to explore restrictions on industry that creates inefficiency and unnecessary burdens for exporters. It will propose new, more-efficient mechanisms for delivering commercial documents to Gulf Cooperation Council (GCC) regulators outside Saudi Arabia.

IN PROGRESS

**Tripe/offal restrictions to China**

**Project Summary**

This project will support activities to promote the food safety credentials of Australian tripe and white offal production, and provide technical support for government-to-government negotiations.

IN PROGRESS

## Program Stream 2: Marketing

During 2014-15, AMPC invested \$950,000 in beef domestic marketing with MLA. This included a full strategic review for the brand, prior to the launch of the new 'You're Better on Beef' creative platform. This investment also contributed to a series of lamb campaigns including the Spring Lamb, Australia Day and the Lamb Roast campaigns.

AMPC invested \$715,000 in a project which demonstrated the importance of red meat in the diet. This project consisted of The Dinner Project and Dinner Three Ways campaigns to educate consumers on the nutritional benefits of red meat. AMPC's investment also contributed to the nutrition influencer program, which consisted of twelve projects on the role of beef and lamb in the Australian diet. These projects focused on health aspects such as ageing, young women, infants, depression and diabetes.



### Program Stream Marketing

#### **Beef campaign 'You're Better on Beef'** **March to May 2015**

##### **Project Overview**

A strategy review evaluated beef's market position in an effort to strengthen the communication strategy. It included analysis of research reports, focusing on key brand health metrics that have experienced recent decline. It concluded that while taste is the differentiated driver for beef purchases, declining health perceptions are an increasingly significant barrier.

A campaign was launched in March 2015 under the new brand position 'You're Better on Beef', which aims to remove barriers to consumption by focusing on the nutritional benefits of beef.

##### **Project outcome**

Brand health metrics and category value share benefited from the new campaign. Results included:

- 13% decrease in mums stating they are 'limiting their consumption of beef due to health concerns'
- 0.17% increase in meal occasion for the year
- 5.1% increase in top-of-mind awareness for beef
- Value share increased 6.3% compared versus the same period last year.

##### **Benefit for industry**

Despite increased prices (11% higher than the same period last year) the campaign grew value share, meaning consumers are still willing to pay more for the product.

**COMPLETE**



## Program Stream Marketing

### Lamb campaign: Spring Lamb October 2014

#### Project Overview

The lamb 'brand' needed a strong and consistent platform to build brand equity and allow a better return for investment. This resulted in the 'You Never Lamb Alone' line.

The first campaign from this platform was Spring Lamb.

#### Project outcome

The new branding delivered strong initial results with high engagement scores for the new TV commercial and positive sales results, with a 10.5% increase in value share compared to 2013.

#### Benefit for industry

The 'You Never Lamb Alone' platform delivered strong results so investment in it will continue for the next 18–24 months.

**COMPLETE**

### Lamb campaign: Australia Day January 2015

#### Project Overview

'You Never Lamb Alone' was continued with the Australia Day campaign. Iconic Australian cricket commentator Richie Benaud was perfectly suited to lead the campaign, reminding Aussies what they love to do on Australia's national day: organise a lamb barbecue and a game of backyard cricket.

#### Project outcome

Results from the campaign were very strong, and included:

- A 35.3% sales uplift in the week before Australia Day
- A 276% return on media investment as a result of partnership with the Nine Network
- 1.13 million people viewing the TV commercial online
- High butcher participation, with above-average sales results.

#### Benefit for industry

Consumers, retailers and the media look forward to the Australia Day campaign each year and it continues to be extremely successful.

**COMPLETE**

### Lamb campaign: Lamb Roast April 2015

#### Project Overview

The Roast campaign continued the 'You Never Lamb Alone' platform. With strong results for the TV commercial, it was decided to re-air the same piece to reinforce the message with consumers.

#### Project outcome

The results from the campaign have yet to be compiled and reported.

#### Benefit for industry

You Never Lamb Alone' proves to be a rich platform that is well received by consumers. It consistently delivers strong sales results so it will continue to be promoted.

**COMPLETE**

### Consumer Nutrition August 2014, June 2015

#### Project Overview

The Dinner Project and Dinner Three Ways content series both surpassed all planned benchmarks. Messages targeted consumers based on key life stages and were relevant to a wide demographic.

#### Project outcome

The Dinner Project reached an audience of more than 100,000 per episode over six episodes on Lifestyle Food, and more than 427,000 cumulative views online. It also ran as five-minute cut-down episodes on JetStar domestic flights. Dinner Three Ways, an 18-part YouTube series designed to help consumers prepare healthy beef and lamb meals, has achieved 1.5 million cumulative views to date.

#### Benefit for industry

The projects continue to educate consumers on the nutritional benefits of red meat. They provide the tools needed to prepare healthy beef and lamb meals, maintaining demand for the product.

**COMPLETE**



Program Stream  
Marketing

### Nutrition influencer activity

Twelve projects were funded during 2014-15 on the role of beef and lamb in the Australian diet. Some focused on aspects such as ageing, young women, infants, depression and diabetes. Others updated the nutrient composition of sausages and commenced secondary analysis of the meat consumption reported in the latest national nutrition survey.

Proceedings of an MLA nutrition symposium on the importance of meals were published in *Vital Health* magazine for pharmacists. The recorded webinar has been viewed by 750 health professionals.

MLA developed a content marketing strategy in partnership with *Australian Doctor* for GPs interested in nutrition, with 500 GPs on the database after one month. It includes a digital newsletter with a dedicated channel and a portal for nutrition education material. Three learning modules target infant nutrition, weight loss and nutrition through the life stages, with each on track to be completed by at least 1,000 GPs a year.

In consultation with more than 20 stakeholders, MLA initiated a discussion on the need for healthy, balanced meal guidelines, including three to four red meat meals a week, to support the Australian Dietary Guidelines. This initiative resulted from insights from MLA-funded research on main meal choices and practices.

IN PROGRESS



## Program Stream 3: Food Safety

AMPC co-invests jointly with MLA in food safety activities that have through supply chain benefits to ensure that high quality, safe and hygienic product is delivered to the market. This will ensure that Australia is able to negotiate favourable technical market access terms for the benefit of the Australian industry.

*In addition to the Joint Program, AMPC invests separately in R&D projects that focus on food safety, product integrity and meat science in the processing part of the supply chain.*



### Program Stream Food Safety

#### AMR in beef

##### Project Overview

This project investigated the prevalence of pathogenic STEC (pSTEC) and the AMR (antimicrobial resistance) status of *Salmonella*, *E. coli* and *Enterococcus* in beef cattle groups slaughtered at Australian export-registered abattoirs.

##### Project outcome

The findings indicated that *E. coli* O157 remains the dominant pSTEC in Australian cattle with *E. coli* O26 and *E. coli* O111 the only other pSTEC serogroups identified. Other pSTEC serogroups (O45, O103, O121 and O145) were not isolated from any sample, which was consistent with previous investigations and suggests that these serogroups are extremely rare in Australian cattle. Nonetheless, the presence of any pSTEC serogroups in cattle represents an ongoing challenge for processors, who must continue to adhere to stringent processing guidelines and testing procedures to ensure contaminated beef products do not enter the market.

##### Benefit for industry

The project results will help industry maintain strict guidelines and controls around the use of antimicrobials, produce consistently high-quality products and reduce AMR issues in Australian industry.

COMPLETE



## Program Stream

### Food Safety

#### ***E. coli* in beef**

##### **Project Overview**

The project investigated the ecology and nature of the super-shedding of STEC (Shiga toxin producing *E. coli*) by grass-fed cattle. It focused on determining the significance of, and opportunities to, predict STEC O157 super-shedding cattle to reduce risks in the processing part of the supply-chain. The project also investigated the public health significance of non-O157 STEC isolated from cattle.

##### **Project outcome**

The project found that high-shedding events and increased herd prevalence occur in association with factors related to the animal and environmental conditions. Rain events were found to precede high prevalence and concentration of *E. coli* O157 shedding in cattle. The project organised a symposium to share knowledge so that the risks of STEC occurrences can be managed through the supply-chain.

##### **Benefit for industry**

The project provides options for the control of STEC, in addition to hide and carcass interventions. The information generated helps Australian producers and farmers reduce the risk of product contamination, increase the efficiency of management programs and allow Australia to negotiate favourable technical market access.

**COMPLETE**

#### **New intervention strategies**

##### **Project Overview**

This project is designed to develop techniques for improving process hygiene and antimicrobial interventions that reduce risks to public health and improve market access. It aims to ascertain whether the principles behind the Gyrotron can be applied to the meat-processing sector to eradicate microorganisms, with the initial focus on *E. coli*. The Gyrotron delivers microwaves to the surface of meat in a non-contact method. The project assessed whether the technology can eradicate *E. coli* without deterioration in meat quality.

##### **Project outcome**

The project demonstrated that microwave technology delivered through the 28GHz Gyrotron can successfully deactivate *E. coli* without damaging meat surfaces. A 4.7 log reduction was achieved with no significant texture and colour effects but the size of deactivation was small and a tight control of the settings was needed.

##### **Benefit for industry**

This project will help industry trial new technologies to improve process hygiene and minimise microbial contamination in processing. This will enhance Australia's reputation as a producer of high-quality products.

**COMPLETE**



## Program Stream

### Food Safety

#### Process control

##### Project Overview

This project aims to provide assurance that slaughter and dressing processes are controlled through the collection of new data and application of new analysis techniques. This will help meet market access requirements and achieve cost effective processing. An important aspect of process control is the understanding of the processing steps that earlier remove microbial contamination from the carcass or add to it.

##### Project outcome

The project investigated the national microbiological databases, *E. coli* and *Salmonella* Monitoring (ESAM) and Product Hygiene Index (PHI). It also surveyed a number of processing establishments to better understand the reasons for varying microbiological results.

##### Benefit for industry

The project has demonstrated that process control indicators, such as zero tolerance, MHA scores and *E. coli* prevalence, yielded infrequent loss of process control. No relationship was found between these indicators and *E. coli* O157 detections, although higher detection rates were associated with calves and, to a lesser degree, dairy cattle. A second edition of the Processor's guide to improving microbiological quality is in preparation and establishments are encouraged to provide anonymous case studies.

COMPLETE

#### Information and Program Management

##### Project Overview

The project monitors scientific developments in meat food safety research and monitors relevant R&D literature to identify areas that may affect the direction of the Food Safety R&D program. Discussions with the program advisory group and scientific risk management panel will help direct future research.

##### Project outcome

The project has continued to produce and circulate news of food safety research and uploads to the Food Safety Centre website. The project has resulted in the development of a Capability Map, which is designed to help Australia's food companies efficiently locate researchers, consultants and trainers to solve problems across the food supply chain.

##### Benefit for industry

The project has generated and maintained sound knowledge and understanding of scientific developments, particularly national and global food safety news. Industry can access this information to keep abreast of developments, locate relevant providers and resources, and respond appropriately to any food safety issues.

IN PROGRESS



## Program Stream

### Food Safety

#### **Salmonella in manufacturing beef**

##### **Project Overview**

This project measures the *Salmonella* on beef trim surfaces and in bovine lymph nodes that cannot easily be removed and to assesses the risk. It will collect microbial data from industry in stages. The initial stage will survey 375g of manufactured trim for *Salmonella*, and the latter stage to include the swabbing of large carcass surface areas before and after interventions. The next stage will examine nine sets of lymph nodes from 200 cattle.

##### **Project outcome**

A survey of *Salmonella* in 375g samples of manufacturing beef found prevalence to be less than 1%, with a low total variable count and low prevalence of *E. coli*. In comparison, the *Salmonella* prevalence in the United States was 2-3 times higher.

There is a developing hypothesis in the United States that *Salmonella* found in ground beef does not only come from faecal contamination of the meat surface, but also from lymph nodes within beef primals and trims. Australian industry needs to understand the risks and devise appropriate risk management actions resulting from the survey.

##### **Benefit for industry**

This project will improve understanding of the prevalence of *Salmonella*. The findings will help enhance the image and reputation of Australian products overseas and will help Australia negotiate favourable technical market access conditions, particularly in the United States market.

**IN PROGRESS**

#### **Product integrity**

##### **Project Overview**

This project aims to manage shelf-life issues by developing shelf-life models and an information package to educate stakeholders throughout the supply chain. The project will collect data on parameters that affect shelf-life and develop tools and prepare texts that help industry and customers understand shelf-life and how to predict and control it.

##### **Project outcome**

A shelf-life prediction tool has been developed for the industry. Based on the inputs provided by the user in terms of initial microbial count and storage temperature, the tool will predict the remaining shelf-life for the product. The project is further refining this tool to improve its precision.

##### **Benefit for industry**

The prediction tool will help the industry better understand the shelf-life of their products, which it can use to find appropriate techniques and strategies to improve shelf-life and maximise the products' market value. With further work, the prediction tool can help industry negotiate better technical market access terms.

**IN PROGRESS**

## Program Stream 4: Integrity Systems

Australia has enjoyed unparalleled access to world meat markets due to its favourable disease status and world class food safety and integrity systems. Continued work is required in these areas to ensure ongoing leadership through both R&D and industry integrity system activities. Investments will continue in the maintenance of the NLIS database and LPA systems; the development of tools and systems for managing food safety based on innovative science; and the development of capabilities, processes and systems that facilitate the electronic transfer of food safety information throughout the supply chain.



### Program Stream Integrity Systems

#### Integrity Systems

##### Project Overview

Projects within this project stream include:

- National Livestock Identification System (NLIS)
- Electronic National Vendor Declaration (eNVD)
- Producer Electronic Declaration (eDEC)
- Livestock Productivity Assurance (LPA).

**IN PROGRESS**



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