IMPACT ADVISORS

AMPC

Future Scan Report

May 2024

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31st May 2024

AMPC
Edwina Toohey
General Manager of Research, Development and Adoption
Australian Meat Processing Corporation Ltd.
Northpoint Tower, Suite 1, Level 29
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North Sydney NSW 2060

Dear Edwina,

We are pleased to submit our findings in this report from the Future Scan research project.

This report has been prepared in accordance with our engagement letter from 13th May 2024.

We acknowledge the support provided by you and your team while undertaking this research, as well as the strong level of industry support that was provided to contribute to the project. The insights, findings and recommendations in this reports can provide useful input to your strategic plan as well as to the ongoing development and future planning for the needs of the industry.

The Australian meat processing industry is of significant important to Australian agriculture, our broader economy, our environment, and our society. With the help of the Australian Meat Processing Corporation (AMPC), the industry has made much progress, and there are a range of attractive opportunities for it emerging in coming years. It is also facing some headwinds today, and these could strengthen or change in the years to come. This research has been prepared to help paint a picture of what these future could look like, to make decisions as to what to do today. There is inherent risk in predicting the future, and we have not sought to do so, however through this work we hope to shed some light on what could potentially emerge in coming years.

As AMPC begins the next phase of its strategic journey, you will likely face a key dilemma – to what extent do you continue to deliver on the priorities of today, or shift your focus to future needs, or in fact support disruption. This will be a complex debate, and one that will ultimately influence the level of impact that AMPC can have. In our report, we have sought to outline what some of those options might look like, to assist you in your planning.

Please contact me on 0438 096 904 if you have any questions regarding this report or findings herein.

Yours sincerely,

Andrew Sprague

CEO

Impact Advisors Pty Ltd

Executive Summary

This document presents the results and findings of the Future Scan research project. This project is one input for AMPC in its strategic and investment planning activities, to help the industry continue to evolve and thrive over the next decade and beyond.

As AMPC begins the next phase of its strategic journey, you will likely face several key decisions

- To what extent do you continue to deliver on the priorities of today, or shift your focus to future needs, or in fact support disruption
- What are the best focus areas for AMPC, and specifically to what degree do you service individual processors vs lift the whole sector
- Should AMPC take a position on the future of the industry and invest accordingly? Or should AMPC service the industry in a more equitable fashion?

These will be a complex debates, and ones that will ultimately influence the nature of the impact that AMPC can have. In our report, we have sought to outline what some of those options might look like, to assist you in your discussions and planning.

We conducted a survey of processors as input to this work. Key findings included:

- Many processors did not have plans in place to systematically identify and respond to their changing environment
- Most were looking for support at an industry level to begin to tackle these trends and issues
- Ongoing automation efforts were seen as both a critical success factor for the industry, but increasingly costly – industry appear to be looking for AMPC to stimulate the next generation of more affordable, scalable and better integrated automation solutions
- Future labour supply was identified as an issue that will remain critical for the next decade
- Many respondents called out the criticality of the industries social licence to operate, and more needed to be done in this area
- This survey also found that improvement was needed in AMPCs delivery to industry and identified a wide range of potential areas

This research has identified 13 established and emerging trends which will likely affect meat processing over the next decade. These include:

- Embracing consumer shifts
- Transforming products and services
- Smart manufacturing and Industry 4.0
- Digital transformation and emerging tech
- New and emerging materials
- Enhancing our digital lives
- Business model innovations
- Building a sustainable future
- Integrated value chains
- Unlocking the potential of collaboration
- The evolution of global trade
- Evolving regulation and compliance
- Securing the workforce of the future

We have used these trends and current observations, to imagine possible futures, from limited and incremental change, to disruptive scenarios. Five divergent scenarios have been prepared for AMPC to consider, along with potential strategies that AMPC could adopt.

1. Thriving, sustainable and trusted processing sector
2. Alternative growth
3. Consolidation of the Global Processing sector
4. Challenging international trade
5. Stagnant and declining industry

Across each of these potential futures, AMPC can adopt a proactive approach to encourage these scenarios to eventuate, support the future capabilities required to be successful in them, or to limit the negative effects if relevant.

Our research has identified 40 key opportunities areas where AMPC could invest. These have been evaluated across multiple horizons, including incremental, adjacent and disruptive.

Detailed studies have been done on 12 opportunities, including a strong emphasis on horizons 2 & 3.

We have conducted a limited review and identification of potential top priority opportunities and highlight these below. Importantly, these have not considered the full context available to AMPC, and as such these should not be considered recommendations. AMPC should conduct appropriate due diligence in evaluating their investments and strategic plans including seeking appropriate advice where relevant.

- Industry benchmarking program
- Future consumer innovation program
- Processor revenue diversification program
- Next generation Automation program
- Processor fundamental models
- Supply chain innovation program
- Lift industry delivery of consumer experience and brand perception
- Build industry Trust (Social licence to operate)
- Build industry sustainability
- Circular economy strategy
- Transform government partnerships
- Create a transformational investment funding model

AMPC have commenced preparation for their strategic planning activities including the identification of broad external factors through this project. Our report identifies a range of questions, steps and considerations which may be useful in these planning activities.

The Future scanning project has enabled the identification of a wide range of external factors that could have an impact on the meat processing industry, and a wide range of specific opportunities for AMPC to consider in its strategic planning process. Our report also makes several suggestions regarding how to take this forward, including

- Engaging stakeholders and refining results
- Conducting an internal review and assessment
- Integrating and analysing results
- Integrating into your strategic planning and fact base

Together these actions will enable AMPC to utilise the findings of this project and to maximise the impact you can have for the benefit of the sector, the broader economy, our communities and the environment.

1. Introduction

Document overview

This document presents the results and findings of the Future Scan research project. This project is one input for AMPC in its strategic and investment planning activities, to help the industry continue to evolve and thrive over the next decade and beyond.

The scope of this research includes:

- Research to identify trends and opportunities over the longer term that have the potential to affect the meat processing and Innovation ecosystem.
- Identifying opportunities from
  - the global meat processing industry
  - cross industry research, including in automotive, electronics, pharmaceutical, logistics and warehousing, as well as food processing
  - across other innovation ecosystems
- Create scenarios based on observed trends which illustrate the future industry and innovation ecosystems.

Limitations

- We have conducted this research in accordance with our engagement letter dated 13th May 2024.
- The information presented in these findings is based on available data such as secondary research. We have not independently verified this data.
- The information contained is not advice for management, and AMPC should review, understand and make their own decisions regarding how the data provided should be interpreted, and the set of investments and decision that you make.
- Impact Advisors disclaims any loss or liability for any party who relies on the information provided in this report. Professional advice should be sought prior to any action being taken.

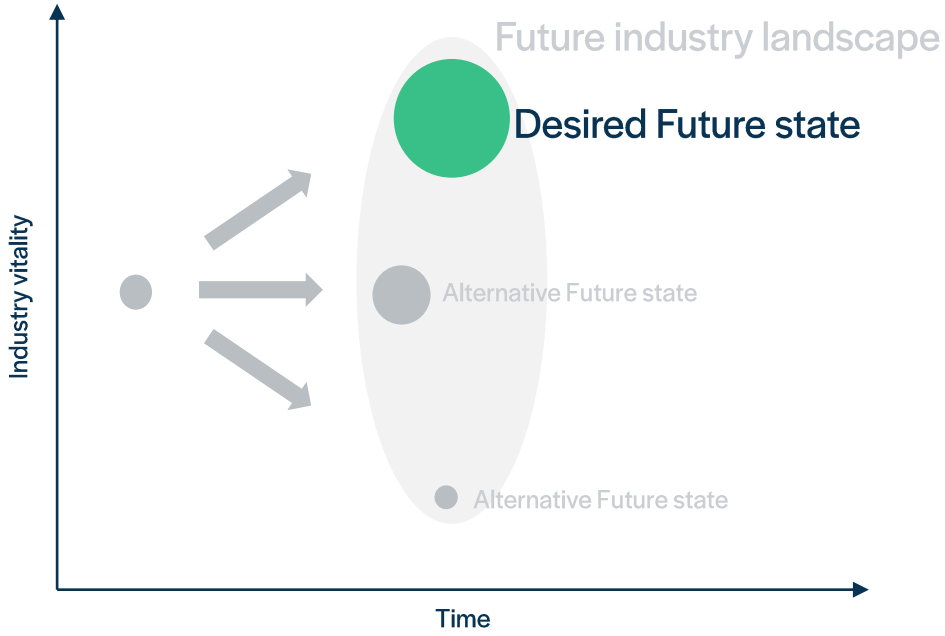
This document contains the following sections:

Section	Outline
1. Introduction	An overview of the document, our methodology and our project and stakeholder engagement plan
2. Current Australian processing landscape and insights	Identifying the key needs of the Australian processing industry and identifying key needs for innovation and Research and Development Corporate (RDC) support
3. Future scan research summary and opportunities identified	Providing a research summary and identifying key opportunities such as macro trends, meat processing trends and trends seen in other industries
4. Key opportunities	Providing a collection of opportunities across various domains, regarding actions that could be taken given the identified trends
5. Analysis and key insights	Identification of common trends emerging along with potential future directions and a prioritisation framework
6. Recommendations and next steps	Identification of possible investment areas, AMPC strategic plan and recommended next steps
7. Appendix	Supporting research , case studies and methodologies provided along with references used

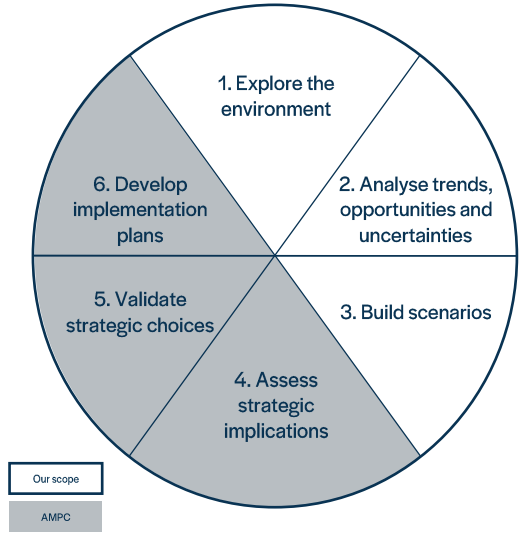
Methodology

Our world is changing fast and becoming more volatile. Drivers such as technology advancements, globalisation, demographic shifts and environmental challenges are driving change at faster rates than ever before. These forces will come to bare on the Australian meat processing sector over time. This will dictate what organisations need to do to be successful. AMPC will play a critical role in assisting industry to predict, understand, and respond to these changes.

Our methodology for exploring future directions uses scenario-based thinking to help explore what the potential future might look like, allowing AMPC to consider their desired future state and response to get there through investments and your strategy. Through this approach, our goal is to transition from a present-focused perspective to a longer-term outlook through this work, acknowledging that some potential futures may be unlikely.



Given the inherent uncertainty in predicting the future, we employ scenario planning to develop a range of plausible future scenarios.



To begin, we conduct comprehensive research spanning multiple domains, including mega trends, meat processing, other industries, and the innovation ecosystem. We complement this research with insights from industry stakeholders regarding current trends and emerging opportunities.

By synthesising these inputs, we identify key trends, encompassing both well-established and emergent developments. These serve as the foundation for extrapolating future implications and making predictions about potential outcomes.

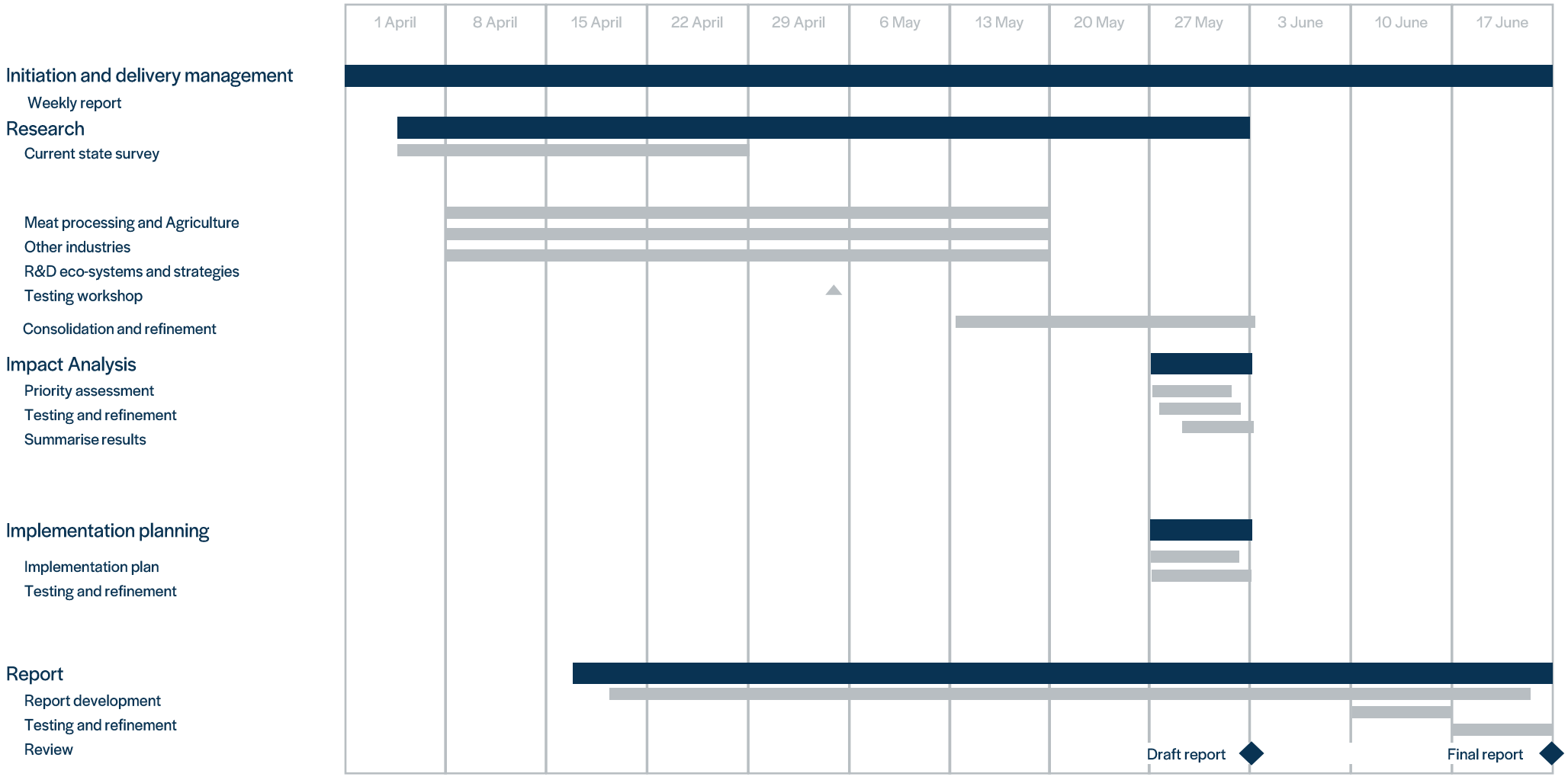
Our analysis also highlights key uncertainties, which we leverage to construct alternative future scenarios. These scenarios serve as valuable tools to inform strategic planning efforts for AMPC.

Additionally, we identify actionable opportunities for AMPC to capitalise on emerging trends and position itself for future success. This includes providing an initial assessment of key opportunities and recommending strategic actions for consideration.

In conclusion, our methodology enables us to generate insights into potential future trajectories, uncertainties, and opportunities for the meat processing industry. We provide recommendations and next steps to guide AMPC in navigating the evolving landscape and achieving its strategic objectives.

Project and stakeholder engagement plan

The table below presents our project plan for the Future Scan research project. This includes undertaking research in nominated industries, identifying priorities, and providing commentary on potential next steps. Industry stakeholders will be engaged through a survey, in order to seek their perspectives and insights relevant to the Future Scan project.



2. Australian Processor survey insights

Survey overview

As part of the Future Scan project, we conducted a survey of processors to seek their input to the project.

Processors were engaged through a mix of online and phone interviews, and asked questions covering a range of issues, including their perspective on key trends affecting the industry, potential areas of innovation in meat processing and other sectors, as well as their experiences with AMPC. The full set of questions is included in Appendix A.

23 organisations were identified by AMPC for this survey. These ranged from large global and local processors, mid-sized processors, and those with diverse business models. Participants included a diverse range of roles, including owners/directors, Chief Executive Officers (CEOs), innovation and plant managers.

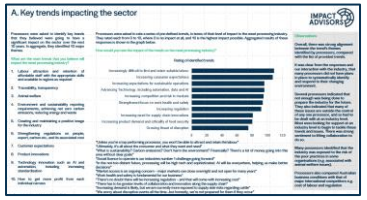
A total of 16 organisations agreed to participate in this survey, and these included a cross section of processors from around the country as indicated in the diagram.

100% of processors surveyed had interacted with AMPC

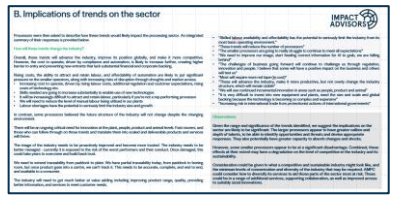
70% response rate from identified organisations

National coverage of survey respondents

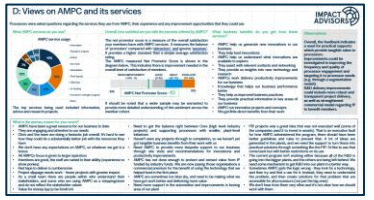
This chapter contains three key elements as depicted below



Industry trends as identify and rated by processors



Implications of trends and Industry needs for innovation



Processor feedback on AMPC and its services

A. Key trends impacting the sector

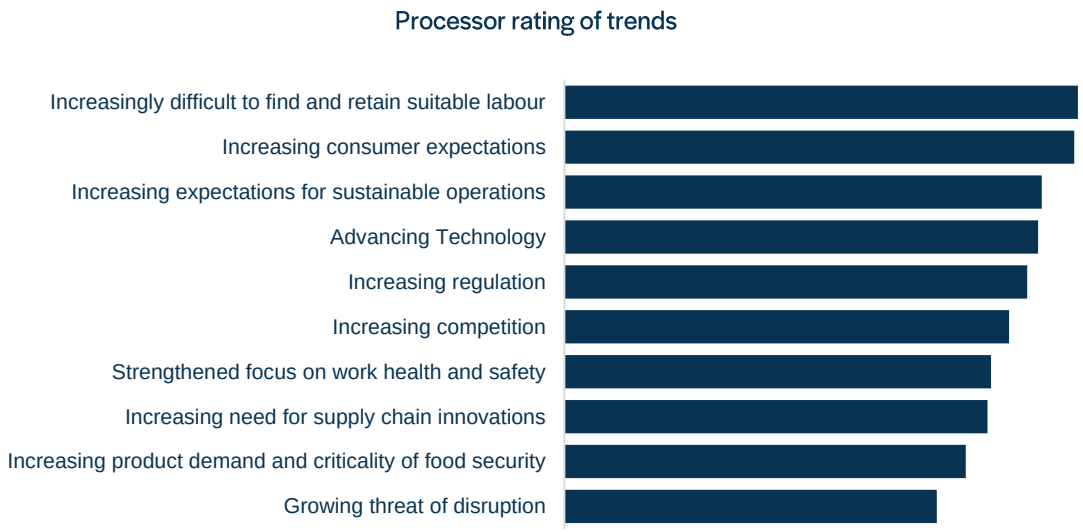
Possessors were asked to identify key trends that they believed were going to have a significant impact on the sector over the next 10 years. In aggregate, they identified 10 major themes.

What are the main trends that you believe will impact the meat processing industry?

1. Evidence based data for industry trust and social licence
2. Labour attraction and retention of affordable staff with the appropriate skills and available in regions as required
3. Traceability, transparency
4. Animal welfare
5. Environment and sustainability reporting requirements, achieving net zero carbon emissions, reducing energy and waste
6. Creating and maintaining a positive image for the industry
7. Strengthening regulations on people, export, carbon etc., and its associated cost
8. Customer expectations
9. Product innovations
10. Technology innovation such as Artificial Intelligence (AI) and automation, augmentation, including increasing standardisation
11. How to get more profit from each individual carcass
12. High performing end to end supply chains

Processors were asked to rate a series of pre-defined trends, in terms of their level of impact to the meat processing industry. They rated each from 0 to 10, where 0 is no impact at all, and 10 is the highest impact possible. Aggregated results of these responses is shown in the graph below.

How would you rate the impact of the trends on the meat processing industry?



"Unless you're a top performing processor, you won't be able to attract and retain the labour"
"Ultimately, it's all about the consumer and what they want and need"
"What is sustainability? Carbon emissions? Don't harm the environment? Financially? There's a lot of money going into this area without clear goals"
"Social licence to operate is our industries number 1 challenge going forward"
"In the not-too-distant future, processing will be high tech and sophisticated. AI will be everywhere, helping us make better decisions"
"Market access is an ongoing concern – major markets can close overnight and not open for many years"
"Work health and safety is fundamental for our business"
"There's no doubt there will be increasing regulation – and that will come with increasing cost"
"There has to be greater levels of collaboration and innovation along the supply chain"
"Increasing demand is likely, but we are currently more exposed to supply side risks regarding cattle"
"We worry about disruptive events all the time...but honestly, we're not prepared for them if they occur"

Observations

Overall, there was strong alignment between the trend's themes identified by processors, compared with the list of provided trends.

It was clear from the responses and our interaction with the industry, that many processors did not have plans in place to systematically identify and respond to their changing environment.

Several processors indicated that not enough was being done to prepare the industry for the future. They also indicated that many of these issues are outside the control of any one processor, and so had to be dealt with at an industry level. Most were looking for support at an industry level to begin to tackle these trends and issues. There was strong sentiment to lift collaboration to do so.

Many prossessors identified that the industry was exposed to the risk of the poor practices in some organisations (e.g. associated with animal welfare issues).

Processors also compared Australian business conditions with that of major international competitors e.g. cost of labour and regulation

B. Implications of trends on the sector

Processors were then asked to describe how these trends would likely impact the processing sector. An integrated summary of their responses is provided below.

How will these trends change the industry?

Overall, these trends will advance the industry, improve its position globally, and make it more competitive. However, the cost to operate, driven by compliance and automation, is likely to increase further, creating higher barrier to entry and preventing new entrants that lack substantial financial and corporate backing.

Rising costs, the ability to attract and retain labour, and affordability of automation and augmentation are likely to put significant pressure on the smaller operators, along with increasing risks of disruption through droughts and market access.

- Increasing cost to operate, driven by rising labour costs, additional regulation and customer expectations, rising costs of technology etc.
- Skills needed are going to increase substantially to enable use of new technologies
- It will be increasingly difficult to attract and retain labour, particularly if you're not a top performing processor
- We will need to reduce the level of manual labour being utilised in our plants
- Labour shortages have the potential to seriously limit the industry size and growth

In contrast, some processors believed the future structure of the industry will not change despite the changing environment.

There will be an ongoing critical need for innovation at the plant, people, product and animal levels. Fast movers, and those who can follow through on those trends and translate them into scaled and deliverable products and services will thrive.

The image of the industry needs to be proactively improved and become more trusted. The industry needs to be better managed - currently it is exposed to the risk of the worst performers and their conduct. Once damaged, this could take years to overcome and build back trust.

We need to extend traceability from paddock to plate. We have partial traceability today, from paddock to boning room, but once product goes into a carton, we can't track it. This needs to be accurate, complete, and end to end, and available to a consumer.

The industry will need to get much better at value adding including improving product range, quality, providing better information, and services to meet customer needs.

- "Skilled labour availability and affordability has the potential to seriously limit the industry from its most basic operating environment."
- "These trends will reduce the number of processors"
- "The smaller processors are going to really struggle to continue to meet all expectations"
- "We need to improve our image, start feeding correct information for AI to grab, we are falling behind"
- "The challenges of business going forward will continue to challenge us through regulation, innovation and people. I believe that some will have a positive impact on the business and others will test us"
- "Most will require more red tape (i.e. cost)"
- "These will advance the industry, make it more productive, but not overly change the industry structure, which will remain stable"
- "We will see continued incremental innovation in areas such as people, product and animal"
- "It is very difficult to invest into new equipment and plants, need the size and scale and global backing because the technology is becoming so complex and expensive"
- "Increasing risk in international trade from protectionist actions of international governments"

Observations

Given the range and significance of the trends identified, we suggest the implications on the sector are likely to be significant. The larger processors appear to have greater calibre and depth of talents, to be able to identify opportunities and threats and devise appropriate responses. They also potentially have greater capacity to absorb changes and shocks.

However, some smaller processors appear to be at a significant disadvantage. Combined, these effects at their extent may have a degradation on the level of competition in the industry and its sustainability.

Consideration could be given to what a competitive and sustainable industry might look like, and the minimum levels of concentration and diversity of the industry that may be required. AMPC could consider how to diversify its services to aid those parts of the sector most at risk. These could be in a range of additional services, supporting collaboration, as well as improved access to suitably sized innovations.

C. Key needs for innovation (1/2)

What are the key challenges that your business will face in this future environment?

People challenges
- Skilled labour availability and affordability
- Finding advanced skills needed to operate and maintain complex equipment and systems

Social licence to operate
- Social licence to operate is the biggest challenge we have. This includes community expectations for how we treat our staff, our conduct as a supplier, and how we treat animals. We are concerned with how little attention there is on the welfare and treatment of animals. If we don't solve these issues at an industry level, it will be impossible to recruit the best talent and sustain our business into the longer term
- Decarbonisation and Sustainability

Strategic, commercial and operational challenges
- Understand how product creates value and what can be done to better evidence that e.g., flavour
- We are focused on improving our business today, rather than responding to emerging trends, for example we are not ready for the sustainability requirements coming at us from our customers
- Market restrictions and overcoming barriers to trade
- Cost to operate
- Being financially sustainable in this future environment will be a challenge
- We are highly dependent on climate for availability and quality of cattle

Regulation
- Red tape and more government charges

Innovation
- We need to have good product innovation
- We need to find ways to take better care of animals

Systems and technology
- Systems (standards) that support integration of technologies. Vendors are not working well enough together to sort that out. As a result, we need to pay a lot of money for technical staff to integrate systems. AMPC should step in and lead standards development
- Automation is getting too expensive. We need alternatives that are affordable. Equipment providers have been amalgamating, and now there are few choices, so they raise their prices. We need better competition in the automation market
- How to store, manage and make use of large amounts of data
- Keeping up with emerging technologies

What are the key areas where your business or your industry could be disrupted?

Droughts – these can have a dramatic effect on the availability of cattle

Market access including wars and other factors effecting international relationships and trade

Cyber security and risks of dis-information online and in social media

Disruptions to our social licence to operate, either broad based activities that damage brand, or behind-the-scene 'silent strike' against processors in the industry for behaviours and work-place practices, which can take years to repair

Activism: Animal activists such as People for Ethical Treatment of Animals (PETA) coming on site, capturing video, possibly using AI to create issue and cause brand damage that is difficult to refute

Pandemics

Labour restrictions

Government regulation

Supply chain risks e.g. wharf disruption is crippling

Disease e.g. foot and mouth

Carbon - Scope 3 emissions requirements

Potential scenario where live export trade is banned or restricted, like sheep

AI could disrupt the decision-making processes such as optimum use of a carcass

Most processors indicated they see the threat of disruption from lab grown meats over the next decade as relatively low

C. Key needs for innovation (2/2)

What are the most innovative developments and practices in meat processing that you see worldwide?

Specialisation of processors including their products and services

Innovative use and adoption of AI

Environmental and sustainable initiatives

New technology e.g., smart cameras for grading or reviewing processing systems

Processors in the US have lower regulatory cost burden

Wearable technologies which allow the assessment of the level of strain on staff, allowing prediction of high-risk areas for injury, and allow preventative programs to be put in place

Laser guides and cutting

Chicken and pork industries are far more mature than red meat processing and we can learn a lot from them and what they can do

Alternative packaging solutions to Modified Atmosphere Packaging (MAP), particularly those in Europe which are better for the product

New Zealand (NZ) processors have much lower levels of waste from their processing plants, we should look at them, how they're doing it and bring those ideas to Australia

What opportunities do you see to learn from other industries to improve the meat processing industry?

Automation in other industries including automotive

Automotive industry and their high performance and integrated automation

How have other proteins captured better narratives

Being able to provide adaptable robots that fit our industry

Medical/surgical industry and their use of lasers and guided cutting in surgery

Scanning technologies, such as those used in airports

Use of cameras and AI to detect people, faces and provide security alerts

Lamb and chicken processing sectors, which have far higher degrees of automation particularly in the boning area

Considering your previous responses, what areas do you recommend be considered for additional research and development investment over the next 10 years?

Extend automation program
- Lower cost automations
- Task specific automations
- Automation in the middle of the plant kill floor and boning room

New systems such as AI applications, simpler systems, data framework for industry

Standards development between vendors

Product and packaging innovation

Build red meat narrative such as its health benefits and social licence image

Help improve industry performance in social licence areas e.g., animal welfare

Help improve industry Sustainability and carbon reduction

Identify and help to overcome Trade barriers

Identify and translate innovations from other industries to the meat processing sector

Observations

Processors have identified a range of potential areas for innovation. These tend to be in highly complex and costly areas, which would make sense to conduct on an industry level.

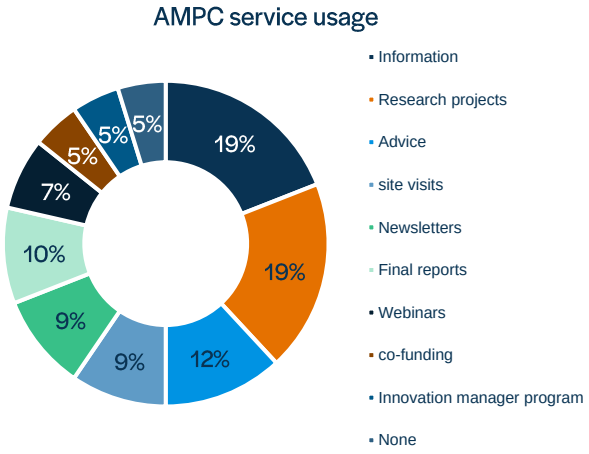
From our interactions with industry, it appears that some processors lack the time and resources to effectively monitor international developments and translate these to domestic operations. AMPC could consider investing in a program on behalf of industry and sharing leading practices on a regular basis.

There was support for extending this concept to other industries, and AMPC playing a role in identifying and translating innovations to meat processing. We see this category of innovation to hold vast opportunity for the industry, but most likely beyond the resources of any one processor.

D: Views on AMPC and its services

Processors were asked questions regarding the services they use from AMPC, their experience and any improvement opportunities that they could see

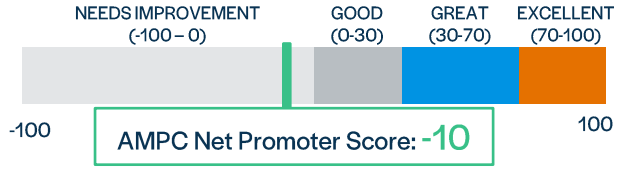
What AMPC services do you use?



The top services being used included information, advice and research projects.

Overall, how satisfied are you with the services offered by AMPC?

The Net Promotor Score (NPS) is a measure of the overall satisfaction your members have with AMPC services. It measures the balance of 'promoters' compared with 'detractors', and ignores 'passives'. It provides a higher standard than a simple average satisfaction rating.
AMPC measured Net Promotor Score is shown in the diagram below. This indicates there is improvement needed in the overall level of satisfaction of members.



It should be noted that a wider sample may be warranted to provide more detailed understanding of this sentiment across the member cohort.

What business benefits do you get from these services?

- AMPC help us generate new innovations in our business
- They help fund innovations
- AMPC help us understand what innovations are available to explore
- They assist with relevant contacts and networking
- They provide us insights into new technology and research
- AMPCs work delivers productivity improvements for our business
- Knowledge that helps our business performance better
- They help us improved business practices
- They provide practical information in key areas of our business
- AMPC run innovative projects and concepts
- We get little direct benefits from their work

Observations

Overall, the feedback indicates a need for practical supports which provide tangible value to processors.
Improvements could be investigated in improving the frequency and quality of processor engagement and targeting it to processor needs (e.g. through a segmentation model).
R&D delivery improvements could include more robust and transparent project delivery, as well as strengthened commercial model regarding IP to benefit members.

What is the primary reason for your score?

- AMPC have been a great resource for our business to date
- They are engaging and attentive to our needs
- Chris and the team are doing a fantastic job overall. It's hard to see how they could do a substantially better job with the resources they have
- We don't have any expectations on AMPC, so whatever we get is a bonus
- All AMPCs focus is given to larger operators
- Intentions are good, the staff are varied in their ability (experience vs show ponies)
- Red tape to deliver is cumbersome
- Project slippage needs work – fewer projects with greater impact
- As a small team there are people within who understand their stakeholders, and some who are using AMPC as a steppingstone and do not reflect the stakeholder values
- Value for money has to be forefront
- Need to get the balance right between Core (high level industry projects) and supporting processors with smaller, plant-level initiatives
- Haven't seen any projects through to completion, so we haven't yet got tangible business benefits from their work with us
- Need AMPC to provide more bespoke support to our business through site visits and recommendations for innovations and productivity improvements
- AMPC has not done enough to protect and extract value from IP funded by industry funds. We are now paying those organisations a commercial premium for the benefit of using the technology that we helped fund in the first place
- AMPC are sometimes too blue sky, and need to be making what we have got work better and delivering more value
- Need more support in the automation and improvements in boning area of our plant
- PIP projects was a great idea that was not executed well (some of the companies used it to invest in assets). That is an execution fault for how AMPC administered the program, there should have been better guidelines and rules to prevent that. A lot of ideas are generated in the plants, and we need the support to turn those into practical solutions through something like the PIP. I'd like to see that come back but with better restrictions on its use
- The current program isn't working either because all of the R&D is going into the bigger plants, and the others are being left behind. We need some mechanism to get R&D into our plant in a better way.
- Sometimes AMPC gets the logic wrong - they look for a technology, and then try and find a use for it. Instead, they need to understand the problem, and then create solutions for that problem that are accessible for all processors (not just the big ones)
- We don't hear from them very often and it's not clear how we should work with them

3. Future scan research

Chapter overview

Research was undertaken in several key industries, including:

1. Multi-industry 'mega' trends
2. Meat processing
3. Automotive
4. Electronics
5. Pharmaceutical industry
6. Logistics and warehousing
7. Food manufacturing
8. Research and development

Our research included a broad range of sources including academic papers, industry plans, company documents such as strategic plans, and secondary research reports. References are provided in the appendix for key documents.

We have selected trends that are most material, and of most relevance to meat processing and AMPC.

Our work has sought to differentiate between two types of trends:

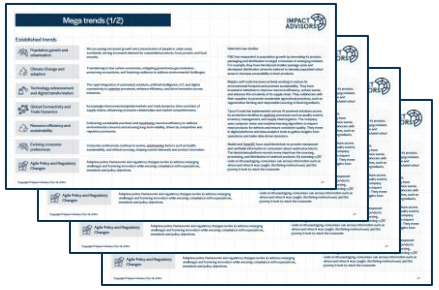
- Established trends – broad based, evident and likely to continue for some time
- Emerging trends – relatively low levels of evidence or take-up, but with the potential to become broad based in time

We delve into several areas of interest, carefully selected in collaboration with AMPC to address key industry concerns and opportunities. These focal areas include protein demand trends, climate change, changing consumers and supply chain models, Australian processing global competitiveness trends, regulatory scenarios, potential areas for processor revenue growth, workforce trends, trends in R&D funding, R&D performance trends, trends in innovation models and R&D services.

This chapter contains three key elements as depicted below

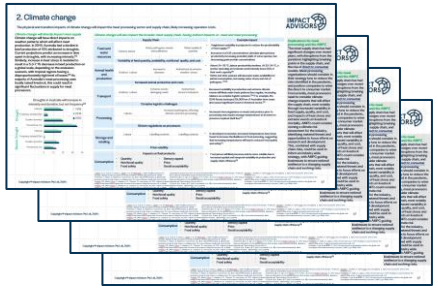
Chapter 3.1: Strategic trends

Summary of trends aggregated across all research areas



Results from the trend analysis in each research area, including established and emerging trends, as well as selected case studies

Chapter 3.2: selected trend deep dives



Presents a series of deep dives in selected areas

Chapter 3.3: Potential implications

Presents a series of extrapolations based on the research and trends to indicate what might eventuate in the meat processing industry

3.1 Key trends

Together, this research indicates several trends which will affect meat processing and the external environment

Looking in

Embracing consumer shifts
Rising population and urbanisation drive innovation to meet evolving consumer preferences, including in products, services and channels.

Transforming products and services
Product and service innovation focus on personalised nutrition, maximising synergy, evolving services, and innovative packaging and labelling.

Smart manufacturing and Industry 4.0
Technology advances drive end-to-end digital transformation, featuring automation, fault-tolerant robotics, smart manufacturing, 3D printing, automated sorting, and Industry 4.0 innovation for accelerated prototyping.

Digital transformation and emerging tech
Digital transformation integrates emerging technologies, revolutionising industries with AI, IoT, blockchain, and automation for enhanced efficiency and innovation.

New and emerging materials
New and emerging materials drive innovation across industries, offering enhanced performance, sustainability, and versatility in product design and development.

Enhancing our digital lives
Digital enhancements revolutionise daily life, integrating seamlessly into routines through personalised experiences, connected devices, and AI-driven conveniences.

Business model innovations
Business model innovation evolves traditional structures, embracing new revenue streams, partnerships, and customer-centric approaches to adapt to changing market dynamics.

Looking out

Building a sustainable future
Businesses and research organisations prioritise climate adaptation, sustainability, Circular Economy (CE), and green initiatives.

Integrated value chains
Integrated value chains leverage blockchain for transparency, foster industry collaboration, innovate supply chains, adopt omni-channel logistics, and emphasise food safety.

Unlocking the potential of collaboration
Strengthened collaboration through cross-industry partnerships fosters open innovation, creating collaborative ecosystems driving industry-wide advancements.

The evolution of global trade
Global connectivity and trade dynamics drive increasing competitiveness amid widening geopolitical fractures, emphasising the importance of social and planetary stewardship.

Evolving regulation and compliance
Regulatory intervention increases, reshaping landscapes with AI visual inspection and cybersecurity measures, necessitating strong compliance and agile policy changes.

Securing the workforce of the future
Future-ready workforce development emphasises skills agility, digital literacy, and adaptability to thrive in rapidly evolving industries and technologies.

Mega trends (1/2)

Established trends

Population growth and urbanisation	Urbanisation globally drives heightened demand for sustainable products, protein, and food security, reflecting the growing concentration of people in cities.
Climate Change and adaption	Transitioning to low-carbon economies, mitigating greenhouse gas emissions, preserving ecosystems, and fostering resilience become crucial for addressing environmental challenges.
Technology advancement and digital transformation	The rapid integration of automated solutions, AI, IoT, and digital connectivity optimises processes, boosts efficiency, and fosters innovation across industries.
Global Connectivity and Trade Dynamics	Interconnected global markets and trade dynamics shape supply chain evolution, impacting economic relationships and market competitiveness on a global scale.
Resource efficiency and sustainability	Driven by competitive and regulatory pressures, industries embrace sustainable practices and optimise resource efficiency to ensure long-term viability and address environmental concerns effectively.
Evolving consumer preferences	Evolving consumer preferences emphasise health, sustainability, and ethical sourcing, shaping market demands and driving product innovation in response to changing trends.
Agile Policy and Regulatory Changes	Dynamic policy frameworks adapt to address emerging challenges, fostering innovation while ensuring compliance with expectations, standards, and policy objectives, facilitating an environment conducive to progress.

See references 1-12

Selected case studies

Proctor & Gamble (P&G) has responded to population growth by innovating its product, packaging and distribution to target consumers in emerging markets. For example, they have introduced smaller package sizes and developed distribution networks tailored to densely populated urban areas to increase accessibility to their products.

Maple Leaf Foods has been actively working to reduce its environmental footprint and promote sustainability. They have invested in initiatives to improve resource efficiency, reduce waste, and enhance the circularity of its supply chain. They collaborate with their suppliers to promote sustainable agricultural practices, such as regenerative farming and responsible sourcing of feed ingredients.

Tyson Foods has implemented various AI-powered solutions across its production facilities to optimise processes such as quality control, inventory management, and supply chain logistics. The company uses computer vision and machine learning algorithms to inspect meat products for defects and ensure consistent quality. They invest in digital platforms and data analytics tools to gather insights from operations and make data-driven decisions.

Nestlé and OpenSC have used blockchain to provide transparent and verifiable information to consumers about seafood products. The blockchain platform records every step from the sourcing, processing, and distribution of seafood products. By scanning a QR code on the packaging, consumers can access information such as where and when it was caught, the fishing method used, and the journey it took to reach the consumer.

Mega trends (2/2)

Emerging trends

Resource scarcity and adaptation accelerates	Governments and industries prioritise sustainable resource use to address critical limitations in water, land, forests, biodiversity, and minerals, incentivising stronger and faster adaptation through regulatory focus and government incentives.
Strengthening global social and planetary stewardship	Globally implemented comprehensive carbon pricing mechanisms drive the adoption of circular economies, ecological restoration, resilient infrastructure, and inclusive growth initiatives.
Widening geopolitical fractures	Escalating trade tensions, conflicts, civil unrest, and displaced populations contribute to geopolitical instability. Nations grapple with complex diplomatic challenges amidst shifting power dynamics.
Next-generation technologies and digital integration	Immersive digital worlds become integral to daily life. AI, nanotech, healthtech, and quantum computing see exponential growth. AI and microbiome innovation spawn new markets. 'Quantified self' provides real-time individualised data on behaviour, performance, and health. Biohacking enables personal enhancement.
Complex ethical challenges of technologies	Ethical concerns arise with genetic modification, technology augmentation, and AI. Prioritising responsible technology standards and compliance regimes becomes essential to address these challenges.
Development of a global trust architecture	A robust trust architecture is crafted to instil confidence in the economy and society. Ethical AI standards and responsible technology practices are enforced, ensuring transparency, privacy, and accountability in data sharing.
Smart cities	Smart cities seamlessly integrate nature and food production, nurturing sustainable living. This integration of IoT devices, sensors, and data analytics revolutionises urban infrastructure, rendering cities more efficient, sustainable, and responsive to residents' needs.

See references 1-12

Selected case studies

Nestlé has implemented water stewardship initiatives to address concerns over water scarcity. They have invested in water-efficient technologies, sustainable sourcing practices, and community engagement programs to mitigate the impact of water scarcity on their operations and local communities.

Unilever has launched its Sustainable Living Plan to enhance social and planetary stewardship. The plan focuses on reducing environmental footprint, improving health and well-being, and enhancing livelihoods across its value chain. Unilever's commitment to sustainability has earned it recognition as a leader in corporate social responsibility.

The ongoing trade tensions between the United States and China exemplify widening geopolitical fractures. These tensions have led to tariffs, trade restrictions, and geopolitical rivalries, impacting global supply chains and economic stability. Companies with global operations must navigate geopolitical risks and uncertainties to ensure business continuity.

Google has developed ethical principles for the responsible development and use of AI. These principles guide Google's AI research and product development efforts, addressing complex ethical challenges such as bias mitigation, privacy protection, and algorithm transparency.

Microsoft has launched the Trustworthy Computing initiative to enhance cybersecurity and build a global trust architecture.

Meat processing (1/3)

Established trends

Global growth in demand for high quality meat	Population growth combined with income shifts are driving overall increased demand for meat, mainly from emerging countries. Demand including high quality and affordable products.
Increasing global competitiveness	Escalating competition in the meat processing sector through market saturation, increased scale and vertical integration, consolidation trends, global expansion, and relentless price competition, thereby offering consumers a wider array of choices.
Innovation to meet changing consumer preferences	Processors are responding to changing consumer needs including for quality, affordability, sustainability, health consciousness and convenience. Growing demand for provenance, sustainable and ethically sourced products. Product diversification and packaging innovation will result to meet these new preferences.
Enhancing and integrated value chains	Meat processors are increasingly focused on enhancing and integrating value chains, streamlining processes from farm to fork to ensure quality, traceability, and efficiency.
End to end technology enhancement	The comprehensive integration of digital tools, robotics and automation throughout the entire production process, from slaughter to packaging, to improve efficiency, quality control, and traceability.
Digital transformation of processors	Integrating digital technologies across all aspects of business operations, including processing, people, finance, customer, supply chain, sustainability goals and innovation
Strengthening sanitation and safety	Implementing monitoring for pollutants, early disease detection, staff training, PPE and testing regimes, equipment and process design, and measures against microbial resistance to ensure product safety.

See references 13-34

Selected case studies

NH Foods has experienced global growth in demand for high-quality meat products, particularly Wagyu beef. By leveraging Japan's reputation for premium beef, NH Foods has expanded its export market and established itself as a leading supplier of Wagyu beef to high-end restaurants and consumers worldwide.

Marfrig Global Foods has embraced innovation to meet changing consumer preferences, particularly regarding sustainability and animal welfare. The company has introduced innovative production practices, such as implementing blockchain technology for traceability to cater to evolving consumer demands for ethical and environmentally friendly products.

Danish Crown has embraced end-to-end technology enhancement to optimise meat processing operations. Through advanced automation, robotics, and data analytics, they have improved productivity, consistency, and food safety.

Hormel Foods has adopted real-time pathogen detection technologies to enhance food safety. They use advanced sensors and diagnostic tools to quickly identify potential contamination.

Cargill initiated the "Facility of the Future" program to modernise its meat processing facilities. Using robotics, automation, digitalisation, and advanced analytics, the program aimed to optimise operations, address labour challenges, and enhance safety and efficiency. Cargill's distribution centre handles 130,000 boxes with just two mechanics working on the floor.

Meat processing (2/3)

Established trends

Increased regulatory intervention

Heightened regulatory scrutiny and consumer awareness regarding food safety, animal welfare, and sustainability drive stricter regulations and certification requirements, enhancing compliance and industry standards.

Selected case studies

Unilever participated in the development and testing of the Taskforce on Nature-related Financial Disclosures (TNFD) framework, which aims to provide organisations with guidance on how to assess and disclose their nature-related financial risks and opportunities. Through its involvement in the TNFD pilot, Unilever has demonstrated its commitment to integrating nature-related considerations into its financial reporting and decision-making processes, contributing to greater transparency and accountability in addressing biodiversity loss and ecosystem degradation.

Nestlé has implemented the Environmental and Social Risk Screening (ESRS) framework in its agricultural supply chain. By utilising ESRS, Nestlé aims to identify and mitigate environmental and social risks associated with its agricultural sourcing activities. This framework helps Nestlé assess its suppliers' compliance with environmental and social standards, ensuring sustainable practices throughout its supply chain. Through ESRS, Nestlé can proactively address issues such as deforestation, water scarcity, and labour rights violations, demonstrating its commitment to responsible sourcing and sustainable agriculture.

See references 13-34

Meat processing (3/3)

Emerging trends

Red meat consumption peak	The demand for affordable, sustainable, and alternative diets, coupled with heightened regulatory intervention, may accelerate the decline in per capita meat consumption beyond initial projections.
Commercialising alternative proteins	The transition to alternative proteins, such as plant-based, lab-grown, and insect-derived sources, may accelerate due to sustainability concerns, regulatory actions, and evolving consumer preferences.
Personalised nutrition and functional foods	Advanced technology and data analytics could facilitate the creation of customisable meat products tailored to individual preferences. Integration of genomics in product development may lead to the emergence of personalised functional foods.
Blockchain technology for supply chain transparency	Blockchain adoption may gain momentum, offering traceability, transparency, and assurances regarding food safety and animal welfare to both consumers and regulators, potentially becoming ubiquitous across industries.
Digital twin technology	Simulations replicating meat processing operations in a virtual environment may emerge, facilitating predictive maintenance, process optimisation, and troubleshooting for enhanced efficiency and reliability.
Collaborative robots	Smart robots are emerging to collaborate with humans, enhancing efficiency and safety in various tasks.
Processor business model innovations	Consolidation may intensify, impacting medium and small-scale operations. Various business models, such as vertical integration, subscriptions, co-manufacturing, direct-to-consumer, value-added processing, collaborative networks, cooperatives, and offshore processing, could gain prevalence.

See references 13-34

Selected case studies

In recent years, there has been a growing awareness of the environmental impact and health concerns associated with high red meat consumption. As a result, companies like Beyond Meat and Impossible Foods have emerged, offering plant-based meat alternatives that mimic the taste and texture of traditional meat products. Traditional meat processors are also diversifying their product offerings to include alternative protein technologies.

Emerson Electric Co., a global technology and engineering company, provides plant digital twin solutions that enable processing plants to achieve operational excellence and drive continuous improvement. Emerson's digital twin solutions integrate process data, equipment models, and advanced analytics to create a virtual representation of the plant, allowing operators to visualise, simulate, and optimise production processes in real-time. By leveraging Emerson's plant digital twin solutions, processing plants can optimise energy usage, reduce emissions, and improve overall sustainability while enhancing profitability and competitiveness in the market.

Universal Robots is a leading manufacturer of cobots, designed to work alongside human operators in manufacturing and processing environments. These flexible and user-friendly robots can perform a wide range of tasks, such as packing, palletising, and assembly, with precision and efficiency. By integrating cobots into their operations, food processors can automate repetitive and labour-intensive tasks, increase productivity, and improve workplace safety, while also adapting to changing production requirements and market demands.

Automotive (1/2)

Established trends

High performance automation	Fully automated systems at an industrial scale, capable of handling heavy components using industrial robots including sensing technologies. Redundancy, fail safes, and extensive diagnostic systems improve their fault tolerance and high performance. Consumer grade automation and connectivity to everything in vehicles including biometrics.
Embedded continuous improvement	Continuous improvement capabilities, embedded and applied, used to create innovations in production processes in areas such as quality, speed, safety, cost and waste
Maximising product synergy	Auto manufacturers are investing in maturing product management capabilities to accommodate diverse customer preferences, increasing demand for multiple variants, and the management of integrated product portfolios to ensure competitiveness in the market.
Disrupting traditional supply chains	Increased adoption of direct-to-consumer models to create direct relationships with customers, enabling personalisation, faster feedback loops and greater control over branding and sales channels. New entrants targeting high value areas and disruption.
Future ready workforce development	Automakers are building a future-ready workforce through Augmented Reality (AR)/Virtual Reality (VR) training, digital skills development, flexible work arrangements, partnerships with universities and technical institutions for continuous learning, diversity initiatives, and talent management technologies.
Driving green	The industries advancement in implementing sustainability practices both internally and throughout supply chain aiming at reducing carbon emissions, reducing waste, and eco-friendly manufacturing
Industry supply chain collaboration	Fostering deep collaboration with its supply chain aiming at co-innovate, drive sustainability and long-term viability through partnership with critical suppliers

See references 35-41

Selected case studies

Automakers are increasingly investing in advanced technologies such as AI to accurately predict customer demand, which in turn helps to determine the need for raw materials and components. This allows them to forecast and adjust their supply plan, particularly for components that have a long lead time.

Predictive maintenance represents a new era in automotive industry, both in terms of their products but also their production systems. Data-driven insights and AI innovation lead to safer, more reliable, and more efficient vehicles and operations.

Machine/computer vision systems play a critical role in the automotive industry, ensuring the production of high-quality vehicles while maintaining efficiency and safety standards.

Automotive manufacturers often adhere to ISO 9001 standards, which focus on ensuring consistent quality in products and services.

Statistical Process Control is an essential function in automotive manufacturing to constantly strive for efficiency and quality while minimising cost. Many automotive manufacturers are turning towards software solutions that to drive improvements.

Automotive manufacturers often collaborate closely with their suppliers to optimise supply chain performance and ensure timely delivery of components.

Automotive (2/2)

Emerging trends

Smart manufacturing	Smart manufacturing technologies like robotics, IoT sensors, and digital twins are being deployed. AR and VR integration enhances design, prototyping, and training. Agile practices enable faster product development cycles and customisation options.
Embedding emerging technology	AI and machine learning are integrated for predictive maintenance and vehicle diagnostics. Advanced driver assistance systems and vehicle-to-pedestrian safety measures are adopted. Blockchain ensures secure and transparent vehicle data, including traceability and ownership. Brain-human interface and emotional AI enhance car interactions.
Material innovation	Vehicle manufacturing increasingly employs sustainable and eco-friendly materials. Advanced materials and nanotechnology are utilised for lightweight and durable products, enhancing fuel efficiency and environmental sustainability.
Circular economy	Circular economy principles are increasingly adopted in vehicle design, manufacturing, and end-of-life processes, promoting resource efficiency and waste reduction. Green hydrogen production is utilised for clean energy generation and transportation, reducing carbon emissions and fostering sustainability.
Broader collaboration	Automotive manufacturers and tech companies collaborate to develop innovative solutions for future mobility challenges, such as autonomous vehicles, electric mobility, and connected transportation systems.
New business models	Implementation of subscription-based ownership models and flexible leasing options addresses changing consumer preferences. Shared mobility services like ride-hailing, car-sharing, and peer-to-peer car rental platforms offer convenient alternatives to traditional car ownership.
Evolution of services	Connected vehicle services expand, offering remote vehicle monitoring, over-the-air software updates, and predictive maintenance alerts. Just-in-time feature upgrades and personalised services enhance user experience. Autonomous delivery services revolutionise logistics and last-mile transportation.

See references 35-41

Selected case studies

BMW has implemented advanced robotics, IoT sensors, and data analytics in its production facilities as part of its Factory 4.0 initiative. This includes using cobots for assembly tasks, AI-powered quality control systems, and digital twins to optimise manufacturing processes.

Ford has been focusing on material innovation and sustainability by incorporating recycled and eco-friendly materials into its vehicle manufacturing process. For example, Ford's F-150 pickup trucks use aluminium alloy bodies to reduce weight and improve fuel efficiency.

Volvo has launched its Recharge program, which aims to promote a CE for Electric Vehicles (EVs). This includes initiatives such as battery recycling and repurposing, as well as offering subscription models for EV ownership to extend the lifespan of vehicles and reduce waste.

Toyota has collaborated with ride-hailing giant Uber to develop and deploy autonomous ride-sharing vehicles. This partnership combines Toyota's expertise in vehicle manufacturing with Uber's platform for mobility services, demonstrating broader collaboration in the automotive industry.

General Motors launched Maven, a car-sharing service that allows users to rent GM vehicles for short periods through a smartphone app. Maven offers various vehicle models for rent on an hourly or daily basis, catering to consumers' evolving preferences for shared mobility solutions.

Electronics (1/2)

Established trends

Smart manufacturing	Adoption of highly automated systems with extensive connectivity, cobots and vision-guided robotics to boost efficiency, precision, and flexibility in production, assembly and packing operations.
3D Printing Technology	Integration of 3D printing in electronics enables rapid prototyping and customised manufacturing, minimising waste, optimising resources, and driving innovation to meet customer preferences, thereby enhancing competitiveness.
Automated sorting systems	Leveraging advanced technologies like machine vision, AI, and robotics enables efficient categorisation and organisation of electronic components based on attributes such as size, shape, and functionality.
Innovative packaging	Advanced packaging solutions are employed to safeguard electronics during transportation, handling, and storage. These solutions encompass anti-static packaging, foam inserts, and smart packaging integrating sensors and RFID tags for real-time monitoring.
AI visual Inspection	Embracing advanced AI and machine learning combined with visual inspection technologies, for precise defect detection and enhancing product quality.
Collaborative ecosystems	Formation of collaborative ecosystems and consortia comprising manufacturers, suppliers, academia, and government agencies to foster innovation, knowledge sharing, and industry standards development in electronics manufacturing.
Cybersecurity	Heightened focus on cybersecurity to protect sensitive data, intellectual property, and critical infrastructure from cyber threats, including ransomware, data breaches, and supply chain attacks.

See references 42-48

Selected case studies

Electronics manufacturing plants have recognised the importance of deploying the appropriate robot technology for specific applications to enhance scalability in their operations. Different types of industrial robots are utilised in electronics manufacturing, each with its unique strengths and weaknesses within specific applications. For instance, SCARA robot arms excel in small component assembly, while Delta robots are ideal for handling small, lightweight parts with high speed and accuracy in clean environments.

Various packaging solutions have emerged, including anti-static packaging, foam inserts, smart packaging, corrugated boxes, and sustainable packaging. Smart packaging, for instance, integrates sensors, RFID tags, and tracking technologies to provide real-time data on factors like location, temperature, and humidity during shipping.

By automating the sorting process, electronic manufacturing plants can achieve higher levels of accuracy, speed, and scalability, leading to improved productivity and cost-effectiveness.

By leveraging sophisticated algorithms and machine learning, manufacturers achieve precise identification of defects, ensuring high-quality products and streamlined production workflows.

Automotive manufacturers utilise 3D printing to streamline production processes, create prototypes efficiently, and customise parts. This technology enhances product development cycles, improves quality, and optimises resource utilisation, driving innovation and competitiveness in the automotive industry

Electronics (2/2)

Emerging trends

Bendable and wearable devices	Flexible electronics incorporating organic, printable, and nanomaterials are emerging, unlocking enhanced applications in industrial settings and packaging.
Biodegradable electronics	Biodegradable electronics may emerge with advances in materials and manufacturing capabilities, yielding electronic chips, sensors, and products designed to break down or degrade in the environment.
AI chips	Specialised semiconductor devices will emerge designed to accelerate AI workloads. This could create a step change in speed and performance and transform the use of AI in multiple industries.
Extended Reality	VR will extend to Extended Reality (XR). This will extend sensory input from sight and sound, to touch and smell. Devices will become cheaper and lighter. AI will provide greater levels of interaction, and virtual avatars. This will open global talent pools and create a digital workplace on an industrial scale.
Printing electronics	The next generation of electronics printing will emerge. This will allow a wide range of customisable electronics to be created, including low-cost RFID tags.
Holographic displays	3D holographic visualisations will become available, for various applications, including entertainment, advertising, communication, education, and augmented reality. In manufacturing, they will enhance visualisation, communication, training and quality control.
Sustainability and circular economy	The electronics industry will increasingly embrace the principles of the CE. Product lifecycles will extend to refurbishment, remanufacturing, and recycling initiatives to minimise electronic waste (e-waste) and conserve resources.

See references 42-48

Selected case studies

ProGlove's wearable barcode scanner features a flexible display that allows workers in manufacturing and logistics to receive real-time information and instructions hands-free, improving productivity and safety on the factory floor.

Several research institutions are exploring the development of biodegradable sensors embedded with electronic components for applications such as soil moisture monitoring, pollution detection, and crop health management in agriculture and environmental monitoring.

Intel's Nervana Neural Network Processors are designed specifically for accelerating deep learning workloads in industrial applications such as predictive maintenance, quality control, and autonomous systems.

Varjo's XR headset combines virtual and augmented reality capabilities, allowing industrial designers and engineers to visualise and interact with 3D models in real-world environments, facilitating product design and prototyping.

Optomec's Aerosol Jet printing technology is utilised in additive manufacturing applications to directly print electronic components such as sensors, antennas, and interconnects onto 3D surfaces, enabling the fabrication of conformal electronics for aerospace, automotive, and medical devices.

Pharmaceuticals (1/2)

Established trends

Robotics and automation	Widespread adoption of robotics and automation technologies in manufacturing and distribution. Real-time monitoring and control systems optimise production performance. Quality by Design of product, manufacturing and handling of product.
Advanced manufacturing	Continuous Manufacturing being adopted over traditional batch processing. Adopting disposable bioreactors to reduce contamination risks Building flexible and scalable manufacturing facilities that can quickly adapt Enhancing cleanroom designs and air filtration systems to prevent contamination. Improving filtration and separation technologies to purify materials and products
Digital transformation	Leveraging data analytics and machine learning algorithms to optimise manufacturing processes, predict equipment failures, and improve overall efficiency Implementation of robust data integrity and cybersecurity measures to protect sensitive manufacturing data and comply with regulatory requirements
Supply chain innovation	Implementing strategies and technologies to enhance the flexibility, agility, and robustness of pharmaceutical supply chains Temperature-controlled storage and transportation solutions to maintain the integrity
Safeguarding innovations	Patenting new drugs and technologies to protect intellectual property rights Strategic management of portfolio of patents including identification, applications and litigation Regulatory exclusivity strategies including data and drug exclusivity
Collaborative ecosystems	Forming strategic alliances with academia, government agencies, and other industry players to accelerate innovation and drug development. Collaboration and licensing of complementary technologies and monetisation of IP
Strong regulatory compliance	Ensuring compliance with regulations and standards set by health authorities using risk-based approach, good manufacturing principles, data integrity and documentation

See references 49-55

Selected case studies

Johnson & Johnson has integrated robotics and automation technologies into its pharmaceutical manufacturing processes to enhance efficiency and quality. By employing robotic systems for tasks such as packaging, labelling, and assembly, the company has achieved higher throughput and reduced human error in its production lines.

Novartis leverages digital transformation initiatives to optimise its manufacturing operations. The company utilises real-time monitoring and control systems to collect and analyse data from its production processes. By applying data analytics and machine learning algorithms, Novartis can predict equipment failures, optimise resource utilisation, and ensure compliance.

Pfizer is committed to safeguarding its innovations through rigorous intellectual property protection strategies. The company actively patents new drugs and technologies to protect its investment in research and development. Pfizer also strategically manages its portfolio of patents, including identifying valuable inventions, filing patent applications globally, and engaging in legal proceedings to defend its intellectual property rights.

The Medicines Manufacturing Innovation Centre (MMIC) in the UK is a collaborative effort among major pharmaceutical companies like AstraZeneca, GlaxoSmithKline, Pfizer, and Roche, alongside academic and government partners, to advance pharmaceutical manufacturing. By pooling resources and expertise, the MMIC aims to revolutionise drug production through cutting-edge technologies.

Pharmaceuticals (2/2)

Emerging trends

Personalised medicines	Tailoring treatments to individual patients based on their genetic makeup and other factors. This is supported by research into how genes affect a person's response to drugs to optimise treatment.
Manufacturing innovations	The emergence of 3D printing extends to medications, medical devices, and tissue constructs. Smart manufacturing platforms integrate IoT devices, sensors, and analytics. Sustainable processes are imperative, and remote monitoring ensures in-line quality assurance.
Enhanced digital transformation	As IoT equipment and devices proliferate, they collect real-time data. Manufacturing integrates digital twins and AR/VR. Wearables and sensors extend data and interactivity, while AI and machine learning accelerate drug discovery and treatment. Blockchain ensures security, transparency, and traceability.
Innovative treatments	Digital technologies emerge to enable behavioural treatments. Treatments emerge to modulate the gut microbiome to improve health and treat diseases. Editing genes to treat genetic disorders and develop new therapies.
Material innovation	Biocompatible materials are adopted for drug delivery, tissue engineering, and regenerative medicine. Nanoscale materials adopted in treatments and drug delivery. Biotechnology is used to produce therapeutic proteins, antibodies, and biological drugs.
Business model innovations	The industry shifts towards prevention and early detection models, emphasising proactive care. Value-Based Healthcare prioritises patient outcomes and cost reduction, promoting a holistic approach to healthcare delivery.
Evolving the regulatory landscape	Regulatory design and decisions are informed by real-world, real-time data and science. Collaboration between regulators and industry aims to harmonise standards, streamline regulatory processes, and facilitate global drug approvals and market access.

See references 49-55

Selected case studies

Foundation Medicine is a molecular information company that offers genomic profiling to help oncologists match patients with personalised cancer therapies.

Aprecia Pharmaceuticals is known for utilising 3D printing technology to manufacture medications, such as its ZipDose® Technology for rapidly disintegrating oral dosage forms.

Proteus Digital Health develops digital medicines that combine medication with ingestible sensors, wearable patches, and smartphone apps to track medication adherence and monitor patient health in real time. Their innovative approach integrates digital technologies into pharmaceutical treatments to improve patient outcomes and medication management.

CRISPR Therapeutics is a biotechnology company that pioneer's gene-editing therapies to treat genetic disorders and diseases. By harnessing the CRISPR-Cas9 technology, CRISPR Therapeutics aims to develop breakthrough treatments for a range of conditions, including sickle cell disease and cancer.

Novartis has been exploring value-based healthcare initiatives by entering into outcomes-based pricing agreements with payers. In these agreements, payment for medications is linked to patient outcomes, such as improved health or reduced hospitalisations. This innovative approach aligns incentives between pharmaceutical companies, payers, and patients to focus on value-driven healthcare delivery.

Logistics and Warehousing (1/2)

Established trends

Automation	The widespread adoption of automated technologies like conveyor systems, robotic arms, and AGVs. Innovative last-mile delivery solutions such as drones and autonomous vehicles are being developed to enhance delivery speed and efficiency, addressing the challenges of the final stage of delivery.
Advanced analytics	Use of data analytics tools to optimise distribution, inventory management, and warehouse layout. Predictive maintenance programs using IoT sensors and data analytics to identify equipment failures before they occur. real-time tracking technologies such as GPS and RFID.
Digital transformation	Leveraging various technologies to enhance efficiency and effectiveness across the supply chain, such as e-commerce, smart warehousing, voice activated technologies, AR/VR, RPA, Blockchain, and Autonomous vehicles.
Omni-channel logistics	Adapting logistics strategies to support omnichannel retailing, including fulfillment from multiple channels, flexible delivery options, and seamless customer experiences. Creating differentiated service levels for a diverse range of clients.
Reverse Logistics	Improving reverse logistics processes and service levels for product returns, refurbishment, and recycling to reduce waste and recover value from returned goods.
Industry collaboration	Building collaborative logistics networks with third-party logistics providers (3PLs), carriers, and suppliers to optimise transportation and warehousing operations.
Sustainability	Integrating sustainability into logistics operations by optimising transportation routes, reducing carbon emissions, and implementing eco-friendly packaging solutions. This also involves green buildings, programs to reduce waste, offsetting carbon emissions, and building sustainable supply chains.

See references 56-60

Selected case studies

Amazon has been a pioneer in the adoption of automation technologies in its warehouses, deploying conveyor systems, robotic arms, and Automated Guided Vehicles (AGVs) extensively to streamline its operations and improve efficiency. The company has been investing in innovative last-mile delivery solutions, including the use of drones and autonomous delivery vehicles, to enhance delivery speed and efficiency.

UPS is leveraging advanced analytics tools to optimise its distribution network, inventory management, and warehouse layout. The company uses predictive maintenance programs powered by IoT sensors and data analytics to identify and address equipment failures before they occur. UPS also utilises real-time tracking technologies such as GPS and RFID to provide customers with visibility into the status of their shipments.

Alibaba is at the forefront of digital transformation in the logistics industry, leveraging various technologies to enhance efficiency and effectiveness across its supply chain. The company has invested in e-commerce platforms, smart warehousing solutions, voice-activated technologies, AR/VR for warehouse operations, and blockchain for supply chain transparency and traceability.

IKEA has implemented innovative reverse logistics processes and solutions to manage product returns, refurbishment, and recycling efficiently. The company has optimised its reverse logistics operations to reduce waste and recover value from returned goods, contributing to its commitment to sustainability and environmental responsibility.

Logistics and Warehousing (2/2)

Emerging trends

Advanced automation	Enhanced deployment of smart warehousing technologies and automation. AI based predictive maintenance systems. Autonomous mobile robots with navigation and sensors. Autonomous vehicles and forklifts.
Enhanced digital transformation	Extensive deployment of digital technologies such as IoT, 5G, AR/VR, blockchain, wearable technology and digital twins. Internet of Robotic Things (IoRT) to create interconnected systems where robots can communication, collaborate and co-ordinate activity.
Warehousing optimisation and edge computing	Adoption of advanced optimisation software for warehouse layout design, inventory slotting, and labour scheduling to maximise space utilisation, improve performance and minimise operational costs. Implementation of edge computing to reduce latency and enable real time analytics.
Building future ready workforce	Collaboration between industry, educational institutions and training providers, including designing specialised programs and courses, offering training opportunities, and promoting lifelong learning.
Cross industry collaboration	Cross industry and competitor collaboration, to improve customer service, reduce shipping costs and carbon emissions.
Enhancing local and regional footprints	Future intelligent and decentralised fabrication will see the need for enhanced regional and local logistics services. Establishment of micro-fulfillment centres located closer to urban areas combined with regional operations centres.
Integrated multi-modal logistics networks	Enhanced logistics networks will emerge operating at scale, using data and automation to provide premium services for the rapid transport of time sensitive goods. This will include comprehensive environmental controls and monitoring systems enabling real time information on integrity and security and electronic customs.

See references 56-60

Selected case studies

Amazon has been at the forefront of implementing advanced automation in its fulfillment centres. With the deployment of thousands of autonomous mobile robots, Amazon has significantly enhanced its warehouse operations. These robots navigate through the warehouse shelves to bring products to human workers for packing and shipping, increasing efficiency and reducing the time taken to fulfill orders.

FedEx has implemented edge computing infrastructure in its smart warehouses to process data closer to the source. By deploying edge computing nodes within warehouses and distribution centres, FedEx reduces latency and enables real-time analytics for optimising inventory management, order fulfillment, and supply chain operations. This enhances operational efficiency and responsiveness to dynamic market demands.

DHL has been investing in connected warehousing solutions that leverage data and automation to provide premium logistics services. By integrating IoT sensors, real-time tracking systems, and environmental monitoring technology, DHL's connected warehouses offer comprehensive visibility and control over inventory, ensuring the integrity and security of time-sensitive goods. This enables DHL to optimise its logistics networks for speed and efficiency.

The Singapore Logistics Association is a collaborative effort among logistics providers, technology firms, government, and industry. It focuses on strategy, digital innovation, shared infrastructure, talent development, and advocacy.

Food Processing Industry (1/2)

Established trends

Diversification of products	Expansion of product lines to cater to diverse consumer preferences, including ethnic foods, fusion cuisines, convenience and novel flavour combinations. Developing and marketing products with health benefits, such as functional foods, plant-based foods and fortified products.
Sustainability	Implementation of sustainable practices throughout the supply chain, including sourcing, waste reduction, and packaging innovations. Preference for locally sourced and commitment to transparency in sourcing practices.
Manufacturing innovation	Robotics and automation revolutionise production processes. Innovations encompass cold storage, hygienic design, hazard analysis, good manufacturing principles, food safety training and certification, sanitation protocols, allergen management, quality assurance testing, and supplier audits and verification.
Digital transformation	Digital technologies and automation solutions are integrated, incorporating AI algorithms and machine learning models. Smart warehouse technologies such as RFID tracking, and autonomous vehicles are implemented to enhance efficiency and streamline operations.
Packaging and labelling innovation	Packaging innovations proliferate, including sustainable, modified atmosphere, vacuum, aseptic, retort, barrier films, intelligent and tamper evident seals. Adoption of eco-friendly and recyclable packaging materials to meet consumer demand for transparency.
Food Safety and Traceability	Implementation of stringent standards and traceability systems to ensure product quality and safety.
Collaboration and partnerships	Collaboration along and across value chains including cross sectors. Development of collaboration ecosystems and shared resources and assets.

See references 61-66

Selected case studies

Unilever showcases sustainability initiatives in the food manufacturing industry through its commitment to sustainable sourcing and packaging innovations. The company focuses on locally sourced ingredients, waste reduction, and eco-friendly packaging materials to minimise its environmental footprint and promote transparency in its supply chain.

Nestlé exemplifies manufacturing innovation with its adoption of digital technologies and automation solutions. The company leverages AI algorithms and machine learning models to optimise manufacturing processes, enhance efficiency, and ensure product quality and safety across its global operations.

Olam International is a leading player in the food industry that emphasises packaging and labelling innovation. The company invests in sustainable packaging solutions, including modified atmosphere packaging, barrier films, and intelligent seals, to extend the shelf life of its products and meet consumer demand for transparency and convenience.

Mars, Incorporated highlights the importance of food safety and traceability in the food manufacturing industry. The company implements stringent standards and traceability systems to ensure the quality and safety of its products, including hazard analysis and critical control points (HACCP), supplier audits, and verification processes, to build trust with consumers and regulators.

Food Processing Industry (2/2)

Emerging trends

Diversification of protein	Diversification of protein sources beyond traditional animal proteins, including plant-based proteins and alternative protein sources. Cultivation of animal cells in bioreactors to produce lab-grown meat, seafood, and dairy products.
Novel manufacturing techniques	3D printing applications emerge using additive manufacturing techniques for customised food products like textured meats, personalised snacks, and intricate desserts. Fermentation processes expand beyond traditional uses, producing alternative protein sources, functional ingredients, and flavour enhancers. Hybrid Food Processing adopts novel methods like cold plasma and pulsed electric fields to enhance food safety, extend shelf life, and preserve nutritional quality. Advanced Food Preservation Techniques explore methods such as high-pressure processing and pulsed light technology to extend perishable food shelf life while maintaining sensory attributes and nutritional content.
Enhanced digital transformation	The industry adopts advanced technologies such as Internet of Things (IoT) Sensors, AI for Product Development and Quality control, AR for Training and Maintenance and Blockchain technologies for traceability and compliance.
Enhanced food products	Use of probiotics, prebiotics, and other microbiome-targeted ingredients to promote gut health and enhance immune function in food products.
Compliance innovation	Automated Compliance Management Systems and remote auditing inspections, to streamline regulatory reporting and documentation. Some food companies are collaborating with industry partners, regulatory agencies, and standards organisations to develop and implement innovative compliance initiatives.
Nanotech applications	Utilisation of nanomaterials and nanoscale techniques to enhance food packaging, improve nutrient delivery, and create novel food textures and structures.

See references 61-66

Selected case studies

Beyond Meat, a pioneer in plant-based meat alternatives, has created a diversified offering of alternative proteins, including a wide range of plant-based burgers, sausages, and other meat substitutes. Their innovative products cater to consumers looking for sustainable and healthier alternatives to traditional meat products.

Barilla showcases the use of advanced food preservation techniques with its implementation of high-pressure processing (HPP) technology. By subjecting food products to high-pressure treatments, Barilla extends their shelf life while preserving their sensory attributes and nutritional content, ensuring food safety and quality for consumers.

Apeel Sciences develops plant-derived coatings that can be applied to fresh produce to extend its shelf life and reduce food waste. Their use of advanced food preservation techniques, such as high-pressure processing and pulsed light technology, demonstrates their commitment to sustainability and improving food quality.

Danone highlights compliance innovation in the food manufacturing industry with its adoption of automated compliance management systems and remote auditing inspections. By streamlining regulatory reporting and documentation processes, Danone enhances operational efficiency and transparency, while collaborating with industry partners and regulatory agencies to develop and implement innovative compliance initiatives.

Research and Development (1/2)

Established trends

Digital Transformation of Innovation	Digitisation of R&D workflows, documentation, and collaboration platforms to streamline processes, enhance data sharing and enable distributed teams to collaborate and accelerate innovation cycles.
Strengthening partnerships and collaboration	Fostering collaboration and partnerships within innovation ecosystems to leverage complementary strengths, share resources, and access new markets and capabilities.
Increasing focus on user centric innovation	Placing a greater emphasis on understanding user needs, preferences, and pain points through methods such as design thinking, user research, and customer co-creation.
Improving innovation models	Enhancing end to end practices to expedite development and improve performance, including resource allocation, commercialisation practices and adoption pathways.
Grow and diversify funding models	Creating innovative approaches to financing innovation to cater for different needs across the portfolio, including such sources as royalties, public and private funding.
Industry 4.0 and advanced manufacturing	R&D initiatives aimed at optimising production efficiency, reducing time to market, and enabling mass customisation to meet consumer demand for personalised products and experiences.
Embedding a focus on sustainability	Portfolios, processes and skills are adapting to place a stronger emphasis on sustainable design, including materials and production methods, as well as addressing the entire product lifecycle.

See references 67-71

Selected case studies

Fraunhofer-Gesellschaft collaborates with public innovation agencies to develop Industry 4.0 solutions for advanced manufacturing. By partnering with government-funded research institutes and technology transfer centres, Fraunhofer accelerates the adoption of digital technologies like AI, IoT, and cyber-physical systems in manufacturing processes.

The Netherlands Innovation Network facilitates partnerships and collaboration in innovation and research. Through programs like the Strategic Sector Cooperation initiative and bilateral innovation agreements with other countries, the Netherlands fosters international collaboration on research and innovation projects, driving knowledge exchange and economic development.

The EU's Horizon Europe program supports collaborative research projects, innovation partnerships, and technology transfer initiatives, by providing funding opportunities for a wide range of stakeholders, including academia, industry, and SMEs.

Technology transfer used by Stanford University, Massachusetts Institute of Technology (MIT), and the University of California (UC) are characterised by several unique features that contribute to their success, including strong IP policies, proactive technology offices, entrepreneurial cultures, strategic partnerships, flexible licensing models and access to venture capital

The European Investment Bank (EIB) collaborates with public innovation entities to promote sustainability-focused financing solutions such as green bonds.

Research and Development (2/2)

Emerging trends

Data driven innovation, AI and machine learning	Integration of AI and machine learning in R&D to analyse large datasets, identify patterns, automate tasks, optimise experiments, and predict outcomes. Quantum computing enables more complex simulations. Federated learning allows R&D teams to train machine learning models across decentralised data sources while preserving data privacy and security.
Digital twins, simulation and neurotech	AR and VR technologies are becoming increasingly sophisticated, offering enhanced ways to innovate in the digital and physical worlds. Enhanced humans will emerge and begin to operate in the innovation system.
Technology accelerated prototyping	Rapid prototyping and testing are accelerated through the integration of robotics, automation, and 3D printing technologies. Generative design algorithms explore a vast range of design possibilities based on specified parameters and constraints.
Open Innovation	Breaking down barriers between diverse disciplines, fostering cross-disciplinary collaboration, and leveraging a wide range of expertise and perspectives in problem-solving and innovation.
Social responsibility and sustainable development	Innovation systems will adapt to fully embed to deliver on sustainability development goals. Integration of ethical considerations and responsible innovation practices will emerge, including engaging stakeholders, conducting ethical assessments, and adhering to ethical guidelines.
Globalisation of R&D	Expansion of R&D activities across geographic boundaries to tap into global talent pools, access new markets, and leverage diverse perspectives and resources. This will include multinational collaboration, outsourcing, and international partnerships to drive innovation on a global scale.
Zero Trust security frameworks	Zero-trust security models are becoming increasingly important in R&D environments to protect sensitive research data and intellectual property.

See references 67-71

Selected case studies

The European Commission launched the European Data Portal (EDP) to promote data-driven innovation and facilitate access to open data across Europe. It provides a wealth of datasets from various public and private sources, enabling researchers, businesses, and policymakers to leverage data analytics, AI, and machine learning to drive innovation.

OpenAI is a research organisation dedicated to advancing AI in a transparent and collaborative manner. By adopting open innovation principles, OpenAI publishes its research findings, develops open-source AI software, and collaborates with academic institutions, industry partners, and policymakers to democratise access to AI technologies and address ethical, safety, and societal concerns associated with AI development.

The GRA is an international network of research institutions, government agencies, and industry partners collaborating to address agricultural greenhouse gas emissions and climate change mitigation. By sharing knowledge, resources, and best practices across borders, the GRA facilitates global R&D collaboration and accelerates the development and adoption of innovative agricultural technologies and practices to reduce emissions and enhance sustainability in the agricultural sector.

Neuralink aims to develop high-bandwidth brain-machine interfaces to connect the human brain with computers. While the primary focus is to treat neurological disorders and enable symbiosis between humans and AI, the technology has significant implications for accelerating innovation.

3.2 Trend deep dives

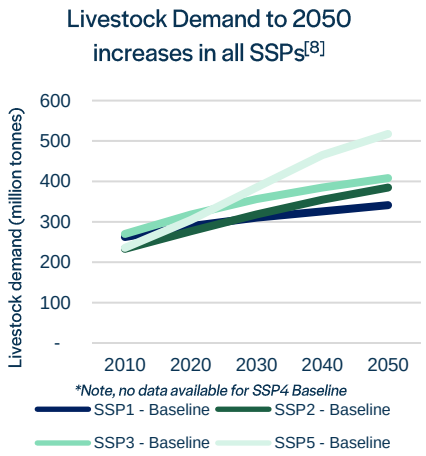
1. Protein demand trends

The long-term growth in demand for protein is significant

Global protein demand forecasts are influence by several competing variables, including population growth, income, per capita protein demand, and level of food loss. A wide range of estimates have been made, which vary in their methods, scenarios and outcomes. A meta-analysis[68] of 57 global food security projection, including the effects of climate change, puts the future protein demand growth in the order of +30% to +62% growth from 2010 to 2050.

Plant-based protein sources dominate today

Currently vegetal sources of protein dominate protein supply globally (57%), with meat (18%), dairy (10%), fish and shellfish (6%) and other animal products (9%) making up the remainder [69]. Factors that influence demand of different protein types include availability, affordability, taste, nutrition, quality, safety and sustainability concerns including resource use and animal welfare.



Overall international meat trade is forecast to continue to expand in the medium term

Growing demand is forecast from rising per-capita income in Asian countries and by high population growth in Sub-Saharan Africa. The Asian region is expected to account for 51% of global trade by 2031. Beef production will grow to 76 Mt by 2031[70].

Red meat demand is weakening in high-income countries, with a shift to white meat

Recent studies[71] have identified evidence of peak meat consumption having been reached in several high-income countries. Overall per capita consumption of beef has declined since 2007 and is projected to fall by a further 2% by 2031. Poultry meat is expected to be the primary driver of meat production growth, increasing 16% by 2031. Pig meat output is projected to rise by 17% by 2031[70]. Red meat industry has several benefits including strong consumer acceptance, social benefits and food security. However, there are also a range of downside risks in red meat forecasts, including potential for disease outbreaks, regulation to reduce meat consumption, or further shifts in consumer sentiment.

The alternative protein category is in early stage of development[72]

Several alternative proteins are emerging including plant-based proteins, insects, yeast, microalgae and cultivated meat. The alternative protein category has market growth rate estimated at 6% p.a., vs. meat and poultry at 3% p.a. Growth rates are highly influenced by region, with India and China having the highest levels of consumer acceptance (69.6% and 64.2% respectively). While not all forecasts agree, one recent study involving over 6000 consumers identified that:

- 36% of consumers intend to use more alternative proteins
- 30% of consumers intend to decrease beef, 30% to increase poultry and 42% to increase fish consumption
- 50% of those surveyed do not intend to change their current meat intake

Significant investments have been made to commercialise cultivated meat products

Cultivated meat and seafood products secured $3.1bn in investments between 2016 and 2022. This includes from major organisations such as venture capital and sovereign wealth funds (SoftBank, Temasek, the Qatar Investment Authority) and major processors (Tyson, Cargill and JBS). This investment has included the development of commercial manufacturing facilities. Forecasts in cultivated meat range from $5bn through to $25bn by 2025, and between $31bn and $367bn by 2050[73]. Presently, circa 3 companies have produced products for sale in Singapore and the US.

However, recently venture capital investments have slowed, and a range of questions have emerged regarding the potential and timing of commercialisation

There are a range of barriers to commercialising and scaling cultivated meats including consumer acceptance, cost of production, safety, and legal barriers.

Many critics point to a fundamental lack of science to create commercial scale that could take decades to resolve:

"I don't know if we, the industry, will be able to figure it out in a way that we need to in our lifetime"

- Josh Tetrick, CEO, Eat Just.

"Capital and operating cost analysis (of cultivated meat) is likely to preclude the affordability of their products as food. R&D will go back into academia. And that's probably a good thing"

- Dave Humbird, Scale-up economics for cultured meat.

The nutritional value of cultured meat is rated low, and combined with its current high cost of production, raises questions of its ability to out-compete other alternative proteins.

Implications for the meat processing industry and AMPC

While the protein market shows promising growth prospects, uncertainties linger regarding the future of red meat. Export and trade appear to continue to dominate the future success of the industry. To mitigate risks and sustain industry competitiveness, continued investment in scaling operations, enhancing sustainability practices, and bolstering disease prevention measures, particularly for red meat exports, is imperative. Additionally, there's a pressing need to gain deeper insights into evolving consumer preferences and values, particularly in the context of health and wellness trends. Consideration could be given to investing in value-added products, such as fortified red meat options tailored for health-conscious consumers, while also undertaking proactive consumer education initiatives on the nutritional benefits of meat consumption. Consideration could be given to what 'responsible consumption of meat' will mean in the future and how the industry would respond to regulators and consumers on this topic. Moreover, it's essential to deliberate on the industry's stance regarding emerging protein alternatives, like cultivated meats, weighing the options between leading development efforts or entering the market opportunistically once it matures.

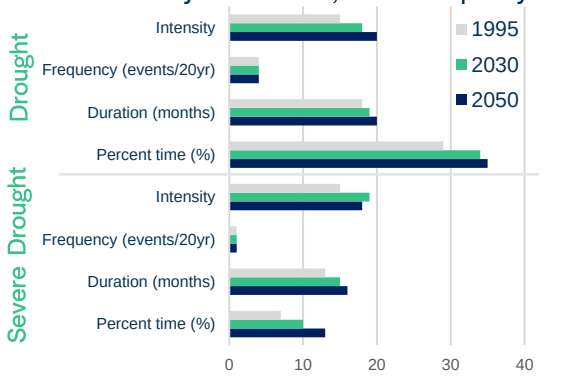
2. Climate change

The physical and transition impacts of climate change will impact the meat processing sector and supply chain, likely increasing operation costs.

Climate change will directly impact meat supply

Climate change will have direct impacts on weather patterns which will affect meat production. In 2019, Australia had a decline in beef production of 15% attributed to droughts. Current projections predict an increase in time spent in droughts, with increasing intensity.[76] Similarly, increase in heat stress is modelled to result in a 5.3-7.1% decrease in beef production on a global scale, depending on the emissions scenario, with tropical regions having a disproportionately high level of losses.[77] As majority of Australia's meat processing uses locally raised livestock, this could result in significant fluctuations in supply for meat processors.

Droughts in Australia will increase in intensity and duration, but not frequency[77]



Climate change will also impact the broader meat supply chain, having indirect impacts on meat and meat processing

Supply Chain		Example impact
Feed and water resources	Outdoor labour; Pests, pathogens, weeds and pollinators; Water quality & quantity → Variability in feed quantity, availability, nutritional quality, and cost	• Heightened variability is projected to reduce the predictability of feed supply.[78] • Increases in eCO2 concentrations stimulate plant primary productivity increasing potential yields of some species, but decreasing grain protein concentrations
Animal health and production	Outdoor Labour; Increase in diseases; Animal heat & extreme weather stress → Increased animal production and costs	• Above 24–26 °C, labour productivity declines. At 33–34 °C, a worker operating at moderate work intensity loses 50% of their work capacity[84] • Hotter and drier seasons will decrease water availability for animal consumption, increasing water stress and risk of pathogens. [85,81]
Transport	Outdoor Labour; Extreme events damaging roads; Animal heat stress in transport → Complex logistics challenges	• Increased variability in production and extreme climate events will likely make trade patterns less regular, increasing reliance on complex logistic systems.[78,79] For example, the 2019 floods destroyed 29,000 km of Australian farm roads and caused significant losses to livestock sector.[80]
Processing	Labour; Increased pathogens, affecting climate control in processing → Stricter regulations on processors	• Increased microorganisms on meats and produce prior to processing may require storage temperatures to be lower to preserve required shelf-live[79]
Storage and retailing	Labour; Labelling controls; Labelling controls → Price volatility	• In developed economies, increased temperatures have been found to increase the likelihood of food poisoning, suggesting that increasing temperatures will lead to reduced food quality and safety[82]
Consumption	Impacts on final products: - Quantity - Nutritional quality - Food safety - Sensory appeal - Price - Social acceptability	• Food prices will likely increase and be more volatile due to increased spatial and temporal variability in production and supply chain efficiency[83]

Implications for meat processing and AMPC

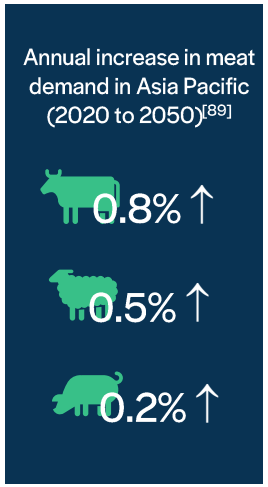
The meat supply chain has had significant changes over recent years, with disruptions from the pandemic highlighting breaking points in the supply chain, and the rise of direct-to-consumer models. AMPC could consider how to improve industry resilience, and position to enter the direct-to-consumer markets. Concurrently, AMPC could consider climate-change impacts that will affect the supply chain, most notably through increased variability in feed supply, quality, and cost, and impacts of heat stress and extreme events on livestock mortality. AMPC could consider running a climate risk assessment for the industry, identifying material threats and opportunities to focus efforts on research and development. This, combined with supply chain risks, could be used to inform an industry wide resilience strategy, with AMPC guiding businesses to ensure national resilience to a changing supply chain and evolving risks.

3. Changing consumers and supply chain models

Over the next decade, consumers will continue to change how they purchase, and who purchases, meat products.

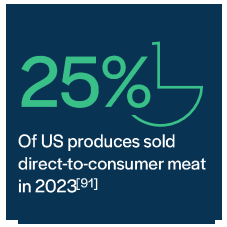
Emerging economies are expected to disproportionately be responsible for increasing demand for meat

Research has identified a direct correlation between increasing GDP per capita and consumption of meat in emerging economies. Consumers in lower-income countries show a steady increase in consumption of meat in diets until a tipping point of $40,000USD per capita, at which point increases in wealth are not associated with increases in meat consumption.[88] Other modelling found per person rates of increase of meat consumption to 2050 in various regions, with an increase in pig, sheep, and beef demand in the East-Asia Pacific region projected to be 0.2%, 0.5%, and 0.8%p.a. respectively.[89] Whilst beef shows the largest annual demand increase, processors should consider the meat types purchased by Asian countries, where beef currently comprises a small proportion in the daily diets with consumers favouring fish, chicken and pork.



With the rise of direct-to-consumer products market models are evolving

The rise of e-commerce platforms and online grocery shopping is enabling meat processors to bypass traditional retail channels and sell directly to consumers. This trend allows for greater control over pricing, branding, and customer relationships. With the convenience and flexibility offered by online sales, direct-to-consumer channels are likely to continue growing in popularity, impacting the traditional retail landscape. Consumer values that have driven this increase are attributed to affordability, traceability, ethical sourcing, sustainable, and convenient products. In the US, the number of consumers selling direct-to-consumer meat increased from 9% to 25% from 2022-23. [6]



Increasing digitisation will enable more detailed traceability

Blockchain technology revolutionises meat supply chain tracking, ensuring transparency from farm to fork by recording all transactions. This enhances traceability, reduces food fraud risks, and boosts safety. Rising consumer demand for transparency drives its adoption in the meat industry, despite interoperability and data privacy challenges. In other sectors, such as tuna canning (e.g., John West) and automotive (e.g., Ford), blockchain verifies product origins, exemplifying its potential in guaranteeing authenticity and quality.

Sustainable Development Goals are encouraging countries and industry to work together to reduce global hunger

The United Nations Sustainable Development Goals (SDGs) outline global targets to be achieved by 2030, including SDG2, which aims to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture. To achieve this goal, researchers have called for increased global collaboration, through strengthening supply chains, global policy reviews, and collaboration with industry.[93] Meat, as a protein-dense food source, has the potential to address hunger and malnutrition, particularly in regions with protein deficiencies. However, there's also growing recognition that the intensive production of meat contributes to environmental degradation and greenhouse gas emissions. Some advocate for reducing meat consumption in flavour of plant-based diets, citing the greater energy efficiency and lower environmental impact of plant agriculture. Balancing the need for food security with sustainability goals poses a significant challenge for meat processors in contributing to SDG 2.

Whilst demand will increase globally, COVID-19 highlighted the instability of global supply chains when disrupted, and Australia's reliance on foreign markets

COVID-19 highlighted the interconnectedness of global supply chains but also the risks. For example, during the pandemic, farmers in the US chose to cull pigs without sales to avoid feed costs, as the pandemic halted pork processing.[86] Key barriers to supplying meat were slaughterhouse availability and location of processors, with increase in local processors proposed in many articles. With increased industrialisation this will be a challenge to address, as automation can be expensive, and operate most effectively at scale. Other barriers were limited access to raw materials, packaging materials, and labour, as well as a significant variation in consumer meat cut demand.

Implications for meat processing and AMPC

Global meat demand is expected to increase over the next decade, driven largely by growth in export markets and emerging economies. AMPC faces the challenge of adapting to the unique dynamics of offshore markets, such as the rising demand for pork compared to local demand profiles. Additionally, it must align its research, development, and strategic initiatives with the Sustainable Development Goals, considering how international polices may influence local meat processing. Leveraging its national stature, AMPC can play a pivotal role in positioning accessible meat as part of the solution to global challenges, rather than being associated with the climate crisis. Strategies like promoting direct-to-consumer products and enhancing traceability through blockchain technology can enhance affordability, consumer confidence, and real-time data transparency on issues like animal welfare. It also could be used to highlight sustainably produced meat with consumer trust to avoid risks of greenwashing, such as beef raised using seaweed feed to reduce emissions. Considering the rapid shifts in market demand witnessed during the COVID-19 pandemic, AMPC must prioritise flexibility in processing to mitigate future losses. Moreover, given the risks of supply shortages stemming from international linkages, AMPC could reassess the industry's reliance on throughput and yield to sustain profitability.

4. Australian processing global competitiveness trends

Looking forward, the Sustainable Development Goals and market drivers may open up global trade, but tariffs, carbon border adjustment mechanisms, and export restrictions could form barriers to this.

Exchange rates will affect international price competitivity - Brazil

A high Australian dollar affects international price competitivity. The MLA noted that Australia and Brazil reached a price parity in 2023, attributed to exchange rates, for the first time since 2015.[94] However, international exchange rates will affect global price competitivity.

Tense international relations can have significant consequences for meat and livestock exports - China

In 2020, in response to Canberra's call for an international inquiry into the origins of COVID-19, China implemented a series of trade restrictions of varying degrees, including beef. China banned a series of beef exporters due to claims of mislabelling, with restrictions remaining on 8 abattoirs, representing $500 million in beef trade.[101]

Recently export restrictions have increased, affected global markets

During 2007-08 there was a global food crisis, where a large spike in grain prices due to increasing energy prices, growing demand for biofuels, unfavourable weather, panic purchases and macroeconomic factors lead to 33 countries introducing export restrictions on grain, rice, or wheat, and 12% share of world market of calories restricted by export bans.[103] In 2022, further export restrictions were observed in response to the Ukraine war. These restrictions negatively impact markets, by decreasing exporters' ability to benefit from high export prices to offset higher costs for imported inputs, prevent producers in that country from benefiting from higher global prices, raise volatility on world markets, encourage panic buying, raise prices, and reduce market confidence.[103] Increased global unrest, such as the Israel-Palestine conflict, could lead to further restrictions.

Conversely, due to shared understanding of critical importance of trade agreements, some countries are entering food security agreements

In 2024 Australia and Singapore signed a set of guiding principles to support a new Food Pact. This agreement looks to share research and development, support trade pathways, and facilitate cooperation on global food security issues.[102]

Unlike global competitors, Australia's food safety setters are not the enforcers: NZ, USA and Canada

A UK review of food safety standards observed that in Canada, NZ, and the USA food safety standards are also the enforcers - this differs in Australia where FSANZ sets standards and coordinates responses, but enforcement is conducted by National Government or State and Territory Government. This fragmentation could lead to disparate food safety between states, and was a concern raised in the UK review.[96]

Australian meat sustainability credentials have been questioned on the global market - United Kingdom

Following the recent free trade agreement with the UK for Australian beef and sheep,[97] farmers in the UK have questioned the sustainability of Australian meat.[98] This is not the first instance, with Germany calling out Australia for having weak climate targets in 2022, suggesting the EU impose additional costs on Australian products. Since then, Australia improved its climate target ambition.

Carbon border adjustment mechanisms in Europe set a precedent for Carbon Boarder Adjustment Mechanisms (CBAMs) globally – Europe & USA

The European Union introduced a carbon border adjustment mechanism (CBAM) in 2023, representing the world's first carbon border adjustment tax. It is currently applied to high emission sectors, with additional sectors falling into scope until 1-January 2026. Whilst Europe represents a small importer of Australian meat, this sets a precent for other sectors. The USA has proposed their own Clean Competition Act aimed to impose a carbon border adjustment on energy intensive imports.[99]

Approximately half of Australian cattle are treated with growth hormones, but these are banned in some regions - Europe

In Europe the use of growth hormones in red meat has been banned for decades. Australian farmers wishing to export to Europe have to segregate, trace, and process cattle using the European Union Cattle Accreditation Scheme (EUCAS).[101] Under the system, hormone treated, and hormone-free herds are completely separated to ensure that beef exported to Europe is fully traceable, and free from added hormones. Whilst other nations that purchase Australian meat accept use of hormones, meat processes should closely monitor changes in policies to avoid significant market disruption.

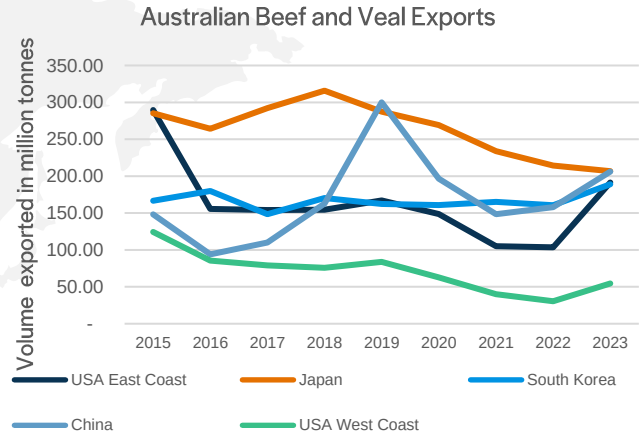
Australia's high labour costs incentivises offshore processing

Australia's labour costs are significantly higher than abroad, resulting in offshoring of meat processing and increased live exports.

> *"The last three decades have seen more and more of our food processing offshored and a steady decline in Australian owned agricultural supply chains"*
>
> *Business Council of Co-operatives and Mutuals CEO Melina Morrison.*

Increasing free trade has resulted in decreased advantages from historic free-trade agreements: Japan

Japan has been the largest importer of Australian meat, but this has steadily declined due to increased competition from US, Canada, New Zealand, and Mexico, with an increase in Japan's trade agreements.[95]



Implications for meat processing and AMPC

Numerous factors affecting the global competitiveness of Australian meat lie beyond the control of processing organisations. AMPC and meat processing entities must strategise ways to enhance resilience against shifts in the global market and develop points of difference other than price. Additionally, AMPC could monitor the expanding sustainability terrain, including carbon border adjustment mechanisms, and proactively address emissions from the sector to avoid adverse effects. Whilst labour costs have always been a challenge for Australian product price competitivity, AMPC could look to establish conditions to enable local processors to flourish and demonstrate the quality of Australian products.

5. Regulatory scenarios

The meat processing industry will face a myriad of challenges as regulatory requirements evolve. From ensuring sustainability practices to managing antibiotic usage, maintaining food safety standards, and potential for live export bans, businesses must navigate a complex landscape. The Australian government has acknowledged that increasing costs of compliance with environmental, welfare and food safety requirements for all meat processors is a key challenge in the industry[107], and previously Federal and state government regulatory costs were estimated by AMPC to account for 54 percent of total Australian beef processor operating costs after livestock purchases are excluded, in 2019.[109] With emerging regulatory requirements, these costs are likely to increase.

Regulatory Topic	There will be increasing data requirements for Sustainability	Biodiversity is likely to follow Sustainability's lead	Big data enablers support increased traceability requirements, requiring a coordinated approach	Negative perceptions of the impacts of meat on health and the environment could impact incentives.
Background	Australia has proposed mandatory collection and reporting of sustainability information,[113] including supply chain emissions, anticipated to have a widespread demand for data across the meat processing industry. This will first impact the industry through the challenges of collecting the data but may have ongoing impacts around managing and mitigating emissions. Emissions from meat represent 10.7% of Australia's total emissions,[112] which will likely result in increased regulation and drivers around emission reduction. Similarly, Australia signed the methane pledge agreed at COP28, to cut global methane emissions by 30% by 2030.[111] Stakeholder consultation with the Food Regulatory System also demonstrated stakeholder interest in regulation.	In 2023 Europe introduced the European Sustainability Reporting Standards (ESRS), which includes mandatory biodiversity reporting for companies in the Agriculture & Farming industry, and leveraging guidance form the reporting 2023 guidance developed by the Taskforce for Nature Related Financial Disclosures (TNFD) . Similar requirements are likely to reach Australia, given global adoption and Australia's recent adoption of the ISSB IFRS S1 and S2, which has suggested S3 will be following the TNFD.	Rapid developments in technology and monitoring, including blockchain, AI and ability to manage big data will enhance the traceability and food security of the supply chain. Research papers have found that blockchain adoption significantly improves traceability and trust in the food supply chain,[104] however it will require sector-wide co-orporation, including incentivisation and increase capacity in primary systems, to support adoption at a significant scale.[105,106]	Government funding currently supports the meat sector through research, infrastructure development, and drought relief for farmers, amongst other investments. In 2022, Australia allocated over $400 million to beef corridors alone,[118], with $53 billion spent on livestock subsidies in OECD in 2013.[119] In the EU, cattle subsidies exceeded $731 million, equivalent to $190 per cow.[119] Animal rights activists have raised concerns around environmental impacts, calling for a cease in subsidies and funding for meat industries. Growing concerns around sustainability and health could impact incentives.
Likelihood	Almost Certain – Bill has been submitted to parliament in April 2024.	High – Woolworths and Coles have already committed to reporting on the TNFD Framework which will result in increasing data requirements.[117]	High – Australia has seen this as a priority and released a 2023-2030 National Agricultural Traceability Strategy[107]	Low – The meat sector is a large component of the Australian economy, and incentives are likely to continue
Impact	High –data will be required from all components of the supply chain, which will require top-down management to avoid disruption	Moderate – increasing data requirements focused on land-use and ecosystem connectivity	High - Increasing traceability could reduce compliance costs by $110-170m p.a., and costs of a biosecurity outbreak by $59-68m p.a.[107]	Low – incentives if removed would likely be allocated to a different form, for example investing in feed that reduce methane emissions
Timescale	Present – increasing over next 3 years	2 to 5 years	Increasing requirements over 5 years	Revisit in 5 years

Regulatory Topic	Live export ban on sheep	There is increasing regulation and concern regarding food safety and labelling relating to public health
Background	In May 2024 the Agriculture Minister announced[120] that live export trade of sheep would end in 2028, through legislation. The aims behind this are to reduce impacts to animals, and generate more local value add and employment. Industry would be provided limited funds for transition support.	In 2022, the Food Regulatory Service (FRS) conducted stakeholder engagement identifying public health as the top priority, focusing on food access, labeling, marketing, and pricing.[11] Australia's National Preventive Health Strategy is developing a National Policy for Food and Nutrition which could contain guidance concerning meat consumption. A UK Food Standards Agency review found Australia's food business operator requirements lower than the USA, Canada, and New Zealand. Fragmented enforcement in Australia has resulted in unequal oversight across regions and food types.[115]
Likelihood	High – should this legislation pass and not be changed by the next government; increased processing capacity will likely be required.	Moderate – The FRS has commenced consultations to review the regulatory system, however clear actions have not been outlined.
Impact	Low – rather than banning use of antibiotics more regulation may appear around applications	Moderate – labelling changes regularly and the industry is adaptable. Impacts of the National Policy for food and nutrition is unclear.
Timescale	Next 4-5 years	Present to 3 years

Implications for meat processing and AMPC

Australia has traditionally lagged in implementing regulations concerning traceability and sustainability compared to Europe, often mirroring the regulatory approach of the United States regarding chemicals and antibiotics. However, examining trends abroad offers valuable insights into potential future trajectories for the meat processing sector. This shift will be propelled by the growing demand for comprehensive data and the emergence of supportive mechanisms to enforce regulations. Consideration could be given to how to coordinate an industry wide ability to collect and assemble data for regulatory purposes in a concise and cost-effective approach and continuing to assess possible future regulation around antibiotics and chemicals. Coordination across the entire industry is essential for effectively addressing these challenges and ensuring compliance with emerging requirements.

6. Potential areas for processor revenue growth

Our research has identified that major international processors are adapting their strategies to drive revenue growth and profitability beyond throughput and yield.

Product and service diversification and differentiation

Processors are diversifying their range of value-added added products to target specific segments both domestically and internationally, such as:

- Improve the characteristics of meat products, including tenderness, colour, stability and taste
- Innovative pre-packaged portions
- Small goods
- Ready to cook meals
- Marinated meals
- Subscriptions services

Smithfield Foods offers a wide range of value-added meat products, including pre-packaged portions, marinated meats, ready-to-cook meals, and small goods. They have also expanded their product lines to include premium-quality meats, such as organic and ethically sourced options, to cater to evolving consumer preferences. This has enabled increased revenue, brand perception, market differentiation and improved customer loyalty.

Premium products and brands

Processors are pursuing premium products through vertical integration or partnering along and across their value chains. These include:

- Luxury products of highest quality and taste
- Rare and distinct lines
- High end curated experiences such as with top end chefs, celebrities and politicians
- Premium small goods product lines
- Premium consumer brands

Market expansion

Processors are seeking growth through expanded market penetration including both domestically and internationally. These include:

- Organic, ethically sourced, clean and sustainable product markets
- Expanding international markets
- Expanding international distribution channels including partnering with additional retailers, wholesalers, and online platforms

Cargill Protein, a leading player in the global beef processing industry, has pursued market expansion, product innovation, and diversification of protein, resulting in significant revenue growth. Through initiatives such as innovative beef cuts and value-added products, Cargill has collaborated closely with clients to craft unique and customised meat solutions. Cargill has diversified its protein portfolio beyond beef, leveraging opportunities across various protein categories.

Food service and retail

Processors are creating new value through expanding their footprint in food service and retail channels. This includes:

- Food service products and convenient delivery arrangements
- Collaboration with retailers to develop new product ranges for consumers
- Developing exclusive product lines
- Establishing branded direct to consumer models

By-products

Many processors and researchers are exploring higher value use of processing by-products [121]. These include:

- Pharmaceuticals
- Chemicals
- Medicals
- Cosmetics
- Bioactives
- Leather and textiles
- Industrial applications
- Enzymes
- Food ingredients and supplements

JBS USA has implemented innovative strategies to maximise the value of processing by-products and transition towards more sustainable practices. Through partnerships with biotechnology companies and research institutions, JBS has explored various avenues for higher-value utilisation of by-products such as extracting bioactive compounds, chemicals and enzymes. JBS has repurposed hides and skins to create high-quality leather products.

Implications for meat processing and AMPC

These revenue opportunities hold significant promise for driving growth, profitability and diversification within the Australian meat processing sector.

AMPC could lead analysis and assessment of these opportunities and provide co-ordination and support for their pursuit.

Realising success is likely to be contingent upon overcoming a range of barriers including regulation, customer acceptance, scaling operations and supply chain, building capabilities and partnering.

To effectively capitalise on these opportunities, it will be important to consider their applicability in different regions. This may require the development of regional plans, to leverage unique strengths and opportunities and focus collaboration and innovation.

Consideration should be given to how to mitigate investment risks while simultaneously capturing the full value derived from innovation.

7. Workforce trends e.g., future skills demand and supply factors, remote workforce

Within the meat industry workforce, there is an anticipated skills shift required to support increased automation. Concurrently, COVID-19 and younger generations entering the workforce has stimulated a change in employee expectations, with employees valuing reward and renumeration, employers who prioritise their wellbeing, and a working environment with a positive and community culture and being willing to change jobs when these needs are not fulfilled, contrasting the previous trend to work in a single role throughout their career.

Meat Processors are looking for an average of

64

Additional workers per business[124]

There is a labour shortage in the meat processing industry

A 2022 report found that meat processors looking for an average of 64 additional workers per business, and retail butchers looking for an average of nine additional workers per business.[124] Agricultural employees have an inter-censal exit rate of between 40% and 70%.[125] Majority agricultural workers counted in a census will leave the industry before the next census. This labour shortage could in part be addressed through increased automation.

Highly automated industries employ

20%

more mechanical and industrial engineers[128] and

2x

the number of maintenance and repair staff than other industries[128]

The future skills profile will be significantly different to present day skills

Demand for skilled machinery operators is expected to increase, driven by advancements in advanced robotics, AI, Big Data, IoT, Machine Learning, Cloud Computing, and M2M communication. In meat processing, automation is crucial for boosting productivity and cutting costs. However, the sector lacks workers skilled in robotics. Comparatively, US industries heavily relying on robotics employ more engineers and maintenance workers, offering higher wages.

This future skills profile will be in high demand across various industries

Meat processing is not the only sector that will be rapidly evolving with the rise of automation and data-analysis. Meat processors will need to be able to offer competitive working environments to be able to attract and retain talent.

Impacts from automation are likely to most severely impact lower skilled workers

Jobs to be automated will likely displace lower-skilled roles. Developing a skills profile to help upskill those in roles that may be automated could help employee retention and help fill skills shortages.

Employee-related costs account for over

50%

of costs per head of meat in Australia[127]

Australia's labour market is more expensive than abroad

To maintain Australia's cost competitiveness in the global market, the meat processing sector needs to implement systems that enhance automation and reduce labour expenses. Australia faces a notable disparity compared to other major red meat exporting nations,[126] with the proportion of employee-related costs in beef processing calculated at 57.7%, equivalent to $210.54 per head out of a total cost of $360.62.[127] Similarly, in sheep and lamb processing, it accounts for 55.2% of total costs.[127] As labour is only likely to increase in cost, enhancing efficiencies will help Australia's meat processing remain cost competitive.

Changing Workforce Expectations

In the wake of COVID-19 and the entrance of millennials and Gen Z into the workforce, there has been a notable shift in employee expectations regarding their workplaces. Employees now seek enhanced work-life balance, spurred by the accelerated digital transformation witnessed during the pandemic.

Six top priorities for workers have been identified in Australia:[123]

- **Reward and remuneration:** Employees grapple with rising living costs, prioritising adequate compensation as the foremost job consideration.
- **Wellbeing:** Employees prioritise work-life equilibrium, mental health support, and wellness benefits, with 22% valuing their wellbeing support above all else.
- **Experience:** Employees esteem positive cultures that nurture diversity and inclusion, fostering strong team dynamics and energy.
- **Ways of working:** Employees seek employer backing for flexible work arrangements facilitated by technology.
- **Career development:** Employees desire on-the-job learning opportunities, clearly defined career progression pathways, and exemplary leadership.
- **Brand:** Employees value the reputation of the company and the job, encompassing considerations such as ESG initiatives, social responsibility, and alignment of values with the employer.

Despite employers' perceptions of demonstrating care, there is a disconnect within the industry, with a 28% gap between whether an employers feels they demonstrate care, and employee feeling cared for.[122]

Implications for meat processing and AMPC

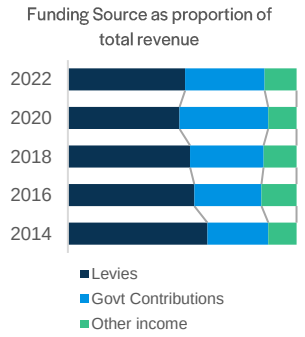
The shift toward automation will prompt a swift demand for highly skilled workers, coupled with a gradual decrease in the need for unskilled labour. Establishing a robust workforce transition plan can address this industry requirement while fostering employee retention. Such a plan may also fulfill various employee needs, showcasing a clear career progression with skill advancement opportunities. Additionally, AMPC may seek collaboration with relevant bodies and governmental agencies to facilitate technical skill provision, develop pathways for workforce upskilling, or support skilled worker immigration. Simultaneously, employers must acknowledge evolving workforce expectations and ensure they are accommodated, especially within a labour-intensive industry subject to stringent hygiene standards. Insights into facility design conducive to employee well-being and retention can prove invaluable amidst heightened demand and limited resources.

8. R&D Funding

Levies and Government Contributions continue to be core funding of RDCs in the Agriculture sector

Driving the increase in government matching is a general increase in the underlying growth of agricultural sales across all product types. However, over the past decade there has been a concerning stagnation of broader Government Contributions beyond agreed matching and access to additional investment opportunities. Assistance from Government did increase in FY20/21, with temporary support available due to the COVID pandemic. However, the growth rate across all RDCs has remained steady over the decade. This stagnation can be attributed to change in funding priorities, and budgetary constraints (particularly in 2020 – 2022 in response to the increased deficit caused by additional funding provided during the COVID pandemic) that have impacted funding opportunities across the board. Despite actual Increases, the growth rate of promotional levies has stagnated across all RDCs.

In response to the stagnation in the core funding of RDCs, in the decade between 2014 and 2022, there was an average increase of 44[129] per cent in 'other income' across all Australian RDCs. This diversification strategy helped to offset some of the limitations posed by the stagnating core funding and promoted greater financial sustainability and resilience among the RDCs.



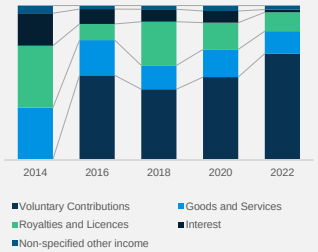
Growth in additional revenue, such as voluntary contributions, provide an opportunity to improve financial sustainability

Across many RDCs there has been a noticeable increase in voluntary contributions from members over the past decade. While these contributions did decrease in 2020, due to the limited discretionary spending faced by many across the economy, there has been a steady 17 per cent growth rate. This category of 'voluntary contributions' includes both membership fees, and funds held for co-investment. The use of co-investment strategies is a particularly interesting opportunity and can provide a greater customisability in the services offered by working in partnership with other organisations.

There was a notable uptick in income received from royalties and licenses held by industry bodies. One such example is the 'Woolmark®' trademark held by Australian Wool Innovation, who provide certification to producers on the quality of their wool, and then licensing out the use of the Woolmark certification to producers and the broader market. This mutually beneficial arrangement generates income for both parties, enhancing collaboration and innovation within the wool industry.

44%

Average growth in 'other income' category between 2014 and 2022 across all Australian RDCs.



17%

Average growth in 'Voluntary Contributions' between 2016 and 2022 across Australian RDCs.

Opportunities lie in international and cross-industry priorities

Accessing international funding opportunities can provide additional resources to support Ag R&D initiatives, with international investors increasingly directing funds towards RD&A in areas such as food quality and sustainability, grocery and restaurant implementation, and manufacturing safety. AMPC can leverage this trend by aligning their R&D efforts with global demands, showcasing AMPC's expertise in agricultural innovation and attracting additional investments. By forging strategic partnerships and capitalising on these diverse funding opportunities, AMPC can also accelerate innovation and drive sustainable growth across their supply chain.

In terms of additional opportunities within Australia, there are greater opportunities for the sector to access increased levels of government assistance beyond the levy matching program offered. This is particularly true in cross industry priority areas, such as sustainability. For example, the Australian Net Zero Economy Agency facilitates investment opportunities in both public and private settings within the realm of sustainable transformations.

$4.6b

Approx. AUD being invested in biotechnology use within the global Ag industry.

Cross-Industry Funding Opportunities

- SUSTAINABLE PRODUCTION
- HEALTHY FOODS
- MANUFACTURING EFFICENCY
- BIOTECHNOLOGY
- FOOD SAFETY
- OPERATIONAL SAFETY
- ROBOTICS & AUTOMATION
- ETHICALY SOURCED FOODS

$7.6b

Approx. AUD being invested in restaurant and retail technologies within the global food industry

Implications for the meat processing industry and AMPC

The trends identified in the funding of both Australian RDCs, and international research organisations provide several opportunities and implications for both AMPC and the broader meat processing industry within Australia. These opportunities can function as a solution to gaps in the current funding configuration and can promote a greater level of ongoing financial sustainability. In terms of Government Contributions, AMPC could advocate for and seek access to increased government funding (including grants and co-investment on projects) aligning with broader national priorities such as food security, sustainability, and population health. AMPC could also embrace global funding opportunities to further innovations and technologies, leveraging both Ag innovation and adjacent sources to support these initiatives. In doing this, AMPC could unlock funding in the convergence of issues such as food and health, manufacturing safety, etc. and explore the intersection of these issues. AMPC could also seize Australia's position as a test market for innovation, to unlock funding that enables AMPC to demonstrate the applicability and scalability of innovations across diverse industries. However, to achieve this AMPC will need to enhance its attractiveness and ease of corporate investment by demonstrating their value proposition and the potential ROI in R&D initiatives, while maintaining autonomy, preserving research integrity, and mitigating conflicts of interest.

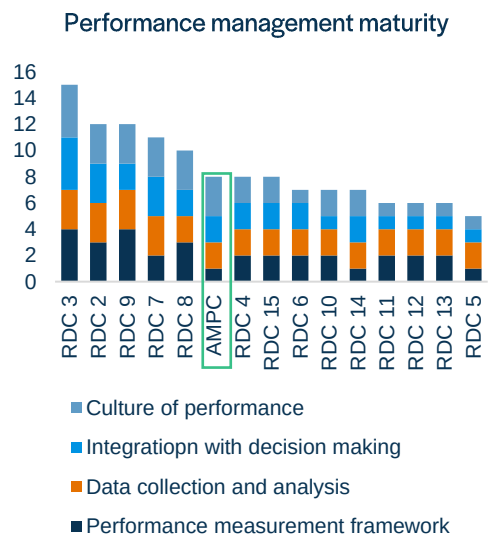
9. R&D Performance trends

Crafting effective performance outcomes and measurement systems for R&D poses a range of challenge and dilemmas

The journey from R&D efforts to tangible impacts is often characterised by a relatively long timelines. Moreover, the multifaceted nature of outcomes, including adoption rates, collaboration levels, and overall benefits, adds layers of complexity to measurement efforts. Compounding these challenges is the scarcity of readily available, complete, and comparable datasets, hindering comprehensive tracking and reporting of performance. Additionally, the inherently unpredictable and non-linear nature of breakthrough innovations further complicates performance evaluation. This often creates a dilemma: should resources be allocated towards enhancing performance measurement or fostering further innovation? Organisations attempt to strike a balance between progress and accountability.

The current performance management and reporting regimes of Australian RDCs varies significantly across different organisations

We conducted research to assess the maturity of performance management frameworks in place across Australian RDCs, including the strength of their framework, data collection and analysis, integration with decision making and performance management culture. BCR varied from 1.3 to 73[129] and averaged 12:1.



These findings have indicated that while AMPC has some strong areas of performance, there are opportunities to improve performance management maturity compared with other RDCs.

By implementing more robust performance measurement systems, AMPC can enhance accountability and transparency, providing stakeholders with clearer insights into the effectiveness of research investments. This increased transparency fosters trust and confidence among stakeholders, leading to stronger partnerships and collaboration. Additionally, improved performance management allows AMPC to better allocate resources, ensuring that funding is directed towards activities with the highest potential for impact. By tracking and evaluating outcomes more effectively, AMPC can also identify areas for improvement and innovation, driving continuous enhancement of research and development efforts within the meat processing sector.

Future performance frameworks will be more robust, covering the whole lifecycle of R&D and leveraging advanced analytics and AI

R&D performance is increasing covering the end-to-end activities that research organisations undertake. Objective measures and KPIs are being developed with stakeholders, which indicate the progress being made towards overall goals. Increasing emphasis is being placed on measuring the real-world impact of research outcomes. Future models will have increased stakeholder engagement and participation throughout the lifecycle of R&D. With the adoption of big data, advanced analytics and AI, R&D frameworks may leverage these technologies to gain deeper insights into research performance, such as forecasting potential impacts and optimising resource allocation.

This will help navigation of increasingly complex landscapes, bring together and focus a wide range of expertise and showcase the opportunity for stakeholders and funders alike.

Performance area	Example outcomes
Research investment	Investment in high impact projects aligned with strategic objectives Contribution to national research agendas and government policies
Research outputs	Number of publications, reports, patents and innovations Quality and impact assessments of research outputs Timeliness of impact delivery
Adoption and impact	Changes in industry practice Economic, social and environmental impacts Return on investment or benefit cost ratio delivered Effectiveness of knowledge transfer mechanisms
Industry engagement	Level of industry participation in R&D activities Collaboration with industry stakeholders Feedback from end users and industry partners Engagement with end users and industry stakeholders
Efficiency and effectiveness	Resource allocation Project performance
Capacity building	Participation in training programs Skills and capabilities developed
Stakeholder satisfaction	Satisfaction levels Feedback from levy payers, industry association and government
Performance monitoring	Depth and effectiveness of performance monitoring Speed of feedback and influence on decision making

Implications for the meat processing industry and AMPC

Enhancing R&D performance management holds the potential to amplify the impact of investments, optimise resource allocation, foster trust, and bolster AMPC's ability to attract funding from diverse sources. Achieving these objectives necessitates the development of a more robust framework that links strategic goals with continuous measurement. This entails placing a heightened emphasis on robust frameworks and comprehensive data collection across all AMPC's activities, while also embracing advancements in analytics and AI to drive decision-making.

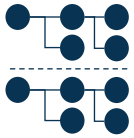
10. Trends in innovation models

A wide range of innovation models are evolving at various scales across the globe, reflecting diverse approaches to fostering creativity, driving growth, and addressing emerging challenges. These models vary in their level of openness, sharing of innovation assets, control, ease of protecting IP and potential to for incremental vs breakthrough innovations. These models are not mutually exclusive.

Project models

A series of individual projects are implemented to achieve specific results

Program



A co-ordinated series of projects are pursued over multiple years to achieve wider objectives and change

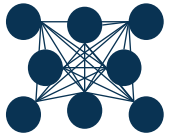
Mission based

A wide range of activities are pursued over multiple decades to achieve an ambitious goal

Innovation hubs

Centres of innovation are established to deliver repeatable innovations in a sector or community

Collaborative / Open



Innovation networks develop to enable innovation partnerships including within and across industries

Key trends[130, 131]

Fully appreciate value: recognise all benefits including economic, social, environmental, and the human capital developed through the research and development activities. Organisations are optimising their portfolios to prioritise measurable value for stakeholders and optimise knowledge sharing vs protection.
Active portfolio management: Shape portfolio for the industry stage and organisation mandate. Improve monitoring of environment, portfolio and speed of adaption in line with risk tolerance.
Accelerating innovation cycle: using data, analytics, agile prototyping, labs and sandboxes, to increase the pace of innovation. Breaking down silos between R&D activities and the users of innovation.
Add system thinking: creating system knowledge and multiple portfolios to enhance system over horizons, maturing practices e.g. v-model for system development and orchestration of the innovation ecosystem.
Build Human capital ecosystem: Attract industry, develop partnerships with education sector, retain talent.
Maturing adoption pathways: development of diverse and proven adoption pathways and improved decision making regarding which adoption pathways to use and when to use them.
Strengthening M&E: Improving the robustness of M&E at project and portfolio level. Integration with research and learning functions, including deep insights from successes and failures. Diverse and independent skills.
Digital / AI: Leveraging digital technologies and AI tools is increasingly crucial for streamlining processes, generating insights, and facilitating sharing of innovation across industries. Strong cybersecurity arrangements.
Global collaborations: Building links with global innovators, creating value from their expertise and portfolios, particularly in related but not core innovation activities(2).
Building innovation communities: Fostering collaboration, development, and trust within innovation communities, include collaborative innovation, training and hackathons.
Government involvement: Increasing collaboration with government to realise economic and social outcomes.

Case study: Technology Transfer in Germany

German Technology Transfer Offices (TTOs) play a crucial role in bridging the gap between academic research and commercialisation. With a strong focus on innovation and collaboration, these TTOs facilitate the transfer of scientific knowledge and discoveries from universities and research institutions to the marketplace, driving economic growth and societal impact.

One notable example of a successful German TTO is the TUM ForTe Innovation and Entrepreneurship Center at the Technical University of Munich (TUM). TUM ForTe serves as the central interface for industry collaboration, startup support, and technology transfer activities at TUM. Through its comprehensive suite of services, TUM ForTe enables researchers and entrepreneurs to translate cutting-edge research into market-ready products and services.

Implications for the meat processing industry and AMPC

To enhance innovation effectiveness, AMPC could consider evolution of its existing models, engage stakeholders proactively, and bolster innovation capacity and capability. This could involve mapping commercialisation pathways and addressing gaps to streamline the flow of ideas to market. Investing in open digital platforms, fostering connectivity and innovation while implementing data sharing regimes that manage privacy and security could also be warranted. Moreover, directing investments towards building innovation capacity and capability, perhaps through innovation challenges, can further increase innovation and help develop a culture of creativity and problem-solving.

11. R&D services

Innovation, commercialisation, and investment capacity

Facilitating research & development
R&D orgs facilitate research efforts through many methods, including building their in-house capacity, administering competitive grant programs, cross sectoral partnerships with other orgs, and co-investment. R&D orgs ensure that their research is tailored to the needs of their stakeholders and industry.

Promoting extension & adoption
R&D orgs facilitate the uptake of research and new technologies through the sharing of information, training and trials, and local support encouraging adoption of industry innovations. Local support throughout the entire process improves adoption by ensuring that innovation meets the needs of users.

Monitoring, evaluation, and reporting
Working with users to review the implementation of innovations within their local context, provide impact assessments, and continually engagement with stakeholders during the process.

Building industry development & sustainability

Partnerships & collaboration
R&D orgs seek partnerships throughout the supply chain for innovation, adoption, and ongoing operations both within their industry and broader sectors. R&D orgs also seek to utilise the capacity of the private sector and seek international funding opportunities for long term sustainability.

Building capacity & appetite for innovation
R&D orgs seek to build the capacity for innovation within their broader industry to promote resilience and adaptation through responsive business structures, collaborative and on-going communication, and extension services.

Industry strategic planning
R&D orgs provide strategic guidance to their industries through targeted research and development throughout the supply chain, forecasting trends, and setting global industry priorities.

Sharing knowledge to support strong communities

Stakeholder engagement
R&D orgs engage their stakeholders throughout the development process, through industry innovation networking, educational programs, and continual feedback opportunities.

Expertise & advisory services
Provide these services to their stakeholders through training opportunities, responding to incoming inquiries, and providing ongoing support for adoption.

Policy analysis and industry advocacy
R&D orgs advocate on behalf of their industry to government in the shaping of policy and strengthen their industry's recognition through consumer-focused marketing.

Cross sectoral knowledge sharing
R&D orgs seek to develop ongoing training and development opportunities and make these available to a broad range of stakeholders. R&D orgs seek partnerships at local levels, to improve adoption.

Auxiliary services supporting R&D efforts

Finance & investment management
R&D orgs support their R&D efforts through effective cost management, to ensure funds can be directed where will have most impact. Financial expenditure is focused on the impact, research, and adoption.

Risk monitoring & mitigation
R&D orgs monitor trends and ensuring that innovation efforts build on best practices in all aspects, ensuring ongoing industry safety.

Governance
R&D orgs governance mechanisms take a long-term outlook, building robust practices that ensure effective implementation of R&D efforts.

Human resources
R&D staff are qualified, and their work is targeted within a collaborative culture, to focus on effective R&D efforts, promoting greater adoption.

Implications for the meat processing industry and AMPC
The services offered by the R&D organisations[129] are closely aligned with AMPC's existing offerings, albeit with varying degrees of emphasis across the sector. Key insights suggest that the delivery of these services can range from highly focused to broad, each with its unique impacts. A focused approach, tailored to local needs, can facilitate greater adoption as research aligns closely with adopters' requirements. Conversely, a broader focus fosters industry collaboration and enables innovations to have a wider range of applications. Additionally, some services exhibit further segmentation, varying by cohort or other factors.
AMPC should carefully assess its service mix in conjunction with its mission and the desired impact on the industry. This assessment could consider whether a broader array of services offered at a local or regional level, or a more segmented approach, could enhance engagement and adoption within the meat processing industry.
Regarding resource allocation to specific services, AMPC should differentiate between core and non-core services and determine how far it wants to extend beyond core offerings. Additionally, it should consider the delivery model for non-core services, particularly the use of partnerships to achieve these objectives.

4. Future directions that could emerge

Based on these trends, we have made several extrapolations for key elements of the future environment for meat processors

Embracing consumer shifts	Demand for differentiated and personalised products and services	Growth in premium products and services	Expansion of direct-to-consumer models e.g. farm to plate and customisation	Innovations in food safety such as rapid pathogen detection	Collaboration with channels such as health, food and restaurants	Consumers demand sustainable and affordable products	Meat consumption plateaus early
Transforming products and services	Increased demand for alternative proteins	Convenience market growth e.g. ready to eat, and snacks	Demand for personalised nutrition and functional meat products	Food safety and origin traceability	Culturally enriched foods	Growth in artisan processors and meat products	Cultured meat products are commercialised and take off
Smart manufacturing and Industry 4.0	Highly automated and fault tolerant processing and packaging systems	Autonomous vehicles and cobots for material handling emerge	Vision systems and machine learning adopted	Automated cleaning and sanitation systems emerge	Smart sensors and IoT devices proliferate	Automated sorting and grading systems using machine vision	3D printing technology for customised meat products
Digital transformation and emerging tech	IoT sensors, connected devices and smart wearables proliferate	Digital supply chains emerge using blockchain, QR codes/RFID and AI	Multi-factor product authentication systems including biomarkers	Advanced cybersecurity measures	Digital twins, AR/VR/XR and Holograms	AI powered analytics and applications proliferate	Global trust systems emerge
New and emerging materials	Biohazard resistant surfaces become commonplace	Biodegradable and smart packaging	Antimicrobial coatings for packaging	Aerogels are adopted as lightweight insulating materials in packaging	Advanced air purification systems adopted	Smart textiles and fabrics to enhance worker safety emerge	Nanomaterials incorporated into packaging and products
Enhancing our digital lives	AR/VR/XR used in operations and marketing	Digital supply chain management proliferates	Digital quality assurance systems become standard	AI powered product development emerges	Digital marketing strategies become essential	Digital R&D platforms emerge	Human augmentation in processing and R&D begins
Business model innovations	Direct to consumer channels emerge	Vertical integration accelerates	Licensing and franchising opportunities emerge	Smaller and agile processors find niche markets	Sustainable business models adopted	Collaboration along and across value chains deepens	Meat processing is offshored
Building a sustainable future	Sustainable processing and packaging becomes essential	Consumer education and awareness	Certification, labelling and reporting programs are embedded	Biodiversity and offset programs adopted at scale	Increased demand for alternative proteins	Circular ecosystems put in place	Carbon price and cost to offset rises significantly
Integrated value chains	Continuous improvement initiatives along and across value chains	Supply chain innovation to reduce time and build resilience	Digital supply chains using blockchain, QR codes/RFID and AI	Differentiated supply chains emerge and find their markets	Supply chain resilience is improved	Data sharing is adopted across the industry	Integrated regulatory compliance along and across value chains
Unlocking the potential of collaboration	Knowledge sharing networks develop	Ecosystem partnerships enable substantial value creation	Shared infrastructure opportunities emerge along the supply chain	Investment grows in joint marketing programs	Open innovation platforms are established	Co-investment models bring in new funding	Regulatory harmonisation begins
The evolution of global trade	Growth in export markets	Trade and export is digitised, and standards increase	Growth in sustainable and ethical sourcing, carbon pricing and labelling	Expansion of e-commerce	Trade disruptions	Food security agreements put in place	International standards for sustainable consumption of meat emerge
Evolving regulation and compliance	Increasing regulatory scrutiny and whistleblower protections	Compliance automation is required to enable real time reporting	Collaboration takes place across stakeholders to develop standards	Increased consumer pressure for sustainable and ethical sourcing	Increased scrutiny and pressure from interest groups e.g. animal welfare	Regulatory convergence	Regulatory intervention e.g. safety, carbon, animal welfare, live trade
Securing the workforce of the future	Labour costs and shortages increase	Upskilling and reskilling programs are scaled	War for talent intensifies	Digital training and upskilling programs are adopted	Deep education and government partnerships to secure labour	Employee ownership or profit-sharing models emerge	Industry workforce value proposition attracts skilled workers

High impact and high uncertainty

This has allowed us to identify 5 potential future scenarios for how the industry might evolve

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1. Thriving, sustainable and trusted processing sector

- Sustainable, Trusted and growing sector
- Tech savvy industry drives innovations at scale
- Strong collaboration enables sustainability goals and diversification of products and services
- Educated consumers support industry
- Strong international demand and open market access
- Processors become a key pathway to end customers
- High value jobs created across Australia

2. Alternative growth

- Consolidated growth
- Bifurcation into highly automated vs artisan and traditional processing
- Differentiated value chains emerge, with strong vertical collaboration and innovation
- Discerning consumers rely heavily on labelling and disclosures
- Market access requirements increase and require ongoing attention
- Direct to consumer models proliferate
- Diverse workforce opportunities

3. Consolidation of the Global Processing sector

- Industrialised and global sector, marginal industry gains
- Major processors fully automate
- Collaboration limited to industry wide issues
- Wholesale markets dominate
- High standards for international export
- Processor consolidation
- Workforce available but transient

4. Challenging international trade

- Industry flatline, exposed to risk of shocks
- Sweating current assets
- Export collaboration to overcome barriers
- Biohazards and food safety issues occur, eroding consumer trust reduced
- Internation tensions rise – tariffs and restrictions
- Fewer export markets, grey trade proliferates
- Workforce challenges increase

5. Stagnant and declining industry

- Industry in decline
- Traditional processing and production practices
- Emissions targets not met Impacts to climate and biodiversity
- Cattle supply in decline, meat products lose market share to alternative proteins
- Consumer trust eroded
- High carbon costs limit market access to key markets
- Export to secondary and lower value markets

1. Thriving, sustainable and trusted processing sector

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Scenario narrative

In the year 2030, the Australian meat processing sector stands as a beacon of sustainable, trusted, and thriving industry, driven by innovation and collaboration. Over the past decade, concerted efforts by industry stakeholders, led by the Australian Meat Processor Corporation (AMPC), have transformed the sector into a global leader in sustainable meat production and processing.

The journey towards this future began with a collective vision of creating a sector that not only meets the demands of consumers but also contributes positively to the environment and society. Through strategic investments in research and development, the sector has embraced cutting-edge technologies, becoming a tech-savvy industry that drives innovations at scale. Automated processing lines, robotics, and advanced monitoring systems have revolutionised production processes, improving efficiency, reducing waste, and ensuring the highest standards of food safety and quality.

Strong collaboration along value chains has been instrumental in achieving industry goals and diversifying products and services. Producers, processors, distributors, retailers, and consumers now work together, sharing information, insights, and best practices. This collaborative approach has enhanced the sector's resilience and opened avenues for growth and innovation.

Educated consumers are pivotal in supporting the industry, demanding transparency, ethical production practices, and sustainable sourcing. As a result, processors have responded by implementing rigorous sustainability standards and certifications, earning the trust and loyalty of consumers both domestically and internationally.

The sector's success has also been bolstered by international demand, open market access, favourable reductions in live animal export, and growth in affordable skilled labour. Australian meat products are sought after worldwide for their quality, safety, and sustainability. Processors have become key pathways to end customers, leveraging digital platforms to new markets and deliver personalised experiences.

This transformation has not only driven economic growth but has also created high-value jobs across Australia, particularly in rural and regional areas. Skilled workers are in high demand, driving wages and living standards in these communities.

Potential strategies for AMPC to consider

To encourage this future to occur:

- Invest in research and development to drive consumer-based innovation, collaboration and technology adoption in the sector.
- Facilitate collaborative initiatives and partnerships to foster sustainability and trust across the value chain.
- Advocate for policies and regulations that support sustainable practices and market access for Australian meat products.
- Promote consumer education and awareness campaigns to highlight the industry's commitment to sustainability and quality.
- Support initiatives that enhance market diversification and export opportunities for Australian meat processors.

Support the future capabilities and requirements of the sector:

- Develop training programs and initiatives to build a skilled workforce capable of meeting the sector's evolving needs.
- Establish funding mechanisms to support the adoption of advanced technologies and sustainable practices by meat processors.
- Create platforms for knowledge sharing and collaboration among industry stakeholders to facilitate continuous learning and improvement.
- Invest in infrastructure and logistics to improve supply chain efficiency and resilience.
- Support research and innovation in value-added products to meet changing consumer preferences and market demands.

2. Alternative growth

2. Alternative growth

Consolidated growth

Bifurcation into highly automated vs artisan and traditional processing

Differentiated value chains emerge, with strong vertical collaboration and innovation

Discerning consumers rely heavily on labelling and disclosures

Market access requirements increase and require ongoing attention

Direct to consumer models proliferate

Diverse workforce opportunities

Scenario narrative

In the year 2030, the Australian meat processing sector has undergone a significant transformation, marked by diverse growth pathways and consolidated market dynamics. As consumer preferences continue to evolve, the sector has bifurcated into two distinct segments: highly automated, technologically advanced processing facilities and artisanal, high value and traditional operations.

Amidst this divergence, differentiated value chains have emerged, characterised by strong vertical collaboration and innovation. While some processors have embraced automation and scale to meet the demands of mass markets, others have chosen to focus on artisanal craftsmanship, catering to niche segments seeking unique, high-value products.

Discerning consumers play a central role in shaping the sector's landscape, relying heavily on labelling and disclosures to make informed purchasing decisions. Transparency, sustainability, and ethical production practices are paramount, driving processors to invest in traceability systems and certifications to maintain consumer trust.

Market access requirements have become increasingly stringent, necessitating ongoing attention and compliance efforts from industry stakeholders. To navigate these challenges, processors have diversified their distribution channels, with direct-to-consumer models proliferating alongside traditional retail and wholesale channels.

This shift has created diverse workforce opportunities across the sector, from highly skilled technicians and engineers managing automated facilities to artisans and craftsmen preserving traditional techniques. Collaboration between these diverse talent pools has become essential, driving innovation and knowledge exchange within the industry.

As the sector continues to evolve, AMPC plays a pivotal role in facilitating collaboration to address emerging challenges and opportunities. Recognising the importance of sustainability, AMPC invests in initiatives that promote responsible resource management, reduce environmental impact, and support community development. By fostering a culture of innovation, collaboration, and responsible business practices, AMPC ensures that the Australian meat processing sector remains at the forefront of global competitiveness while maintaining quality, integrity, and sustainability for generations to come.

Potential strategies for AMPC to consider

To encourage this future to occur:

- Promote awareness of alternative growth opportunities and support processors in exploring diversified business models.
- Facilitate knowledge sharing and collaboration between highly automated and artisanal processors to foster innovation and best practices.
- Advocate for policies that incentivise investment in automation, while also supporting the preservation of traditional techniques and craftsmanship.
- Develop consumer education campaigns to raise awareness of the diverse range of meat products available and the value of transparency in labelling and disclosures.
- Provide support and resources to help processors navigate increasingly complex market access requirements and compliance standards.

Support the future capabilities and requirements of the sector:

- Invest in research and development to support the technological advancements needed for highly automated processing facilities.
- Develop training programs and initiatives to equip workers with the skills needed to thrive in both automated and artisanal processing environments.
- Create platforms for collaboration and knowledge exchange between processors, suppliers, and industry experts to drive innovation and continuous improvement.
- Advocate for regulatory frameworks that balance the need for innovation with consumer safety and transparency.
- Support the development of direct-to-consumer models and e-commerce platforms to help processors reach new markets and connect directly with consumers.

3. Consolidation of the Global Processing sector

3. Consolidation of the Global Processing sector

- Industrialised and global sector, marginal industry gains
- Major processors fully automate
- Collaboration limited to industry wide issues
- Wholesale markets dominate
- High standards for international export
- Processor consolidation
- Workforce available but transient

Scenario narrative

In the year 2030, the global meat processing sector stands at a crossroads, having undergone a profound transformation marked by significant consolidation and globalisation. This industrialised landscape, characterised by heightened efficiency and productivity, primarily benefits major processors that have fully embraced automation technologies. While these advancements have propelled the sector forward, the benefits have not been equally distributed, with smaller players struggling to compete against the scale and resources of their larger counterparts. Consequently, collaboration within the industry remains constrained, primarily focused on addressing overarching challenges, while wholesale markets dominate the distribution channels, further exacerbating the divide between industry giants and smaller enterprises.

Amidst the push for efficiency and productivity, processors face mounting pressure to adhere to stringent international export standards, necessitating substantial investments in regulatory compliance to safeguard market access. This regulatory burden, coupled with the challenges posed by consolidation, has perpetuated a cycle of further consolidation, as smaller players find it increasingly difficult to navigate the competitive landscape. To navigate the complexities of fluctuating labour costs and market variability, workforce practices have evolved to embrace short-term contracts and temporary employment arrangements, contributing to a transient labour force that presents challenges in attracting and retaining skilled talent within the sector.

As the sector grapples with the ramifications of consolidation, concerns mount regarding the potential erosion of diversity and innovation. There is a palpable fear that the dominance of major players and the overwhelming emphasis on automation may inadvertently stifle creativity, limit consumer choice and create an increased risk of offshoring. Moreover, the reliance on a transient workforce poses significant challenges related to job insecurity and employee turnover, potentially impeding the sector's long-term sustainability and growth trajectory. Recognising these challenges, stakeholders are increasingly turning their attention towards alternative approaches aimed at preserving diversity and fostering innovation within the meat processing sector. Efforts to empower smaller processors through cooperative models, shared infrastructure, and collaborative marketing strategies are gaining momentum, underscoring a collective commitment to safeguarding the sector's vibrancy and resilience in the face of consolidation pressures.

Potential strategies for AMPC to consider

To encourage this future to occur:
- Advocate for policies that incentivise investment in automation and technological innovation to improve efficiency and competitiveness.
- Invest in initiatives that promote consolidation to achieve economies of scale and global competitiveness.
- Advocate for the adoption of high standards for export
- Encourage the development of wholesale markets.

Support the future capabilities and requirements of the sector:
- Invest in training and education programs to develop the skills needed to operate and maintain automated processing.
- Foster partnerships with international regulatory bodies to ensure alignment with global standards and facilitate market access for Australian meat products.
- Invest in R&D of innovative solutions for sustainable and efficient meat processing in the face of global consolidation.

To limit the negative impacts of the scenario:
- Provide targeted resources and funding to help small and medium-sized processors remain competitive e.g. co-operative models.
- Encourage smaller processors to collaborate within local or regional clusters to share resources and market insights.
- Invest in R&D to explore new technologies and product diversification strategies for smaller processors.
- Assist smaller processors in accessing new markets.
- Advocate for regulatory frameworks that balance food safety standards with the needs of smaller processors.
- Help smaller processors explore direct-to-consumer models and niche markets for product differentiation.

4. Challenging international trade

4. Challenging international trade

Industry flatline, exposed to risk of shocks

Sweating current assets

Export collaboration to overcome barriers

Biohazards and food safety issues occur, eroding consumer trust reduced

Internation tensions rise – tariffs and restrictions

Fewer export markets, grey trade proliferates

Workforce challenges increase

Scenario narrative

Amidst the backdrop of increasingly intricate international relations, the global meat processing industry finds itself navigating a prolonged period of stagnation and uncertainty. This challenging environment is characterised by increasingly challenging international trade, where international competitors have captured key markets with products that rival the quality of Australian offerings but at more competitive prices. Consequently, the industry witnesses a plateau in growth.

Adding to these challenges are the escalating trade barriers and tensions prevailing on the international stage. The imposition of tariffs, quotas, and various other trade restrictions by different countries create formidable barriers for meat processors seeking access to foreign markets. In response, collaborative endeavours aimed at addressing these obstacles become vital.

The industry's journey is further complicated by the occurrence of biohazards and food safety issues, which have a profound impact on consumer trust. Mounting concerns regarding food safety, sustainability, nutritional value of meat, and ethical practices of processors exacerbate the situation, adding an additional layer of intricacy to export initiatives. Disinformation runs rampant, and the industry struggles to regain the trust it once commanded.

In the face of dwindling export markets owing to trade barriers, the spectre of grey trade—comprising unofficial or unauthorised channels of commerce—casts a long shadow, presenting both regulatory and reputational hazards for the industry. Simultaneously, the intensification of workforce challenges emerges as a pressing concern, as other industries aggressively vie for the limited pool of skilled resources. Consequently, meat processing companies find themselves embroiled in a struggle to attract and retain talent, intensifying the strain on an already beleaguered sector. The erosion of the industry's workforce not only compromises its capacity to innovate and adapt but also magnifies its susceptibility to prevailing vulnerabilities within the sector.

The industry’s weakness has created a heightened exposure to the risks of economic shocks and disruptions. With the ground constantly shifting beneath their feet, meat processors are compelled to sweat their existing assets, labouring tirelessly to optimise resources and minimise costs in a desperate bid to retain a semblance of competitiveness amidst the tumultuous market conditions.

Potential strategies for AMPC to consider

Support the future capabilities and requirements of the sector:

- Innovate to enhance efficiency and competitiveness
- Invest in technology adoption to streamline production processes and reduce labour costs.
- Enhance supply chain management practices to minimise waste and improve efficiency.
- Diversify product offerings by developing value-added products to cater to evolving consumer preferences.
- Implement sustainable production practices to meet consumer demand.
- Develop unique selling propositions and branding strategies to differentiate products in the market.
- Expand market reach by diversifying export destinations and exploring emerging markets.
- Advocate for trade negotiations and agreements to facilitate market access for Australian meat products.
- Obtain and maintain certifications and standards compliance to meet the requirements of target export markets.
- Conduct market research to identify trends, consumer preferences, and market gaps.

To limit the negative impacts of the scenario:

- Advocate for transparent and science-based regulatory frameworks to mitigate risks associated with grey trade and ensure consumer confidence in the safety and quality of Australian meat products.
- Diversify market strategies to reduce reliance on export markets that are particularly vulnerable to trade tensions and disruptions.
- Enhance supply chain resilience through strategic partnerships and contingency planning

5. Stagnant and declining industry

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5. Stagnant and declining industry

- Industry in decline
- Traditional processing and production practices
- Emissions targets not met
  Impacts to climate and biodiversity
- Cattle supply in decline, meat products lose market share to alternative proteins
- Consumer trust eroded
- High carbon costs limit market access to key markets
- Export to secondary and lower value markets

Scenario narrative

Amid shifting consumer preferences and mounting environmental concerns, the meat processing industry finds itself entrenched in a state of stagnation and decline. Despite the growing urgency to innovate and adapt to changing market dynamics, traditional processing and production practices persist, leaving the sector trailing behind its more agile counterparts. Furthermore, plans to reduce live trade have failed, and combined with Australia's high labour cost and shortage of skilled labour is putting pressure on the local industry. The failure to embrace innovation has far-reaching consequences, with the industry falling short of meeting emissions reduction targets set by regulators. This not only exacerbates the climate crisis but also takes a toll on biodiversity, further underscoring the urgent need for transformative change within the sector. The industry fails to engage consumers on the benefits of red meat, opening the window for alternative proteins to capture the narrative.

As the environmental impacts of traditional meat production become increasingly apparent, consumer attitudes towards meat consumption undergo a profound shift. With cattle supply dwindling due to climate change and meat products losing market share to alternative proteins, breakthroughs in cultured meats offer a compelling alternative with lower carbon content. Eroding consumer trust in traditional meat products, coupled with the allure of more sustainable alternatives, prompts a mass exodus towards plant-based and lab-grown proteins, reshaping the dietary landscape and challenging the very foundation of the meat processing industry.

Compounding the industry's woes are the high carbon costs imposed by regulators, further restricting market access to key international markets. Unable to meet stringent carbon emissions standards, meat processors find themselves relegated to secondary and lower-value markets, further exacerbating the downward spiral of the industry. The consequent loss of market share and competitiveness threatens the viability of the industry, compelling stakeholders to urgently seek solutions for sustainable practices that align with evolving consumer preferences and regulatory requirements.

The meat processing industry responds to challenges by investing in sustainable technologies, enhancing consumer education, and fostering collaborative partnerships to regain trust, secure market access, and lead in sustainable food production. Through these efforts, it aims to address underlying issues and chart a path towards revitalisation.

Potential strategies for AMPC to consider

Support the future capabilities and requirements of the sector:

- Invest in R&D to promote sustainable meat production technologies, such as clean energy-powered processing facilities and carbon capture solutions.
- Implement training programs and incentives to help traditional meat processors transition towards more sustainable. production practices and adopt carbon-neutral technologies.
- Foster collaboration across the supply chain to establish traceability and certification systems that validate sustainable and ethical meat production practices, rebuilding consumer trust and confidence.
- Support the industry to create functional foods.
- Facilitate partnerships with research institutions and startups to accelerate the development and commercialisation of alternative proteins.

To limit the negative impacts of the scenario:

- Advocate for policies and incentives that support the transition to sustainable meat production, including carbon pricing and subsidies for eco-friendly technologies.
- Promote diversification to mitigate reliance on traditional meat products, exploring opportunities in alternative protein markets and value-added products.
- Develop marketing campaigns and consumer education initiatives to highlight the environmental and health benefits of sustainably produced meat products, fostering demand and market acceptance.
- Engage in dialogue with regulators and international trade partners to negotiate fair and equitable carbon standards that do not disproportionately disadvantage the meat processing industry.

5. Potential opportunities for AMPC

Chapter overview

In the preceding chapter, we identified key trends shaping the trajectory of the meat processing sector, alongside a wealth of potential innovations emanating from diverse industries. This chapter attempts to envision the opportunities these trends could represent for Australia meat processing and AMPC. This set of opportunities lay out potential areas for investment, and provide relevant information based on our research to profile these. These are provided to give AMPC some practical options to consider as part of your planning process. We expect that AMPC may wish to refine and adapt these opportunities during your planning process, to maximise impact from your actions and investments.

Multiple iterations of this product portfolio were created and refined during this project. The final 39 represent an aggregation of these key opportunities into areas of work designed to span multiple years. We have categorised them into five domains: Consumer Insights, Technological Advancements and Operational Efficiency, Human Capital, Business Model Enhancement and Supply Chain Optimisation, and Research and Development.

We have identified a preliminary pool of opportunities for further exploration, with the potential for further opportunities. Scoring has been based on three broad dimensions: Horizon, delineating the level of innovation; Value for money, reflecting the potential for industry-wide impact; and Fit, assessing alignment with AMPC's strategic objectives and the use of public research funds.

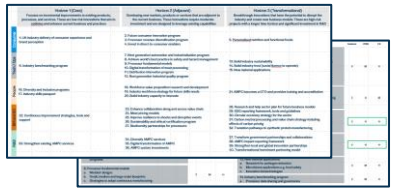
This preliminary evaluation sets the stage for recommending a select portfolio of opportunities. Through this, we have prioritised a broad spread of opportunities covering the medium to longer term.

Finally, we'll delve into an examination of key opportunities, providing actionable insights as input for your strategic review and decision-making to drive growth and sustainability of the sector.

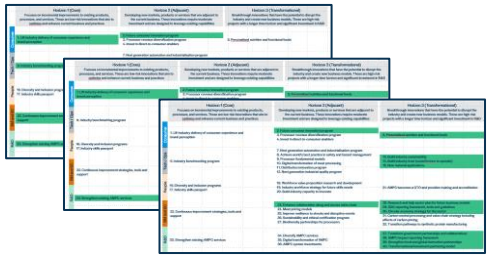
40 Opportunities

13%	Consumer
25%	Technology and Operations
15%	People
27%	Business Model and supply chain
20%	Research and development

Chapter 4.1: Opportunities identified



A prioritised and full list of opportunities identified



Three example portfolios – low risk, balanced and transformational

Chapter 4.2: Opportunity profiles

Opportunity profiles for high priority opportunities

5.1. Opportunities identified

Opportunity portfolio

	Horizon 1 (Core) Focuses on incremental improvements to existing products, processes, and services. These are low-risk innovations that aim to optimise and enhance current business and practices	Horizon 2 (Adjacent) Developing new markets, products or services that are adjacent to the current business. These innovations require moderate investment and are designed to leverage existing capabilities	Horizon 3 (Transformational) Breakthrough innovations that have the potential to disrupt the industry and create new business models. These are high-risk projects with a longer time horizon and significant investment in R&D
Consumer	1. Lift consumer knowledge and brand perception	2. Future consumer innovation program 3. Processor revenue diversification program 4. Invest in direct-to-consumer enablers	5. Personalised nutrition and functional foods
Tech / Ops	6. Industry benchmarking program	7. Next generation automation and industrialisation program 8. Achieve world's best practice in safety and hazard management 9. Processor fundamental models 10. Digital transformation of meat processing 11. Supply chain innovation program 12. Next generation industrial quality program	13. Build industry sustainability 14. Fostering trust (social licence to operate) 15. New material applications
People	16. Diversity and inclusion programs 17. Industry skills passport	18. Workforce value proposition research and development 19. Industry workforce strategy for future skills needs 20. Build industry capacity to innovate	21. AMPC becomes a Group Training Organisation (GTO) and provides training and accreditation
BM and SC	22. Continuous improvement strategies, tools and support	23. Enhance collaboration along and across value chain 24. Meat pricing models 25. Improve resilience to shocks and disruptive events 26. Sustainability and ethical certification program 27. Biodiversity partnerships for processors	28. Research and help sector plan for future business models 29. SDG reporting framework, tools and guidelines 30. Circular economy strategy for the sector 31. Carbon neutral processing and value chain strategy including effects of carbon pricing 32. Transition pathways to synthetic protein manufacturing
R&D	33. Strengthen existing AMPC services	34. Diversify AMPC services 35. Digital transformation of AMPC 36. AMPC system investments	37. Transform government partnerships and collaborations 38. AMPC impact reporting framework 39. Strengthen local and global innovation partnerships 40. Create a transformational investment funding model

Consumer – high level scoring

	Horizon	VFM	Fit
1. Lift consumer knowledge and brand perception a. Lift industry capacity to deliver on consumer expectations in product, packaging and experience b. Consumer grade industry profiling information and media such as industry spotlight program and nutritional, health and wellness information c. Digital engagement including online and social media profile d. Proactive engagement on key issues, such as social licence and responsible consumption of meat	1	H	H
2. Future consumer innovation program a. Conduct regular research to deepen understanding about emerging and high value consumer segments, preferences and their purchasing behaviours. Understand how to demonstrate value e.g. nutrients, flavour b. Lift industry capacity for product innovation, development and management capabilities c. Establish and mature consumer product development ecosystem and partnerships including joint product R&D	2	H	H
3. Processor revenue diversification program a. Conduct research into revenue growth opportunities for Australian processors, including new products, services and markets b. Conduct a revenue growth program with industry, to build capabilities, develop, launch and market new revenue generating activities	2	H	M
4. Invest in direct-to-consumer enablers a. Branding and marketing program b. Participation framework for processors c. Shared e-commerce platform development	2	M	M

	Horizon	VFM	Fit
5. Personalised nutrition and functional foods a. Conduct research into personalised nutrition and functional food markets globally b. Invest in product innovation to develop product prototypes c. Support industry to market and test products d. Build industry capacity to enter and scale in this new market	3	H	H

Technology and operations – high level scoring

	Horizon	VFM	Fit
6. Industry benchmarking program a. Cross industry benchmarking program and governance	1	H	H
7. Next generation automation and industrialisation program a. High performance automation to including system integration, improved availability, and reduced cost. Extended innovation program into front and middle of plant including cutting and gripping technologies b. Smart robots' initiative c. Expanded use of IoT sensors d. AI for predictive modelling, optimisation, and decision-making e. Extend human augmentation and intelligent machines	2	M	H
8. Achieve world's best practice in safety and hazard management a. Improved biosecurity hazard detection and management b. Biosecurity predictive modelling and early warning system c. Next generation of sanitation and safety practices including microbiome detection and treatment d. Resilience program e. Worker safety program f. Food safety program	2	H	H
9. Processor fundamental models a. Modular designs including small, medium and large-scale blueprints b. Development of industry standards including technology, data, equipment and interfaces c. Strategies to adopt continuous manufacturing	2	H	H
10. Digital transformation of meat processing a. Extend AR/VR to XR, add holographic applications b. AI strategy and applications e.g. predictive maintenance c. Smart packaging solutions d. Block chain technology initiative and application development, including AI and blockchain enabled regulatory compliance e. Cybersecurity, data protection, and industry risk management	2	M	H

	Horizon	VFM	Fit
11. Supply chain innovation program a. Supply chain optimisation and resilience program b. Service innovation strategy with partners and customers including sourcing program c. Supply chain monitoring program	2	H	M
12. Next generation industrial quality program a. ISO 9001 certification b. In-line quality systems c. Quality by Design d. AI quality system	2	H	H
13. Build industry sustainability a. Identify, develop and cascade emerging sustainability solutions in processing and along the value chain, including energy, processing efficiency, waste reduction and packaging b. Reducing impact of processing e.g. urban impacts c. Design and develop an industry trust and social licence system d. Design, incentivise and implement SDG and continuous improvement programs	3	H	H
14. Fostering trust (social licence to operate) a. Develop Trust framework including outcomes, measures and practice b. Develop industry code of conduct, knowledge and awareness c. Trusted information platforms for industry data and reporting d. Development of multi factor product authentication systems	3	H	H
15. New material applications a. Nanotech for pathogen detection b. Microbiome applications e.g. food safety c. Innovative biotechnologies	3	M	H

People – high level scoring

	Horizon	VFM	Fit
16. Diversity and inclusion programs a. Develop industry diversity and inclusion strategy b. Diversity training and education program c. Enhance recruitment / hiring practices and HR practices across the sector d. Build workforce resource groups including networking and advocacy e. Measurement program	1	M	H
17. Industry skills passport a. Create industry skills framework including competencies and standards b. Establish credentialing and certification framework c. Create digital passport system d. Activate industry and partners, provide ongoing management, insight generation for key skills, development programs and gaps	1	M	H
18. Workforce value proposition research and development a. Conduct research into the value proposition for working in the meat processing sector b. Conduct market analysis to identify opportunity and challenges for attracting and retaining staff c. Collaborate with the sector to identify improvement opportunities Conduct implementation program d. Build knowledge and pathways to attract workforce	2	H	H
19. Industry workforce strategy for future skills needs a. Conduct research to identify and quantify the skills needed in the future, including shaping the future roles b. Conduct strategic planning for addressing future skills needs c. Develop training and education programs d. Partnership and collaboration across industry, government and education institutions e. Monitoring and evaluation of progress and results	2	H	H

	Horizon	VFM	Fit
20. Build industry capacity to innovate a. Design and run a series of innovation challenges with industry and partners b. Conduct innovation training, networking and mentoring programs c. Build a collaborative innovation platform and orchestrate activity d. Sponsor collaborative innovation projects	2	H	H
21. AMPC becomes a GTO and provides training and accreditation a. Gain accreditation b. Develop training programs with industry c. Develop curriculum, trainer recruitment d. Put in place quality assurance systems	3	M	M

Business model and supply chain – high level scoring

	Horizon	VFM	Fit
22. Continuous improvement strategies, tools and support a. Practice development b. Expert support c. Monitoring tools	1	M	H
23. Enhance collaboration along and across value chain a. Conduct industry value chain mapping, identifying key areas of potential collaboration b. Facilitate a range of pilots to leverage collaboration c. Design supports to encourage the broad-based adoption of enhance collaborative practices	2	H	H
24. Meat pricing models a. Conduct research into existing and future pricing models b. Carbon and sustainability price signals c. Support capability development and practice change	2	H	M
25. Improve resilience to shocks and disruptive events a. Detailed supply chain risk assessment b. Contingency planning c. Monitoring and support	2	M	H
26. Sustainability and ethical certification program a. Certification process b. Training and capacity building c. Certifications	2	M	M
27. Biodiversity partnerships for processors a. Risk assessment b. Partner identification	2	M	M
28. Research and help sector plan for future business models a. Establish playbook for business model innovations b. Conduct training and development c. Prepare transition plans	3	M	H
29. SDG reporting framework, tools and guidelines a. Develop of framework, tools and guidelines b. Develop industry standards for measurement and monitoring of sustainability footprint of processors and supply chain	3	H	H
30. Circular economy strategy for the sector a. Resource flows mapping b. Product and packing redesign c. Supply chain optimisation d. Partnerships and collaborations	3	M	H
31. Carbon neutral processing and value chain strategy including effects of carbon pricing Carbon footprint assessments Emissions reductions measures Carbon offset investment opportunities	3	M	H
32. Transition pathways to synthetic protein manufacturing a. Transition strategy b. Transition supports c. Regulatory compliance	3	M	H

Research and development – high level scoring

	Horizon	VFM	Fit
33. Strengthen existing AMPC services a. Improve processor engagement b. Improve project delivery and benefit realisation including outcome funding c. Improve targeting of investments to increase sector coverage d. Strengthen AMPC market access supports e. Strengthen and diversify adoption and technology transfer f. Strategic risk monitoring and preparedness g. Increase frequency and depth of future scanning and co-planning of responses with industry	1	H	H
34. Diversify AMPC services a. Industry ecosystem mapping b. Increasing levels of industry innovation c. Co-create and launch a mission challenge d. Develop an open innovation program e. Develop processing R&D sandbox and digital twin f. Support market development activities (processor, technology vendors etc)	2	H	H
35. Digital transformation of AMPC a. Digital tools b. Digital capability development	2	M	H
36. AMPC system investments a. CRM b. Industry digital innovation platform c. Knowledge management system	2	M	H
37. Transform government partnerships and collaborations a. Market access b. Food security c. Public health d. Regulatory design	3	H	H
38. AMPC impact reporting framework a. Objective setting b. Metrics and indicator preparation c. Data collection d. Analysis and reporting e. Improvement programs	3	H	H
39. Strengthen local and global innovation partnerships a. Identify partners including with research organisations and key industries b. Develop partnership framework c. Establish collaborative programs and sharing	3	H	H
40. Create a transformational investment funding model a. Diversify funding sources such creating attractive funding pathways for institutional and corporate funding, and co-investment from adjacent sectors b. Identify and prioritise funding gaps across the innovation ecosystem c. Create solutions to bridge gaps including AMPC co-funding d. Implement and support participants and funders to better enable markets	3	H	H

Example: Low risk portfolio

	Horizon 1 (Core) Focuses on incremental improvements to existing products, processes, and services. These are low-risk innovations that aim to optimise and enhance current business and practices	Horizon 2 (Adjacent) Developing new markets, products or services that are adjacent to the current business. These innovations require moderate investment and are designed to leverage existing capabilities	Horizon 3 (Transformational) Breakthrough innovations that have the potential to disrupt the industry and create new business models. These are high-risk projects with a longer time horizon and significant investment in R&D
Consumer	1. Lift consumer knowledge and brand perception	2. Future consumer innovation program 3. Processor revenue diversification program 4. Invest in direct-to-consumer enablers	5. Personalised nutrition and functional foods
Tech / Ops	6. Industry benchmarking program	7. Next generation automation and industrialisation program 8. Achieve world's best practice in safety and hazard management 9. Processor fundamental models 10. Digital transformation of meat processing 11. Supply chain innovation program 12. Next generation industrial quality program	13. Build industry sustainability 14. Fostering trust (social licence to operate) 15. New material applications
People	16. Diversity and inclusion programs 17. Industry skills passport	18. Workforce value proposition research and development 19. Industry workforce strategy for future skills needs 20. Build industry capacity to innovate	21. AMPC becomes a GTO and provides training and accreditation
BM and SC	22. Continuous improvement strategies, tools and support	23. Enhance collaboration along and across value chain 24. Meat pricing models 25. Improve resilience to shocks and disruptive events 26. Sustainability and ethical certification program 27. Biodiversity partnerships for processors	28. Research and help sector plan for future business models 29. SDG reporting framework, tools and guidelines 30. Circular economy strategy for the sector 31. Carbon neutral processing and value chain strategy including effects of carbon pricing 32. Transition pathways to synthetic protein manufacturing
R&D	33. Strengthen existing AMPC services	34. Diversify AMPC services 35. Digital transformation of AMPC 36. AMPC system investments	37. Transform government partnerships and collaborations 38. AMPC impact reporting framework 39. Strengthen local and global innovation partnerships 40. Create a transformational investment funding model

Example: Balanced portfolio

	Horizon 1 (Core) Focuses on incremental improvements to existing products, processes, and services. These are low-risk innovations that aim to optimise and enhance current business and practices	Horizon 2 (Adjacent) Developing new markets, products or services that are adjacent to the current business. These innovations require moderate investment and are designed to leverage existing capabilities	Horizon 3 (Transformational) Breakthrough innovations that have the potential to disrupt the industry and create new business models. These are high-risk projects with a longer time horizon and significant investment in R&D
Consumer	1. Lift consumer knowledge and brand perception	2. Future consumer innovation program 3. Processor revenue diversification program 4. Invest in direct-to-consumer enablers	5. Personalised nutrition and functional foods
Tech / Ops	6. Industry benchmarking program	7. Next generation automation and industrialisation program 8. Achieve world's best practice in safety and hazard management 9. Processor fundamental models 10. Digital transformation of meat processing 11. Supply chain innovation program 12. Next generation industrial quality program	13. Build industry sustainability 14. Fostering trust (social licence to operate) 15. New material applications
People	16. Diversity and inclusion programs 17. Industry skills passport	18. Workforce value proposition research and development 19. Industry workforce strategy for future skills needs 20. Build industry capacity to innovate	21. AMPC becomes a GTO and provides training and accreditation
BM and SC	22. Continuous improvement strategies, tools and support	23. Enhance collaboration along and across value chain 24. Meat pricing models 25. Improve resilience to shocks and disruptive events 26. Sustainability and ethical certification program 27. Biodiversity partnerships for processors	28. Research and help sector plan for future business models 29. SDG reporting framework, tools and guidelines 30. Circular economy strategy for the sector 31. Carbon neutral processing and value chain strategy including effects of carbon pricing 32. Transition pathways to synthetic protein manufacturing
R&D	33. Strengthen existing AMPC services	34. Diversify AMPC services 35. Digital transformation of AMPC 36. AMPC system investments	37. Transform government partnerships and collaborations 38. AMPC impact reporting framework 39. Strengthen local and global innovation partnerships 40. Create a transformational investment funding model

Example: Transformational portfolio

	Horizon 1 (Core) Focuses on incremental improvements to existing products, processes, and services. These are low-risk innovations that aim to optimise and enhance current business and practices	Horizon 2 (Adjacent) Developing new markets, products or services that are adjacent to the current business. These innovations require moderate investment and are designed to leverage existing capabilities	Horizon 3 (Transformational) Breakthrough innovations that have the potential to disrupt the industry and create new business models. These are high-risk projects with a longer time horizon and significant investment in R&D
Consumer	1. Lift consumer knowledge and brand perception	2. Future consumer innovation program 3. Processor revenue diversification program 4. Invest in direct-to-consumer enablers	5. Personalised nutrition and functional foods
Tech / Ops	6. Industry benchmarking program	7. Next generation automation and industrialisation program 8. Achieve world's best practice in safety and hazard management 9. Processor fundamental models 10. Digital transformation of meat processing 11. Supply chain innovation program 12. Next generation industrial quality program	13. Build industry sustainability 14. Fostering trust (social licence to operate) 15. New material applications
People	16. Diversity and inclusion programs 17. Industry skills passport	18. Workforce value proposition research and development 19. Industry workforce strategy for future skills needs 20. Build industry capacity to innovate	21. AMPC becomes a GTO and provides training and accreditation
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R&D	33. Strengthen existing AMPC services	34. Diversify AMPC services 35. Digital transformation of AMPC 36. AMPC system investments	37. Transform government partnerships and collaborations 38. AMPC impact reporting framework 39. Strengthen local and global innovation partnerships 40. Create a transformational investment funding model

5.2. Selected opportunity profiles

1. Lift consumer knowledge and brand perception

PRIORITY | CRITICAL

Description

This marketing and brand development program aims to elevate consumer knowledge and perception of Australian red meat products. This initiative aims to provide comprehensive information on nutritional benefits, taste and flavor profiles, product use, cooking tips, and the overarching benefits of choosing Australian meats. By fostering a unified voice, the program will ensure consistent messaging, enhance credibility, achieve broader market reach, and build an interactive platform for key stakeholders. Ultimately, this will strengthen the international brand of Australian processed meats, meeting diverse global consumer needs and preferences while reinforcing Australia's reputation for producing high-quality, sustainable, and ethically sourced meats.

Rationale

The initiative aims to transforming consumer knowledge, build trust, and strengthen global brand presence of Australian red meats. By leveraging a unified voice and consistent messaging, the program will enhance consumer perceptions, drive demand, and support sustainable growth for the Australian red meat industry. Investing in this initiative aligns with the industry's long-term goals of quality, sustainability, and ethical production. Educating consumers on the nutritional benefits, taste profiles, versatile uses, and sustainability practices of Australian red meats is crucial for building trust and loyalty. Informed consumers are more likely to make purchase decisions based on the comprehensive understanding and perceived value of the products. A central voice, such as AMPC, can ensure that all communications are consistent, accurate, and aligned with the overall brand strategy. This unified approach will enhance the credibility of the information and reinforce the positive perception of Australian red meats..

Uniqueness / Fit

This initiative enhances existing marketing efforts from MLA and individual processors, transforming them into a cohesive global brand and marketing campaign. It aligns with AMPC's strategic goals to elevate the Australian meat processing sector's international reputation.

Criticality and readiness for investment

This investment is vital for industry development and global competitiveness, releasing value from synergies across the sector.
Potential for near-term investments, and ongoing program to develop brand.

- Critical investment
- Market Ready

Investment profile

Represents a scalable and sustainable investment over the short, medium and longer term and potential for collaboration with other RDCs. Investment levels can be regularly adjusted based on market dynamics and opportunities that may arise.

- Size per annum
- Less than 1m
- 1 – 5m
- 5m+

Benefit profile

Creates a unified brand, enhancing consistency and credibility. It educates consumers on key attributes they value, builds trust and loyalty while driving demand and market expansion. The program amplifies the impact of marketing efforts through coordinated campaigns, optimising resource use.

- Revenue
- Productivity
- Reduce Risk
- Sustainability
- People

Risks and sensitivities

Navigating authorising environment to invest in this area with MLA.
Leveling the playing field between some competitors.
Impact of individual processor or producer actions and risks on brand.

Implementation considerations

Consider starting with a targeted brand program and develop this over multiple years. As program matures, build internal capability to capture and analyse data. Maintain co-ordination with MLA regarding scope and sharing insights. Also consider both consumer and wholesale marketing and branding campaigns.

Case Studies

Wine Australia collaborates with Australian wine producers to promote Australian wines abroad through shared marketing efforts. By participating in trade shows, organising wine tastings, and conducting targeted marketing campaigns, Australian wine exporters have been able to expand their market reach and increase demand for Australian wines.

Zespri operates as a cooperative of kiwifruit growers who collectively market their produce under the Zespri brand. By pooling their resources and coordinating marketing efforts, Zespri has successfully positioned New Zealand kiwifruit as a premium product in international markets, driving up demand and commanding higher prices.

Various coffee cooperatives across Latin America, Africa, and Asia have come together under the Fair Trade label to collectively market their coffee to international buyers. By leveraging the Fair Trade brand, these cooperatives have improved market demand for their products by appealing to socially conscious consumers who are willing to pay a premium for ethically sourced coffee.

Champagne producers, represented by various champagne houses and cooperatives, have made shared investments in marketing and branding initiatives to promote Champagne as a premium sparkling wine. Champagne is marketed based on its association with luxury, celebration, and French craftsmanship.

2. Future consumer innovation program

PRIORITY | CRITICAL

Description

A Future consumer innovation program could provide AMPC and the meat processing industry with comprehensive, actionable insights into consumer behaviours, preferences, and perceptions, as well as better understand competitor profiles and market trends. This investment area could leverage advanced research methodologies, data analytics, and collaborative industry efforts to drive product innovation.

This would likely involve investments into market research, including consumer surveys and focus groups, as well as cultural and regional analysis for key export markets. Social media monitoring and analysis of consumer sentiment could also provide the industry with valuable information on consumer experience, brand perception and emerging trends and issues. AMPC and industry could utilise this information in a structured program of consumer centric product development. This investment can target horizon 1, 2 or 3 impacts depending on desired impact i.e. from immediate to transformation change. It could be combined with initiative 1 to provide a comprehensive growth platform for Australian processed meat products.

Rationale

For AMPC and the meat processing industry, understanding consumer needs and what they value is fundamental to:

- Maintaining competitiveness - helps the industry tailor products to meet the tastes and demands of different markets and consumer preferences.
- Ensuring compliance - understanding what consumers expect in terms of product quality, safety, and ethical standards helps ensure that the industry complies regulations.
- Driving innovation - insights into consumer preferences and experiences can guide the development of new products and innovations. Understanding what consumers value most allows the industry to enhance product features that matter, such as taste, convenience, nutritional benefits, and ethical sourcing.
- Economic performance - can lead to increased sales and profitability. Satisfied consumers are more likely to pay a premium for brands they trust and perceive as quality.

Uniqueness / Fit

This investment offers a deeper understanding of markets relevant to meat processors and directly applies insights to product development. Additionally, it enables more frequent and timely feedback to processors, enhancing their ability to adapt to market demands swiftly.

Criticality and readiness for investment

This investment is critical to driving the competitiveness of Australian meat products, enhancing revenue, profitability, and industry capability and capacity. This is applicable to the entire industry, and a shared investment can generate scale and scope efficiencies.

Market Ready

Critical investment

Investment profile

Consideration could be given to the level of ongoing investment being made across the industry in this area today, the minimum level of investment needed to contribute meaningful across key international markets and the contribution to portfolio return on investment available from this area.

Size per annum

Less than 1m

1 – 5m

5m+

Benefit profile

This investment can enhance international competitiveness for the industry, improve consumer satisfaction, strengthen brand loyalty and grow market share. It can also lead to cost avoidance, promote industry sustainability, enhance attractiveness for top talent, and reduced compliance risk.

Revenue

Productivity

Reduce Risk

Sustainability

People

Risks and sensitivities

Increasing investment in this area could be sensitive to industry who may perceive this overlaps with their competitive advantage, and to MLA who may see this as an overlap or conflict with the interests of their broader membership.

The quality and reliability of this research should be carefully managed.

Implementation considerations

AMPC could consider expanding its partnership with MLA to support this initiative, either by providing increased funding to MLA or by taking a more active role in leading and contributing directly to the identified areas. It could also consider a wider range of partners in the protein, packaging or food industry.

AMPC could consider targeting any or all horizons with this program.

Case Studies

Beef+Lamb NZ initiated a collaborative effort involving industry stakeholders to invest in comprehensive consumer research aimed at understanding changing consumer preferences and market trends. This initiative led to the development of targeted marketing strategies, product innovations, and brand positioning, resulting in increased demand for New Zealand beef and lamb products.

The Centre for Food Integrity is a non-profit organisation that facilitates collaboration among food producers, processors, retailers, and consumer groups to address issues related to food integrity, transparency, and consumer trust. Through shared investments in consumer research, CFI conducts surveys, focus groups, and communication studies to identify consumer concerns, build trust, and enhance dialogue between stakeholders. This has transformed the food industry by promoting transparency, accountability, and ethical practices across the supply chain.

The Food Fortification Initiative is a global initiative between companies, research institutions, and government to invest in research projects aimed at creating sustainable food systems. Through shared investments in consumer research, members collaborate on initiatives such as understanding consumer attitudes towards sustainable food products, developing plant-based alternatives, and promoting CE principles. This model has the potential to transform the environmental performance, social equity, and food security.

3. Processor revenue diversification program

PRIORITY | HIGH

Description

This initiative aims to empower Australian processors to diversify their revenue streams through product and service differentiation, premiumisation, and market expansion initiatives. The program does this through research into revenue growth opportunities, capability building within the industry, and the development and launch of new revenue-generating activities in collaboration with industry stakeholders.
Through this program, AMPC could conduct research to identify potential revenue growth opportunities for Australian processors; develop and enhance the capabilities of processors through training, workshops, and mentorship programs focused on product development, marketing strategies, brand building, and market expansion; facilitate collaboration within and across the industry value chain and beyond to develop, launch, and market new revenue-generating activities, such as premium products and brands, value-added services, and by-products utilisation; support processors in expanding their market reach by facilitating partnerships with food service and retail outlets, exploring export opportunities, and leveraging e-commerce platforms; promote sustainable and resilient business practices among processors to ensure long-term viability and competitiveness in the market.

Rationale

Australian processors must remain agile in response to shifting consumer preferences, market dynamics, and competitive pressures. Through this initiative, processors can strengthen their resilience, elevate their competitiveness, and bolster their profitability within a changing marketplace. This not only enables processors to anticipate and adapt to evolving consumer trends but also empowers them to proactively innovate, introducing novel products and services tailored to meet emerging needs. Additionally, this initiative positions processors at the forefront of industry innovation, fostering unique and evolving points of differentiation that set them apart from international competitors. By enhancing revenue performance, processors not only ensure their own sustainability but also contribute to a broader range of economic and social benefits, particularly in regional Australia. This, in turn, cultivates a more vibrant and dynamic industry landscape, attracting and retaining top talent drawn to the promise of growth and innovation.

Uniqueness / Fit

Careful consideration of spend in this program should differentiate broad based industry level research and capability development, vs specific research which individual processors would be expected to conduct themselves, in order to avoid cost shifting.

Criticality and readiness for investment

Given the dynamic nature of the market and the increasing competitive pressures faced by processors, the need for investment in revenue initiatives is critical. This initiative can address immediate market challenges while building capability for long-term success and resilience within the industry.

- Market Ready
- Critical investment

Investment profile

Investment includes funding for research, capability building, and the development and launch of new revenue-generating projects. Funding sources may include government grants, industry contributions, and AMPC investments, with a focus on maximising returns and long-term sustainability.

Size per annum
Less than 1m
1 – 5m
5m+

Benefit profile

This is expected to lead to higher revenue and profitability for processors, processors gaining competitive advantage, drive sustainable growth and long-term viability for the Australian processing sector.

- Revenue
- Productivity
- Reduce Risk
- Sustainability
- People

Risks and sensitivities

Changes in consumer preferences, market demand, and competitive dynamics could impact the success of revenue growth initiatives.
Implementation challenges may pose risks to project execution and outcomes.
Financial risks including return on investment expectations and cost shifting.

Implementation considerations

Collaboration with industry stakeholders, research organisations, and government agencies is critical for the success of revenue growth initiatives.
The initiative should be flexible and adaptable to evolving market conditions, consumer trends, and industry dynamics, whilst also building longer term capabilities.

Case Studies

Revenue diversification is a long-established practice in the private sector. For example, Cargill, one of the largest privately-owned companies in the world, has established an innovation centre dedicated to developing new products, technologies, and solutions across its various business segments, including agriculture, food ingredients, and animal nutrition. Through this initiative, Cargill collaborates with customers, suppliers, and partners to co-create innovative products and address emerging market needs, thereby creating diversified revenue opportunities and driving growth.

Many research institutes conduct revenue diversification studies for the agricultural sector (such as Aberystwyth University in their 2022 research into farm business diversification). These investigate the opportunities and challenges, including balancing core vs ancillary revenue opportunities.

Multiple Australian RDCs have conducted research into revenue diversification opportunities and assisted in capability development in product innovation for their sectors. For example, GRDC conducted research into the diversification of farming businesses, and the range of skillsets and lessons learnt involved. They also publish research into pricing, margins and profitability of farms, to inform diversification decisions.

6. Industry benchmarking program

PRIORITY | CRITICAL

Description

The Industry Benchmarking Program, led by AMPC, represents a transformational shift in the level of collaborative across the sector, aimed at fostering knowledge exchange, evaluating performance, and driving continuous improvement across the meat processing sector. This initiative entails benchmarking key operational metrics, identifying leading practices, and innovative strategies not only within the meat processing domain but also among a diverse array of pertinent industries. By engaging in this program, participating meat processors stand to elevate their competitive edge, operational efficiency, and sustainability practices.

This program could also transform the way AMPC serves the sector, enabling data-driven insights and informed dialogue regarding enhancement opportunities. Designed to encompass both meat processors and relevant industries, this program will enable comprehensive comparisons of performance metrics and practices. AMPC could facilitate collaborations among participating entities, fostering the exchange of insights and innovations that create mutual benefit. The program holds the potential to accelerate transformative advancements, driving excellence and resilience across the meat processing sector and beyond.

Rationale

The meat processing sector operates within a dynamic and competitive environment, facing evolving consumer preferences, regulatory requirements, and market pressures. This initiative allows meat processors to better understand where their performance can be improved, in a confidential way which protects their critical business information. This allows for both cost efficiency, risk management and revenue generating improvements. By leveraging insights and methodologies from other industries, such as manufacturing, technology, and logistics, the program seeks to identify opportunities for process optimisation, cost reduction, and value creation. Additionally, cross-industry benchmarking fosters a culture of innovation, collaboration, and learning, driving long-term strategic growth and resilience for participating companies. Such collaboration is unlikely to evolve across the sector without a trusted party like AMPC being involved.

Uniqueness / Fit

This program is unique in Australia, and the multi-industry aspect is unique for meat processing internationally. The initiative's focus on performance assessment and continuous improvement aligns well with the goals of AMPC.

Criticality and readiness for investment

There are pressing needs for the meat processing sector to adapt and improve in an increasingly complex and competitive landscape. As global markets evolve and consumer preferences shift, meat processors face mounting pressure to enhance their operations and differentiate.

Market Ready

Critical investment

Investment profile

This program has the potential to deliver significant returns in operational efficiency, market competitiveness, and long-term sustainability. While initial investment may be required to establish the infrastructure and framework for the benchmarking program, the benefits are likely to far outweigh the costs.

Size per annum

Less than 1m

1 – 5m

5m+

Benefit profile

This program can enable improvement opportunities, stimulate innovation from diverse industries, enhance risk management, identify emerging threats, and developing proactive strategies to mitigate risks. It can position AMPC as a catalyst for collaboration and operational improvement.

Revenue

Productivity

Reduce Risk

Sustainability

People

Risks and sensitivities

Protecting sensitive business information and proprietary data shared during benchmarking activities to prevent competitive disadvantages or breaches. Data compatibility issues, organisational resistance to change, and resource constraints in individual processors.

Implementation considerations

Engage industry stakeholders to build support and collaboration. Develop standardised methodologies, metrics, and data collection protocols. Establish a governance framework to manage data and information. Establishing mechanisms for regular feedback, performance monitoring, and knowledge sharing. Evaluate program outcomes, impact, and effectiveness regularly and report results.

Case Studies

The Meat Industry Excellence Benchmarking Project in New Zealand involves collaboration between stakeholders to benchmark performance and identify opportunities for improvement within the red meat processing sector. By analysing indicators such as yield, efficiency, and value-added processing, participating companies can benchmark their performance, implement best practices, and drive improvements in efficiency, quality, and competitiveness.

North American Meat Institute Benchmarking Program, in collaboration with industry partners, has established a benchmarking program to assess and compare operational performance metrics across meat processing facilities in North America. By sharing best practices, identifying opportunities for improvement, and setting industry standards, this initiative has driven transformational changes in production processes, quality control measures, and food safety protocols within the meat processing sector.

The USDA's Meat Market News Program is a shared investment initiative that provides timely and accurate market information, including price benchmarks, supply-demand trends, and industry performance metrics, to stakeholders in the red meat and livestock sectors. By facilitating transparent price discovery, market analysis, and risk management, this program has transformed market dynamics, facilitated informed decision-making, and enhanced market efficiency and competitiveness for meat processors and producers.

7. Next generation Automation program

PRIORITY | HIGH

Description

The next-generation automation program aims to extend current automation efforts by harnessing the power of intelligent automation to redefine production processes and elevate industry standards. This forward-looking initiative integrates state-of-the-art technologies such as robotics, AI, machine learning, and data analytics into every facet of meat processing operations. By integrating these advanced technologies throughout the meat processing environment, the program aims to optimise workflow, enhance equipment availability, and drive down the overall cost of automation solutions.

The program could target critical areas within meat processing facilities, including the boning room, kill floor, and development of cutting technologies. By investing in R&D in these critical areas, the program seeks to unlock new levels of efficiency and productivity, ultimately transforming the way meat products are processed and distributed.

In addition, the programs could create a range of scalable automation and augmentation solutions for operations of all sizes. These are likely to be more targeted in their application, open source, and involve greater levels of standardisation.

Rationale

The meat processing industry has to continually innovation to maintain competitiveness and sustainability in an increasingly dynamic market landscape. Automation holds the key to unlocking new levels of efficiency, productivity, and quality control, driving operational excellence and cost optimisation throughout the production process. By integrating intelligent automation technologies such as smart robots, IoT sensors, and AI-driven predictive modeling, meat processors can streamline operations, minimise downtime, and make data-driven decisions to optimise resource allocation and production planning. This proactive approach to automation not only enhances operational efficiency but also future-proofs the industry, positioning it for continued growth and resilience in the face of evolving market demands and challenges. It allows for ongoing improvement in the use of labour and creates a range of higher skilled industries, roles and careers.

Uniqueness / Fit

This program builds on current automation programs, but extends it throughout meat processing, adds greater levels of intelligence, better integration with humans in the production process, and creates a range of more scalable and cost-effective solutions. Market solutions are not readily available, which suits public investment.

Criticality and readiness for investment

There is urgent need for the meat processing industry to embrace automation and innovation to stay competitive in the global market. Investing in the next-generation of automation solutions is likely to require a medium to long term commitment to build the knowledge and market.

Market Ready

Critical investment

Investment profile

This program may require sustained investments by AMPC and industry to realise its full potential. Intelligent automation is at an early stage, with few locally available partners outside of research organisations. Key to realising benefits, would be careful partner selection for the program, and robust IP management.

Size per annum

Less than 1m

1 – 5m

5m+

Benefit profile

Benefits could include improved operational efficiency, enhanced equipment availability, reduced labor costs, and increased product quality and consistency. This program could also open automation opportunities for all players, and lead to the creation of higher skilled roles in the industry.

Revenue

Productivity

Reduce Risk

Sustainability

People

Risks and sensitivities

Initial investment costs to realise commercial solutions.

Technical complexities associated with system integration.

Data security issues with the increased use of IoT sensors and AI technologies.

Ability to develop local market and contain automation costs.

Implementation considerations

Identify a prioritised list of automation opportunities. Stakeholder engagement and buy-in are crucial as it properly protecting IP. Consider how markets for these solutions can be developed and sustained. Consider a strategic partnerships with industry, technology providers and research institutions to accelerate the implementation process and mitigate risks associated with technology adoption.

Case Study

The Intelligent Automation Centre at Loughborough University is a pioneering research hub dedicated to advancing the field of intelligent automation across various industries. With a focus on cutting-edge technologies such as robotics, AI, machine learning, and data analytics, the Centre collaborates with industry partners to develop innovative solutions that drive efficiency, productivity, and sustainability.

The centre works with a range of manufacturing companies to develop a next-generation production lines, incorporating state-of-the-art automation technologies to optimise efficiency and productivity. Key components of the solution included advanced robotics, IoT sensors, and AI-driven analytics, all integrated with human operators to create a collaborative manufacturing environment. IoT sensors are strategically placed throughout the manufacturing lines to capture real-time data on equipment performance, product quality, and environmental conditions.

Advanced robotics systems are integrated into the production process, working alongside human operators to perform complex tasks with speed and precision. Human-robot collaboration is facilitated using intuitive interfaces and safety mechanisms, enabling safe interaction between humans and machines.

9. Processor fundamental models

PRIORITY | CRITICAL

Description

This initiative aims to improve the scalability, efficiency and cost of the meat processing industry by establishing standardised processing models encompassing essential processes, systems, technology, workflows, and design principles applicable across a spectrum of meat processing operations. Moreover, the initiative aims to establish key standards and interfaces to be universally adopted by equipment vendors operating within the processing landscape. By developing standardised models and blueprints, the initiative seeks to equip meat processors with a dynamic toolkit to optimise operations, enhance adaptability, and foster innovation amidst the evolving industry landscape. Drawing insights from leading practices in international meat processing and relevant manufacturing industries, this initiative endeavours to craft optimal designs, drive efficiencies, and mitigate risks. Multiple horizons and capability pathways can be developed, to enable diverse specialisations while benefit from increased standards. Furthermore, standardised models serve as a crucial enabler for benchmarking activities, enabling industry players to gauge performance and identify improvement opportunities effectively.

Rationale

The meat processing sector is facing a range of complex challenges stemming from disparate production methods, diverse equipment configurations, and varied operational practices, resulting in escalating costs, inefficiencies, inconsistencies, and scalability limitations. By establishing fundamental models and modular designs, the initiative seeks to streamline operations, mitigate waste, and improve productivity. Standardisation simplifies the integration of automation technologies across multiple suppliers. Moreover, standardised processes and designs foster a common language among industry stakeholders, fostering knowledge exchange, collaboration, and continuous improvement efforts. By promoting data standards and driving down the cost of equipment, this initiative serves as a strategic investment in the future of the meat processing industry, positioning it for sustainable growth, resilience, and enhanced competitiveness in the global marketplace. This initiative improves labour attraction and use across the sector.

Uniqueness / Fit

This initiative creates new standards for meat processing industry development into the future. This creates a new role for AMPC to lead improvement of interoperability across the sector, improving the cohesiveness of the ecosystem and industry workforce.

Criticality and readiness for investment

Given the increasing demand for efficiency and flexibility in meat processing operations, and growing technology investment and automation cost, investment in standardised processes and modular designs is critical for the industry's long-term competitiveness.

- Market Ready
- Critical investment

Investment profile

Funding for research and development, stakeholder engagement, and the establishment of industry standards would be needed. Investments in standard development are likely to be modest compared to the overall benefits, however, are likely to take several years to fully materialise.

- Size per annum
- Less than 1m
- 1 – 5m
- 5m+

Benefit profile

Potential for enhanced efficiency, scalability, and interoperability. Standardised processes and modular designs enable meat processors to streamline operations, adapt to changing market demands, and integrate new technologies more easily. They also promote more cost-effective solutions.

- Revenue
- Productivity
- Reduce Risk
- Sustainability
- People

Risks and sensitivities

Resistance to change from traditional industry players.
Challenges in aligning competing interests among stakeholders.
Delays in standardisation efforts.
Adoption and implementation of standardised processes and equipment.

Implementation considerations

Support collaboration among industry stakeholders, including meat processors, equipment manufacturers, and global standards bodies. Stakeholder engagement, technology adoption strategies, and ongoing monitoring and evaluation are warranted to encourage compliance with industry standards. Investment in workforce training and capacity building to support adoption.

Case Studies

The Open Manufacturing Platform is a collaborative initiative founded by BMW Group and Microsoft, aiming to accelerate the development of smart factory solutions through standardisation. It focuses on creating open standards and data models to enhance interoperability across manufacturing systems. By fostering collaboration among manufacturers, technology providers, and solution integrators, the OMP has developed shared standards that reduce integration costs and complexity, driving innovation and efficiency in smart manufacturing.

The Industry 4.0 Standards Initiative by the German Electrical and Electronic Manufacturers' Association (ZVEI):

ZVEI, the German Electrical and Electronic Manufacturers' Association, runs an initiative involving multiple stakeholders from the manufacturing sector collaborating to develop and implement Industry 4.0 standards. It aims to standardise communication protocols and interfaces to enhance interoperability and integration of smart manufacturing technologies. This includes a reference model (RAMI 4.0) which gives companies a framework for developing future products and business models. The initiative has led to the creation of standardised frameworks and guidelines that are widely adopted across the industry, facilitating smoother integration of new technologies and improving overall efficiency.

11. Supply chain innovation program

PRIORITY | HIGH

Description

The Supply Chain Innovation Program aims to create the next generation digital supply chain for the meat processing sector, improving performance, sustainability and driving innovation within the meat processing sector. Addressing the critical need for reliable, cost-efficient cold chain distribution systems, this program ensures comprehensive traceability extending beyond the paddock-to-processor scope, covering the entire journey to the retailer and, ultimately, the consumer's plate. By integrating advanced technologies such as IoT, blockchain, and AI with standardised processes and collaborative practices, the program focuses on optimising supply chain efficiency, resilience, and overall performance.
The program involves a detailed mapping and improvement of key supply chains to uphold high standards of performance and integrity. This entails identifying potential supply chain challenges and developing appropriate responses, which may include market development initiatives and infrastructure investment opportunities. Additionally, the program aims to define and promote the development of superior cold chain services, including robust temperature controls and monitoring systems, to ensure the integrity of premium export products, identify in-transit issues, and optimise supply chain operations from farm to fork. The program seeks to elevate the meat processing sector's global competitiveness and sustainability.

Rationale

The meat processing sector faces significant challenges, including complex logistics, fluctuating demand, and stringent regulatory requirements. Current traceability systems do not adequately cover the supply chain beyond the processor, leading to inefficiencies and gaps in product tracking. This program aims to address these issues by creating a seamless and intelligent supply chain that enhances visibility, reliability, and cost-effectiveness. This initiative will streamline operations, reduce inefficiencies, and improve overall supply chain performance, ensuring the sector's competitiveness and sustainability in the global market. Through collective supply chain development, the industry can also benefit from economies of scale. Through supply chain innovation, the sector can benefit from a wider range of services which improve the attractiveness of premium Australian red meat product.

Uniqueness / Fit

The program focuses on the needs of the meat processing industry. The program aligns with the broader strategic goals of AMPC to promote efficiency, sustainability, and growth within the sector. The integration of advanced technologies and services provides opportunities to differentiate export products.

Criticality and readiness for investment

This investment is important to lift the international competitiveness of the sector, address existing inefficiencies and enhance the resilience of the meat processing supply chain. Coordinated action with industry and supply chain partners is required.

- Market Ready
- Critical investment

Investment profile

The investment profile includes funding for technology development, stakeholder collaboration, market development and the establishment of standardised processes. Funding could support training and capacity building to ensure industry-wide adoption of new technologies and practices.

- Size per annum
- Less than 1m
- 1 – 5m
- 5m+

Benefit profile

Improved supply chain visibility, efficiency, and traceability. Better decision-making and demand forecasting. Reduce operational costs and increase responsiveness to market changes. Enhance the sector's ability to provide high-value services and maintain quality and safety of product.

- Revenue
- Productivity
- Reduce Risk
- Sustainability
- People

Risks and sensitivities

Resistance to change from industry stakeholders, technological integration challenges, and potential disruptions during the transition to new systems.
Data privacy and security concerns, particularly with the use of IoT and blockchain technologies.

Implementation considerations

Implementation would likely involve a multi-phase approach, starting with maturity and gap assessments, pilot projects to validate technologies and processes before scaleup. Key considerations include stakeholder engagement, technology integration, and continuous monitoring and evaluation. Prioritisation of key markets and improvement opportunities will enable the program to realise benefits faster.

Case Studies

The Cool Chain Association (CCA) is a not-for-profit membership organisation which helps industries and companies implement best practices and standardised procedures to ensure the efficient transport of perishable goods. The CCA's initiatives include the development of industry standards for temperature-controlled logistics and the promotion of collaboration among stakeholders. These efforts improved the reliability and efficiency of transporting temperature-sensitive goods, such as pharmaceuticals, fresh produce, and flowers.

Nestlé implemented a robust supply chain for its fresh dairy products, which require constant refrigeration. Nestlé employed IoT sensors and real-time monitoring systems to ensure temperature control from production to retail. This initiative minimised spoilage and waste, ensuring that fresh dairy products reached consumers in optimal condition.

UPS Healthcare partnered with Cryoport to enhance its cold chain logistics capabilities for the biopharmaceutical sector. This collaboration provided a comprehensive supply chain solution for time- and temperature-sensitive therapies, such as cell and gene therapies. Cryoport's advanced cryogenic logistics solutions ensured precise temperature control, while UPS's global network offered rapid and reliable delivery.

13. Build industry sustainability

PRIORITY | CRITICAL

Description

This initiative is designed to transform the meat processing sector into a model of environmental stewardship and operational excellence. This initiative focuses on identifying, developing, and implementing cutting-edge sustainability solutions across the entire value chain, from farm to fork. Key areas of focus include enhancing energy efficiency through renewable energy sources and innovative technologies, optimising processing practices to reduce resource consumption, implementing advanced waste reduction and recycling methods, and developing sustainable packaging solutions. Additionally, the initiative aims to mitigate the urban impacts of processing plants by employing best practices in noise reduction, odour control, and emissions management. The program will incentivise and support the implementation of Sustainable Development Goals (SDG) and continuous improvement programs to ensure ongoing progress and adaptation to emerging sustainability challenges. These efforts include contributions to SDGs such as clean water and sanitation (SDG 6), affordable and clean energy (SDG 7), responsible consumption and production (SDG 12), climate action (SDG 13), life on land (SDG 15), and decent work and economic growth (SDG 8).

Rationale

The meat processing industry is under increasing pressure to adopt sustainable practices due to growing consumer demand for environmentally friendly products, stringent regulatory requirements, and heightened awareness of climate change and resource scarcity. Traditional processing methods are often resource-intensive, generating significant waste and emissions, and contributing to urban environmental issues such as noise, odors, and air pollution. This creates a pressing need for innovative solutions that can enhance efficiency, reduce environmental impacts, and build a positive relationship with surrounding communities. This initiative addresses these challenges by promoting a comprehensive approach to sustainability that encompasses the entire value chain. A proactive and centralised response will likely result in a faster and better response from industry to this changing environment.

Uniqueness / Fit

This initiative positions AMPC as a leader of sustainability within the meat processing sector. By adopting an approach that encompasses the entire value chain, AMPC aims to drive significant improvements in environmental performance and operational efficiency.

Criticality and readiness for investment

Investment in sustainability is critical for the long-term viability of the meat processing sector. Increasing consumer demand and regulatory pressures, mean a proactive and rapid response is needed. AMPC's leadership can help ensure that resources are quickly mobilised to the most critical areas.

Market Ready

Critical investment

Investment profile

Funding is needed for research and development of sustainable technologies, stakeholder engagement, and the implementation of pilot projects. Initial investments could focus on identifying sustainability challenges, developing scalable solutions, and piloting technologies before industry-wide adoption.

Size per annum

Less than 1m

1 – 5m

5m+

Benefit profile

Enhanced environmental performance, reduced operational costs, and improved societal outcomes. Promotes environmental conservation and reduces the carbon footprint. Fosters inclusive workplaces, enhances the sector's reputation, strengthens consumer trust, and long-term viability.

Revenue

Productivity

Reduce Risk

Sustainability

People

Risks and sensitivities

Resistance to change from industry stakeholders, the cost of implementing new technologies, and potential disruptions during the transition to more sustainable practices. Sensitivities around fair work practices and economic growth will also need careful management

Implementation considerations

A multi-phase approach is needed, starting with the identification of key sustainability challenges and opportunities. Pilot projects will be conducted to test and refine solutions before broader rollout. Incentive programs may be needed to encourage industry-wide adoption.

Case Study

Field to Market, a multi-stakeholder initiative in the United States, brings together farmers, food companies, retailers, conservation groups, and academic institutions to advance sustainable agriculture practices. Through collaborative efforts, Field to Market has developed science-based metrics and tools to measure and improve the environmental performance of commodity crop production, leading to enhanced soil health, water conservation, and biodiversity conservation.

SAI Platform is a global membership organisation that facilitates collaboration among leading agricultural companies to promote sustainable farming practices. Through shared investments in research, knowledge sharing, and capacity building, SAI Platform members have made significant progress in areas such as climate-smart agriculture, water management, and biodiversity conservation, contributing to improved sustainability across the agricultural supply chain.

The Global Roundtable for Sustainable Beef (GRSB) brings together stakeholders from across the beef value chain to promote sustainable beef production. Through collaborative efforts, GRSB members have developed principles and criteria for sustainable beef production, established regional roundtables to address local sustainability challenges, and facilitated knowledge sharing and capacity building among producers, processors, retailers, and consumers.

14. Fostering Trust (Social licence to operate)

PRIORITY | CRITICAL

Description

This initiative is dedicated to cultivating trust and transparency throughout the industry. This initiative aims to develop and implement a robust trust framework including key principles, standards of practice, code of conduct, communications and engagement, enabling monitoring and reporting systems, as well as a governance model including continuous improvement and risk management functions. Key issues which could impact Trust include ensuring food safety and quality, health and nutrition, high standards of animal welfare, product authenticity and integrity, environmental impact, labour practices, industry transparency, ethical and social responsibility, as well as market and economic impacts such as fair pricing. Emerging issues including ethical standards in the use of technology including AI, additives and new materials such as nanotechnology, antibiotic resistance, blockchain and data privacy, contribution and response to climate change, microplastics contamination, biodiversity loss, and long-term health impacts of meat consumption.
Through education and building understanding, as well as translating this to practical conduct, AMPC can help to build and sustain confidence and enhance industry reputation.

Rationale

Trust is the cornerstone of a sustainable and thriving meat processing industry. Concerns surrounding social licence issues, such as food safety, quality, nutritional value, and animal welfare practices have challenged consumer trust in recent years. Addressing these concerns and fostering transparency is imperative to building and sustaining trust and safeguarding the industry's integrity. This initiative recognises the critical role that trust plays in ensuring consumer confidence, market competitiveness, and long-term industry sustainability. By building a strong Trust framework in the industry, which prioritises key issues, translates those to practice, and monitors conduct, AMPC aims to reinforce trust throughout the supply chain and strengthen industry reputation.

Uniqueness / Fit

While individual processors are responding to some of social licence issues, this initiative broadens that to a complete framework to develop conduct and practice which build and sustain trust on an industry level. This enables AMPC to address industry-wide challenges, promote excellence, sustainability, and integrity.

Criticality and readiness for investment

Investing in trust-building is critical to maintain consumer confidence and safeguarding the industry's reputation. With increasing consumer expectations and regulatory scrutiny, the industry has an opportunity to proactively respond to these issues in a transparent and ethical way.

- Market Ready
- Critical investment

Investment profile

The investment profile would include funding for the development and implementation of an industry wide trust framework, including key performance areas, industry code of conduct, educational programs and implementation of technology solutions for monitoring and reporting.

- Size per annum
- Less than 1m
- 1 – 5m
- 5m+

Benefit profile

This initiative offers numerous benefits, including enhanced consumer confidence, improved industry reputation, and strengthened market access and competitiveness. By promoting transparency, authenticity, and ethical practices, the initiative helps to support long-term industry sustainability.

- Revenue
- Productivity
- Reduce Risk
- Sustainability
- People

Risks and sensitivities

Resistance to change from industry stakeholders, concerns about data privacy and security, and challenges related to technology adoption and implementation. Sensitivities may exist including prioritising industry trust-building initiatives (compared with revenue or productivity) and the delivery of tangible benefits.

Implementation considerations

An industry Trust framework should ideally be developed in an open and transparent manner, including industry, government, consumers, and various interest groups. A key implementation decision will likely be the degree to which a mandatory code of conduct or certification program is used.

Case Study

Ethical Trading Initiative is an alliance of companies, trade unions, and NGOs that promote ethical labour practices. This focuses on improving working conditions and workers' rights in global supply chains. The initiative helps companies in various industries improve labour practices and gain consumer trust.

Global Animal Partnership is an animal welfare rating program that assesses and certifies organisations based on their treatment of animals. The program uses a tiered system (Steps 1-5+) to rate animal welfare, including access to pasture, environmental enrichment, and humane slaughter practices. A labeling scheme provides clear information to consumers to help them make informed choices.

Sustainable Apparel Coalition is a global alliance of apparel, footwear, and textile companies committed to sustainable production. The Higg Index tools measure sustainability performance across the supply chain. This helps companies in the apparel industry improve their sustainability practices and gain consumer trust.

Sustainable Rice Program is a global multi-stakeholder alliance promoting sustainable rice cultivation. Standards cover resource use efficiency, climate resilience, and social equity. The certification offered by this program helps rice producers demonstrate sustainability and gain market access.

30. Circular economy strategy

PRIORITY | HIGH

Description

This initiative aims to transform the meat processing sector by integrating CE principles into existing sustainability initiatives. While AMPC is already making strides in individual processor sustainability, through water, waste, energy, and packaging development, this initiative extends to a more comprehensive, interconnected approach to resource efficiency and waste minimisation across value chains and local economies. The initiative focuses on applying CE principles to meat processing, the supply chain, economies, and the entire lifecycle of products and packaging. This includes: rendering and repurposing of by products; advanced waste management; energy efficiency, capture and renewable energy use; packing innovation by developing packaging innovations which are biodegradable, recyclable or reuseable; promoting use of materials that can be continuously cycled, reducing the need for virgin resources; initiatives to reduce product waste in the supply chain such as losses in distribution, and shelf-life extension to reduce product waste; building more sustainable supply chains; and engaging consumers in awareness to promote the benefits of CE and encouraging sustainable consumption. The initiative will use a combination of research, collaboration projects, training and capacity building, monitoring and evaluation, and policy and regulatory design.

Rationale

The meat processing industry consumes large amounts of energy, water, chemicals and materials for packaging, and generates significant amounts of waste and by-products, which present both environmental challenges and untapped economic opportunities. By adopting a CE approach, the industry can reduce its environmental footprint, enhance sustainability, and create new revenue streams. This initiative will help processors capitalise on emerging trends in sustainability and meet growing consumer and regulatory demands for environmentally responsible practices. It will also contribute to the industry's long-term resilience and competitiveness by turning waste into valuable resources. Measurement, monitoring and certification of processors and value chains which meet CE principles, will become more critical into the future. Engaging consumers in the industry efforts and building their knowledge and support will be important to strengthen trust and further differentiate the product globally.

Uniqueness / Fit

This initiative extends existing AMPC sustainability initiatives such as water, waste, energy and packaging, building in principles of circularity. AMPC is suited to lead this initiative given the immaturity of CE principles in meat processing and the ability to facilitate collaboration across diverse stakeholders.

Criticality and readiness for investment

The urgency of addressing environmental sustainability and waste in the meat processing sector makes this initiative a critical. The readiness for investment is high, given the existing interest and commitment from industry stakeholders and the availability of advanced technologies and expertise.

- Market Ready
- Critical investment

Investment profile

The initiative will require an investment to research and develop of CE technologies and processes, form partnerships with technology providers and industry, undertake training and capacity-building programs, measurement and monitoring activities, as well as marketing and communication.

- Size per annum
- Less than 1m
- 1 – 5m
- 5m+

Benefit profile

The benefits of this initiative include: reduced environmental impact through decreased waste and emissions; new revenue streams from the sale of recycled and repurposed by-products; enhanced brand reputation and marketability through sustainable practices; improve compliance.

- Revenue
- Productivity
- Reduce Risk
- Sustainability
- People

Risks and sensitivities

High initial investment costs and uncertain return on investment.
Potential resistance to change from industry stakeholders.
Technical challenges in developing and implementing new processes.
Market fluctuations affecting the demand for recycled products.

Implementation considerations

Quantify resource use, waste streams and by-products to identify opportunities for CE practices. Conduct research into application of circularity principles in meat processing. Develop pilot projects to test and refine CE technologies and processes. Provide training and capacity building for industry to adopt new practices.

Case Studies

The Kalundborg Eco-Industrial Park is an example of applying circular principles in a location, where companies in the region share resources and by-products to minimise waste. For example, excess heat from a power plant is used by a nearby fish farm, and sludge from the fish farm is used as fertiliser by local farmers. This exemplifies the use of network thinking where waste from one process becomes a resource for another, enhancing resource efficiency and reducing overall waste.

The Ellen MacArthur Foundation's Circular Economy 100 (CE100) Network brings together businesses, innovators, cities, and governments to collaborate on CE initiatives. Projects include developing products designed for disassembly and recycling, creating regenerative supply chains, and implementing reverse logistics for material recovery. This supports a CE by promoting systemic changes across industries, facilitating collaborations that create value from what would traditionally be considered waste.

Nestlé has committed to achieving zero waste to landfill in its operations. This involves reducing food waste through improved production processes, redistributing surplus food to communities in need, and recycling or repurposing by-products. For example, coffee grounds are used to produce biofuel and compost.

37. Transform government partnerships

PRIORITY | CRITICAL

Description

This initiative aims to enhance and transform the extent, diversity and impact of partnerships between AMPC, the red meat industry, and various government departments to achieve greater levels of collaboration regarding common objectives. Several areas of collaboration are possible, including market access, trade and export development, food security, public health, regulation design, realising a Future Made in Australia, jobs and skills, regional development, and supporting a transition to a net-zero economy. This initiative seeks to align industry goals with public policies, ensuring that the meat processing sector thrives while meeting regulatory and societal expectations.
Careful design of the program and roles is needed, to create an effective and timely partnership to achieve shared goals. This will need to create effective and detailed dialogue backed by research, on key industry issues and effective government responses, effective pathways to action, as well as a strong positive incentive to collaborate (which could include collaboration with industry bodies to achieve consistent public awareness and advocacy regarding key issues). Furthermore, AMPC could consider leading proactive industry responses in some areas, such as industry self-regulation.

Rationale

Government partnerships are crucial for the meat processing industry to navigate complex and evolving regulatory environments, expand market access, enhance sustainability, and improve overall industry conditions. By fostering deeper relationships with government entities, AMPC can help shape policies that support the industry's growth and sustainability. Collaborative efforts can unlock new export opportunities, bolster food security, and elevate public health standards. Involving the industry in regulatory design ensures policies are practical and effective, aligning with national objectives. Such partnerships also promote workforce development and regional growth, ensuring the industry's resilience and capability to meet future challenges. A proactive engagement strategy is likely to generate more significant benefits for the industry compared to a reactive approach. Additionally, this engagement strategy aligns with AMPC's responsible use of public funds, maximising the value and impact of investments.

Uniqueness / Fit

AMPC's unique position allows it to bridge the gap between the meat processing sector and government agencies. This initiative fits within AMPC's strategic goals by promoting industry advancement through collaboration and innovation.

Criticality and readiness for investment

Investing in this initiative is critical as the meat processing sector faces increasing regulatory scrutiny, market competition, and pressure to reduce environmental impact. Readiness is high, given the established relationships and need for immediate action to deliver policy and industry objectives.

Market Ready

Critical investment

Investment profile

Investments are likely to include an expanded government relations team, funding research efforts to support policy development, establishing collaborative platforms and forums for regular industry-government dialogue and leading industry development events and forums.

Size per annum

Less than 1m

1 – 5m

5m+

Benefit profile

Enhanced market access, consumer awareness and market share, improved regulatory environment, improved industry sustainability, sustainment of funding, access skilled labour and transition support. For government, it enables realisation of policy objectives and enhanced collaboration with industry.

Revenue

Productivity

Reduce Risk

Sustainability

People

Risks and sensitivities

Potential changes in government policies could impact the initiative’s focus or effectiveness.
Resistance from within the industry, government or advocacy bodies.
Securing appropriately skilled resources.

Implementation considerations

Establish internal capability and align with key agencies and policy objectives. Consider both commonwealth and state government priorities and roles. Ensure that broad based, relevant and positive/constructive industry voice is involved. Collaborate with industry partners including Australian Meat Industry Council (AMIC) and MLA to create and disseminate a whole of industry narrative.

Case Study

CSIRO, Australia's national science agency, stands out for its collaborative approach with the government, spanning diverse partnerships across multiple industries, academia, and international organisations.
CSIRO tackles significant challenges with sustained research in these areas. They often focus on complex interconnected issues and rapidly seize emerging opportunities for national benefit. They have built strong capabilities in technology transfer, commercialisation, and policy advice, to translate research into innovative products, services, and solutions, driving economic growth and societal impact.
In terms of collaboration with government, they:

- carefully align their research agenda with government priorities through active engagement including identification of key challenges and opportunities.
- play a significant role in providing evidence-based policy advice to government, effectively combining scientific, economic and policy skills.
- actively collaborate with government to facilitate technology transfer and commercialisation of research.
- collaborate across multiple sectors and disciplines.

This integrated model which balances sustained research with flexibility and adaptability, helps to position CSIRO at the forefront of scientific and technological innovation, contributing significantly to Australia's competitiveness and sustainability.

40. Create a transformational investment funding model

PRIORITY | CRITICAL

Description

This initiative aims to establish a transformational investment funding model for AMPC and the meat processing industry, through building an open and collaborative investment platform which attracts diverse investors from institutional, corporate, government and adjacent sectors. By leveraging partnerships with innovators, the program seeks co-investment that are focused on longer-term, complex issues identified as critical for the meat processing sectors future, both locally and globally. While individual investors objectives may vary, projects could have a demonstratable benefit to the whole meat processing sector to be considered suitable investments. AMPC levy funds could be co-invested through this program. The platform will attract investors, through the opportunity for significant impacts in the meat processing sector, to gain access to innovative solutions, provide strong market and financial potential, have favourable regulatory and policy support. Transparency and governance will need to be commercial investment grade to build trust and confidence with potential investors. An effective communications and engagement model will also be needed, to maximise global investor participation. AMPC will need to integrate this into existing advisory panels and governance models.

Rationale

This initiative aims to transform the meat processing industry by establishing a collaborative investment platform that attracts additional research funding, fosters commercialisation, and generates returns for AMPC members. By attracting and harnessing diverse financial and research resources, the initiative accelerates innovation, enhances competitiveness, and addresses large scale challenges within the sector. Through strategic partnerships with innovators, it facilitates the seamless translation of research findings into tangible products and services, driving economic growth and sustainability. Crucially, the initiative aligns with AMPC's goal of delivering tangible returns to its members, ensuring that successful projects yield dividends that can be reinvested to further benefit the industry. Through an independent investment platform, the processing industry can prioritise and accelerate transformative investments for members.

Uniqueness / Fit

This initiative aligns with AMPC's mission to drive innovation and progress in the meat processing sector. However, it has the potential to overlap with the MLA owned MDC. Careful positioning will be needed to align and distinguish the two funds.

Criticality and readiness for investment

The initiative focuses on projects that benefit the entire meat processing sector, ensuring investments address critical industry needs. With a clear emphasis on longer-term, complex issues, the initiative will offer strategic opportunities for investors.

- Market Ready
- Critical investment

Investment profile

In addition to the financial resources required for projects, establishing and running this program will involve setup costs (such as legal and administrative expenses, technology, and staffing), and ongoing costs (such as governance, compliance, project selection, due diligence, M&E, marketing, communication)

Size per annum

- Less than 1m
- 1 – 5m
- 5m+

Benefit profile

This initiative offers a wide range of benefits, including enhanced efficiency, product quality, and market competitiveness. By fostering collaboration and innovation, the initiative accelerates the development and adoption of cutting-edge technologies and practices.

- Revenue
- Productivity
- Reduce Risk
- Sustainability
- People

Risks and sensitivities

Risks include regulatory hurdles, building suitable commercial grade fund management skills, investment failures and associated brand damage. Sensitivities include managing conflicts of interest, distinguishing from other funds, project selection, resource allocation.

Implementation considerations

Effective implementation of the initiative entails establishing robust governance structures, transparent decision-making and effective communication and marketing. Care should be taken in distinguishing this fund from others in the sector and ensuring appropriate levels of skilled management. Learn from the successes and challenges of other funds. Managing project selection and investment risk.

Case Studies

The MLA Donor Company drives innovation throughout the Australian red meat and livestock industry, ensuring its sustained competitiveness in the global arena. By fostering collaboration and attracting commercial investment from individual enterprises and partners, the MDC facilitates co-investment in innovative projects aimed at advancing the industry. This includes Government matching of voluntary partner contributions for eligible projects.

The Hort Frontiers strategic partnership initiative facilitates cross industry investments that tackle complex issues. Five investment themes have been identified, including healthy living, adaptation and resilience, market growth, disruptive technologies and capability building. The initiative forms strategic partnerships around key industry issues, including industry, investors, innovators and government. Hort Innovation manages the establishment of the investment and the outcomes that are delivered to the sector and project partners.

Agriculture Innovation Australia (AIA) targets big, cross-sectoral opportunities and challenges which will drive transformational change across Australian agriculture, fisheries and forestry. It aims to attract new and non-traditional investment into Australian Agriculture. AIA Its founding members include MLA and AMPC.

6. Recommendations and next steps

Recommendations: AMPC strategy

The current AMPC strategy aligns strongly with many themes identified in this research, confirming the validity of the previous strategic plan. However, industry feedback indicates a need for greater impact. This report suggests ways AMPC can:

Extending investments in current portfolio areas

AMPC should continue to invest in areas where further progress is warranted, such as:

- Extend Market access support including deeper partnership with government to reduce barriers and improve trade deals
- Next generation automation including end to end, lower cost and more diverse automation solutions
- Sustainability Initiatives including expanding to all 17 sustainable development goals and pursuing CE principles
- Social licence including widening focus to the full spectrum of issues and lead sector response
- Transform government partnerships including deeper and wider engagement and alignment with policy objectives and coordinated action

Adding new areas

To stay ahead of industry trends and demands, AMPC could explore investments in new areas such as:

- Building a focus on the end consumer including understanding consumers, identifying new markets and building product innovation capability
- Supply Chain Innovations including leading the development of superior cold supply chains using advanced technologies such as IoT, blockchain, and AI
- Processor revenue diversification including proactively identification, design and support for industry to pursue revenue growth
- Industry benchmarking program to create detailed operational performance comparisons for processors
- Industry standards program to lead development of standards for technology and practice across the sector

Adapting the model

AMPC should continue to adapt its model to better address current and future industry needs, such as:

- Strengthen services such as processor engagement, project delivery and outcome funding model
- Diversify services such as increasing industry innovation, mission based or open innovation models
- New funding model that attracts a wider range of investors and capabilities
- Digitally transform AMPC through targeted investments in digital tools and capabilities

Several strategic questions have emerged as we conducted this future scan:

Vision and alignment

- Do AMPC and the industry have a shared vision for the future of the meat processing industry?
- What does this shared vision look like, and what will be essential to its success?
- How can your initiatives best help the industry progress towards this future vision?

Role and influence

- How does AMPC best participate in and influence this evolution?
- Should AMPC act as a service provider to all processors, respond to market developments, proactively lead and influence market developments, or set the agenda/standards?
- How can AMPC measure performance and hold processors to account?

Investment strategy and decisions

- Where should AMPC invest versus where should the industry invest?
- Where should collaboration be pursued, or alternative funding models considered?
- How can AMPC best balance its portfolio breadth, focus, risk/return, and emphasis on disruption?

Research and Development

- How can AMPC overcome gaps in research investment?
- What strategies can address issues over multiple stages in your strategic plan?

Evolution and improvement

- How can AMPC best evolve what it does and how it does it?
- How can existing services be improved, and what additional services could be offered?
- How can you lift the innovation capability of the industry?

Collaboration and partnerships

- How can you elevate your partnership and collaboration potential?
- Should AMPC service the entire industry, and how can this be balanced with targeted initiatives?

Operating model and capabilities

- What does this mean for AMPC operating model and how will you develop your model over time?
- What capabilities do you need, and how will you acquire them?
- How much will you invest in digital enablement to support these changes?

Recommendations: Adjusting your investment portfolio

Key Considerations for AMPC in adjusting your innovation portfolio

When adjusting your innovation portfolio, an essential decision will be how to strike the right balance between continuing to invest in current portfolio areas, addressing critical industry needs, and exploring transformative innovations.

In making this decision, some considerations may include:

Strategic alignment

- How do your investments align with the future vision for the industry?
- How do they respond to likely future challenges and opportunities?
- How well do they fit with AMPCs role, in particular what it considers to be within its investment mandate, vs that of individual organisations, or other R&D organisations in the ecosystem?
- How well do they fit with the use of public funds?
- Should you invest independently, collaborate with industry partners, or engage with other stakeholders where they may have a joint interest or ongoing investments?

Portfolio balance

- What balance is appropriate between growth opportunities, operational improvements, risk reduction, and building resilience?
- Time to impact: To what extend are shorter term vs longer term impacts needed and are possible?
- How will investments impact the processing industry and meet the needs of different segments?

Risk vs reward: What are the potential for returns and value for money for industry funds vs project/investment risk and how that fits within your level of risk tolerance?

The availability of funds or ability to attract new funds, to support various innovation initiatives

We have conducted a limited review and identification of potential top priority opportunities and a perspective on the primarily delivery model. Importantly, these have not considered the full context available to AMPC, and as such these should not be considered recommendations. AMPC should conduct appropriate due diligence in evaluating their investments and strategic plans including seeking appropriate advice where relevant.

Investment area	Rationale
1. Lift consumer experience and brand perception	Create evidence and demand, lead in shaping narrative with markets, common interest with other parts of the sector
2. Future consumer innovation program	Foundation of processing industry positioning into best value markets and opportunities
3. Processor revenue diversification program	Shared investment in identifying and activating these opportunities is likely to benefit the whole sector
6. Industry benchmarking program	High impact and value for money, unlikely to develop without AMPCs support
7. Next generation Automation program	Evidence that further automation and augmentation will be required, centralised development is a better approach, potential for investable opportunities with international market potential
9. Processor fundamental models	Greater levels of standardisation and efficiency, sets standards for industry and partners
11. Supply chain innovation program	The integrity and performance of supply chains is the next critical limitation on ability to service top tier markets, common interests with the supply chain and government in achieving these objectives
13. Build industry sustainability	Strong evidence this will be required, and central/coordinated investment is lower risk approach. Common interest with other parties including producers and retailers.
14. Industry Trust (Social licence to operate)	Fundamental industry issue, needs sector leadership and standards, better to be proactive vs reactive
30. Circular economy strategy	Multiple parties with common interests in achieving this goal
37. Transform government partnerships	Proactive engagement strategy is likely to benefit industry, alignment of priorities, use of public funds
40. Create a transformational investment funding	Create opportunities to substantially increase innovation funding and accelerate industry

Direct | Partner | New funding

Recommendations: AMPC strategic planning

AMPC have commenced early preparation for their strategic planning activities including the identification of broad external factors through this project. Set out below are a range of potential steps and considerations which may be useful in conducting high impact strategic planning activities.

Define objectives of the strategic planning
- Set Clear Goals: Establish the primary objectives for the strategic planning process, ensuring alignment with AMPC's long-term vision and mission.
- Determine the key strategic questions that need to be addressed to navigate future challenges and opportunities.

Identify full strategic fact base required
- Conduct a comprehensive internal review to assess current portfolio performance, identifying strengths, weaknesses, and areas requiring continued financial support.
- Gather and analyse portfolio data and relevant information to understand progress and identify further opportunities to benefit the industry.
- Incorporate insights from future scans to anticipate and evaluate trends and their potential implications for the sector and AMPC.

Assess strategic implications of fact base
- Create an integrated view of how identified trends and factors will likely impact the industry, considering scenarios where these issues are addressed or not.
- Assess the strategic implications of the data and trends, considering the potential risks and opportunities for the sector and AMPC.
- Build potential portfolios and strategic options for AMPC as you go

Create a vision for the future Australian Meat processing industry
- Engage stakeholders and seek their aspirations, goals and objectives.
- Articulate a compelling vision for the future which considers the key trends.
- Set strategic goals that are long term and align with the vision.

Identify, review and validate strategic choices
- Generate a list of key strategic options that address the identified trends and implications, including both your investment portfolio, as well as AMPC's strategic response.
- Rigorously evaluate these options, considering benefits, trade-offs, and potential impacts.
- Engage industry stakeholders in discussions to validate options and refine strategies.
- Share the findings and rationale with industry and other stakeholders.

Develop implementation plans
- Define the scope of initiatives required to implement the strategic choices.
- Consider implementation options, especially given AMPC's role and the use of public funds.
- Plan how to leverage public funds, address market failures, and utilise strategic partnerships and collaborations.

Set strategic goals and objectives
- Establish clear strategic goals, objectives, and measurable outcomes.
- Develop an expected timetable for achieving these goals, including key milestones.
- Build a robust investment logic that demonstrates how planned investments will contribute to objectives.
- Create a plan to ensure benefits are realised from investments, including an industry adoption plan.

Engage industry and report progress
- Plan for continuous industry engagement throughout the lifecycle of investments.
- Implement a framework for regular industry reporting to track progress and maintain accountability.
- Compile a comprehensive strategic plan and distribute it to industry stakeholders for feedback and alignment.

Governance arrangements
- Design and implement appropriate governance arrangements to oversee strategic planning and implementation.
- Create a strategic investment plan that allocates capital to prioritised areas, with specific investment gates and objectives for fund release.

Strategic workshop with the AMPC board
- Prepare a detailed agenda and materials for a strategic workshop with AMPC Board.
- Conduct the workshop to facilitate in-depth discussions on strategic choices, implementation plans, and investment priorities.
- Gather input from the Board, ensuring their insights and perspectives are integrated into the final strategic plan.
- Use the outcomes of the workshop to finalise the strategic plan, seeking Board approval for implementation.

Next steps

The Future scanning project has enabled the identification of a wide range of external factors that could have an impact on the meat processing industry, and a wide range of specific opportunities for AMPC to consider in its strategic planning process. Below we have identified some of the potential immediate next steps that may be needed when utilising these results and integrating them into your planning approach.

Analyse future scanning results

- Summarise key insights from the future scanning project, highlighting major trends, potential disruptions, and opportunities.
- Assess the potential impact of identified trends on the meat processing industry and AMPC specifically.
- Prioritise trends based on their potential impact and the urgency of addressing them.

Engage stakeholders

- Share the synthesised findings with key stakeholders, including AMPC management, industry partners, and relevant external experts.
- Identify and engage various stakeholder groups, including members, government, and partners.
- Gather feedback from stakeholders to refine the understanding of trends and their implications. Solicit both support and challenge areas.
- Organise discussions or workshops to validate the findings and gather diverse perspectives on strategic priorities.
- Integrate stakeholder input and feedback into the strategic fact base.

Conduct internal review and assessment

- Conduct a comprehensive review of AMPC's current strategic initiatives, performance, and portfolio.
- Identify gaps between current capabilities and what is needed to address the prioritised trends.
- Evaluate available resources, including financial, human, and technological, to understand constraints and opportunities.

Define an integrated workplan

- Create a comprehensive workplan that outlines the steps, timelines, and responsibilities for the strategic planning process.
- Establish key milestones and deliverables to ensure the strategic planning process stays on track.

Prepare for strategic workshop

- Plan a strategic workshop with AMPC Board and other key stakeholders.
- Create a detailed agenda that includes presentations of future scanning results, discussions on strategic options, and decision-making sessions.
- Develop comprehensive materials, including reports, presentations, and data visualisations, to facilitate the workshop discussions.
- Define clear objectives for the workshop, such as prioritising strategic initiatives and gaining alignment on key decisions.

Build an integrated engagement plan

- Develop a strategic engagement plan to bring various stakeholders along the strategic planning journey.
- Design a communication plan to ensure continuous engagement and transparency with stakeholders.
- Establish mechanisms for continuous feedback from stakeholders to ensure ongoing alignment and responsiveness.

Design implementation framework

- Outline a high-level implementation plan for the chosen strategic options.
- Develop indicative timelines and milestones for the strategic initiatives.
- Plan for the allocation of resources required to implement the strategic initiatives.
- Identify potential risks and develop mitigation strategies.

Finalise and approve strategic plan

- Compile the findings, strategic options, and implementation framework into a draft strategic plan.
- Review the draft with key stakeholders and refine it based on their input.
- Present the final strategic plan to AMPC Board for approval.

Establish monitoring and evaluation framework

- Establish key performance indicators (KPIs) to monitor the progress and success of strategic initiatives.
- Plan for regular reviews and adjustments to the strategic plan based on performance data and changing circumstances.

7. Appendix

Abbreviations

3 Dimensional (3D)
Agriculture Innovation Australia (AIA)
Artificial Intelligence (AI)
Augmented Reality (AR)
Australian Meat Industry Council
Australian Meat Processing Corporation (AMPC)
Automated Guided Vehicle (AGV)
Carbon Border Adjustment Mechanism (CBAM)
Chief Executive Officers (CEOs)
Circular Economy (CE)
Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)
Cool Chain Association (CCA)
Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Coronavirus (COVID-19)
Customer Relationship Management system (CRM)
Electric Vehicle (EV)
Electronic Waste (e-Waste)
Environmental and Social Risk Screening (ESRS)
Environmental Social and Governance (ESG)
European Data Portal (EDP)
European Investment Bank (EIB)
European Union (EU)
European Union Cattle Accreditation Scheme (EUCAS)
Extended Reality (XR)
Fifth Generation Technology Standard for Mobile Services (5G)
Food Regulatory Service (FRS)
Food Standards Australia New Zealand (FSANZ)
Global Research Alliance on Agricultural Greenhouse Gases (GRA)
Global Positioning System (GPS)
Global Roundtable for Sustainable Beef (GRSB)
Grains Research and Development Corporation (GRDC)
Gross Domestic Product (GDP)
Group Training Organisation (GTO)
Hazard Analysis Critical Control Points (HACCP)
High Pressure Processing (HPP)
Human Resources (HR)
Intellectual Property (IP)
International Financial Reporting Standards (IFRS)
International Organisation for Standisation (ISO)
International Sustainability Standards Board (ISSB)
Internet of Things (IoT)
Internet of Robotic Things (IoRT)
Key Performance Indicator (KPI)
Massachusetts Institute of Technology (MIT)
Machine to Machine (M2M)
Meat and Livestock Australia (MLA)
Medicines Manufacturing Innovation Centre (MMIC)
MLA Donor Company (MDC)
Modified Atmosphere Packaging (MAP)
Monitoring and Evaluation (M&E)
Net Promotor Score (NPS)
Non Government Organisation (NGO)
New Zealand (NZ)
People for Ethical Treatment of Animals (PETA)
Personal Protective Equipment (PPE)
Proctor & Gamble (P&G)
Quick Response (QR)
Radio Frequency Identification (RFID)
Reference Architecture Model Industrie (RAMI)
Research & Development (R&D)
Research and Development Corporate (RDC)
Return on Investment (ROI)
Robotic Process Automation (RPA)
Selective Compliance Articulated Robot Arm (SCARA)
Small Medium Enterprise (SME)
Sustainable Agriculture Initiative (SAI)
Sustainable Development Goals (SDG)
Taskforce on Nature-related Financial Disclosures (TNFD)
Technical University of Munich (TUM)
Technology Transfer Office (TTO)
Third Party Logistics (3PL)
United Kingdom (UK)
United Nations Climate Change Conference or Conference of the Parties of the UNFCCC (COP)
United States Department of Agriculture (USDA)
United States of America (USA)
University of California (UC)
Value for Money (VFM)
Virtual Reality (VR)

7.1 Appendix A

Future Scan Survey - Questions

Survey questions

Introduction

The Australian Meat Processing Corporation (AMPC) is conducting a Future Scan project, to help shape upcoming strategic and investment planning activities later in 2024. These planning activities will build on the diverse range of innovations which are underway and extend these to help the industry continue to evolve and thrive over the next decade and beyond.

The purpose of this survey is to provide the Australian Meat Processing industry with the opportunity to provide input to this activity.

This survey seeks your views on how the meat processing industry may evolve, key innovation priorities that may be needed, and how AMPC can best support the industry over the next 10 years.

Collection Notice

The information collected in this survey is being collected by Impact Advisors on behalf of AMPC to gather input from processors on their longer-term outlook for the industry.

All responses to this survey will remain confidential. Impact Advisors will consolidate findings in our report which will be shared with stakeholders such as AMPC, industry, relevant peak bodies, and Government.

If you have any questions about how your information will be handled, please email us at enquiries@impactadvisors.com.au.

Section 1: Introduction

What is the name of your organisation?

Survey questions

Section 2: Longer term outlook and development priorities

Thinking about the next 10 years

Question 1: What are the main trends that you believe will impact the meat processing industry? Open answer

Question 2: Rate the impact of the trends identified below on the meat processing industry, from 0-10, where 0 means no effect at all, and 10 means high impact.

a. Increasing consumer expectations such as quality, price, product origin, and social licence to operate

b. Increasing expectations for sustainable operations throughout the supply chain

c. Increasing regulation

d. Advancing Technology, including automation, data and AI

e. Increasing need for supply chain innovations such as traceability, collaboration, and integration

f. Increasing competition, cost and price pressure, and risk in domestic and international markets

g. Increasing product demand and criticality of food security

h. Strengthened focus on work health and safety

i. Increasingly difficult to find and retain suitable labour

j. Growing threat of disruption from decarbonisation and alternative meats

k. Other

Survey questions

Question 2: How will these trends change the industry?

Question 3: What are the key challenges that your business will face?

Question 4: What are the most innovative developments and practices in meat processing that you see worldwide?

Question 5: What are the key areas where your business or your industry could be disrupted?

Question 6: What opportunities do you see to learn from other industries to improve the meat processing industry? Name the industry and the focus e.g. Advanced and reliable automation in the automotive industry.

Question 7: Considering your previous responses, what areas do you recommend be considered for additional research and development investment over the next 10 years?

Section 3: Your perspectives regarding AMPC

Question 8: What AMPC services do you use?

Question 9 What benefits do you get from these services?

Question 10: What improvements should AMPC make in their business and operations to best support industry over the next 10 years?

Question 11: Overall, how satisfied are you with the services offered by AMPC?

0 1 2 3 4 5 6 7 8 9 10, where 0 means not satisfied at all, and 10 means highly satisfied.

What is the primary reason for your score?

7.2 Appendix B

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